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Traffic Impact and Access Study

**Apartment and Tavern Development
15 Mattakeesett Street
Pembroke, Massachusetts**

Prepared for:

**Crocker Design Group, Inc.
2 Sharp Street, Unit A
Hingham, MA 02043**

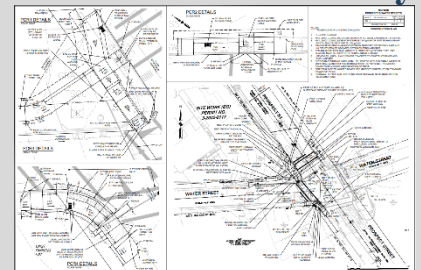
October 2, 2023



Quality



Accuracy



Integrity



Traffic Impact and Access Study

To:	Ms. Maggie Laracy	Reg:	Apartment and Tavern Development
	Crocker Design Group, Inc.		15 Mattakeesett Street
	2 Sharp Street, Unit A		Pembroke, Massachusetts
	Hingham, MA 02043		
From:	Kirsten Braun, P.E., Principal	Date:	October 2, 2023
		Project #:	22101

INTRODUCTION

Chappell Engineering Associates, LLC (CEA) has conducted this Traffic Impact and Access Study for the proposed age-restricted apartment and tavern development to be located at 15 Mattakeesett Street (Route 14) in Pembroke, Massachusetts. As proposed, the project consists of razing the existing funeral home on site and constructing a 66-unit age-restricted apartment development amongst three buildings. Building A will consist of 18 units while both Buildings B and C will contain 24 units each. In addition to the apartments, a fourth building will be constructed on site which will contain an approximately 4,580 square foot tavern with patio. Access to the site is proposed via two full access/egress driveways, the westerly of which will be located opposite the Pembroke Center Plaza. The site is bordered by Mattakeesett Street to the south, Rockland Trust Bank to the east, Boston Connect Real Estate to the west and undeveloped land to the north. The site location is shown on Figure 1.

This report has been prepared to assess the safety of the site driveways, estimate the increase in traffic as a result of the project, evaluate the impacts of that traffic on the adjacent streets and nearby intersections, and provide recommendations to improve traffic operations. As this report shows, adequate sightlines are provided at the existing site driveways to allow for safe operation. It is recommended that any proposed landscaping, fencing or signs in the vicinity of the site driveways be kept low to the ground or outside the sight triangles so as not to impede the available sight distances.

Traffic-volume increases are expected to be greatest on Mattakeesett Street, between the site's eastern driveway and Center Street, with increases expected in the range of 45 to 48 additional peak hour vehicles. These increases represent, on average, approximately one additional vehicle

every one to one and a half minutes during peak hours. Traffic increases on Center Street and on Mattakeesett Street west of the site are expected in the range of 11 to 29 additional vehicles, or approximately one additional vehicle every two to five and a half minutes. These increases are negligible and well within the daily fluctuation in traffic.

Figure 1
Site Location Map



As this study shows, construction of the apartment units and tavern is not expected to have an adverse impact on the study area. All approaches are expected to operate comparable between future No-Build and Build conditions. All site driveways are expected to operate at acceptable levels with minimal delays and queue lengths.

EXISTING CONDITIONS

Study Area

Evaluation of the traffic impacts associated with the proposed site development requires an evaluation of existing and projected traffic volumes, the volume of traffic expected to be generated by the project, and the impact that this traffic will have on the adjacent street. In preparing this study, the following intersections were analyzed and evaluated:

- Mattakeesett Street at Center Street
- Mattakeesett Street at Pembroke Center Plaza Driveway
- Mattakeesett Street at the proposed site driveways

The project is expected to have a minimal effect on traffic operations beyond this study area. The study area intersections and roadways are described in detail below.

Mattakeesett Street (Route 14) is classified as an urban minor arterial under town jurisdiction. Within the study area, Mattakeesett Street is a two-way street running in the northeast/southwest direction with one lane per direction separated by a double yellow center line with pavement in good condition. There are sidewalks along both sides of the roadway and shoulders wide enough to support bicycle traffic. The posted speed limit is 25 mph within the vicinity of the site. Land use within the study area is predominantly commercial with some residential uses.

Center Street (Route 14 & Route 36) is classified as an urban minor arterial under town jurisdiction. Within the study area, Center Street is a two-way street running in the north/south direction with generally one lane per direction separated by a double yellow center line with pavement in good condition. There are sidewalks on both sides of the roadway and no bicycle accommodations. Within the study area, the posted speed limit is 25 mph. Center Street is classified as Route 14 north of the intersection with Mattakeesett Street and Route 36 south of the intersection. Land use within the study area is a mix of municipal and commercial uses.

Mattakeesett Street (Route 14) and Center Street (Route 36) intersect to form a three-way signalized intersection. The southbound Center Street (Route 14) approach consists of a dedicated through lane and a channelized right turn lane that operates under yield control. The northbound Center Street (Route 36) approach consists of a dedicated left turn lane and a through lane. The eastbound Mattakeesett Street (Route 14) approach consists of dedicated left and right turn lanes.

There are crosswalks across the southern and western legs of the intersection as well as the southbound channelized right turn lane.

Mattakeesett Street (Route 14) and the Pembroke Center Plaza Driveway intersect to form a three way unsignalized intersection. The Mattakeesett Street approaches operate freely while the Pembroke Center Plaza driveway approach operates under STOP control. All approaches consist of a single shared-use lane. There is a crosswalk across the eastern leg of the intersection.

Traffic Volumes

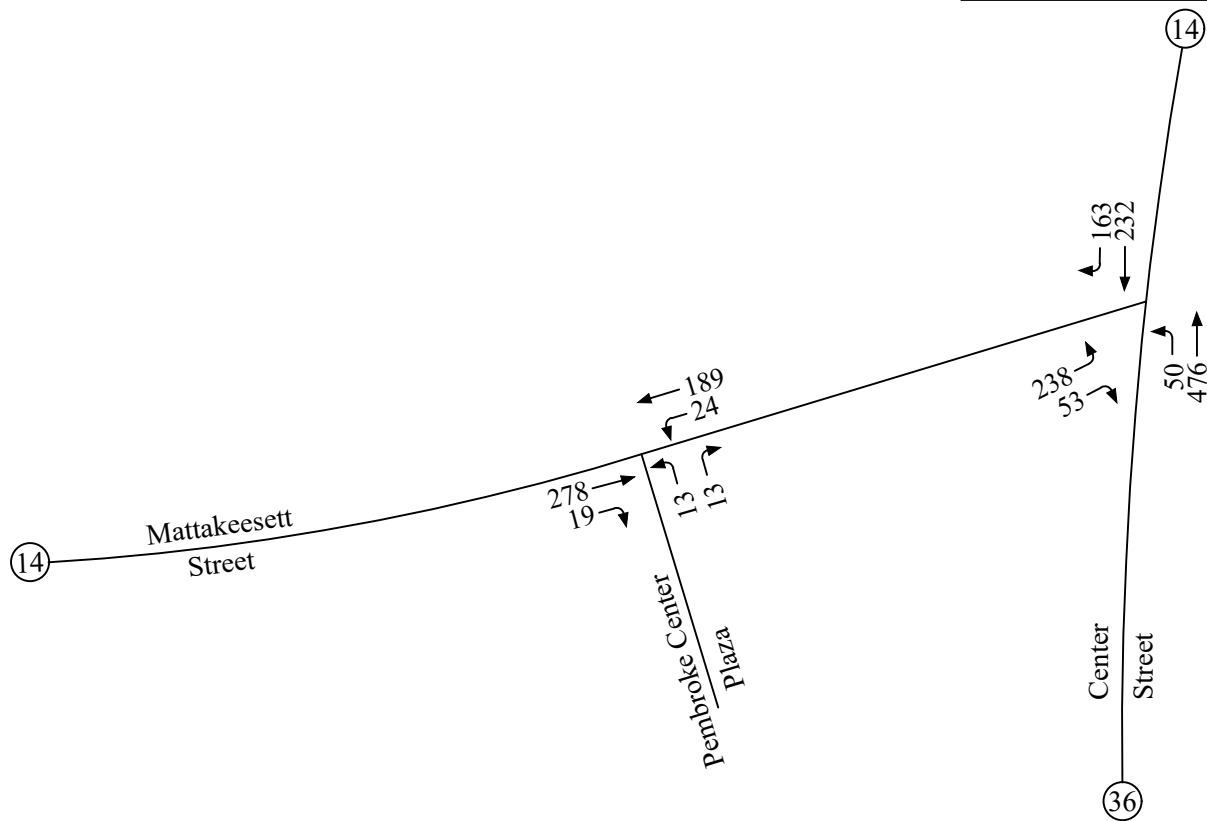
Base traffic conditions within the study area were developed by conducting automatic traffic recorder (ATR) counts on Mattakeesett Street to collect daily and peak hour traffic volume information. In addition, manual turning movement and vehicle classification counts (TMC's) were conducted at the study area intersections during the weekday AM peak period (7:00 to 9:00 AM) and the weekday PM peak period (4:00 to 6:00 PM). Both the ATR and the TMC counts were collected in January 2023. All traffic count data are provided in the Appendix. Individual intersection peak hours were used to present a conservative analytical framework.

To determine if the count data needed to be adjusted to represent annual average month conditions consistent with Massachusetts Department of Transportation (MassDOT) guidelines for traffic impact assessment, historical traffic volume data were obtained from MassDOT's Seasonal Weekday Adjustment Factor file. This document provides a monthly adjustment factor based on the roadway classification of the study roadways. Mattakeesett Street and Center Street are both classified as urban minor arterials (U4). This roadway classification has an adjustment factor of 1.01 for the month of January, meaning January represents a slightly lower-than-average traffic condition month. The collected counts were therefore upwardly adjusted by one percent to represent average-month conditions. The MassDOT Seasonal Adjustment Factor file is provided in the Appendix.

The MassDOT *Traffic and Safety Engineering 25% Design Submission Guidelines* were updated on May 31, 2022. These new directives note that traffic volume data collected after March 1, 2022 are no longer subject to any adjustments to represent pre-pandemic traffic volume conditions, except in areas where land use is predominantly office. Therefore, since the traffic volume data were collected in January 2023 and land use in the area is predominantly commercial, COVID adjustments do not need to be applied to the data. Table 1 summarizes the 2023 Existing traffic volumes on the study area roadways and the peak hour traffic flow networks provided are on Figure 2.

Figure 2
2023 Existing
Peak Hour Traffic Volumes

Weekday AM Peak Hour



Weekday PM Peak Hour

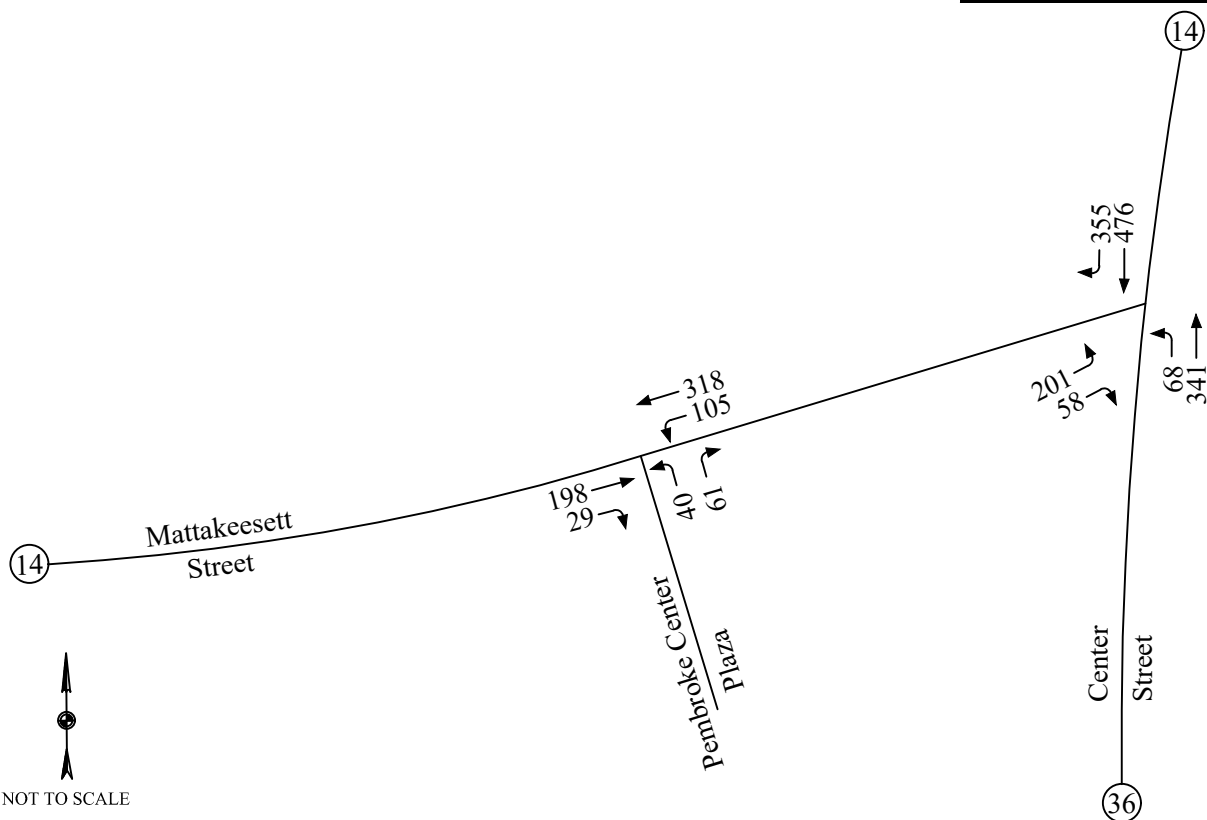


Table 1
Existing Traffic Volume Summary

Location	Daily Volume ^a	Peak Hour Volume ^b	K-Factor ^c	Directional Distribution ^d
Mattakeesett Street:				
Weekday	6,915	AM: 429 PM: 662	6.2% 9.6%	60% EB 60% WB

^a In vehicles per day.

^b In vehicles per hour.

^c Percentage of daily traffic occurring during the peak hour.

^d EB = eastbound, WB = westbound.

Crash Data

Crash data for the study area intersections were obtained from MassDOT for the period between 2015 and 2019, the latest five years of available data (excluding 2020 due to impacts on traffic volumes related to COVID). A summary of the MassDOT crash data at the study area intersections is provided in Table 2. In addition to the summary, crash occurrences should also be compared to the volume of traffic through a particular intersection to determine any significance. Accordingly, a crash rate was calculated for each intersection and compared with the statewide and district-wide averages. An intersection crash rate is a measure of the frequency of crashes compared to the volume of traffic through an intersection and is presented in crashes per million entering vehicles (crashes/MEV). For signalized intersections, the statewide average crash rate is 0.78 crashes/MEV and the district-wide (MassDOT District 5) crash rate is 0.75 crashes/MEV. For unsignalized intersections, the statewide average crash rate and the district-wide crash rate is 0.57 crashes/MEV. A comparison of the calculated crash rate to the statewide and district-wide averages can be used to establish the significance of crash occurrence and whether potential safety problems exist. The crash rate worksheets are provided in the Appendix.

Table 2
Accident Summary

Location	Number of Accidents			Severity ^a			Accident Type ^b						% During Wet/Icy Conditions
	Total	Avg./Year	Accident Rate ^c	PD	PI	U	CM	RE	HO	SV	SS	RR	
Mattakeesett Street at Center Street	11	2.2	0.39	8	3	0	2	7	1	1	0	0	45%
Mattakeesett Street at Pembroke Center Plaza	2	0.4	0.14	2	0	0	1	1	0	0	0	0	0%

Source: MassDOT Traffic Operations Safety Management System – 2015 through 2019 data.

^a PD = property damage only; PI = personal injury; U = unknown.

^b CM = cross movement/angle; RE = rear end; HO = head on; SV = single vehicle; SS = sideswipe; RR = rear to rear.

^c Measured in accidents per million entering vehicles.

As shown in Table 2, the intersection of Mattakeesett Street and Center Street experienced 11 crashes over the five-year period, averaging just over two crashes per year. Of the 11 total collisions, most (73 percent) resulted in property damage only. There were two angle type collisions (18 percent), seven rear-end type collisions (64 percent), one single vehicle type collision (9 percent) and one head-on collision (9 percent). The calculated crash rate of 0.39 is lower than both the statewide and district wide averages for signalized intersections.

The intersection of Mattakeesett Street and the Pembroke Center Plaza driveway experienced only two crashes over the five-year period. There was one rear-end type collision and one angle-type collision, both resulting in property damage only. The calculated crash rate of 0.14 is lower than both the statewide and district wide averages for unsignalized intersections.

Vehicle Speeds

Speed measurements were conducted along Mattakeesett Street adjacent to the site driveways by measuring the elapsed time for vehicles traveling a short, pre-measured distance between two checkpoints. The travel time was recorded using automatic traffic recorders and the speed is derived by dividing the elapsed time into the measured distance between checkpoints. The results of the speed measurements are summarized in Table 3.

Table 3
Observed Travel Speeds ^a

Location/Direction	Posted Speed Limit	Average Speed	85 th Percentile Speed ^b
Mattakeesett Street adjacent to the site			
Eastbound	25	19	24
Westbound	25	26	30

^a In miles per hour (mph).

^b Speed at, or below which 85 percent of all observed vehicles travel.

As shown in Table 3, the average travel speed along Mattakeesett Street adjacent to the site was found to be comparable to the posted speed limit of 25 miles per hour (mph) with 26 mph traveling westbound. Traveling eastbound however, the average travel speed was found to be slightly lower than the posted speed limit with 19 mph. Similarly, the 85th percentile speed traveling westbound was found to be slightly higher than the posted speed limit with 30 mph, while the 85th percentile speed traveling eastbound was found to still be slightly lower than the posted speed limit with 24 mph. The lower travel speeds traveling eastbound are likely due to the fact that vehicles are slowing as they approach the intersection. The higher of the posted speed limit or 85th percentile speed were accordingly used in the calculation of minimum sight distance requirements, as described below.

Sight Distance

To identify potential safety concerns associated with site access and egress, sight distances have been evaluated at the proposed site driveway intersections with Mattakeesett Street to determine if the available sight distances for vehicles exiting the site meet or exceed the minimum distances required for approaching vehicles to safely stop. The available sight distances were compared with minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO).¹ AASHTO is the national standard by which vehicle sight distance is calculated, measured, and reported. The MassDOT and the Executive Office of Energy and Environmental Affairs (EEA) require the use of AASHTO sight distance standards when preparing traffic impact assessments and studies, as stated in their guidelines for traffic impact assessments.

¹*A Policy on Geometric Design of Highways and Streets, 7th Edition*; American Association of State Highway and Transportation Officials (AASHTO); 2018.

Sight distance is the length of roadway ahead that is visible to the driver. Stopping Sight Distance (SSD) is the minimum distance required for a vehicle traveling at a certain speed to safely stop before reaching a stationary object in its path. The values are based on a driver perception and reaction time of 2.5 seconds and a braking distance calculated for wet, level pavements. When the roadway is either on an upgrade or downgrade, grade correction factors are applied. Stopping sight distance is measured from an eye height of 3.5 feet to an object height of 2 feet above street level, equivalent to the taillight height of a passenger car. The SSD is measured along the centerline of the traveled way of the major road.

Intersection sight distance (ISD) is provided on minor street approaches to allow the drivers of stopped vehicles a sufficient view of the major roadway to decide when to enter the major roadway. By definition, ISD is the minimum distance required for a motorist exiting a minor street to turn onto the major street, without being overtaken by an approaching vehicle reducing its speed from the design speed to 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet above street level. The use of an object height equal to the driver eye height makes intersection sight distances reciprocal (i.e., if one driver can see another vehicle, then the driver of that vehicle can also see the first vehicle). When the minor street is on an upgrade that exceeds 3 percent, grade correction factors are applied.

SSD is generally more important as it represents the minimum distance required for safe stopping while ISD is based only upon acceptable speed reductions to the approaching traffic stream. However, the ISD must be equal to or greater than the minimum required SSD in order to provide safe operations at the intersection. In accordance with the AASHTO manual, *"If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road."* Accordingly, ISD should be at least equal to the distance required to allow a driver approaching the minor road to safely stop.

The available intersection sight distances at the proposed site driveway intersections with Mattakeesett Street were measured and compared to minimum requirements as established by AASHTO. The 85th percentile speed traveling westbound on Mattakeesett Street was used over the posted speed limit of 25 mph to determine the minimum required sight distance looking left while the posted speed limit traveling eastbound was used to determine the minimum required sight distance looking right as it was found to be higher than the 85th percentile speed. The required minimum sight distances for these speeds are compared to the available distances, as shown in Table 4.

Table 4
Sight Distance Summary

Location/Direction	Sight Distance (feet)		
	Measured	Minimum Required (SSD) ^a	Desirable (ISD) ^b
Mattakeesett Street at Eastern Driveway			
East of intersection	200	200	280
West of intersection	500+	155	280
Mattakeesett Street at Western Driveway			
East of intersection	410	200	280
West of intersection	500+	155	280

^a Values based on AASHTO SSD requirements for the posted speed limit of 25 mph traveling eastbound and for the observed 85th percentile speed of 30 mph traveling westbound on Mattakeesett Street.

^b Values based on AASHTO ISD requirements for the posted speed limit of 25 mph on Mattakeesett Street.

As shown in Table 4, the available sight distances meet or exceed the minimum requirements at both driveways. To ensure the above sight lines are maintained, it is recommended that any proposed landscaping or signs in the vicinity of the site driveway be kept low (maximum 2 feet in height from street level) or set back outside the sight triangles (as defined by AASHTO) so as not to impede the available sight distances.

FUTURE CONDITIONS

Traffic Growth

Future traffic conditions were projected to the year 2030, representing a 7-year design horizon consistent with MassDOT requirements for traffic impact analysis and functional design reports for highway improvement projects. To project traffic conditions within this design horizon, two components of traffic growth were included. First, an annual average traffic growth rate was determined to account for general socio-economic growth and smaller development projects (i.e. residential subdivisions) that may impact traffic in the site vicinity. Based on MassDOT Transportation Data Management System information, the closest permanent traffic count station to the site with the most complete data is Station No. 7318 located on Route 3 north of Route 228 in Hingham. This counting station shows that traffic in the area has increased by approximately 0.5 percent per year between 2010 to 2019. Therefore, based on the data, a half a percent per year

growth rate was used to bring the 2023 Existing volumes to 2030 (7-year growth). The MassDOT historical traffic data are provided in the Appendix.

Second, any planned or approved specific developments in the area that would generate a significant volume of traffic on study area roadways within the next seven years were included. Based on discussions with the Town of Pembroke, the following developments were included:

- *Boat Storage Facility, 43 Mattakeesett Street Pembroke, MA* – construction of an approximately 18,750 square-foot boat storage warehouse. The traffic to be generated by this development was taken from the town application² prepared for the project. Distribution of this traffic was estimated based on existing travel patterns and is provided in the Appendix.
- *New Community Center, 128 Center Street, Pembroke, MA* – construction of a new 42,000 square-foot community center. The proposed community center will replace the existing 35,300 square-foot community center on site. The traffic to be generated by this development was taken from the town application³ prepared for the project. The distribution of that traffic was estimated based on existing travel patterns and is provided in the Appendix.

No-Build Conditions

The 2030 No-Build conditions were accordingly developed by applying a compounded 0.5 percent annual growth rate (3.6 percent over seven years) to the existing traffic on the adjacent streets and by assuming the completion of the above noted development projects. The 2030 No-Build peak-hour traffic volumes are shown on Figure 3.

Trip Generation

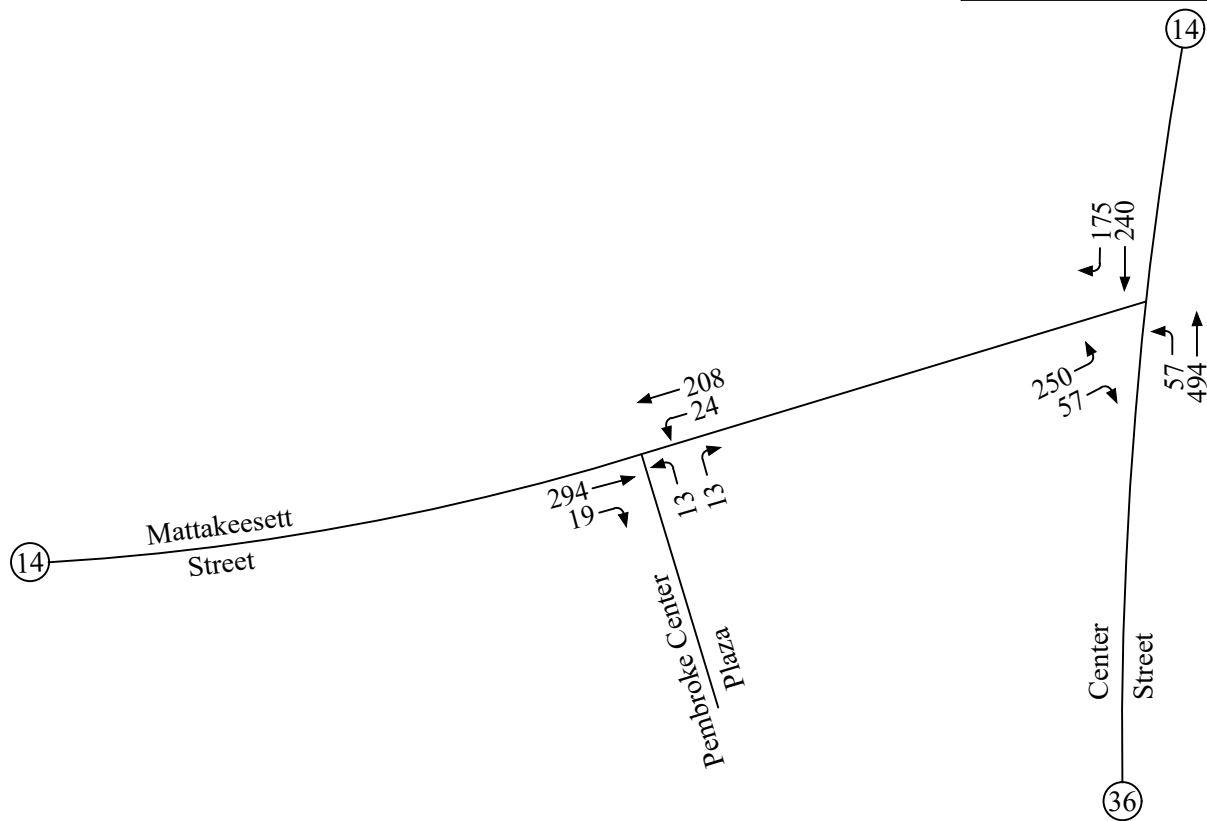
The traffic to be generated by the proposed development was estimated using the Institute of Transportation Engineering (ITE) *Trip Generation Manual*. As proposed, the site will include construction of 66 age-restricted apartment units split amongst three buildings. Each unit will share both floors and walls with other units in the building. Therefore, ITE Land Use Code 252 (Senior Adult Housing - Multifamily) was accordingly used in estimating the traffic generation characteristics of the project. In addition to the apartments, a 4,600 square foot tavern (including patio square footage) will also be built on site in its own standalone building. The tavern will consist of a combination of sit-down dining and bar seating, with a total of 132 seats. Accordingly,

² *Town of Pembroke Application for Site Plan Approval, , Medford, MA*; prepared for North Shore Construction & Development, Inc.; prepared by MDM Transportation Consultants Inc.; October 2014.

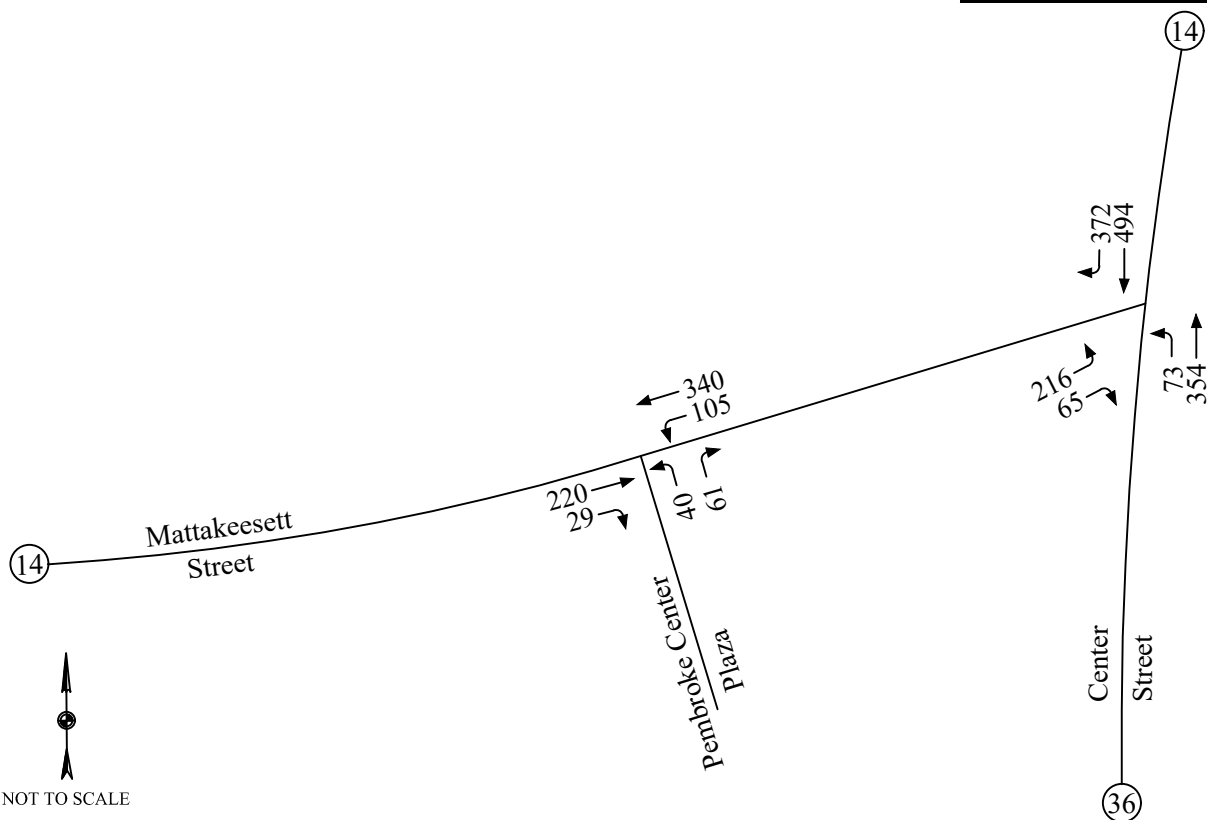
³ *Application for Site Plan Approval, Pembroke Community Center, 128 Center Street, Pembroke, MA*; prepared for The Town of Pembroke.; Compass Project Management.; May 2022.

Figure 3
2030 No Build
Peak Hour Traffic Volumes

Weekday AM Peak Hour



Weekday PM Peak Hour



ITE Land Use Code 932 (High Turnover Sit Down Restaurant) was used in estimating the traffic for this portion of the development. Table 5 provides a summary of the expected trip generation of the site. The trip generation calculations are provided in the Appendix.

Table 5
Trip Generation Summary

Time Period	Age-Restricted Apartment Development ^a	Tavern ^b	Total ^a
Weekday Daily	220	493	713
Weekday AM Peak			
Enter	4	24	28
<u>Exit</u>	<u>9</u>	<u>20</u>	<u>29</u>
Total	13	44	57
Weekday PM Peak			
Enter	10	26	36
<u>Exit</u>	<u>7</u>	<u>16</u>	<u>23</u>
Total	17	42	59

^a ITE Land Use Code 252 (Senior Adult Housing - Multifamily) applied to 66 units.

^b ITE Land Use Code 932 (High Turnover Sit Down Restaurant) applied to 4,600 square feet.

As shown in Table 5, the proposed senior housing and tavern development will generate 713 weekday daily vehicle trips (half entering and half exiting) with 57 vehicle trips (28 entering and 29 exiting) occurring during the weekday AM peak hour and 59 vehicle trips (36 entering and 23 exiting) occurring during the weekday PM peak hour.

In addition, no trip credit was taken for the fact a portion of the patrons to the tavern will likely be from traffic already present on the adjacent roadway. Based on the ITE *Trip Generation Manual*, as much as 44 percent of the trips generated by a tavern will likely be from pass-by traffic.

Trip Distribution

For the age-restricted apartments, the US Census Bureau's Journey to Work data for the workplace location of those living in Pembroke were used to estimate the expected distribution of the site generated trips. Based on these data, it is expected that 60 percent of the site traffic will be to and from the north on Center Street (Route 14), 20 percent will be to and from the south on Center

Street (Route 36) and 20 percent will be to and from the west on Mattakeesett Street. The US Census Bureau's Journey to Work data are included in the Appendix.

The tavern trip distribution was based on the existing travel patterns within the study area. Based on the data, it was found that approximately 45 percent of tavern traffic will be to and from the north on Center Street (Route 14), 35 percent will be to and from the south on Center Street (Route 36) and the remaining 20 percent will be to and from the west on Mattakeesett Street. The resulting trip distribution estimates along with the added volume of site traffic during the critical weekday AM and PM peak hours is shown on Figure 4.

Since a majority of the apartment parking is most easily accessed from the western driveway, it was further assumed that of the traffic to and from the east, 75 percent would utilize the western driveway and 25 percent would utilize the eastern driveway. All traffic to and from the west is expected to utilize the western driveway. For the tavern, it was assumed that traffic would utilize the first available driveway, meaning that all traffic to and from the east would utilize the eastern site driveway and all traffic to and from the west would utilize the western site driveway.

Build Conditions

Based on the traffic generation and distribution estimates for this project, the traffic volumes generated by the proposed project were assigned to the roadway network as shown on Figure 4 and were added to the 2030 No-Build traffic volumes to develop the 2030 Build traffic volumes. The 2030 Build peak hour traffic volume networks are graphically depicted on Figure 5.

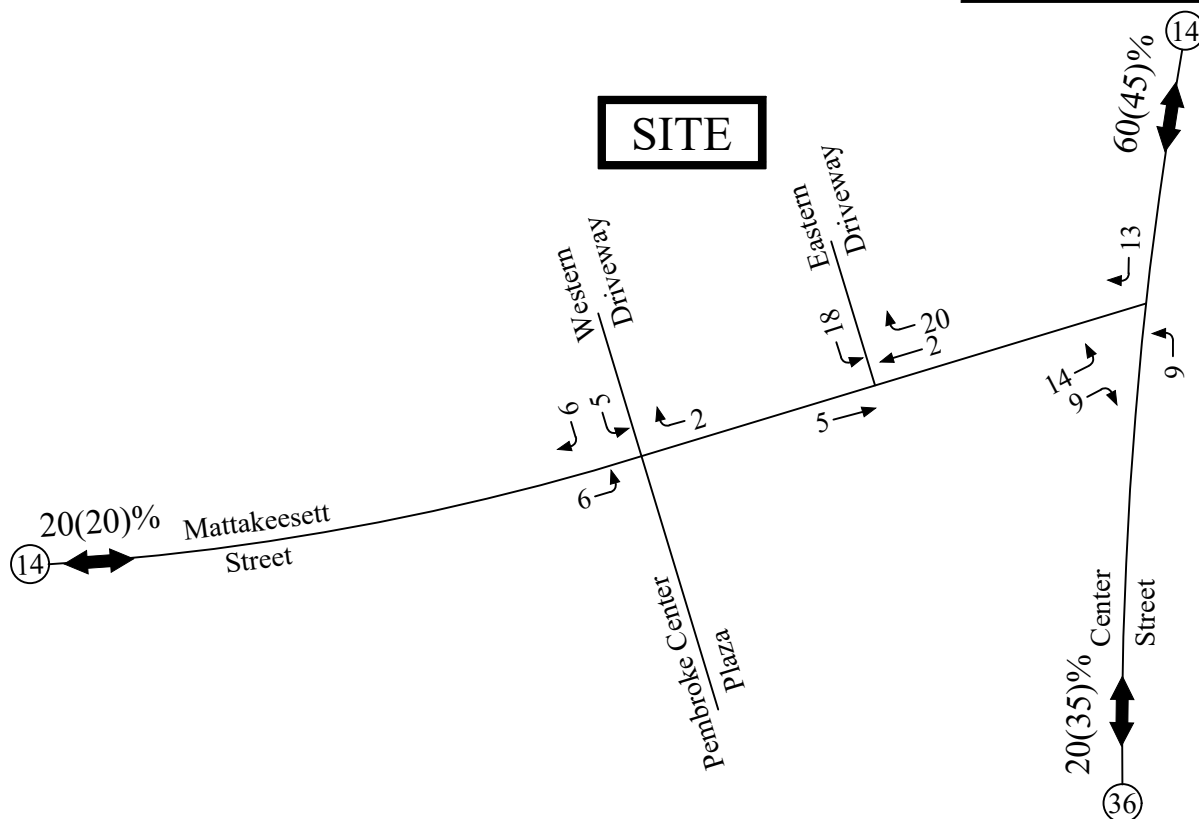
Traffic Increases

Based on the above traffic generation and distribution patterns, the greatest increase in traffic is expected on the short section of Mattakeesett Street, between the site's eastern driveway and Center Street, with increases in the range of 45 to 48 additional peak hour vehicles. These increases represent, on average, approximately one additional vehicle approximately every one to one and a half minutes during peak hours. Traffic increases on Center Street, north of Mattakeesett Street, are expected in the range of 27 to 29 additional vehicles, or approximately one additional vehicle approximately every two to two and a half minutes. Traffic increases on Center Street, south of Mattakeesett Street, are expected in the range of 18 to 19 additional vehicles, or approximately one additional vehicle every three to three and a half minutes. Traffic increases on Mattakeesett Street, west of the site, are expected to be in the range of 11 to 12 additional vehicles during peak hours, or approximately one additional vehicle every five to five and a half minutes. These traffic increases are minimal and well within the daily fluctuation of traffic.

Site Access and On-Site Circulation

Figure 4
Site Generated Traffic
Peak Hour Traffic Volumes

Weekday AM Peak Hour



Weekday PM Peak Hour

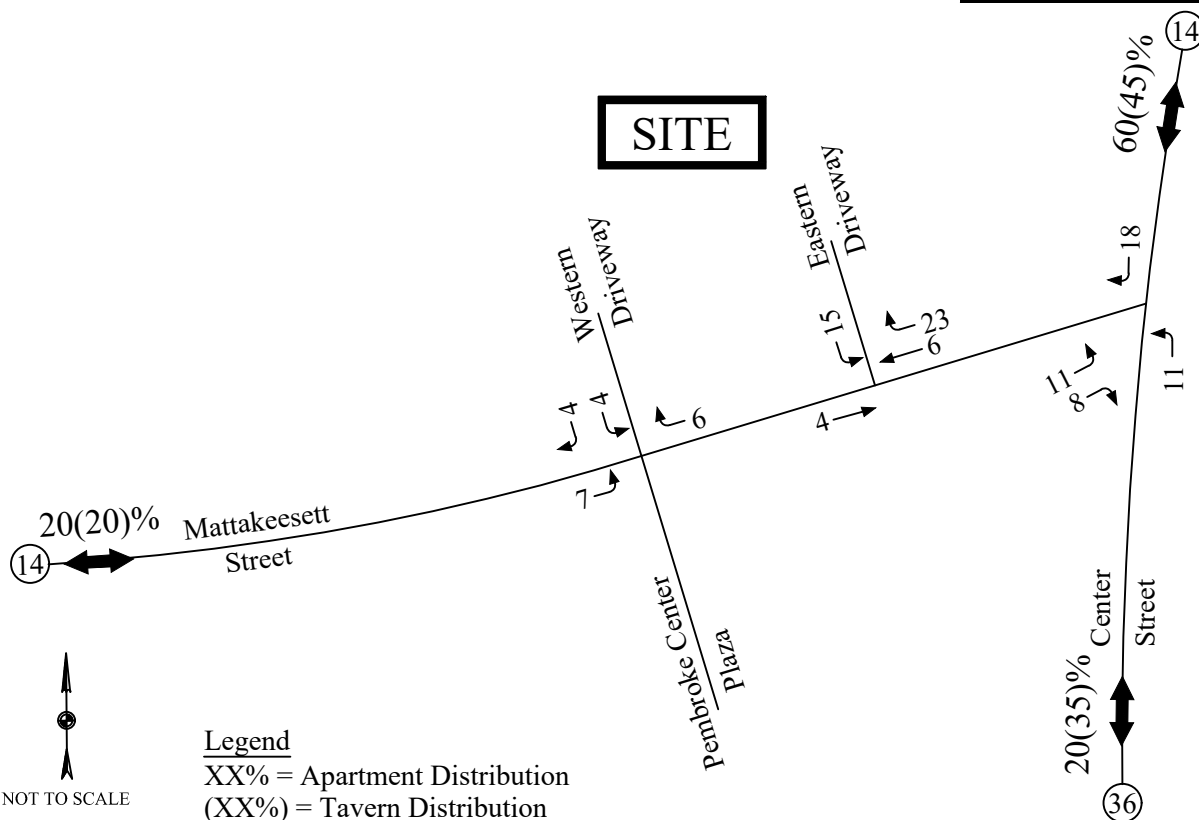
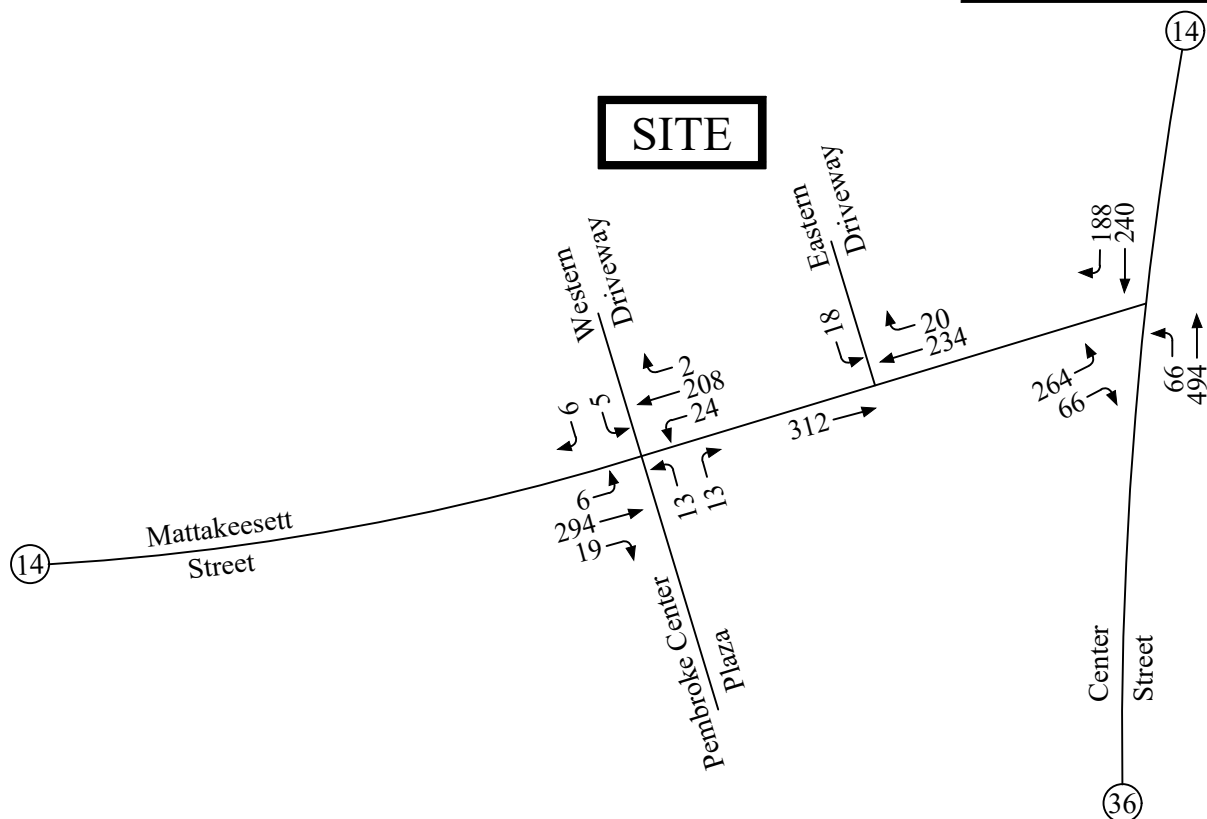
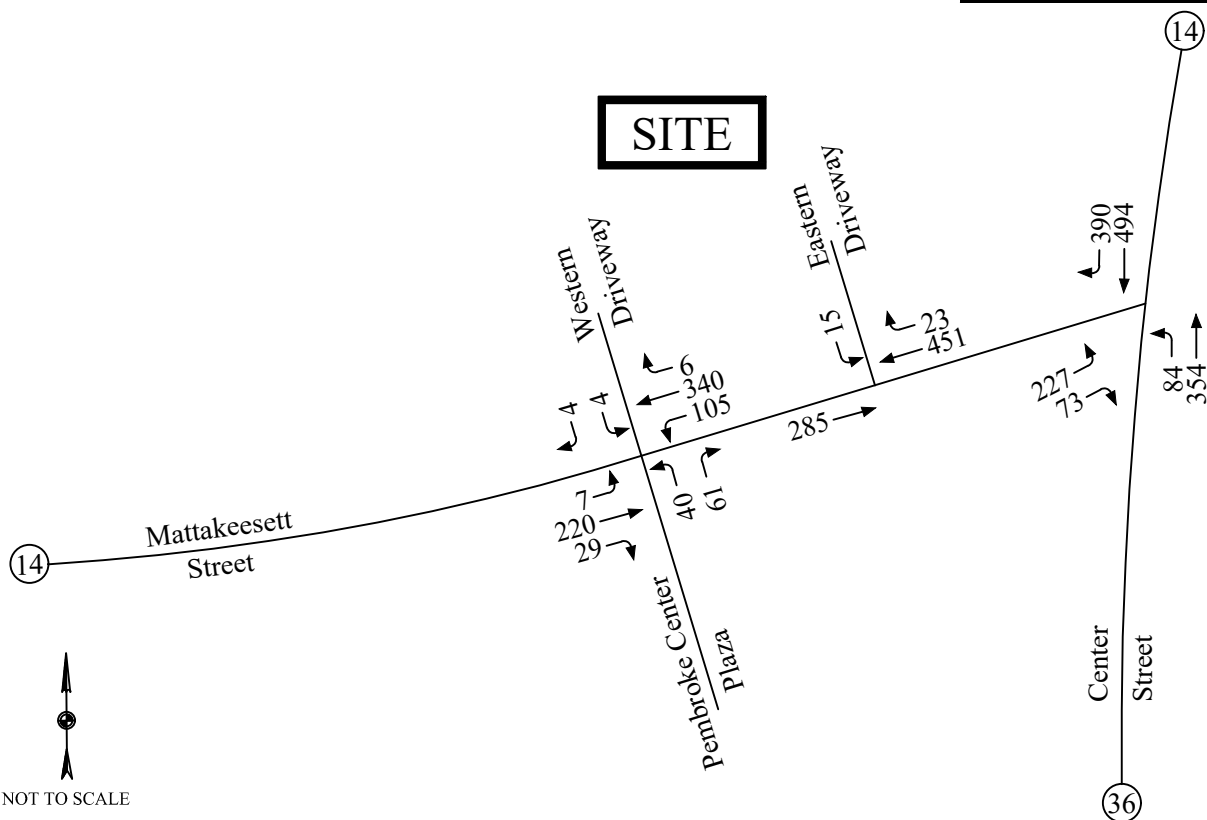


Figure 5
2030 Build
Peak Hour Traffic Volumes

Weekday AM Peak Hour



Weekday PM Peak Hour



Access to the development is proposed via two full access/egress driveways on Mattakeesett Street, the westerly of which will be located opposite the Pembroke Center Plaza driveway. The driveways are proposed to be 24 feet wide with single entering and exiting lanes and 20-foot corner radii. All drive aisles are proposed to be 24 feet wide. Sidewalks are proposed throughout the site which will connect each building to the existing sidewalk on the north side of Mattakeesett Street. ADA-compliant wheelchair ramps and crosswalks should be provided across both driveway exits. STOP signs (R1-1) and stop lines should be placed four feet back from the proposed crosswalks.

Alternatively, the curb cuts could be constructed in accordance with MassDOT Standard detail E107.7.0 whereby the existing sidewalk continues across the driveway and the driveway ramps up to the sidewalk. This requires cars to enter and exit the driveways at slower speeds as they ramp up to (or down from) the sidewalk, providing additional safety for pedestrians. Since the existing sidewalks are concrete, the sidewalk across the driveways should also be made of concrete to provide the visual effect that it is a sidewalk where pedestrian will cross the driveways.

CAPACITY ANALYSIS

Level-of-service (LOS) analyses were conducted at the study area intersections and site driveways under existing and projected volume conditions to determine the effect that the additional site-generated traffic will have on traffic operations. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual*⁴ (HCM) and is described in the Appendix.

For signalized intersections, the maximum back of queue during an average signal cycle and a 95th percentile signal cycle was calculated for each lane group during the peak periods studied. The back of queue is the length of a backup of vehicles from the stop line of a signalized intersection to the last car in the queue that is required to stop, regardless of the signal indication. The length of this queue depends on a number of factors including signal timing, vehicle arrival patterns, and the saturation flow rate. For unsignalized intersections, the 95th percentile queue represents the length of queue of the critical minor-street movement that is not expected to be exceeded 95 percent of the time during the analysis period (typically one hour). The queue length is a function of the capacity of the movement and the movement's degree of saturation.

The capacity and queue analysis results for the signalized study intersection are summarized in Table 6 and the analysis results of the unsignalized study intersections are summarized in Table 7. All analysis worksheets are provided in the Appendix.

⁴ *Highway Capacity Manual 2010*; Transportation Research Board; Washington, DC; 2010.

Table 6
Signalized Intersection Level-of-Service Analysis Summary

Location/Peak Hour/Movement	2023 Existing				2030 No-Build				2030 Build			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
Center Street and Mattakeesett Street												
<i>Weekday AM Peak Hour</i>												
EB Left	0.76	17.0	B	89/138	0.74	17.2	B	81/147	0.75	17.4	B	87/156
EB Right	0.18	12.3	B	3/22	0.18	12.6	B	2/24	0.20	12.7	B	3/27
NB Left	0.12	8.5	A	8/22	0.12	8.0	A	8/25	0.14	8.3	A	10/27
NB Thru	0.57	8.2	A	97/185	0.57	7.9	A	98/194	0.58	8.2	A	101/194
SB Thru/Right	0.65	14.5	B	150/#242	0.55	13.3	B	113/#270	0.56	13.9	B	120/#280
Overall		12.2	B			11.6	B			11.9	B	
<i>Weekday PM Peak Hour</i>												
EB All	0.73	21.4	C	120/192	0.74	22.1	C	124/#204	0.75	22.5	C	132/#231
EB Left	0.24	16.9	B	12/45	0.25	17.4	B	14/49	0.27	17.7	B	16/54
EB Thru/Right	0.18	8.2	A	12/26	0.18	8.5	A	13/30	0.21	8.8	A	15/41
WB All	0.36	5.7	A	75/121	0.36	5.7	A	77/124	0.36	5.9	A	80/124
WB Left	0.75	14.6	B	397/#699	0.76	15.0	B	438/#745	0.77	15.5	B	469/#770
Overall		12.9	B			13.3	B			13.7	B	

^a Volume-to-capacity ratio

^b Average control delay in seconds per vehicle

^c Level of service

^d Average/95th percentile queue in feet, assuming 25 feet per vehicle

Queue Notes: # = 95th percentile volume exceeds capacity; ~ = volume exceeds capacity; m = queue length is metered.

As shown in Table 6, the intersection of Center Street (Routes 14/36) and Mattakeesett Street (Route 14) currently operates at an overall desirable level of service (LOS) B during both weekday peak hours. All movements currently operate at LOS C or better. Under future No-Build conditions, the intersection will continue to operate at an overall desirable LOS B or better. All movements will continue to operate at LOS C or better. Under future Build conditions, minimal increases in delay are expected with no changes in LOS.

Table 7
Unsignalized Intersection Level-of-Service Analysis Summary

Peak Hour/ Movement	2023 Existing				2030 No-Build				2030 Build			
	V/C ^a	Delay ^b	LOS ^c	Q ^d	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q
Mattakeesett Street at Pembroke Center Plaza driveway/West Site Driveway												
<i>Weekday AM Peak Hour</i>												
NB All	0.05	12.1	B	25	0.05	12.4	B	25	0.06	12.6	B	25
EB Left	-	-	-	-	-	-	-	-	0.01	7.7	A	0
WB Left	0.02	8.0	A	25	0.02	8.0	A	25	0.02	8.0	A	25
SB All	-	-	-	-	-	-	-	-	0.02	11.9	B	25
<i>Weekday PM Peak Hour</i>												
NB All	0.24	15.5	C	25	0.25	16.1	C	25	0.26	16.5	C	25
EB Left	-	-	-	-	-	-	-	-	0.01	8.0	A	0
WB Left	0.09	8.0	A	25	0.09	8.1	A	25	0.09	8.1	A	25
SB All	-	-	-	-	-	-	-	-	0.03	16.4	C	25
Mattakeesett Street at East Site Driveway												
<i>Weekday AM Peak Hour</i>												
EB Left	-	-	-	-	-	-	-	-	0.0	0.0	A	0
SB All	-	-	-	-	-	-	-	-	0.04	13.1	B	0
<i>Weekday PM Peak Hour</i>												
EB Left	-	-	-	-	-	-	-	-	0.0	0.0	A	0
SB All	-	-	-	-	-	-	-	-	0.05	15.9	C	0

^a Volume-to-capacity ratio;

^b Average control delay in seconds per vehicle;

^c Level of service;

^d 95th percentile queue in feet, assuming 25 feet per vehicle.

As shown in Table 7, the intersection of Mattakeesett Street and the Pembroke Center Plaza driveway currently operates at acceptable levels, with all movements operating at LOS C or better. Under future No-Build conditions, the intersection will continue to operate at LOS C or better. Under future Build conditions, with the addition of the western site driveway, all movements will continue to operate at LOS C or better. The proposed eastern site driveway on Mattakeesett Street is expected to operate at acceptable levels with minimal delays and queue lengths. Queue lengths on both site driveways are not expected to exceed more than one vehicle.

CONCLUSIONS

Existing and future conditions at the study area intersections have been described and analyzed with respect to traffic operations and the impact of the proposed site redevelopment. Conclusions of this effort and recommendations are presented below.

- The project consists of razing the existing funeral home on the site and constructing a 66-unit age-restricted apartment development amongst three buildings, with 18 units in Building A and 24 units in Buildings B and C. In addition to the apartments, a 4,600 square foot tavern with patio will also be built on site in its own standalone building.
- Access to the site is proposed via two full access/egress driveways, the westerly of which will be located opposite the Pembroke Center Plaza.
- This traffic study focuses on the impacts of the project at the following intersections:
 - Mattakeesett Street at Center Street
 - Mattakeesett Street at Pembroke Center Plaza Driveway
 - Mattakeesett Street at the proposed site driveways
- Future traffic conditions were projected to the year 2030 consistent with MassDOT requirements for traffic impact analysis. These traffic projections were made by accounting for future population growth and accounting for traffic from other nearby developments.
- The minimum required sight distances are met or exceeded at the proposed site driveway intersections with Mattakeesett Street, thereby allowing safe operation.
- It is recommended that any proposed landscaping, fencing or signs in the vicinity of the driveways be kept low (maximum 2 feet in height from street level), or set back sufficiently so as not to impede the available sight distances.
- The proposed senior housing and tavern development will generate 713 weekday daily vehicle trips (half entering and half exiting) with 57 vehicle trips (28 entering and 29 exiting) occurring during the weekday AM peak hour and 59 vehicle trips (36 entering and 23 exiting) occurring during the weekday PM peak hour.
- Traffic-volume increases are expected to be greatest on the short section of Mattakeesett Street, between the site's eastern driveway and Center Street, with increases in the range of 45 to 48 additional peak hour vehicles. These increases represent, on average, approximately one additional vehicle approximately every one to one and a half minutes during peak hours. Traffic increases on Center Street, north of Mattakeesett Street, are expected in the range of 27 to 29 additional vehicles, or approximately one additional vehicle approximately every two to two and a half minutes. Traffic increases on Center Street, south of Mattakeesett Street, are expected in the range of 18 to 19 additional vehicles, or approximately one additional vehicle every three to three and a half minutes. Traffic increases on Mattakeesett Street, west of the

site, are expected to be in the range of 11 to 12 additional vehicles during peak hours, or approximately one additional vehicle every five to five and a half minutes. These traffic increases are minimal and well within the daily fluctuation of traffic.

- Traffic operations analyses indicate the above increases in traffic along study area roadways do not have any adverse traffic impacts. All of the study area intersections are expected to operate at acceptable levels of service under future No-Build and Build conditions with no change in level of service due to the project.
- It is recommended that ADA-compliant wheelchair ramps and crosswalks be provided across both driveway exits. STOP signs (R1-1) and stop lines should be placed four feet back from the proposed crosswalks.
- Alternatively, the curb cuts could be constructed in accordance with MassDOT Standard detail E107.7.0 whereby the existing sidewalk continues across the driveway and the driveway ramps up to the sidewalk. This requires cars to enter and exit the driveways at slower speeds as they ramp up to (or down from) the sidewalk, providing additional safety for pedestrians. Since the existing sidewalks are concrete, the sidewalk across the driveways should also be made of concrete to provide the visual effect that it is a sidewalk where pedestrian will cross the driveway.

APPENDIX

Traffic Count Data

Traffic Count Adjustment Data

Crash Rate Worksheets, Background Developments, and Journey to Work

Trip Generation Worksheets

Capacity Analysis Methodology and Worksheets

Traffic Count Data

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA
Direction: EB,

22101001

1/4/2023	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	1	0	2	0	1	0	0	0	0	0	4
1:00	0	0	0	0	0	1	2	0	1	0	0	0	0	0	4
2:00	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
3:00	0	0	0	1	1	1	0	0	1	0	0	0	0	1	5
4:00	0	0	0	0	1	3	7	5	4	2	0	0	0	0	22
5:00	0	0	0	1	5	8	18	13	10	3	3	0	0	0	61
6:00	0	0	4	5	16	22	33	25	16	6	2	0	0	0	129
7:00	0	0	14	14	40	38	52	35	17	4	0	0	0	0	214
8:00	0	0	16	13	37	30	60	47	25	12	1	0	0	0	241
9:00	0	0	2	2	13	32	63	48	26	8	2	0	0	0	196
10:00	0	0	2	8	25	34	53	42	30	10	3	2	0	0	209
11:00	0	0	1	9	28	38	61	33	37	10	4	2	1	0	224
12:00 PM	0	0	0	9	30	36	54	40	26	12	2	0	2	0	211
1:00	0	0	3	13	34	39	64	56	40	8	2	0	0	0	259
2:00	0	0	20	21	43	51	62	37	17	0	0	0	0	0	251
3:00	0	0	21	23	43	44	57	42	18	3	3	1	0	0	255
4:00	0	0	11	30	49	42	58	44	22	6	2	0	0	0	264
5:00	0	0	4	12	41	35	56	35	23	11	0	0	0	0	217
6:00	0	0	1	6	23	25	33	33	15	3	0	0	0	0	139
7:00	0	0	1	2	14	24	45	36	12	6	1	0	0	0	141
8:00	0	0	0	0	14	11	26	14	11	3	1	3	0	1	84
9:00	0	0	0	0	3	6	9	7	11	1	2	1	0	0	40
10:00	0	0	0	0	3	5	3	9	6	3	0	1	0	0	30
11:00	0	0	0	0	0	3	1	1	3	2	0	0	0	0	10
Total	0	0	100	169	464	528	820	602	373	113	28	10	3	2	3212

Percentile	15th
Speed	14
Mean Speed (Average)	19.2
10 MPH Pace Speed	14-23
Number in Pace	2100
Percent in Pace	65.4%
Number > 21 MPH	1131
Percent > 21 MPH	35.2%

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA
Direction: EB,

22101001

1/5/2023	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	1	1	2	3	0	0	0	0	0	0	7
1:00	0	0	0	0	2	0	1	2	0	0	0	0	0	0	5
2:00	0	0	0	0	1	0	2	1	0	0	0	0	0	0	4
3:00	0	0	0	0	2	0	1	1	1	1	1	0	0	0	7
4:00	0	0	0	0	0	1	4	5	2	2	2	0	0	0	16
5:00	0	0	0	0	2	4	25	13	10	5	0	0	0	0	59
6:00	0	0	2	3	11	25	41	29	12	7	1	0	0	0	131
7:00	0	0	14	11	29	33	67	27	26	4	3	0	0	0	214
8:00	0	0	20	19	39	40	56	40	10	6	1	0	0	0	231
9:00	0	0	1	7	25	41	58	49	18	8	2	1	0	0	210
10:00	0	0	0	6	21	42	55	40	33	18	2	0	0	1	218
11:00	0	0	2	2	36	30	40	48	26	13	3	0	0	0	200
12:00 PM	0	0	1	7	43	43	45	59	28	8	3	0	0	1	238
1:00	0	0	3	3	29	31	54	39	22	11	1	0	1	0	194
2:00	0	0	27	22	43	42	51	34	9	7	2	1	0	0	238
3:00	0	0	17	30	48	38	49	35	18	4	1	2	0	0	242
4:00	0	0	16	31	37	38	62	29	21	4	2	0	0	0	240
5:00	0	0	10	13	39	36	54	41	10	4	1	0	0	0	208
6:00	0	0	1	5	22	28	37	30	10	3	2	0	0	0	138
7:00	0	0	1	5	19	14	28	19	12	3	0	0	0	0	101
8:00	0	0	0	2	11	18	21	23	8	3	0	0	1	0	87
9:00	0	0	0	1	5	7	13	11	4	0	0	0	0	0	41
10:00	0	0	0	1	1	8	9	6	4	2	0	0	0	0	31
11:00	0	0	0	0	0	0	3	0	1	0	0	0	0	0	4
Total	0	0	115	168	466	520	778	584	285	113	27	4	2	2	3064
Percentile															
Speed															
Mean Speed (Average)															18.9
10 MPH Pace Speed															14-23
Number in Pace															2033
Percent in Pace															66.4%
Number > 21 MPH															1017
Percent > 21 MPH															33.2%
Grand Total	0	0	215	337	930	1048	1598	1186	658	226	55	14	5	4	6276
Stats															
Percentile															15th
Speed															14
Mean Speed (Average)															19.0
10 MPH Pace Speed															14-23
Number in Pace															4133
Percent in Pace															65.9%
Number > 21 MPH															2148
Percent > 21 MPH															34.2%

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA
Direction: WB,

22101001

1/4/2023	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	1	1	7	5	1	0	0	0	15
1:00	0	0	0	0	0	0	0	0	1	1	1	0	0	1	4
2:00	0	0	0	0	0	1	0	0	1	2	0	0	0	0	4
3:00	0	0	0	0	0	2	0	1	1	2	1	0	0	0	7
4:00	0	0	0	1	0	0	0	1	2	3	1	0	1	0	9
5:00	0	0	0	0	0	0	2	3	10	5	5	1	1	1	28
6:00	0	0	0	0	2	0	5	7	23	19	14	5	3	0	78
7:00	0	0	0	0	2	4	8	19	34	42	25	11	2	0	147
8:00	0	0	1	2	2	1	16	22	54	38	27	16	3	0	182
9:00	0	0	0	1	2	9	26	30	44	44	28	7	2	0	193
10:00	0	0	3	0	9	11	17	37	52	44	20	9	2	2	206
11:00	0	0	4	5	9	12	40	38	63	35	35	8	3	0	252
12:00 PM	0	0	2	0	5	14	45	43	69	50	17	10	3	3	261
1:00	0	0	0	3	5	12	40	48	54	45	43	10	2	1	263
2:00	0	0	1	6	9	21	40	48	74	74	39	10	4	0	326
3:00	0	0	1	10	16	26	42	58	102	84	28	8	3	1	379
4:00	0	0	2	5	14	27	60	70	86	82	37	6	1	1	391
5:00	0	0	0	3	6	14	46	42	72	79	46	9	4	0	321
6:00	0	0	0	2	4	15	40	26	41	46	25	7	3	1	210
7:00	0	0	0	0	3	3	27	23	35	51	27	5	2	1	177
8:00	0	0	0	0	1	3	11	14	35	32	12	7	0	0	115
9:00	0	0	0	0	0	1	10	10	23	22	11	1	1	0	79
10:00	0	0	0	1	1	0	2	5	16	17	8	3	2	0	55
11:00	0	0	0	0	0	0	1	0	6	7	1	2	0	0	17
Total	0	0	14	39	90	176	479	546	905	829	452	135	42	12	3719

Percentile	15th
Speed	19
	50th
	25
	85th
	30
	95th
	34
Mean Speed (Average)	25.6
10 MPH Pace Speed	21-30
Number in Pace	2432
Percent in Pace	65.4%
Number > 21 MPH	2921
Percent > 21 MPH	78.5%

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA
Direction: WB,

22101001

1/5/2023	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	0	0	0	1	1	2	1	0	0	0	5
1:00	0	0	0	0	0	0	0	0	1	0	2	1	1	0	5
2:00	0	0	0	0	0	0	3	2	0	1	1	0	0	0	7
3:00	0	0	0	0	0	0	1	0	1	1	0	0	0	0	3
4:00	0	0	0	0	0	0	1	0	3	2	3	0	0	0	9
5:00	0	0	0	0	0	1	0	6	11	11	5	1	2	0	37
6:00	0	0	0	0	3	2	9	8	27	23	9	4	2	0	87
7:00	0	0	0	0	5	6	6	11	44	55	19	5	0	0	151
8:00	0	0	1	1	2	4	15	22	57	48	28	7	0	2	187
9:00	0	0	1	4	3	5	29	42	57	46	18	2	3	0	210
10:00	0	0	0	0	5	7	27	41	59	38	20	5	2	0	204
11:00	0	0	2	1	7	16	39	40	64	49	23	6	7	1	255
12:00 PM	0	0	0	6	9	24	49	42	50	54	24	5	5	0	268
1:00	0	0	2	4	9	22	46	44	61	48	19	4	3	0	262
2:00	0	0	4	5	17	20	41	58	56	45	37	12	5	1	301
3:00	0	0	1	4	10	30	58	61	74	67	35	11	5	0	356
4:00	0	0	5	10	22	29	58	47	86	65	30	10	2	0	364
5:00	0	0	4	8	9	28	45	44	78	67	30	4	2	0	319
6:00	0	0	0	2	7	15	40	32	59	48	18	5	2	0	228
7:00	0	0	0	2	8	6	16	24	42	47	27	6	3	1	182
8:00	0	0	0	0	4	4	14	19	24	26	10	5	0	0	106
9:00	0	0	0	0	0	0	6	8	23	18	17	8	1	0	81
10:00	0	0	0	0	0	0	2	1	13	12	5	0	1	0	34
11:00	0	0	0	0	0	1	0	0	3	2	1	2	0	0	9
Total	0	0	20	47	120	220	505	553	894	775	382	103	46	5	3670
Percentile															
Speed				15th	50th	85th	95th								
				19	25	30	33								
Mean Speed (Average)				24.9											
10 MPH Pace Speed				20-29											
Number in Pace				2381											
Percent in Pace				64.9%											
Number > 21 MPH				2758											
Percent > 21 MPH				75.1%											
Grand Total	0	0	34	86	210	396	984	1099	1799	1604	834	238	88	17	7389
Stats															
Percentile				15th	50th	85th	95th								
Speed				19	25	30	33								
Mean Speed (Average)				25.3											
10 MPH Pace Speed				20-29											
Number in Pace				4809											
Percent in Pace				65.1%											
Number > 21 MPH				5679											
Percent > 21 MPH				76.9%											

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA
Direction: Combined

22101001

1/4/2023	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	1	0	3	1	8	5	1	0	0	0	19
1:00	0	0	0	0	0	1	2	0	2	1	1	0	0	1	8
2:00	0	0	0	0	0	1	1	0	2	2	0	0	0	0	6
3:00	0	0	0	1	1	3	0	1	2	2	1	0	0	1	12
4:00	0	0	0	1	1	3	7	6	6	5	1	0	1	0	31
5:00	0	0	0	1	5	8	20	16	20	8	8	1	1	1	89
6:00	0	0	4	5	18	22	38	32	39	25	16	5	3	0	207
7:00	0	0	14	14	42	42	60	54	51	46	25	11	2	0	361
8:00	0	0	17	15	39	31	76	69	79	50	28	16	3	0	423
9:00	0	0	2	3	15	41	89	78	70	52	30	7	2	0	389
10:00	0	0	5	8	34	45	70	79	82	54	23	11	2	2	415
11:00	0	0	5	14	37	50	101	71	100	45	39	10	4	0	476
12:00 PM	0	0	2	9	35	50	99	83	95	62	19	10	5	3	472
1:00	0	0	3	16	39	51	104	104	94	53	45	10	2	1	522
2:00	0	0	21	27	52	72	102	85	91	74	39	10	4	0	577
3:00	0	0	22	33	59	70	99	100	120	87	31	9	3	1	634
4:00	0	0	13	35	63	69	118	114	108	88	39	6	1	1	655
5:00	0	0	4	15	47	49	102	77	95	90	46	9	4	0	538
6:00	0	0	1	8	27	40	73	59	56	49	25	7	3	1	349
7:00	0	0	1	2	17	27	72	59	47	57	28	5	2	1	318
8:00	0	0	0	0	15	14	37	28	46	35	13	10	0	1	199
9:00	0	0	0	0	3	7	19	17	34	23	13	2	1	0	119
10:00	0	0	0	1	4	5	5	14	22	20	8	4	2	0	85
11:00	0	0	0	0	0	3	2	1	9	9	1	2	0	0	27
Total	0	0	114	208	554	704	1299	1148	1278	942	480	145	45	14	6931

Percentile	15th
Speed	15
Mean Speed (Average)	22.6
10 MPH Pace Speed	18-27
Number in Pace	4031
Percent in Pace	58.2%
Number > 21 MPH	4052
Percent > 21 MPH	58.5%

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA
Direction: Combined

22101001

1/5/2023	0 - 3	> 3 - 6	> 6 - 9	> 9 - 12	> 12 - 15	> 15 - 18	> 18 - 21	> 21 - 24	> 24 - 27	> 27 - 30	> 30 - 33	> 33 - 36	> 36 - 39	> 39	Total
Time	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	MPH	
12:00 AM	0	0	0	0	1	1	2	4	1	2	1	0	0	0	12
1:00	0	0	0	0	2	0	1	2	1	0	2	1	1	0	10
2:00	0	0	0	0	1	0	5	3	0	1	1	0	0	0	11
3:00	0	0	0	0	2	0	2	1	2	2	1	0	0	0	10
4:00	0	0	0	0	0	1	5	5	5	4	5	0	0	0	25
5:00	0	0	0	0	2	5	25	19	21	16	5	1	2	0	96
6:00	0	0	2	3	14	27	50	37	39	30	10	4	2	0	218
7:00	0	0	14	11	34	39	73	38	70	59	22	5	0	0	365
8:00	0	0	21	20	41	44	71	62	67	54	29	7	0	2	418
9:00	0	0	2	11	28	46	87	91	75	54	20	3	3	0	420
10:00	0	0	0	6	26	49	82	81	92	56	22	5	2	1	422
11:00	0	0	4	3	43	46	79	88	90	62	26	6	7	1	455
12:00 PM	0	0	1	13	52	67	94	101	78	62	27	5	5	1	506
1:00	0	0	5	7	38	53	100	83	83	59	20	4	4	0	456
2:00	0	0	31	27	60	62	92	92	65	52	39	13	5	1	539
3:00	0	0	18	34	58	68	107	96	92	71	36	13	5	0	598
4:00	0	0	21	41	59	67	120	76	107	69	32	10	2	0	604
5:00	0	0	14	21	48	64	99	85	88	71	31	4	2	0	527
6:00	0	0	1	7	29	43	77	62	69	51	20	5	2	0	366
7:00	0	0	1	7	27	20	44	43	54	50	27	6	3	1	283
8:00	0	0	0	2	15	22	35	42	32	29	10	5	1	0	193
9:00	0	0	0	1	5	7	19	19	27	18	17	8	1	0	122
10:00	0	0	0	1	1	8	11	7	17	14	5	0	1	0	65
11:00	0	0	0	0	0	1	3	0	4	2	1	2	0	0	13
Total	0	0	135	215	586	740	1283	1137	1179	888	409	107	48	7	6734
Percentile					15th	50th	85th	95th							
Speed					15	22	29	31							
Mean Speed (Average)					22.1										
10 MPH Pace Speed					18-27										
Number in Pace					3890										
Percent in Pace					57.8%										
Number > 21 MPH					3775										
Percent > 21 MPH					56.1%										
Grand Total	0	0	249	423	1140	1444	2582	2285	2457	1830	889	252	93	21	13665
Stats					Percentile	15th	50th	85th	95th						
Speed					15	22	29	32							
Mean Speed (Average)					22.4										
10 MPH Pace Speed					18-27										
Number in Pace					7921										
Percent in Pace					58.0%										
Number > 21 MPH					7827										
Percent > 21 MPH					57.3%										

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA

22101001

1/4/2023	EB,		Hour Totals		WB,		Hour Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	1	50			10	64				
12:15	2	57			2	57				
12:30	1	54			1	65				
12:45	0	50	4	211	2	75	15	261	19	472
1:00	1	63			1	73				
1:15	1	62			3	74				
1:30	2	64			0	56				
1:45	0	70	4	259	0	60	4	263	8	522
2:00	0	66			1	75				
2:15	0	65			2	80				
2:30	1	57			1	77				
2:45	1	63	2	251	0	94	4	326	6	577
3:00	1	55			0	82				
3:15	1	70			1	101				
3:30	0	71			2	94				
3:45	3	59	5	255	4	102	7	379	12	634
4:00	5	61			0	105				
4:15	1	78			2	92				
4:30	5	60			3	93				
4:45	11	65	22	264	4	101	9	391	31	655
5:00	10	57			5	83				
5:15	16	61			10	86				
5:30	18	57			4	69				
5:45	17	42	61	217	9	83	28	321	89	538
6:00	18	43			13	60				
6:15	29	32			20	45				
6:30	40	36			18	58				
6:45	42	28	129	139	27	47	78	210	207	349
7:00	45	42			29	49				
7:15	44	34			33	42				
7:30	71	32			40	45				
7:45	54	33	214	141	45	41	147	177	361	318
8:00	66	20			42	44				
8:15	64	21			43	31				
8:30	46	28			56	21				
8:45	65	15	241	84	41	19	182	115	423	199
9:00	49	11			58	25				
9:15	37	10			47	27				
9:30	52	10			44	18				
9:45	58	9	196	40	44	9	193	79	389	119
10:00	52	15			53	21				
10:15	54	5			51	14				
10:30	39	5			47	7				
10:45	64	5	209	30	55	13	206	55	415	85
11:00	57	4			80	8				
11:15	54	1			55	5				
11:30	56	2			59	1				
11:45	57	3	224	10	58	3	252	17	476	27
Total	1311	1901			1125	2594			2436	4495
Percent	40.8%	59.2%			30.3%	69.7%			35.1%	64.9%

Accurate Counts
978-664-2565

Location : Mattakeesett Street
Location : West of Center Street
City/State: Pembroke, MA

22101001

1/5/2023		EB,		Hour Totals		WB,		Hour Totals		Combined Totals	
Time	Morning	Afternoon		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		0	56			2	77				
12:15		1	63			0	71				
12:30		2	54			3	61				
12:45		4	65	7	238	0	59	5	268	12	506
1:00		1	57			3	71				
1:15		1	44			1	70				
1:30		3	52			1	59				
1:45		0	41	5	194	0	62	5	262	10	456
2:00		1	65			2	57				
2:15		1	54			2	69				
2:30		1	56			2	91				
2:45		1	63	4	238	1	84	7	301	11	539
3:00		2	51			0	89				
3:15		4	66			1	86				
3:30		0	63			1	80				
3:45		1	62	7	242	1	101	3	356	10	598
4:00		3	55			0	97				
4:15		3	61			2	96				
4:30		4	56			4	96				
4:45		6	68	16	240	3	75	9	364	25	604
5:00		11	59			3	97				
5:15		17	47			10	84				
5:30		14	52			8	66				
5:45		17	50	59	208	16	72	37	319	96	527
6:00		20	41			18	83				
6:15		19	31			16	50				
6:30		53	34			21	44				
6:45		39	32	131	138	32	51	87	228	218	366
7:00		38	35			20	50				
7:15		50	18			49	45				
7:30		68	20			42	46				
7:45		58	28	214	101	40	41	151	182	365	283
8:00		49	23			34	25				
8:15		65	24			55	28				
8:30		52	21			50	30				
8:45		65	19	231	87	48	23	187	106	418	193
9:00		59	14			51	24				
9:15		48	10			61	26				
9:30		58	13			35	18				
9:45		45	4	210	41	63	13	210	81	420	122
10:00		54	6			54	13				
10:15		52	6			52	7				
10:30		56	12			45	9				
10:45		56	7	218	31	53	5	204	34	422	65
11:00		46	4			52	9				
11:15		52	3			68	7				
11:30		40	4			68	5				
11:45		62	2	200	13	67	7	255	28	455	41
Total	1302	1771				1160	2529			2462	4300
Percent	42.4%	57.6%				31.4%	68.6%			36.4%	63.6%
Grand Total	2613	3672				2285	5123			4898	8795
Percent	41.6%	58.4%				30.8%	69.2%			35.8%	64.2%

ADT

ADT: 6,846

AADT: 6,846

22101001

22101001

1

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center St AM

Site Code : 22101

Start Date : 1/4/2023

Page No : 1

E-W Street:Mattakeesett St/Rte 14

N-S Street:Center St/Rte 36

Groups Printed- Cars - Trucks

Start Time	Center Street/RTE 36 From North				Center Street/RTE 36 From South				Mattakeesett Street/RTE 14 From West				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:00 AM	90	28	0	118	5	122	0	127	38	9	0	47	292
07:15 AM	48	26	0	74	10	118	0	128	33	15	0	48	250
07:30 AM	36	32	0	68	10	121	1	132	61	9	0	70	270
07:45 AM	56	36	0	92	13	110	1	124	53	9	0	62	278
Total	230	122	0	352	38	471	2	511	185	42	0	227	1090
08:00 AM	69	33	0	102	7	87	2	96	54	14	0	68	266
08:15 AM	43	40	0	83	5	119	0	124	56	11	0	67	274
08:30 AM	39	46	0	85	12	87	1	100	39	11	0	50	235
08:45 AM	43	31	0	74	10	91	0	101	51	17	0	68	243
Total	194	150	0	344	34	384	3	421	200	53	0	253	1018
Grand Total	424	272	0	696	72	855	5	932	385	95	0	480	2108
Apprch %	60.9	39.1	0		7.7	91.7	0.5		80.2	19.8	0		
Total %	20.1	12.9	0	33	3.4	40.6	0.2	44.2	18.3	4.5	0	22.8	
Cars	405	263	0	668	69	824	5	898	369	91	0	460	2026
% Cars	95.5	96.7	0	96	95.8	96.4	100	96.4	95.8	95.8	0	95.8	96.1
Trucks	19	9	0	28	3	31	0	34	16	4	0	20	82
% Trucks	4.5	3.3	0	4	4.2	3.6	0	3.6	4.2	4.2	0	4.2	3.9

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center St AM

Site Code : 22101

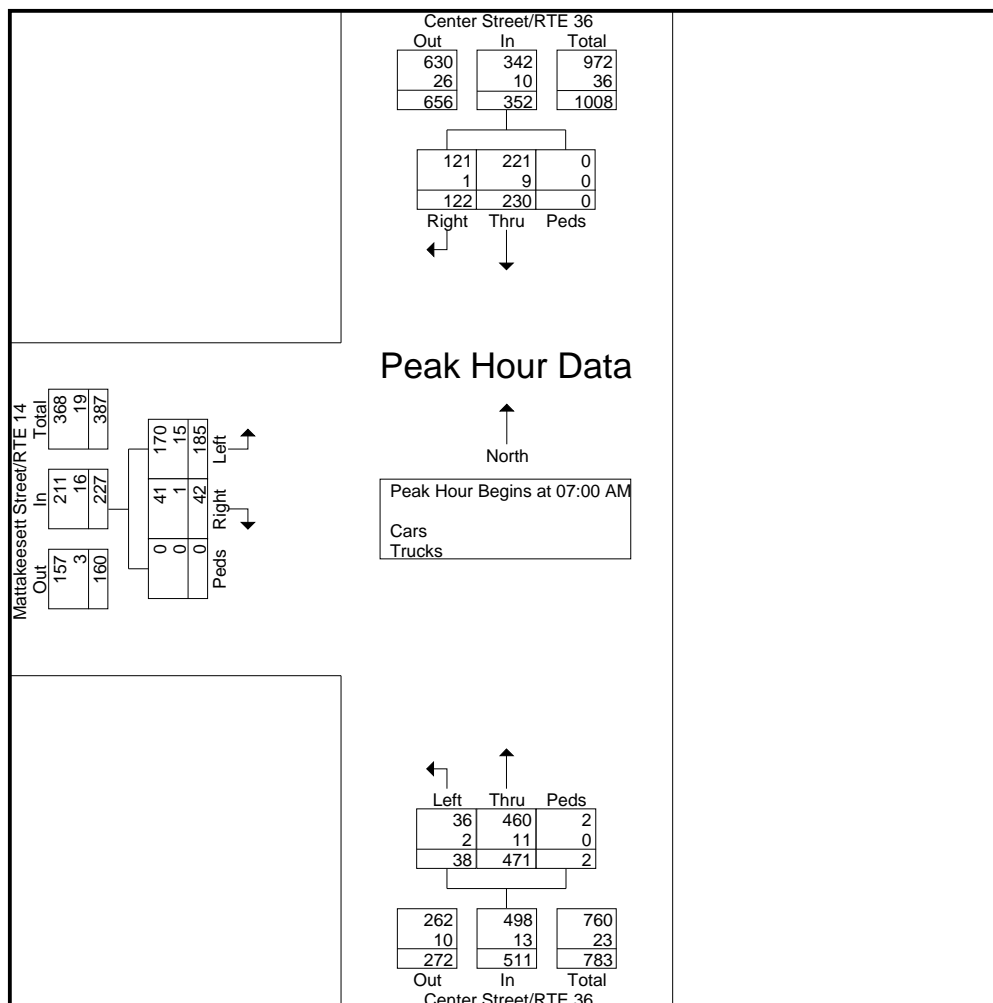
Start Date : 1/4/2023

Page No : 2

E-W Street: Mattakeesett St/Rte 14

N-S Street: Center St/Rte 36

	Center Street/RTE 36 From North				Center Street/RTE 36 From South				Mattakeesett Street/RTE 14 From West				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	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 07:00 AM													
07:00 AM	90	28	0	118	5	122	0	127	38	9	0	47	292
07:15 AM	48	26	0	74	10	118	0	128	33	15	0	48	250
07:30 AM	36	32	0	68	10	121	1	132	61	9	0	70	270
07:45 AM	56	36	0	92	13	110	1	124	53	9	0	62	278
Total Volume	230	122	0	352	38	471	2	511	185	42	0	227	1090
% App. Total	65.3	34.7	0		7.4	92.2	0.4		81.5	18.5	0		
PHF	.639	.847	.000	.746	.731	.965	.500	.968	.758	.700	.000	.811	.933
Cars	221	121	0	342	36	460	2	498	170	41	0	211	1051
% Cars	96.1	99.2	0	97.2	94.7	97.7	100	97.5	91.9	97.6	0	93.0	96.4
Trucks	9	1	0	10	2	11	0	13	15	1	0	16	39
% Trucks	3.9	0.8	0	2.8	5.3	2.3	0	2.5	8.1	2.4	0	7.0	3.6



Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center St PM

Site Code : 22101

Start Date : 1/3/2023

Page No : 1

E-W Street:Mattakeesett St/Rte 14

N-S Street:Center St/Rte 36

Groups Printed- Cars - Trucks

	Center Street/RTE 36 From North				Center Street/RTE 36 From South				Mattakeesett Street/RTE 14 From West				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
04:00 PM	118	103	0	221	8	79	2	89	57	16	0	73	383
04:15 PM	121	87	1	209	25	71	1	97	54	11	1	66	372
04:30 PM	117	90	0	207	18	89	0	107	44	14	0	58	372
04:45 PM	115	68	0	183	15	99	1	115	44	16	0	60	358
Total	471	348	1	820	66	338	4	408	199	57	1	257	1485
05:00 PM	114	78	0	192	17	73	0	90	42	5	0	47	329
05:15 PM	136	73	0	209	10	52	0	62	41	13	0	54	325
05:30 PM	102	64	0	166	8	86	0	94	41	10	0	51	311
05:45 PM	84	45	0	129	6	80	0	86	24	12	0	36	251
Total	436	260	0	696	41	291	0	332	148	40	0	188	1216
Grand Total	907	608	1	1516	107	629	4	740	347	97	1	445	2701
Apprch %	59.8	40.1	0.1		14.5	85	0.5		78	21.8	0.2		
Total %	33.6	22.5	0	56.1	4	23.3	0.1	27.4	12.8	3.6	0	16.5	
Cars	898	606	1	1505	105	622	4	731	343	96	1	440	2676
% Cars	99	99.7	100	99.3	98.1	98.9	100	98.8	98.8	99	100	98.9	99.1
Trucks	9	2	0	11	2	7	0	9	4	1	0	5	25
% Trucks	1	0.3	0	0.7	1.9	1.1	0	1.2	1.2	1	0	1.1	0.9

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center St PM

Site Code : 22101

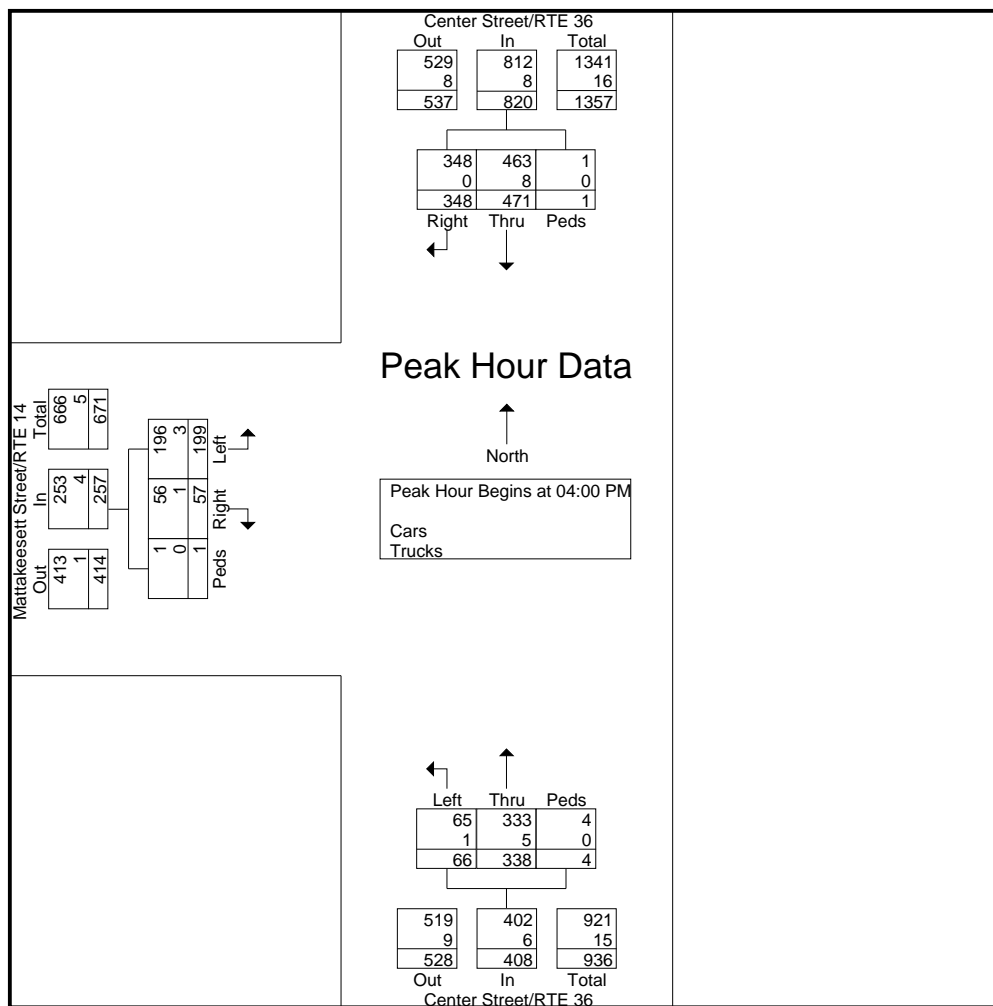
Start Date : 1/3/2023

Page No : 2

E-W Street: Mattakeesett St/Rte 14

N-S Street: Center St/Rte 36

	Center Street/RTE 36 From North				Center Street/RTE 36 From South				Mattakeesett Street/RTE 14 From West				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	118	103	0	221	8	79	2	89	57	16	0	73	383
04:15 PM	121	87	1	209	25	71	1	97	54	11	1	66	372
04:30 PM	117	90	0	207	18	89	0	107	44	14	0	58	372
04:45 PM	115	68	0	183	15	99	1	115	44	16	0	60	358
Total Volume	471	348	1	820	66	338	4	408	199	57	1	257	1485
% App. Total	57.4	42.4	0.1		16.2	82.8	1		77.4	22.2	0.4		
PHF	.973	.845	.250	.928	.660	.854	.500	.887	.873	.891	.250	.880	.969
Cars	463	348	1	812	65	333	4	402	196	56	1	253	1467
% Cars	98.3	100	100	99.0	98.5	98.5	100	98.5	98.5	98.2	100	98.4	98.8
Trucks	8	0	0	8	1	5	0	6	3	1	0	4	18
% Trucks	1.7	0	0	1.0	1.5	1.5	0	1.5	1.5	1.8	0	1.6	1.2



Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center Plaza Drwy AM

Site Code : 22101

E-W Street: Mattakeesett St/Rte14

Start Date : 1/3/2023

N-S Street: Center Plaza Drwy

Page No : 1

Groups Printed- Cars - Trucks

	Mattakeesett Street/RTE 14 From East				Pembroke Center Plaza Driveway From South				Mattakeesett Street/RTE 14 From West				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	2	122	0	124	0	1	0	1	112	0	0	112	237
07:15 AM	3	144	0	147	1	2	0	3	49	0	0	49	199
07:30 AM	4	129	0	133	0	3	0	3	44	3	0	47	183
07:45 AM	5	112	0	117	3	5	0	8	89	1	0	90	215
Total	14	507	0	521	4	11	0	15	294	4	0	298	834
08:00 AM	5	112	0	117	1	9	0	10	58	2	0	60	187
08:15 AM	4	120	0	124	3	5	0	8	52	3	0	55	187
08:30 AM	7	85	0	92	2	5	0	7	58	4	0	62	161
08:45 AM	10	104	1	115	3	5	0	8	66	1	0	67	190
Total	26	421	1	448	9	24	0	33	234	10	0	244	725
Grand Total	40	928	1	969	13	35	0	48	528	14	0	542	1559
Apprch %	4.1	95.8	0.1		27.1	72.9	0		97.4	2.6	0		
Total %	2.6	59.5	0.1	62.2	0.8	2.2	0	3.1	33.9	0.9	0	34.8	
Cars	40	899	1	940	13	35	0	48	488	14	0	502	1490
% Cars	100	96.9	100	97	100	100	0	100	92.4	100	0	92.6	95.6
Trucks	0	29	0	29	0	0	0	0	40	0	0	40	69
% Trucks	0	3.1	0	3	0	0	0	0	7.6	0	0	7.4	4.4

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center Plaza Drwy AM

Site Code : 22101

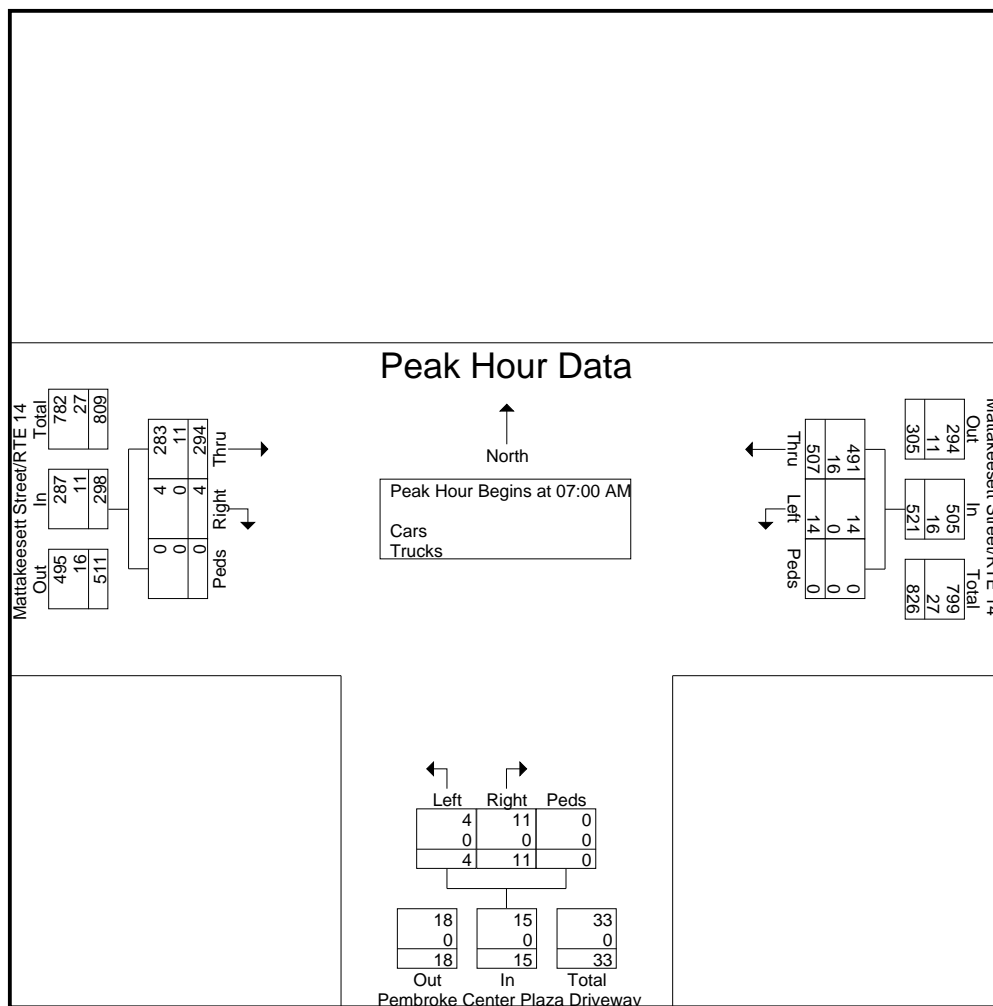
Start Date : 1/3/2023

Page No : 2

E-W Street: Mattakeesett St/Rte14

N-S Street: Center Plaza Drwy

	Mattakeesett Street/RTE 14 From East				Pembroke Center Plaza Driveway From South				Mattakeesett Street/RTE 14 From West				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	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 07:00 AM													
07:00 AM	2	122	0	124	0	1	0	1	112	0	0	112	237
07:15 AM	3	144	0	147	1	2	0	3	49	0	0	49	199
07:30 AM	4	129	0	133	0	3	0	3	44	3	0	47	183
07:45 AM	5	112	0	117	3	5	0	8	89	1	0	90	215
Total Volume	14	507	0	521	4	11	0	15	294	4	0	298	834
% App. Total	2.7	97.3	0		26.7	73.3	0		98.7	1.3	0		
PHF	.700	.880	.000	.886	.333	.550	.000	.469	.656	.333	.000	.665	.880
Cars	14	491	0	505	4	11	0	15	283	4	0	287	807
% Cars	100	96.8	0	96.9	100	100	0	100	96.3	100	0	96.3	96.8
Trucks	0	16	0	16	0	0	0	0	11	0	0	11	27
% Trucks	0	3.2	0	3.1	0	0	0	0	3.7	0	0	3.7	3.2



Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center Plaza Drwy PM

Site Code : 22101

E-W Street: Mattakeesett St/Rte14

Start Date : 1/3/2023

N-S Street: Center Plaza Drwy

Page No : 1

Groups Printed- Cars - Trucks

	Mattakeesett Street/RTE 14 From East				Pembroke Center Plaza Driveway From South				Mattakeesett Street/RTE 14 From West				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	36	77	1	114	12	18	0	30	54	11	0	65	209
04:15 PM	30	84	0	114	14	13	0	27	51	3	0	54	195
04:30 PM	20	93	0	113	6	24	0	30	42	6	0	48	191
04:45 PM	19	61	0	80	8	6	0	14	48	9	0	57	151
Total	105	315	1	421	40	61	0	101	195	29	0	224	746
05:00 PM	23	71	0	94	8	11	0	19	38	7	0	45	158
05:15 PM	23	61	0	84	10	19	0	29	39	7	0	46	159
05:30 PM	24	46	0	70	10	12	0	22	37	15	0	52	144
05:45 PM	14	36	0	50	9	7	0	16	24	4	0	28	94
Total	84	214	0	298	37	49	0	86	138	33	0	171	555
Grand Total	189	529	1	719	77	110	0	187	333	62	0	395	1301
Apprch %	26.3	73.6	0.1		41.2	58.8	0		84.3	15.7	0		
Total %	14.5	40.7	0.1	55.3	5.9	8.5	0	14.4	25.6	4.8	0	30.4	
Cars	187	522	1	710	77	110	0	187	321	62	0	383	1280
% Cars	98.9	98.7	100	98.7	100	100	0	100	96.4	100	0	97	98.4
Trucks	2	7	0	9	0	0	0	0	12	0	0	12	21
% Trucks	1.1	1.3	0	1.3	0	0	0	0	3.6	0	0	3	1.6

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101 Mattakeesett at Center Plaza Drwy PM

Site Code : 22101

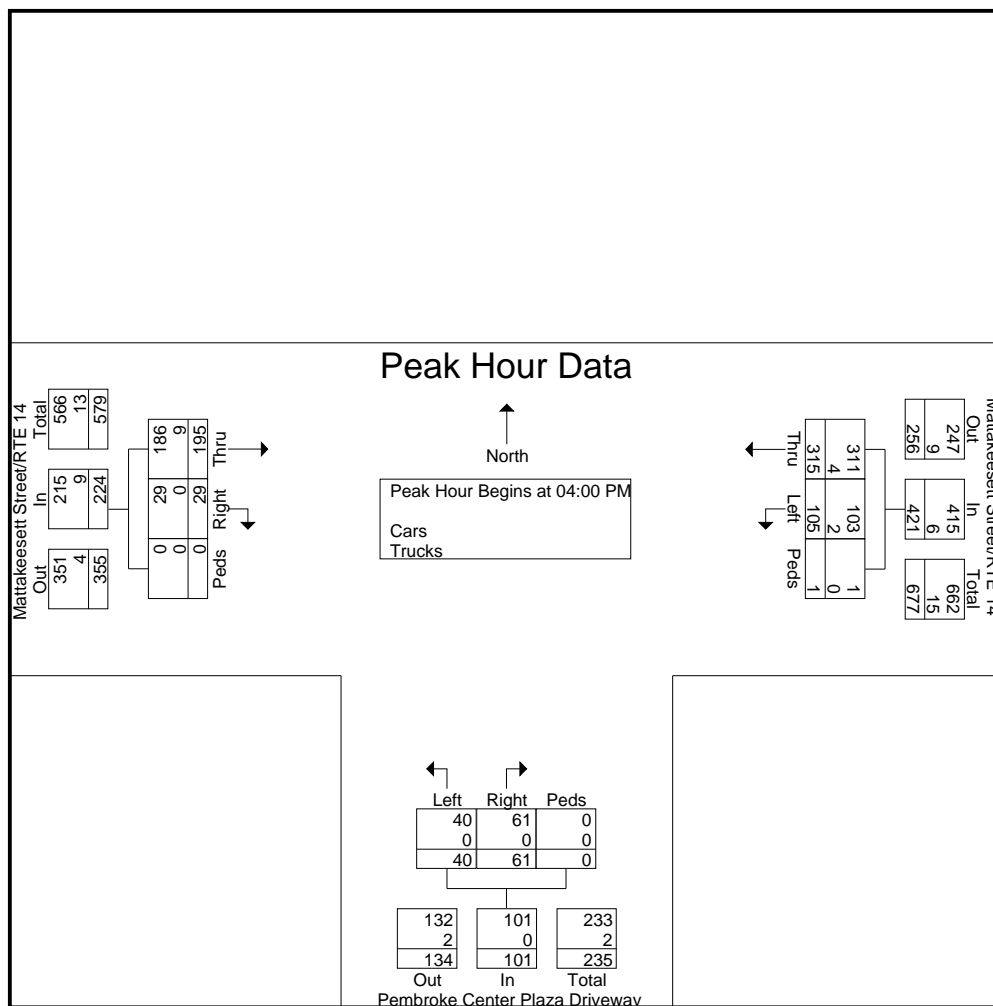
Start Date : 1/3/2023

Page No : 2

E-W Street: Mattakeesett St/Rte14

N-S Street: Center Plaza Drwy

	Mattakeesett Street/RTE 14 From East				Pembroke Center Plaza Driveway From South				Mattakeesett Street/RTE 14 From West				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	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 04:00 PM													
04:00 PM	36	77	1	114	12	18	0	30	54	11	0	65	209
04:15 PM	30	84	0	114	14	13	0	27	51	3	0	54	195
04:30 PM	20	93	0	113	6	24	0	30	42	6	0	48	191
04:45 PM	19	61	0	80	8	6	0	14	48	9	0	57	151
Total Volume	105	315	1	421	40	61	0	101	195	29	0	224	746
% App. Total	24.9	74.8	0.2		39.6	60.4	0		87.1	12.9	0		
PHF	.729	.847	.250	.923	.714	.635	.000	.842	.903	.659	.000	.862	.892
Cars	103	311	1	415	40	61	0	101	186	29	0	215	731
% Cars	98.1	98.7	100	98.6	100	100	0	100	95.4	100	0	96.0	98.0
Trucks	2	4	0	6	0	0	0	0	9	0	0	9	15
% Trucks	1.9	1.3	0	1.4	0	0	0	0	4.6	0	0	4.0	2.0



Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101_Mattakeesett at Center Plaza Drwy AM

Site Code : 22101

E-W Street:Mattakeesett St-Rte 14

Start Date : 1/10/2023

N-S Street:Center Plaza Drwy

Page No : 1

Groups Printed- Cars - Trucks

	Mattakeesett Street/RTE 14 From East				Pembroke Center Plaza Driveway From South				Mattakeesett Street/RTE 14 From West				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	2	32	0	34	1	2	0	3	40	1	0	41	78
07:15 AM	3	37	0	40	2	2	0	4	48	1	0	49	93
07:30 AM	2	38	0	40	2	2	0	4	70	1	0	71	115
07:45 AM	2	37	0	39	1	1	0	2	64	7	0	71	112
Total	9	144	0	153	6	7	0	13	222	10	0	232	398
08:00 AM	6	41	0	47	4	3	0	7	77	5	0	82	136
08:15 AM	6	51	0	57	3	4	0	7	70	6	0	76	140
08:30 AM	4	46	0	50	1	5	0	6	65	2	0	67	123
08:45 AM	8	49	0	57	5	1	0	6	63	6	1	70	133
Total	24	187	0	211	13	13	0	26	275	19	1	295	532
Grand Total	33	331	0	364	19	20	0	39	497	29	1	527	930
Apprch %	9.1	90.9	0		48.7	51.3	0		94.3	5.5	0.2		
Total %	3.5	35.6	0	39.1	2	2.2	0	4.2	53.4	3.1	0.1	56.7	
Cars	32	313	0	345	18	20	0	38	469	29	1	499	882
% Cars	97	94.6	0	94.8	94.7	100	0	97.4	94.4	100	100	94.7	94.8
Trucks	1	18	0	19	1	0	0	1	28	0	0	28	48
% Trucks	3	5.4	0	5.2	5.3	0	0	2.6	5.6	0	0	5.3	5.2

Ron Müller & Associates

Traffic Engineering and Consulting Services

File Name : 22101_Mattakeesett at Center Plaza Drwy AM

Site Code : 22101

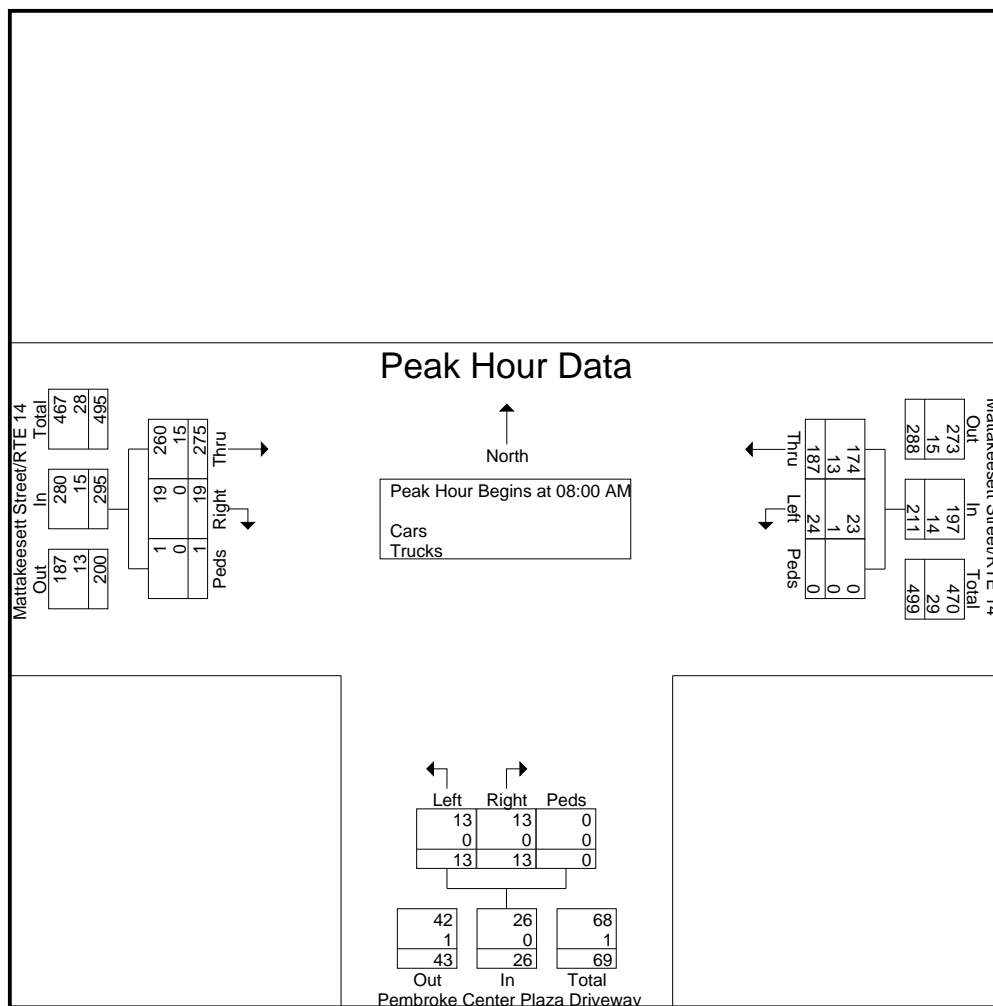
Start Date : 1/10/2023

Page No : 2

E-W Street:Mattakeesett St-Rte 14

N-S Street:Center Plaza Drwy

	Mattakeesett Street/RTE 14 From East				Pembroke Center Plaza Driveway From South				Mattakeesett Street/RTE 14 From West				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	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 08:00 AM													
08:00 AM	6	41	0	47	4	3	0	7	77	5	0	82	136
08:15 AM	6	51	0	57	3	4	0	7	70	6	0	76	140
08:30 AM	4	46	0	50	1	5	0	6	65	2	0	67	123
08:45 AM	8	49	0	57	5	1	0	6	63	6	1	70	133
Total Volume	24	187	0	211	13	13	0	26	275	19	1	295	532
% App. Total	11.4	88.6	0		50	50	0		93.2	6.4	0.3		
PHF	.750	.917	.000	.925	.650	.650	.000	.929	.893	.792	.250	.899	.950
Cars	23	174	0	197	13	13	0	26	260	19	1	280	503
% Cars	95.8	93.0	0	93.4	100	100	0	100	94.5	100	100	94.9	94.5
Trucks	1	13	0	14	0	0	0	0	15	0	0	15	29
% Trucks	4.2	7.0	0	6.6	0	0	0	0	5.5	0	0	5.1	5.5



Traffic Count Adjustment Data

Massachusetts Highway Department
Statewide Traffic Data Collection
2019 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.22	1.14	1.12	1.06	1.00	0.96	0.87	0.85	0.96	0.99	1.04	1.12	0.85
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.06	1.07	1.00	0.89	0.88	0.89	0.89	0.95	0.92	1.02	1.01	0.97
R4-R7	1.09	1.09	1.11	1.02	0.96	0.92	0.89	0.89	0.99	0.98	1.09	1.13	0.98
U1-Boston	1.03	1.01	0.98	0.94	0.94	0.92	0.95	0.93	0.94	0.94	0.97	1.04	0.96
U1-Essex	1.09	1.06	1.03	0.99	0.94	0.90	0.88	0.86	0.93	0.94	0.99	1.06	0.93
U1-Southeast	1.06	1.05	1.01	0.97	0.95	0.93	0.93	0.90	0.94	0.94	0.98	1.04	0.98
U1-West	1.19	1.14	1.09	0.95	0.92	0.89	0.89	0.86	0.91	0.95	0.97	1.07	0.84
U1-Worcester	1.02	1.04	0.97	0.94	0.93	0.91	0.95	0.91	0.93	0.92	0.95	1.10	0.88
U2	1.01	1.00	0.94	0.93	0.91	0.89	0.93	0.90	0.90	0.91	0.94	1.02	0.99
U3	1.06	1.03	0.98	0.94	0.93	0.91	0.95	0.91	0.92	0.93	0.97	1.00	0.98
U4-U7	1.01	1.00	0.95	0.92	0.88	0.86	0.92	0.91	0.92	0.94	0.99	1.04	0.99
Rec - East	1.04	1.16	1.12	0.98	0.92	0.88	0.77	0.81	0.94	1.02	1.08	1.12	0.99
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.98

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.
Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

AADT Summary By Year for 1/1/2010 - 12/31/2019
Criteria: Location ID = 7318. From 1/1/1900 To 12/31/2049 12:00:00 AM

Community	Station	Station Information			2010	2011	2012	2013	2014	2015	2016	2017	2018
		Location	SOUTHEAST EXPRESSWAY		92983	89680	90993	90738	92478	96218	94644	96013	94947
		Description	Route 3		1	1	1	1	1	1	1	1	1
		FC	2		Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual

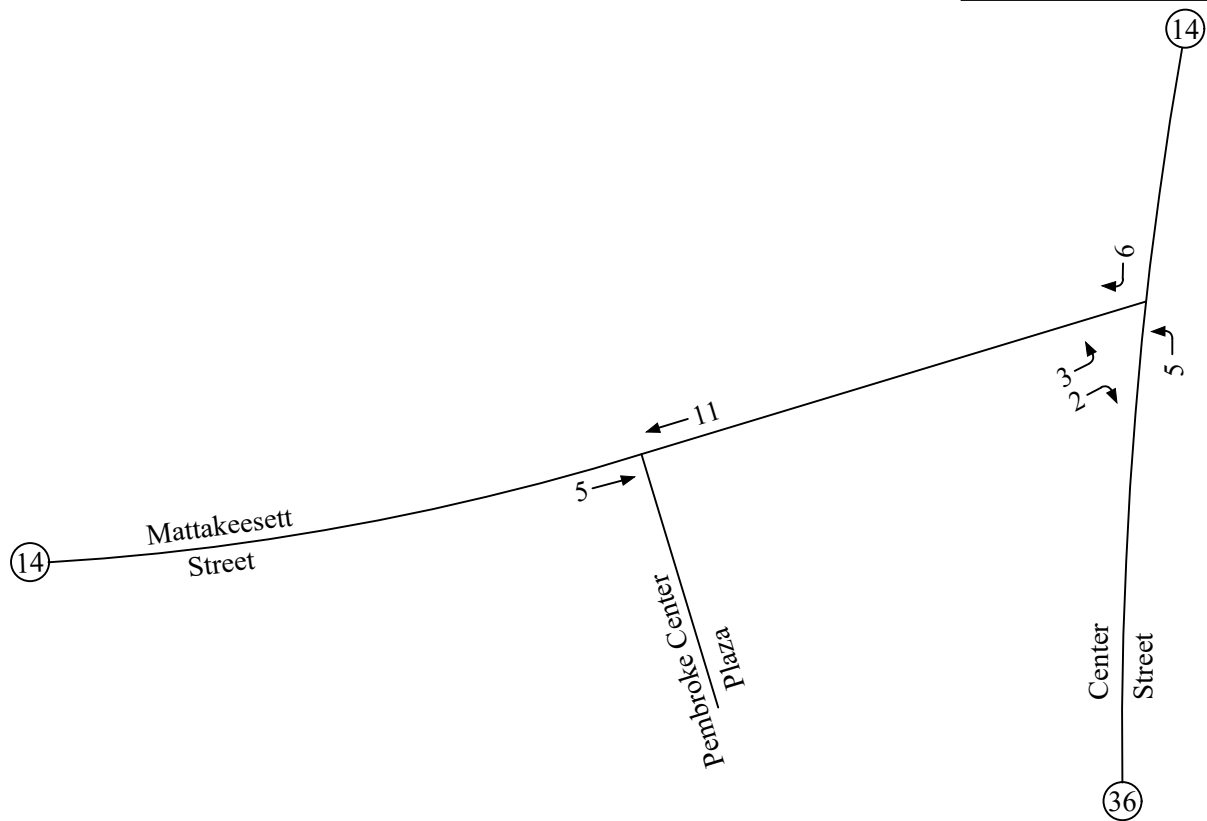
AADT Summary By Year for 1/1/2010 - 12/31/2019
Criteria: Location ID = 7318. From 1/1/1900 To 12/31/2049 12:00:00 AM

2019
93915
1
Actual

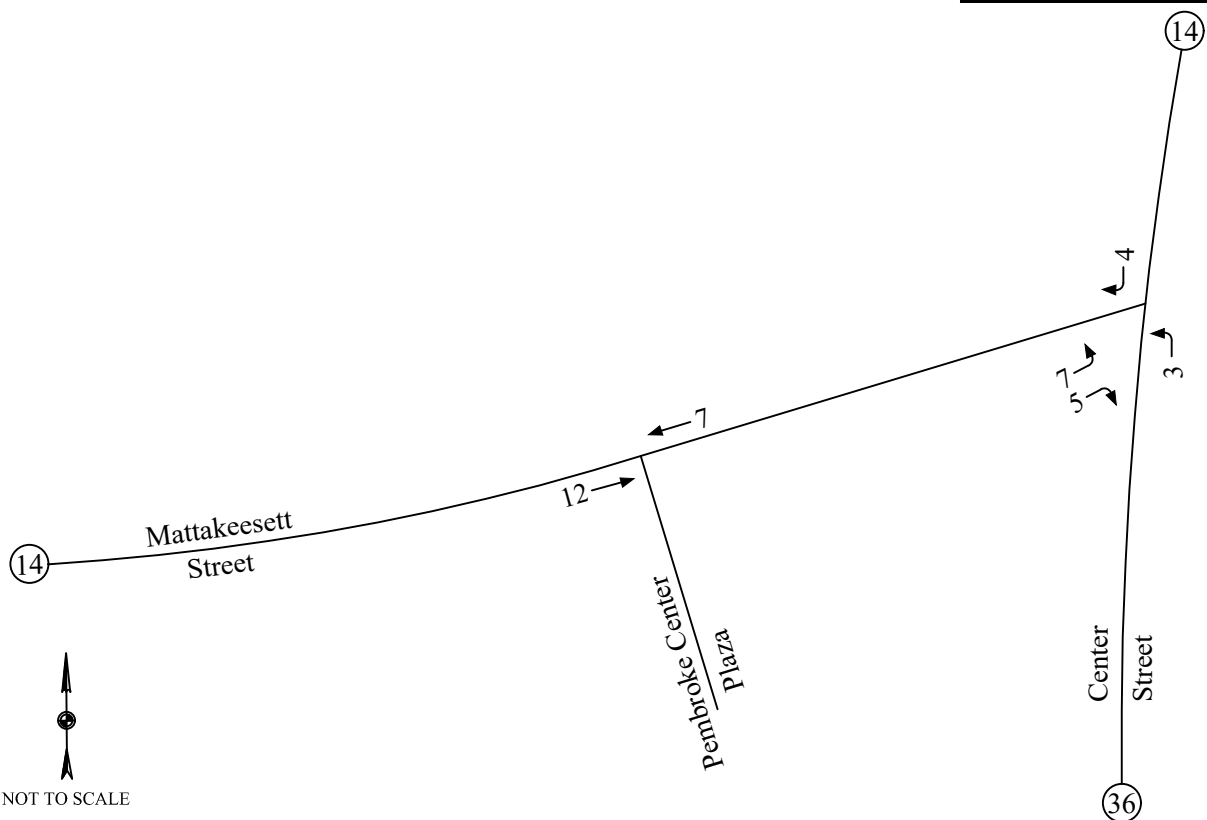
Crash Rate Worksheets, Background Developments, and Journey to Work

Boat Warehouse TG
Peak Hour Traffic Volumes

Weekday AM Peak Hour

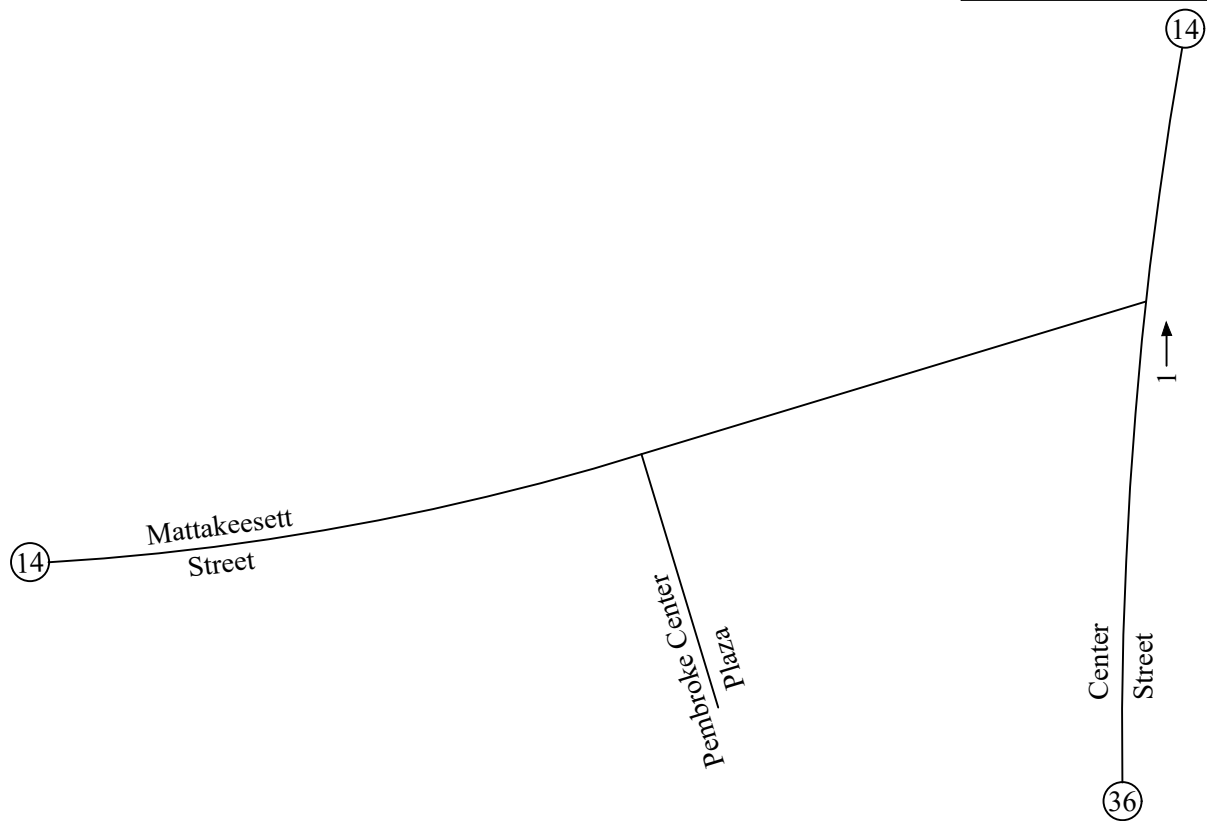


Weekday PM Peak Hour

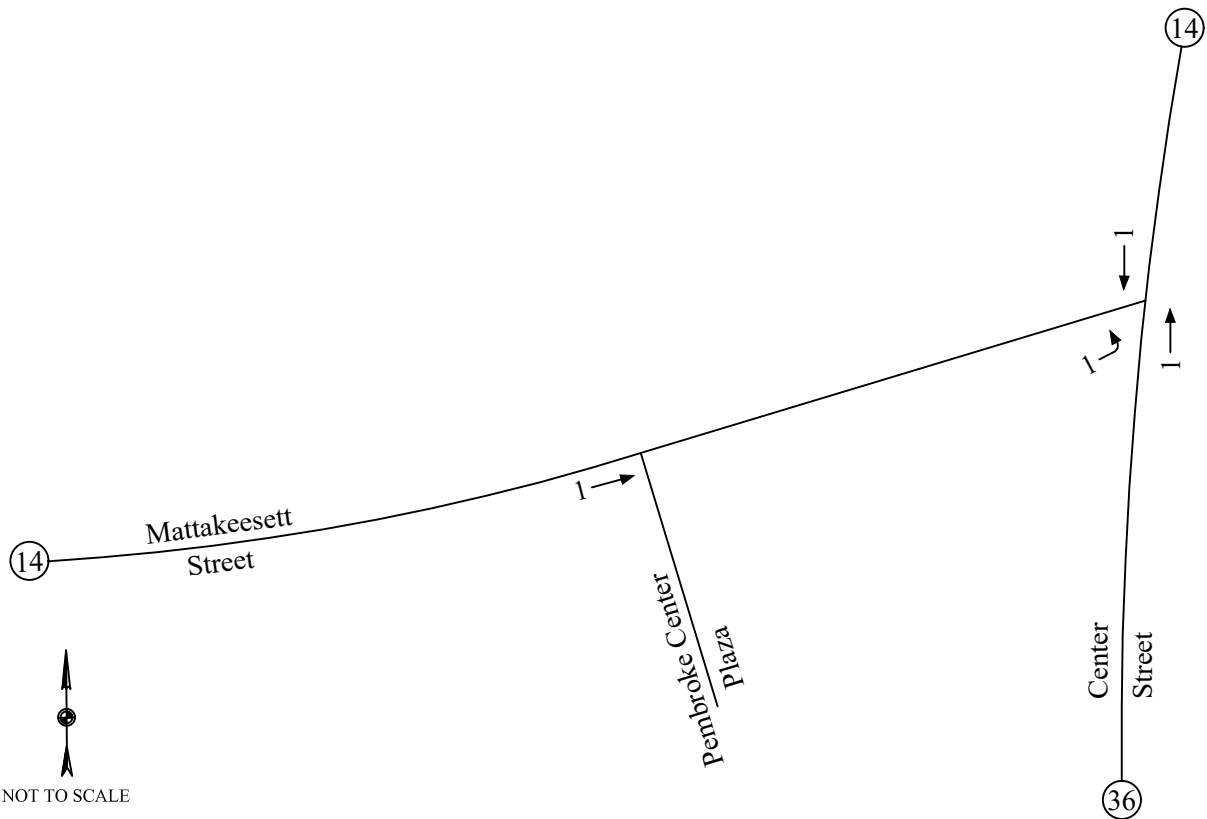


Community Center TG
Peak Hour Traffic Volumes

Weekday AM Peak Hour



Weekday PM Peak Hour



INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Pembroke COUNT DATE : Jan-23

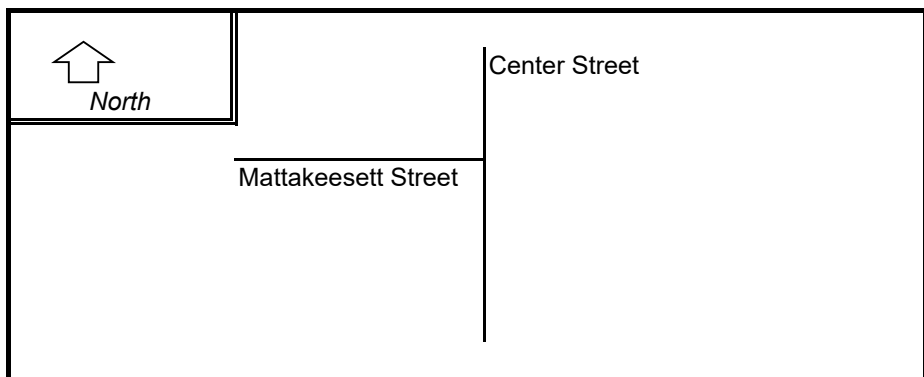
DISTRICT : 5 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Center Street

MINOR STREET(S) : Mattakeesett Street

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	SB	WB	NB	EB		
PEAK HOURLY VOLUMES (PM) :	831	0	409	259		1,499

" K " FACTOR : **0.096** APPROACH VOLUME : **15,615**

TOTAL # OF CRASHES : **11** # OF YEARS : **5** AVERAGE # OF CRASHES PER YEAR (A) : **2.20**

CRASH RATE CALCULATION :

0.39

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : MassDOT Crash Portal 2015-2019

Project Title & Date : Apartment Expansion 01/19/23

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Pembroke COUNT DATE : Jan-23

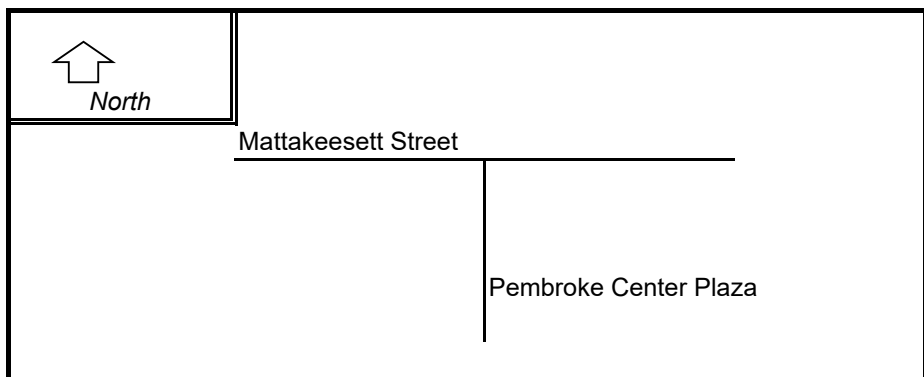
DISTRICT : 5 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Mattakeesett Street

MINOR STREET(S) : Pembroke Center Plaza

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	SB	WB	NB	EB		
PEAK HOURLY VOLUMES (PM) :	0	423	101	227		751

" K " FACTOR : **0.096** APPROACH VOLUME : **7,823**

TOTAL # OF CRASHES : **2** # OF YEARS : **5** AVERAGE # OF CRASHES PER YEAR (A) : **0.40**

CRASH RATE CALCULATION :

0.14

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : MassDOT Crash Portal 2015-2019

Project Title & Date: Apartment Development 01/19/23

From	To	# of Trips	% of Total
Pembroke town	Pembroke town	1,828	21.4%
Pembroke town	Boston city	1,200	14.0%
Pembroke town	Plymouth town	598	7.0%
Pembroke town	Haver town	524	6.1%
Pembroke town	Brockton city	505	5.9%
Pembroke town	Quincy city	446	5.2%
Pembroke town	Hingham town	388	4.5%
Pembroke town	Marshfield town	334	3.9%
Pembroke town	Kingston town	301	3.5%
Pembroke town	Norwell town	297	3.5%
Pembroke town	Weymouth Town city	289	3.4%
Pembroke town	Braintree Town city	272	3.2%
Pembroke town	Duxbury town	265	3.1%
Pembroke town	Carleton town	221	2.6%
Pembroke town	Rockland town	167	2.0%
Pembroke town	Abington town	159	1.9%
Pembroke town	Hanson town	139	1.6%
Pembroke town	Whitman town	102	1.2%
Pembroke town	Bridgewater town	84	1.0%
Pembroke town	Norwood town	83	1.0%
Pembroke town	Sandwich town	75	0.9%
Pembroke town	Dedham town	71	0.8%
Pembroke town	East Bridgewater town	70	0.8%
Pembroke town	Westwood town	65	0.8%
Pembroke town	Barnstable Town city	64	0.7%

Total Trips: 8,547

To/From North on Center Street	To/From South on Center Street	To/From West on Mattakeesett Street
45%	45%	10%
100%		
40%	60%	
70%		30%
80%		100%
100%		20%
50%	50%	
100%	100%	
100%		
70%		30%
50%	50%	
50%		50%
50%		50%
50%		50%
50%		50%
80%	100%	
60%		40%
60%	100%	100%
		40%

To/From North on Center Street	To/From South on Center Street	To/From West on Mattakeesett Street
10%	10%	2%
14%	0%	0%
3%	4%	0%
4%	0%	2%
0%	0%	6%
4%	0%	1%
5%	0%	0%
2%	2%	0%
0%	4%	0%
3%	0%	0%
3%	0%	0%
2%	0%	1%
2%	2%	0%
1%	0%	1%
1%	0%	1%
1%	0%	1%
1%	0%	1%
0%	0%	1%
1%	1%	0%
0%	0%	0%
0%	0%	0%
0%	0%	1%
0%	0%	0%
0%	1%	0%

Total:	58%	22%	19%
Say:	60%	20%	20%

Trip Generation Worksheets

Institute of Transportation Engineers (ITE); 11th Edition
Land Use Code (LUC) 252 - Senior Adult Housing - Multifamily

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 66

AVERAGE WEEKDAY DAILY

$$T = 2.89 * (X) + 24.82$$

$$T = 215.56$$

T = 220 vehicle trips
with 50% (110 vpd) entering and 50% (110 vpd) exiting.

WEEKDAY AM PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 0.19 * (X) + 0.90$$

$$T = 13.44$$

T = 13 vehicle trips
with 34% (4 vph) entering and 66% (9 vph) exiting.

WEEKDAY PM PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 0.25 * (X) + 0.07$$

$$T = 16.57$$

T = 17 vehicle trips
with 56% (10 vph) entering and 44% (7 vph) exiting.

SATURDAY DAILY

$$T = 2.33 * (X) + 31.21$$

$$T = 184.99$$

T = 180 vehicle trips
with 50% (90 vpd) entering and 50% (90 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

$$\ln T = 0.93 \ln (X) - 0.81$$

$$\ln T = 3.086$$

$$T = 21.90$$

T = 22 vehicle trips
with 54% (12 vph) entering and 46% (10 vph) exiting.

Institute of Transportation Engineers (ITE); 11th Edition
Land Use Code (LUC) 932 - High-Turnover (Sit Down) Restaurant

Average Vehicle Trips Ends vs: 1,000 Sq. Feet Gross Floor Area
Independent Variable (X): 4.600 ksf

AVERAGE WEEKDAY DAILY

$$T = 107.20 * (X)$$

$$T = 493.12$$

T = 493 vehicle trips
with 50% (247 vpd) entering and 50% (247 vpd) exiting.

WEEKDAY AM PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 9.57 * (X)$$

$$T = 44.02$$

T = 44 vehicle trips
with 55% (24 vph) entering and 45% (20 vph) exiting.

WEEKDAY PM PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 9.05 * (X)$$

$$T = 41.63$$

T = 42 vehicle trips
with 61% (26 vph) entering and 39% (16 vph) exiting.

SATURDAY DAILY

$$T = 122.40 * (X)$$

$$T = 563.04$$

T = 560 vehicle trips
with 50% (280 vpd) entering and 50% (280 vpd) exiting.

SATURDAY PEAK HOUR OF GENERATOR

$$T = 11.19 * (X)$$

$$T = 51.47$$

T = 51 vehicle trips
with 51% (26 vph) entering and 49% (25 vph) exiting.

Capacity Analysis Methodology and Worksheets

General

A primary result of capacity analysis is the assignment of levels of service to traffic facilities under various traffic flow conditions. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual* (HCM); Transportation Research Board; Washington, D.C.; 2010. The concept of level of service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level of service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year. A description of the operating condition under each level of service is provided below:

- LOS A describes conditions with little to no delay to motorists.
- LOS B represents a desirable level with relatively low delay to motorists.
- LOS C describes conditions with average delays to motorists.
- LOS D describes operations where the influence of congestion becomes more noticeable. Delays are still within an acceptable range.
- LOS E represents operating conditions with high delay values. This level is considered by many agencies to be the limit of acceptable delay.
- LOS F is considered to be unacceptable to most drivers with high delay values that often occur, when arrival flow rates exceed the capacity of the intersection.

Unsignalized Intersections

Levels of service for unsignalized intersections are calculated using the operational analysis methodology of the HCM. The procedure accounts for lane configuration on both the minor and major street approaches, conflicting traffic stream volumes, and the type of intersection control (STOP, YIELD, or all-way STOP control). The definition of level of service for unsignalized intersections is a function of average *control* delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The level-of-service criteria for unsignalized intersections are shown in Table A-1.

Signalized Intersections

Levels of service for signalized intersections are also calculated using the operational analysis methodology of the HCM. The methodology for signalized intersections assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometries on average *control* delay. Control delay includes queue move-up time and stopped delay. Table A-1 summarizes the relationship between level of service and average control delay.

Table A-1
Level-of-Service Criteria for Intersections

Level of Service	Unsignalized Criteria	Signalized Criteria
	Average Control Delay In Seconds Per Vehicle	Average Control Delay In Seconds Per Vehicle
A	≤ 10	≤ 10
B	10.1 to 15.0	10.1 to 20.0
C	15.1 to 25.0	20.1 to 35.0
D	25.1 to 35.0	35.1 to 55.0
E	35.1 to 50.0	55.1 to 80.0
F	>50	>80

For signalized intersections, this delay criterion may be applied in assigning level of service designations to individual lane groups, to individual intersection approaches, or to the entire intersection. For unsignalized intersections, this delay criterion may be applied in assigning level of service designations to individual lane groups or to individual intersection approaches.

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	238	53	50	476	232	163
Future Volume (vph)	238	53	50	476	232	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	45	100			30
Storage Lanes	1	1	1			0
Taper Length (ft)	25		45			
Satd. Flow (prot)	1671	1583	1719	1863	1745	0
Flt Permitted	0.950		0.205			
Satd. Flow (perm)	1671	1583	371	1863	1745	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		53			60	
Link Speed (mph)	30			30	30	
Link Distance (ft)	205			550	553	
Travel Time (s)	4.7			12.5	12.6	
Peak Hour Factor	0.81	0.81	0.97	0.97	0.75	0.75
Heavy Vehicles (%)	8%	2%	5%	2%	4%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	294	65	52	491	526	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	10.0	10.0	
Minimum Split (s)	24.0	24.0	12.0	24.0	24.0	
Total Split (s)	24.0	24.0	12.0	36.0	24.0	
Total Split (%)	40.0%	40.0%	20.0%	60.0%	40.0%	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.0	6.0	6.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	13.7	13.7	25.7	24.7	18.5	
Actuated g/C Ratio	0.27	0.27	0.50	0.49	0.36	
v/c Ratio	0.65	0.14	0.14	0.54	0.79	
Control Delay	25.2	7.5	7.8	12.2	27.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	25.2	7.5	7.8	12.2	27.8	
LOS	C	A	A	B	C	
Approach Delay	22.0			11.8	27.8	
Approach LOS	C			B	C	
Queue Length 50th (ft)	89	3	8	97	150	
Queue Length 95th (ft)	138	22	22	185	#242	
Internal Link Dist (ft)	125			470	473	
Turn Bay Length (ft)		45	100			
Base Capacity (vph)	617	618	381	1147	682	

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.48	0.11	0.14	0.43	0.77	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 50.9

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 20.3

Intersection LOS: C

Intersection Capacity Utilization 55.3%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14)

 01 12 s	 02 24 s	 04 24 s
 06 36 s		

HCM 6th Signalized Intersection Summary

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	238	53	50	476	232	163
Future Volume (veh/h)	238	53	50	476	232	163
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1781	1870	1826	1870	1841	1885
Adj Flow Rate, veh/h	294	65	52	491	309	0
Peak Hour Factor	0.81	0.81	0.97	0.97	0.75	0.75
Percent Heavy Veh, %	8	2	5	2	4	1
Cap, veh/h	389	363	431	865	473	
Arrive On Green	0.23	0.23	0.08	0.46	0.26	0.00
Sat Flow, veh/h	1697	1585	1739	1870	1841	0
Grp Volume(v), veh/h	294	65	52	491	309	0
Grp Sat Flow(s),veh/h/ln	1697	1585	1739	1870	1841	0
Q Serve(g_s), s	6.3	1.3	0.7	7.4	5.8	0.0
Cycle Q Clear(g_c), s	6.3	1.3	0.7	7.4	5.8	0.0
Prop In Lane	1.00	1.00	1.00			0.00
Lane Grp Cap(c), veh/h	389	363	431	865	473	
V/C Ratio(X)	0.76	0.18	0.12	0.57	0.65	
Avail Cap(c_a), veh/h	785	733	610	1442	851	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.0	12.1	8.4	7.6	12.9	0.0
Incr Delay (d2), s/veh	3.0	0.2	0.1	0.6	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.4	0.2	2.1	2.1	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.0	12.3	8.5	8.2	14.5	0.0
LnGrp LOS	B	B	A	A	B	
Approach Vol, veh/h	359			543	309	
Approach Delay, s/veh	16.2			8.2	14.5	
Approach LOS	B			A	B	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	8.0	16.0		14.9		24.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	7.0	18.0		18.0		30.0
Max Q Clear Time (g_c+I1), s	2.7	7.8		8.3		9.4
Green Ext Time (p_c), s	0.0	1.3		0.8		3.1

Intersection Summary

HCM 6th Ctrl Delay	12.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC

5: Pembroke Center Plaza Driveway/West Site Driveway & Mattakeesett Street (Route 1A) 02/01/2023

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	278	19	24	189	0	13	0	13	0	0	0
Future Vol, veh/h	0	278	19	24	189	0	13	0	13	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	93	93	93	93	93	93	92	92	92
Heavy Vehicles, %	0	6	0	4	7	0	0	0	0	2	2	2
Mvmt Flow	0	309	21	26	203	0	14	0	14	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	203	0	0	330	0	0	575	575	320	582	585	203
Stage 1	-	-	-	-	-	-	320	320	-	255	255	-
Stage 2	-	-	-	-	-	-	255	255	-	327	330	-
Critical Hdwy	4.1	-	-	4.14	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.2	-	-	2.236	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1381	-	-	1218	-	-	432	431	725	424	423	838
Stage 1	-	-	-	-	-	-	696	656	-	749	696	-
Stage 2	-	-	-	-	-	-	754	700	-	686	646	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1381	-	-	1218	-	-	424	421	725	408	413	838
Mov Cap-2 Maneuver	-	-	-	-	-	-	424	421	-	408	413	-
Stage 1	-	-	-	-	-	-	696	656	-	749	679	-
Stage 2	-	-	-	-	-	-	736	683	-	673	646	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.9			12.1			0		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	535	1381	-	-	1218	-	-	-				
HCM Lane V/C Ratio	0.052	-	-	-	0.021	-	-	-				
HCM Control Delay (s)	12.1	0	-	-	8	0	-	0				
HCM Lane LOS	B	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	-				

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 0 291 213 0 0 0

Future Vol, veh/h 0 291 213 0 0 0

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 90 92 92 92 92

Heavy Vehicles, % 0 6 7 0 2 2

Mvmt Flow 0 323 232 0 0 0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 232 0 - 0 555 232

Stage 1 - - - - 232 -

Stage 2 - - - - 323 -

Critical Hdwy 4.1 - - - 6.42 6.22

Critical Hdwy Stg 1 - - - - 5.42 -

Critical Hdwy Stg 2 - - - - 5.42 -

Follow-up Hdwy 2.2 - - - 3.518 3.318

Pot Cap-1 Maneuver 1348 - - - 493 807

Stage 1 - - - - 807 -

Stage 2 - - - - 734 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1348 - - - 493 807

Mov Cap-2 Maneuver - - - - 493 -

Stage 1 - - - - 807 -

Stage 2 - - - - 734 -

Approach EB WB SB

HCM Control Delay, s 0 0 0

HCM LOS A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1348 - - - -

HCM Lane V/C Ratio - - - - -

HCM Control Delay (s) 0 - - - 0

HCM Lane LOS A - - - A

HCM 95th %tile Q(veh) 0 - - - -

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	201	58	68	341	476	355
Future Volume (vph)	201	58	68	341	476	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	45	100			30
Storage Lanes	1	1	1			0
Taper Length (ft)	25		45			
Satd. Flow (prot)	1770	1583	1770	1863	1770	0
Flt Permitted	0.950		0.092			
Satd. Flow (perm)	1770	1583	171	1863	1770	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		41			64	
Link Speed (mph)	30			30	30	
Link Distance (ft)	205			550	553	
Travel Time (s)	4.7			12.5	12.6	
Peak Hour Factor	0.88	0.88	0.89	0.89	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	228	66	76	383	894	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	10.0	10.0	
Minimum Split (s)	24.0	24.0	12.0	24.0	24.0	
Total Split (s)	24.0	24.0	12.0	66.0	54.0	
Total Split (%)	26.7%	26.7%	13.3%	73.3%	60.0%	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.0	6.0	6.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	14.9	14.9	54.2	53.2	44.3	
Actuated g/C Ratio	0.18	0.18	0.67	0.66	0.55	
v/c Ratio	0.70	0.20	0.29	0.31	0.89	
Control Delay	44.9	16.8	7.6	6.7	29.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	44.9	16.8	7.6	6.7	29.8	
LOS	D	B	A	A	C	
Approach Delay	38.6			6.9	29.8	
Approach LOS	D			A	C	
Queue Length 50th (ft)	120	12	12	75	397	
Queue Length 95th (ft)	192	45	26	121	#699	
Internal Link Dist (ft)	125			470	473	
Turn Bay Length (ft)		45	100			
Base Capacity (vph)	412	400	260	1395	1124	

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.55	0.17	0.29	0.27	0.80	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 80.6

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 25.0

Intersection LOS: C

Intersection Capacity Utilization 77.6%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14)



HCM 6th Signalized Intersection Summary

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	201	58	68	341	476	355
Future Volume (veh/h)	201	58	68	341	476	355
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1900
Adj Flow Rate, veh/h	228	66	76	383	512	0
Peak Hour Factor	0.88	0.88	0.89	0.89	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	0
Cap, veh/h	311	276	433	1058	679	
Arrive On Green	0.17	0.17	0.09	0.57	0.36	0.00
Sat Flow, veh/h	1781	1585	1781	1870	1870	0
Grp Volume(v), veh/h	228	66	76	383	512	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	0
Q Serve(g_s), s	5.6	1.7	1.0	5.2	11.1	0.0
Cycle Q Clear(g_c), s	5.6	1.7	1.0	5.2	11.1	0.0
Prop In Lane	1.00	1.00	1.00			0.00
Lane Grp Cap(c), veh/h	311	276	433	1058	679	
V/C Ratio(X)	0.73	0.24	0.18	0.36	0.75	
Avail Cap(c_a), veh/h	694	618	535	2429	1943	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.1	16.4	8.0	5.5	12.9	0.0
Incr Delay (d2), s/veh	3.4	0.4	0.2	0.2	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.6	0.3	1.3	4.1	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	21.4	16.9	8.2	5.7	14.6	0.0
LnGrp LOS	C	B	A	A	B	
Approach Vol, veh/h	294			459	512	
Approach Delay, s/veh	20.4			6.1	14.6	
Approach LOS	C			A	B	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.4	22.8		14.1		32.1
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	7.0	48.0		18.0		60.0
Max Q Clear Time (g_c+I1), s	3.0	13.1		7.6		7.2
Green Ext Time (p_c), s	0.0	3.7		0.6		2.6

Intersection Summary

HCM 6th Ctrl Delay	12.9
HCM 6th LOS	B

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC

5: Pembroke Center Plaza Driveway/West Site Driveway & Mattakeesett Street (Route 1A) 09/2023

Intersection												
Int Delay, s/veh	3.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	198	29	105	318	0	40	0	61	0	0	0
Future Vol, veh/h	0	198	29	105	318	0	40	0	61	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	2	1	0	0	0	0	2	2	2
Mvmt Flow	0	230	34	114	346	0	43	0	66	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	346	0	0	264	0	0	821	821	247	854	838	346
Stage 1	-	-	-	-	-	-	247	247	-	574	574	-
Stage 2	-	-	-	-	-	-	574	574	-	280	264	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1224	-	-	1300	-	-	296	312	797	279	302	697
Stage 1	-	-	-	-	-	-	761	706	-	504	503	-
Stage 2	-	-	-	-	-	-	507	506	-	727	690	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1224	-	-	1300	-	-	271	278	797	234	269	697
Mov Cap-2 Maneuver	-	-	-	-	-	-	271	278	-	234	269	-
Stage 1	-	-	-	-	-	-	761	706	-	504	448	-
Stage 2	-	-	-	-	-	-	452	451	-	667	690	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2			15.5			0		
HCM LOS							C			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	451	1224	-	-	1300	-	-	-				
HCM Lane V/C Ratio	0.243	-	-	-	0.088	-	-	-				
HCM Control Delay (s)	15.5	0	-	-	8	0	-	0				
HCM Lane LOS	C	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.9	0	-	-	0.3	-	-	-				

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 0 259 423 0 0 0

Future Vol, veh/h 0 259 423 0 0 0

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 90 92 92 92 92

Heavy Vehicles, % 0 6 7 0 2 2

Mvmt Flow 0 288 460 0 0 0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 460 0 - 0 748 460

Stage 1 - - - - 460 -

Stage 2 - - - - 288 -

Critical Hdwy 4.1 - - - 6.42 6.22

Critical Hdwy Stg 1 - - - - 5.42 -

Critical Hdwy Stg 2 - - - - 5.42 -

Follow-up Hdwy 2.2 - - - 3.518 3.318

Pot Cap-1 Maneuver 1112 - - - 380 601

Stage 1 - - - - 636 -

Stage 2 - - - - 761 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1112 - - - 380 601

Mov Cap-2 Maneuver - - - - 380 -

Stage 1 - - - - 636 -

Stage 2 - - - - 761 -

Approach EB WB SB

HCM Control Delay, s 0 0 0

HCM LOS A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1112 - - - -

HCM Lane V/C Ratio - - - - -

HCM Control Delay (s) 0 - - - 0

HCM Lane LOS A - - - A

HCM 95th %tile Q(veh) 0 - - - -

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	250	57	57	494	240	175
Future Volume (vph)	250	57	57	494	240	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	45	100			30
Storage Lanes	1	1	1			0
Taper Length (ft)	25		45			
Satd. Flow (prot)	1671	1583	1719	1863	1744	0
Flt Permitted	0.950		0.272			
Satd. Flow (perm)	1671	1583	492	1863	1744	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		55			62	
Link Speed (mph)	30			30	30	
Link Distance (ft)	205			550	553	
Travel Time (s)	4.7			12.5	12.6	
Peak Hour Factor	0.92	0.92	0.97	0.97	0.92	0.92
Heavy Vehicles (%)	8%	2%	5%	2%	4%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	272	62	59	509	451	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	10.0	10.0	
Minimum Split (s)	24.0	24.0	12.0	24.0	24.0	
Total Split (s)	24.0	24.0	12.0	36.0	24.0	
Total Split (%)	40.0%	40.0%	20.0%	60.0%	40.0%	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.0	6.0	6.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	13.1	13.1	24.4	23.4	17.3	
Actuated g/C Ratio	0.27	0.27	0.50	0.48	0.35	
v/c Ratio	0.61	0.13	0.14	0.58	0.69	
Control Delay	23.7	7.0	7.6	12.6	22.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	23.7	7.0	7.6	12.6	22.1	
LOS	C	A	A	B	C	
Approach Delay	20.6			12.1	22.1	
Approach LOS	C			B	C	
Queue Length 50th (ft)	81	2	8	98	113	
Queue Length 95th (ft)	147	24	25	194	#270	
Internal Link Dist (ft)	125			470	473	
Turn Bay Length (ft)		45	100			
Base Capacity (vph)	648	648	429	1205	715	

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.42	0.10	0.14	0.42	0.63	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 49.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 17.5

Intersection LOS: B

Intersection Capacity Utilization 57.2%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14)



HCM 6th Signalized Intersection Summary

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	250	57	57	494	240	175
Future Volume (veh/h)	250	57	57	494	240	175
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1781	1870	1826	1870	1841	1885
Adj Flow Rate, veh/h	272	62	59	509	261	0
Peak Hour Factor	0.92	0.92	0.97	0.97	0.92	0.92
Percent Heavy Veh, %	8	2	5	2	4	1
Cap, veh/h	365	341	484	886	477	
Arrive On Green	0.22	0.22	0.09	0.47	0.26	0.00
Sat Flow, veh/h	1697	1585	1739	1870	1841	0
Grp Volume(v), veh/h	272	62	59	509	261	0
Grp Sat Flow(s),veh/h/ln	1697	1585	1739	1870	1841	0
Q Serve(g_s), s	5.8	1.2	0.8	7.6	4.7	0.0
Cycle Q Clear(g_c), s	5.8	1.2	0.8	7.6	4.7	0.0
Prop In Lane	1.00	1.00	1.00			0.00
Lane Grp Cap(c), veh/h	365	341	484	886	477	
V/C Ratio(X)	0.74	0.18	0.12	0.57	0.55	
Avail Cap(c_a), veh/h	791	739	651	1454	859	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.2	12.4	7.9	7.3	12.3	0.0
Incr Delay (d2), s/veh	3.0	0.3	0.1	0.6	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.4	0.2	2.1	1.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.2	12.6	8.0	7.9	13.3	0.0
LnGrp LOS	B	B	A	A	B	
Approach Vol, veh/h	334			568	261	
Approach Delay, s/veh	16.3			7.9	13.3	
Approach LOS	B			A	B	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	8.3	16.0		14.3		24.3
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	7.0	18.0		18.0		30.0
Max Q Clear Time (g_c+I1), s	2.8	6.7		7.8		9.6
Green Ext Time (p_c), s	0.0	1.1		0.8		3.3

Intersection Summary

HCM 6th Ctrl Delay	11.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC

5: Pembroke Center Plaza Driveway/West Site Driveway & Mattakeesett Street (Route 1A) 09/2023

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	294	19	24	208	0	13	0	13	0	0	0
Future Vol, veh/h	0	294	19	24	208	0	13	0	13	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	93	93	93	93	93	93	92	92	92
Heavy Vehicles, %	0	6	0	4	7	0	0	0	0	2	2	2
Mvmt Flow	0	320	21	26	224	0	14	0	14	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	224	0	0	341	0	0	607	607	331	614	617	224
Stage 1	-	-	-	-	-	-	331	331	-	276	276	-
Stage 2	-	-	-	-	-	-	276	276	-	338	341	-
Critical Hdwy	4.1	-	-	4.14	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.2	-	-	2.236	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1357	-	-	1207	-	-	411	414	715	404	405	815
Stage 1	-	-	-	-	-	-	687	649	-	730	682	-
Stage 2	-	-	-	-	-	-	735	685	-	676	639	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1357	-	-	1207	-	-	403	404	715	389	395	815
Mov Cap-2 Maneuver	-	-	-	-	-	-	403	404	-	389	395	-
Stage 1	-	-	-	-	-	-	687	649	-	730	665	-
Stage 2	-	-	-	-	-	-	717	668	-	663	639	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.8			12.4			0		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	515	1357	-	-	1207	-	-	-				
HCM Lane V/C Ratio	0.054	-	-	-	0.021	-	-	-				
HCM Control Delay (s)	12.4	0	-	-	8	0	-	0				
HCM Lane LOS	B	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	-				

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 0 307 232 0 0 0

Future Vol, veh/h 0 307 232 0 0 0

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, % 0 6 7 0 2 2

Mvmt Flow 0 334 252 0 0 0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 252 0 - 0 586 252

Stage 1 - - - - 252 -

Stage 2 - - - - 334 -

Critical Hdwy 4.1 - - - 6.42 6.22

Critical Hdwy Stg 1 - - - - 5.42 -

Critical Hdwy Stg 2 - - - - 5.42 -

Follow-up Hdwy 2.2 - - - 3.518 3.318

Pot Cap-1 Maneuver 1325 - - - 473 787

Stage 1 - - - - 790 -

Stage 2 - - - - 725 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1325 - - - 473 787

Mov Cap-2 Maneuver - - - - 473 -

Stage 1 - - - - 790 -

Stage 2 - - - - 725 -

Approach EB WB SB

HCM Control Delay, s 0 0 0

HCM LOS A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1325 - - - -

HCM Lane V/C Ratio - - - - -

HCM Control Delay (s) 0 - - - 0

HCM Lane LOS A - - - A

HCM 95th %tile Q(veh) 0 - - - -

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	216	65	73	354	494	372
Future Volume (vph)	216	65	73	354	494	372
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	45	100			30
Storage Lanes	1	1	1			0
Taper Length (ft)	25		45			
Satd. Flow (prot)	1770	1583	1770	1863	1770	0
Flt Permitted	0.950		0.079			
Satd. Flow (perm)	1770	1583	147	1863	1770	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		42			65	
Link Speed (mph)	30			30	30	
Link Distance (ft)	205			550	553	
Travel Time (s)	4.7			12.5	12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	235	71	79	385	931	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	10.0	10.0	
Minimum Split (s)	24.0	24.0	12.0	24.0	24.0	
Total Split (s)	24.0	24.0	12.0	66.0	54.0	
Total Split (%)	26.7%	26.7%	13.3%	73.3%	60.0%	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.0	6.0	6.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	15.2	15.2	55.8	54.8	45.9	
Actuated g/C Ratio	0.18	0.18	0.68	0.67	0.56	
v/c Ratio	0.72	0.22	0.33	0.31	0.92	
Control Delay	46.5	17.3	8.8	6.7	33.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	46.5	17.3	8.8	6.7	33.0	
LOS	D	B	A	A	C	
Approach Delay	39.8			7.1	33.0	
Approach LOS	D			A	C	
Queue Length 50th (ft)	124	14	13	77	438	
Queue Length 95th (ft)	#204	49	30	124	#745	
Internal Link Dist (ft)	125			470	473	
Turn Bay Length (ft)		45	100			
Base Capacity (vph)	399	390	241	1380	1091	

Lanes, Volumes, Timings

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.59	0.18	0.33	0.28	0.85	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 82.4

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 27.2

Intersection LOS: C

Intersection Capacity Utilization 80.7%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14)



HCM 6th Signalized Intersection Summary

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 02/09/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	216	65	73	354	494	372
Future Volume (veh/h)	216	65	73	354	494	372
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1900
Adj Flow Rate, veh/h	235	71	79	385	531	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	0
Cap, veh/h	316	282	427	1069	695	
Arrive On Green	0.18	0.18	0.10	0.57	0.37	0.00
Sat Flow, veh/h	1781	1585	1781	1870	1870	0
Grp Volume(v), veh/h	235	71	79	385	531	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	0
Q Serve(g_s), s	6.0	1.8	1.1	5.3	11.9	0.0
Cycle Q Clear(g_c), s	6.0	1.8	1.1	5.3	11.9	0.0
Prop In Lane	1.00	1.00	1.00			0.00
Lane Grp Cap(c), veh/h	316	282	427	1069	695	
V/C Ratio(X)	0.74	0.25	0.18	0.36	0.76	
Avail Cap(c_a), veh/h	670	597	518	2346	1877	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.6	16.9	8.3	5.5	13.2	0.0
Incr Delay (d2), s/veh	3.4	0.5	0.2	0.2	1.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.6	0.3	1.4	4.4	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	22.1	17.4	8.5	5.7	15.0	0.0
LnGrp LOS	C	B	A	A	B	
Approach Vol, veh/h	306			464	531	
Approach Delay, s/veh	21.0			6.2	15.0	
Approach LOS	C			A	B	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	23.8		14.5		33.3
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	7.0	48.0		18.0		60.0
Max Q Clear Time (g_c+I1), s	3.1	13.9		8.0		7.3
Green Ext Time (p_c), s	0.0	3.9		0.7		2.7

Intersection Summary

HCM 6th Ctrl Delay	13.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC

5: Pembroke Center Plaza Driveway/West Site Driveway & Mattakeesett Street (Route 1A) 09/2023

Intersection												
Int Delay, s/veh	3.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	220	29	105	340	0	40	0	61	0	0	0
Future Vol, veh/h	0	220	29	105	340	0	40	0	61	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	2	1	0	0	0	0	2	2	2
Mvmt Flow	0	239	32	114	370	0	43	0	66	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	370	0	0	271	0	0	853	853	255	886	869	370
Stage 1	-	-	-	-	-	-	255	255	-	598	598	-
Stage 2	-	-	-	-	-	-	598	598	-	288	271	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1200	-	-	1292	-	-	281	299	789	265	290	676
Stage 1	-	-	-	-	-	-	754	700	-	489	491	-
Stage 2	-	-	-	-	-	-	492	494	-	720	685	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1200	-	-	1292	-	-	257	266	789	222	258	676
Mov Cap-2 Maneuver	-	-	-	-	-	-	257	266	-	222	258	-
Stage 1	-	-	-	-	-	-	754	700	-	489	436	-
Stage 2	-	-	-	-	-	-	437	439	-	659	685	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			1.9			16.1			0		
HCM LOS							C			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	434	1200	-	-	1292	-	-	-				
HCM Lane V/C Ratio	0.253	-	-	-	0.088	-	-	-				
HCM Control Delay (s)	16.1	0	-	-	8.1	0	-	0				
HCM Lane LOS	C	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	1	0	-	-	0.3	-	-	-				

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 0 281 445 0 0 0

Future Vol, veh/h 0 281 445 0 0 0

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, % 0 6 7 0 2 2

Mvmt Flow 0 305 484 0 0 0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 484 0 - 0 789 484

Stage 1 - - - - 484 -

Stage 2 - - - - 305 -

Critical Hdwy 4.1 - - - 6.42 6.22

Critical Hdwy Stg 1 - - - - 5.42 -

Critical Hdwy Stg 2 - - - - 5.42 -

Follow-up Hdwy 2.2 - - - 3.518 3.318

Pot Cap-1 Maneuver 1089 - - - 359 583

Stage 1 - - - - 620 -

Stage 2 - - - - 748 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1089 - - - 359 583

Mov Cap-2 Maneuver - - - - 359 -

Stage 1 - - - - 620 -

Stage 2 - - - - 748 -

Approach EB WB SB

HCM Control Delay, s 0 0 0

HCM LOS A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1089 - - - -

HCM Lane V/C Ratio - - - - -

HCM Control Delay (s) 0 - - - 0

HCM Lane LOS A - - - A

HCM 95th %tile Q(veh) 0 - - - -

Lanes, Volumes, Timings

Build AM Peak Hour

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 09/25/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	264	66	66	494	240	188
Future Volume (vph)	264	66	66	494	240	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	45	100			30
Storage Lanes	1	1	1			0
Taper Length (ft)	25		45			
Satd. Flow (prot)	1671	1583	1719	1863	1741	0
Flt Permitted	0.950		0.249			
Satd. Flow (perm)	1671	1583	451	1863	1741	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		60			67	
Link Speed (mph)	30			30	30	
Link Distance (ft)	205			550	553	
Travel Time (s)	4.7			12.5	12.6	
Peak Hour Factor	0.92	0.92	0.97	0.97	0.92	0.92
Heavy Vehicles (%)	8%	2%	5%	2%	4%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	287	72	68	509	465	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	10.0	10.0	
Minimum Split (s)	24.0	24.0	12.0	24.0	24.0	
Total Split (s)	24.0	24.0	12.0	36.0	24.0	
Total Split (%)	40.0%	40.0%	20.0%	60.0%	40.0%	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.0	6.0	6.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	13.5	13.5	23.9	22.8	16.8	
Actuated g/C Ratio	0.27	0.27	0.49	0.46	0.34	
v/c Ratio	0.63	0.15	0.17	0.59	0.73	
Control Delay	23.9	7.3	8.0	13.0	23.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	23.9	7.3	8.0	13.0	23.6	
LOS	C	A	A	B	C	
Approach Delay	20.5			12.4	23.6	
Approach LOS	C			B	C	
Queue Length 50th (ft)	87	3	10	101	120	
Queue Length 95th (ft)	156	27	27	194	#280	
Internal Link Dist (ft)	125			470	473	
Turn Bay Length (ft)		45	100			
Base Capacity (vph)	654	656	412	1215	722	



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.44	0.11	0.17	0.42	0.64	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 49.1

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 18.2

Intersection LOS: B

Intersection Capacity Utilization 58.7%

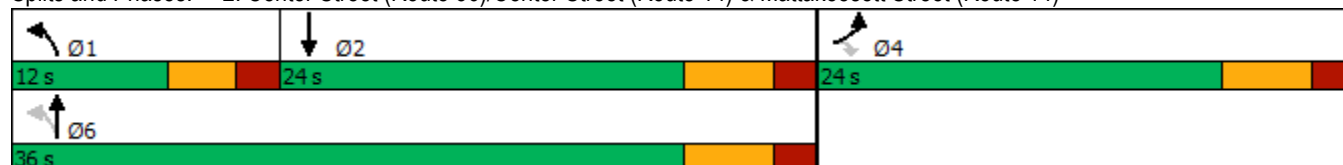
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14)



HCM 6th Signalized Intersection Summary

Build AM Peak Hour

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 09/25/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	264	66	66	494	240	188
Future Volume (veh/h)	264	66	66	494	240	188
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1781	1870	1826	1870	1841	1885
Adj Flow Rate, veh/h	287	72	68	509	261	0
Peak Hour Factor	0.92	0.92	0.97	0.97	0.92	0.92
Percent Heavy Veh, %	8	2	5	2	4	1
Cap, veh/h	381	356	485	883	465	
Arrive On Green	0.22	0.22	0.09	0.47	0.25	0.00
Sat Flow, veh/h	1697	1585	1739	1870	1841	0
Grp Volume(v), veh/h	287	72	68	509	261	0
Grp Sat Flow(s),veh/h/ln	1697	1585	1739	1870	1841	0
Q Serve(g_s), s	6.2	1.5	1.0	7.8	4.9	0.0
Cycle Q Clear(g_c), s	6.2	1.5	1.0	7.8	4.9	0.0
Prop In Lane	1.00	1.00	1.00			0.00
Lane Grp Cap(c), veh/h	381	356	485	883	465	
V/C Ratio(X)	0.75	0.20	0.14	0.58	0.56	
Avail Cap(c_a), veh/h	772	721	631	1418	837	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	14.3	12.5	8.1	7.6	12.9	0.0
Incr Delay (d2), s/veh	3.0	0.3	0.1	0.6	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.5	0.3	2.2	1.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.4	12.7	8.3	8.2	13.9	0.0
LnGrp LOS	B	B	A	A	B	
Approach Vol, veh/h	359			577	261	
Approach Delay, s/veh	16.4			8.2	13.9	
Approach LOS	B			A	B	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	8.7	16.0		14.9		24.7
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	7.0	18.0		18.0		30.0
Max Q Clear Time (g_c+I1), s	3.0	6.9		8.2		9.8
Green Ext Time (p_c), s	0.0	1.1		0.8		3.2

Intersection Summary

HCM 6th Ctrl Delay	11.9
HCM 6th LOS	B




Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	294	19	24	208	2	13	0	13	5	0	6
Future Vol, veh/h	6	294	19	24	208	2	13	0	13	5	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	93	93	93	93	93	93	92	92	92
Heavy Vehicles, %	0	6	0	4	7	0	0	0	0	2	2	2
Mvmt Flow	7	320	21	26	224	2	14	0	14	5	0	7
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	226	0	0	341	0	0	626	623	331	629	632	225
Stage 1	-	-	-	-	-	-	345	345	-	277	277	-
Stage 2	-	-	-	-	-	-	281	278	-	352	355	-
Critical Hdwy	4.1	-	-	4.14	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.2	-	-	2.236	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1354	-	-	1207	-	-	400	405	715	395	398	814
Stage 1	-	-	-	-	-	-	675	640	-	729	681	-
Stage 2	-	-	-	-	-	-	730	684	-	665	630	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1354	-	-	1207	-	-	388	392	715	378	386	814
Mov Cap-2 Maneuver	-	-	-	-	-	-	388	392	-	378	386	-
Stage 1	-	-	-	-	-	-	671	636	-	725	664	-
Stage 2	-	-	-	-	-	-	706	667	-	648	626	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.8			12.6			11.9		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	503	1354	-	-	1207	-	-	534				
HCM Lane V/C Ratio	0.056	0.005	-	-	0.021	-	-	0.022				
HCM Control Delay (s)	12.6	7.7	0	-	8	0	-	11.9				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.1				

HCM 6th TWSC
8: Mattakeesett Street (Route 14) & East Site Driveway

Build AM Peak Hour
09/25/2023

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	312	234	20	18	0
Future Vol, veh/h	0	312	234	20	18	0
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, %	0	6	7	0	2	2
Mvmt Flow	0	339	254	22	20	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	276	0	604
Stage 1	-	-	265
Stage 2	-	-	339
Critical Hdwy	4.1	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.2	-	3.518
Pot Cap-1 Maneuver	1299	-	461
Stage 1	-	-	779
Stage 2	-	-	722
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1299	-	461
Mov Cap-2 Maneuver	-	-	461
Stage 1	-	-	779
Stage 2	-	-	722

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1299	-	-	-	461
HCM Lane V/C Ratio	-	-	-	-	0.042
HCM Control Delay (s)	0	-	-	-	13.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lanes, Volumes, Timings

Build PM Peak Hour

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 09/25/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	227	73	84	354	494	390
Future Volume (vph)	227	73	84	354	494	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	45	100			30
Storage Lanes	1	1	1			0
Taper Length (ft)	25		45			
Satd. Flow (prot)	1770	1583	1770	1863	1766	0
Flt Permitted	0.950		0.078			
Satd. Flow (perm)	1770	1583	145	1863	1766	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		45			68	
Link Speed (mph)	30			30	30	
Link Distance (ft)	205			550	553	
Travel Time (s)	4.7			12.5	12.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	247	79	91	385	950	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Detector Phase	4	4	1	6	2	
Switch Phase						
Minimum Initial (s)	7.0	7.0	7.0	10.0	10.0	
Minimum Split (s)	24.0	24.0	12.0	24.0	24.0	
Total Split (s)	24.0	24.0	12.0	66.0	54.0	
Total Split (%)	26.7%	26.7%	13.3%	73.3%	60.0%	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	5.0	6.0	6.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	
Act Effect Green (s)	15.7	15.7	56.4	55.4	46.4	
Actuated g/C Ratio	0.19	0.19	0.68	0.66	0.56	
v/c Ratio	0.74	0.24	0.38	0.31	0.94	
Control Delay	47.9	18.0	11.4	6.8	36.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	47.9	18.0	11.4	6.8	36.2	
LOS	D	B	B	A	D	
Approach Delay	40.6			7.7	36.2	
Approach LOS	D			A	D	
Queue Length 50th (ft)	132	16	15	80	469	
Queue Length 95th (ft)	#231	54	41	124	#770	
Internal Link Dist (ft)	125			470	473	
Turn Bay Length (ft)		45	100			
Base Capacity (vph)	392	385	238	1375	1070	

Lanes, Volumes, Timings

Build PM Peak Hour

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 09/25/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.63	0.21	0.38	0.28	0.89	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 83.4

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 29.3

Intersection LOS: C

Intersection Capacity Utilization 82.4%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14)



HCM 6th Signalized Intersection Summary

Build PM Peak Hour

2: Center Street (Route 36)/Center Street (Route 14) & Mattakeesett Street (Route 14) 09/25/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	227	73	84	354	494	390
Future Volume (veh/h)	227	73	84	354	494	390
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1900
Adj Flow Rate, veh/h	247	79	91	385	531	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	0
Cap, veh/h	328	292	431	1070	690	
Arrive On Green	0.18	0.18	0.10	0.57	0.37	0.00
Sat Flow, veh/h	1781	1585	1781	1870	1870	0
Grp Volume(v), veh/h	247	79	91	385	531	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	0
Q Serve(g_s), s	6.5	2.1	1.3	5.5	12.3	0.0
Cycle Q Clear(g_c), s	6.5	2.1	1.3	5.5	12.3	0.0
Prop In Lane	1.00	1.00	1.00			0.00
Lane Grp Cap(c), veh/h	328	292	431	1070	690	
V/C Ratio(X)	0.75	0.27	0.21	0.36	0.77	
Avail Cap(c_a), veh/h	652	580	504	2280	1824	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.0	17.2	8.5	5.7	13.7	0.0
Incr Delay (d2), s/veh	3.5	0.5	0.2	0.2	1.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.7	0.4	1.5	4.6	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	22.5	17.7	8.8	5.9	15.5	0.0
LnGrp LOS	C	B	A	A	B	
Approach Vol, veh/h	326			476	531	
Approach Delay, s/veh	21.4			6.4	15.5	
Approach LOS	C			A	B	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	10.0	24.2		15.1		34.2
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	7.0	48.0		18.0		60.0
Max Q Clear Time (g_c+I1), s	3.3	14.3		8.5		7.5
Green Ext Time (p_c), s	0.1	3.9		0.7		2.7

Intersection Summary

HCM 6th Ctrl Delay	13.7
HCM 6th LOS	B

Notes




Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	220	29	105	340	6	40	0	61	4	0	4
Future Vol, veh/h	7	220	29	105	340	6	40	0	61	4	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	2	1	0	0	0	0	2	2	2
Mvmt Flow	8	239	32	114	370	7	43	0	66	4	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	377	0	0	271	0	0	875	876	255	906	889	374
Stage 1	-	-	-	-	-	-	271	271	-	602	602	-
Stage 2	-	-	-	-	-	-	604	605	-	304	287	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1193	-	-	1292	-	-	272	290	789	257	282	672
Stage 1	-	-	-	-	-	-	739	689	-	486	489	-
Stage 2	-	-	-	-	-	-	489	491	-	705	674	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1193	-	-	1292	-	-	246	255	789	214	248	672
Mov Cap-2 Maneuver	-	-	-	-	-	-	246	255	-	214	248	-
Stage 1	-	-	-	-	-	-	733	683	-	482	434	-
Stage 2	-	-	-	-	-	-	431	436	-	641	669	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.9	16.5	16.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	421	1193	-	-	1292	-	-	325
HCM Lane V/C Ratio	0.261	0.006	-	-	0.088	-	-	0.027
HCM Control Delay (s)	16.5	8	0	-	8.1	0	-	16.4
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1	0	-	-	0.3	-	-	0.1

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	285	451	23	15	0
Future Vol, veh/h	0	285	451	23	15	0
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, %	0	6	7	0	2	2
Mvmt Flow	0	310	490	25	16	0
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	515	0	-	0	813	503
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	310	-
Critical Hdwy	4.1	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1061	-	-	-	348	569
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	744	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1061	-	-	-	348	569
Mov Cap-2 Maneuver	-	-	-	-	348	-
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	744	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		15.9		
HCM LOS				C		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1061	-	-	-	348	
HCM Lane V/C Ratio	-	-	-	-	0.047	
HCM Control Delay (s)	0	-	-	-	15.9	
HCM Lane LOS	A	-	-	-	C	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	