TRAFFIC IMPACT AND ACCESS STUDY

PROPOSED RESIDENTIAL DEVELOPMENT

Salisbury Pine Tree Estates
Holden, Massachusetts

Prepared for:
Holden Realty Trust
Holden, MA

October 2019

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Traffic Impact and Access Study

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October 2019

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EXECUTIVE SUMMARY

MDM Transportation Consultants, Inc. (MDM) has prepared this initial Transportation Impact and Access Study (TIAS) for proposed residential development to be located off of Pine Tree Road and Bailey Road in Holden, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. This report documents existing operational and safety-related characteristics of roadways serving the development site, estimates future year operating characteristics of these roadways independent of the development, estimates development-related trip generation, and identifies incremental impacts of site-related traffic. Improvements are recommended that will offset project-related traffic increases and enhance the safety of traffic flow.

This TIAS has been developed in conformance with guidelines for preparation of traffic studies as jointly issued by the Commonwealth of Massachusetts Executive Office of Energy & Environmental Affairs/Massachusetts Department of Transportation (EEA/MassDOT).

E.1 PROJECT DESCRIPTION

The project site includes approximate 21 acres of land located between Pine Tree Road and Bailey Road in Holden, Massachusetts. The existing site is comprised of undeveloped land, a single-family home (#124 Bailey Road), and an abandoned single-family home off of Salisbury Street.

Under the proposed development plan, a 102 unit (12 single family and 90 multifamily) residential development will be constructed with off-street parking for approximately 204 vehicles. The existing single-family home located at 124 Bailey Road will remain with access via a new driveway connection to the proposed subdivision roadway. Access to the site will be provided by a full-access unsignalized driveway along Salisbury Street via the existing Pine Tree Road and a full-access unsignalized driveway along Bailey Road just south of house #124. Salisbury Street and Bailey Road are both public ways and are owned and controlled by the Town of Holden.

Pine Tree Road is an existing "way in existence" stub roadway currently providing access to two multi-family residential buildings (totaling 8 apartment units). Under the proposed development program, the 8 apartment units will continue to have access from Pine Tree Road. One of the proposed single-family residential units will have direct access to Salisbury Street.

E.2 STUDY AREA

This TIAS evaluates transportation characteristics of roadways and intersections that provide a primary means of access to the site, and that are likely to sustain a measurable level of traffic impact from the proposed development. The study area includes the following intersections:

- Salisbury Street at Subdivision Site Drive (Unsignalized)
- Salisbury Street at Main Street (Route 122A) (Signalized)
- Bailey Road at Subdivision Site Drive (Unsignalized)
- Bailey Road at Main Street (Route 122A) (Unsignalized)

E.3 SUMMARY OF ANALYSIS AND FINDINGS

Capacity analyses were conducted for each study area intersection to quantify existing and future year traffic operations with and without the development for the weekday morning and weekday evening peak hours. These hours coincide with peak traffic activity of the proposed residential development and the adjacent streets.

The analyses presented in this TIAS are based on industry-standard trip rates published by the Institute of Transportation Engineers (ITE). The proposed development is estimated to generate approximately 52 vehicle trips during the weekday morning peak hour (12 entering and 40 exiting) and 66 vehicle trips during the weekday evening peak hour (42 entering and 24 exiting). On a daily basis, the development is estimated to generate approximately 754 vehicle trips on a weekday.

Under Build conditions, capacity analyses indicate that the Site Driveway approaches to Salisbury Street and Baily Road will operate under capacity at LOS B or better during the weekday morning and weekday evening peak hours. Mainline (through) travel along Main Street will continue to operate unimpeded with minimal delay. The minor street approaches at the intersection of Main Street (Route 122A) and Bailey Road/ Mayo Drive currently operate with long delays during the peak hours. Likewise, left turns from Main Street (again low volumes) experience delays, resulting in use of the paved shoulders to by-pass left turning vehicles. Operations at the signalized Main Street at Salisbury Street intersection are projected to be LOS C or better during peak hours

The proposed development is expected to have a minimal impact on the study area intersections as there will be a nominal overall change in level of service and operations of the study intersections under future conditions with the development. Adequate capacity is available under future Build conditions on both Salisbury Street and Bailey Road to accommodate the site use.

E.4 RECOMMENDATIONS AND CONCLUSIONS

Traffic impacts associated with the residential development are not expected to notably affect travel or safety conditions in the site vicinity. However, MDM recommends access-related improvements aimed at enhancing traffic operations and/or travel safety. Specific recommendations are as follows:

Pine Tree Road at Salisbury Street. The existing Pine Tree Road and Salisbury Street intersection will serve as primary access to the site. Currently, no traffic control or marked pedestrian crossing is present on the Pine Tree Road eastbound approach. MDM recommends the following improvements:

- A STOP sign (R1-1) and STOP line pavement markings is recommended on the Pine Tree Road approach to Salisbury Street. A marked crosswalk and ADA compliant ramps should be installed at the intersection across Pine Tree Road.
- A sidewalk is recommended on Pine Tree Road to connect the site with the existing sidewalk system on the western side of Salisbury Street which extends from Main Street to the Dawson Elementary School.
- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the Salisbury Street layout in vicinity of the site driveway to provide unobstructed sight lines.

Bailey Road at Proposed Site Drive. The proposed site driveway will connect the site with Bailey Road just south of the existing garage for #124 Bailey Road. MDM recommends that the Applicant implement the following items:

- A STOP sign (R1-1) and STOP line pavement markings should be installed on the Site Drive approach to Bailey Road.
- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the Bailey Road layout in vicinity of the site driveway to provide unobstructed sight lines.

In summary, adequate capacity is available under future Build conditions on both Salisbury Street and Bailey Road to accommodate the site use. The project is not projected to significantly change any reported operating levels compared to future No-Build conditions. Proposed access improvements will provide ample capacity to accommodate site-generated traffic while also enhancing safety and capacity.

1.0 INTRODUCTION

This report presents a transportation impact and access evaluation for a proposed 112-unit residential development to be located off of Pine Tree Road and Bailey Road in Holden, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. The evaluation includes existing traffic operations in the study area and assesses incremental impacts on area roadways under future year conditions with and without the development.

This TIAS has been developed in conformance with guidelines for preparation of traffic studies as jointly issued by the Commonwealth of Massachusetts Executive Office of Energy & Environmental Affairs/Massachusetts Department of Transportation (EEA/MassDOT).

1.1 PROPOSED DEVELOPMENT

The project site includes approximate 21 acres of land located between Pine Tree Road and Bailey Road in Holden, Massachusetts. The existing site is comprised of undeveloped land, a single-family home (#124 Bailey Road), and an abandoned single-family home off of Salisbury Street.

Under the proposed development plan, a 102 unit (12 single family and 90 multifamily) residential development will be constructed with off-street parking for approximately 204 vehicles. The existing single-family home located at 124 Bailey Road will remain with access via a new driveway connection to the proposed subdivision roadway. Access to the site will be provided by a full-access unsignalized driveway along Salisbury Street via the existing Pine Tree Road and a full-access unsignalized driveway along Bailey Road just south of house #124. Salisbury Street and Bailey Road are both public ways and are owned and controlled by the Town of Holden.

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Figure 1

Site Location

Date: September 2019
Dwg No. 1038 TIAS dwg

Pine Tree Road is an existing "way in existence" stub roadway currently providing access to two multi-family residential buildings (totaling 8 apartment units). Under the proposed development program, the 8 apartment units will continue to have access from Pine Tree Road. One of the proposed single-family residential units will have direct access to Salisbury Street. The preliminary Site layout prepared by Places Associates; Inc. is presented in **Figure 2**.

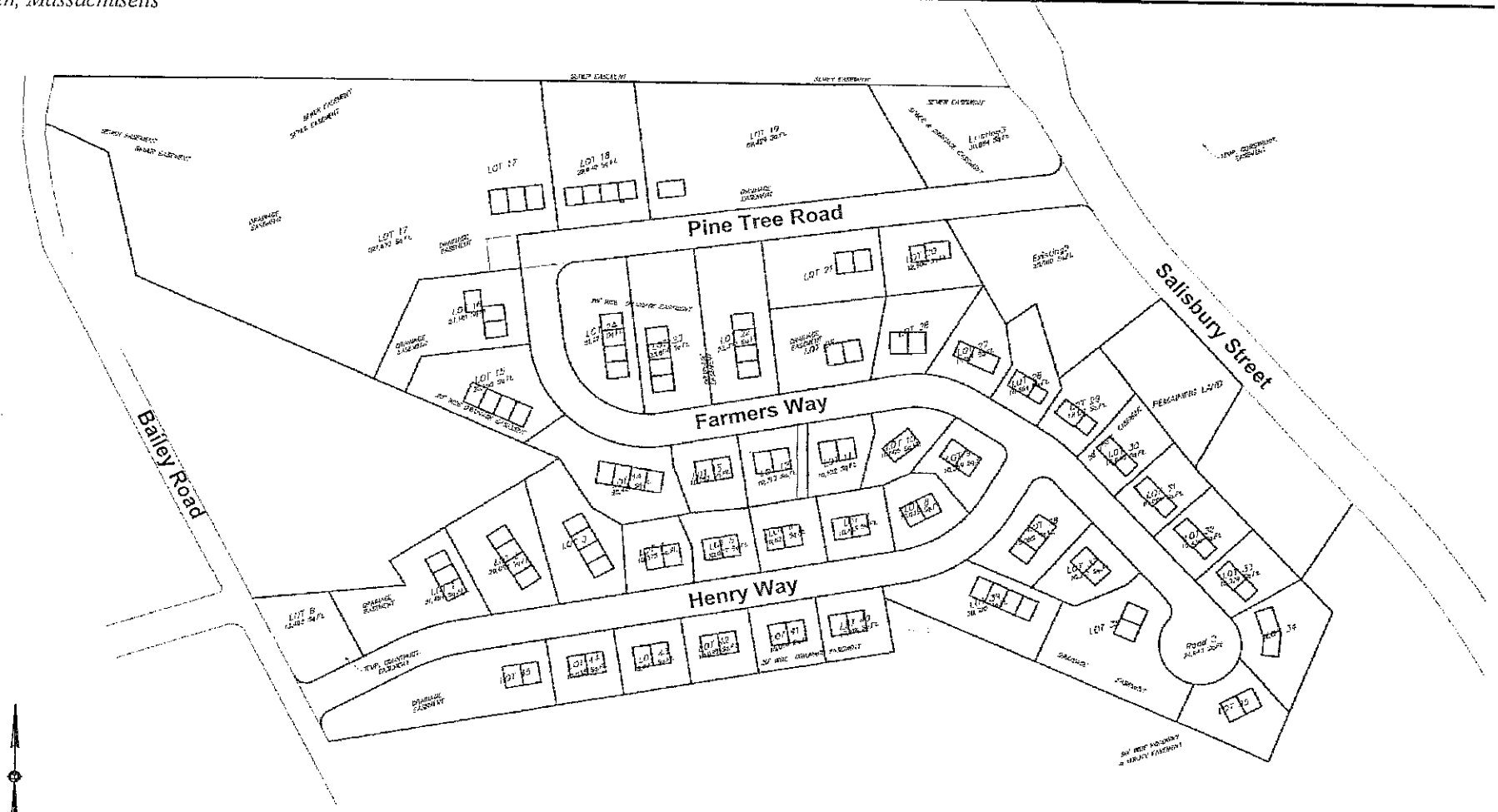
1.2 STUDY METHODOLOGY

This transportation impact and access evaluation was conducted in accordance with EEA/MassDOT guidelines and consists of several steps. The first step documents existing conditions in the transportation study area including an inventory of roadway geometry, observed traffic volumes, and safety characteristics. Next, future year traffic conditions are forecast that account for other planned area developments, normal area growth, and development-related traffic increases. The third step quantifies operating characteristics of the primary study intersections. Specific attention is given to the incremental impacts of the proposed development. Finally, off-site improvements are identified to address specific development-related access needs as required.

1.3 STUDY AREA

This TIAS evaluates transportation characteristics of roadways and intersections that provide a primary means of access to the site, and that are likely to sustain a measurable level of traffic impact from the development. The study area includes the following intersections, which are also identified in **Figure 1**:

- Salisbury Street at Subdivision Site Drive (Unsignalized)
- Salisbury Street at Main Street (Route 122A) (Signalized)
- Bailey Road at Subdivision Site Drive (Unsignalized)
- Bailey Road at Main Street (Route 122A) (Unsignalized)



Scale: Not to Scale

Source: Places Associates, Inc.

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Figure 2

Preliminary Site Layout

Date: October 2019
Dwg No. 1038 TIAS.dwg

2.0 EXISTING CONDITIONS

In order to provide a basis for quantifying the transportation impacts of the development, the existing roadway system and the existing traffic operations of study area roadways were reviewed. This section describes the existing traffic characteristics and operations of roadways and intersections within the study area. Specifically, this section presents an overview of the traffic data collection program, existing traffic volumes, safety data, and public transportation facilities serving the area.

2.1 STUDY AREA ROADWAY NETWORK

The study area roadways and intersections are described briefly in this section. A general description of the physical roadway and intersection features is provided. The study area and intersections are depicted in **Figure 1.**

2.1.1 Roadways

Main Street (Route 122A)

Main Street (Route 122A) is an east-west roadway, in the immediate study area, under State (MassDOT) jurisdiction and classified as an Urban Other Principal Arterial Roadway. Main Street (Route 122A) provides a connection between Grove Street (Route 122A) to the southeast in the City of Worcester and North Main Street to the southwest in the Town of Holden. In the study area, the roadway width is approximately 44 feet wide and generally provides one lane of travel in each direction separated by a double yellow centerline and 10-foot paved shoulders. Near major intersections including Salisbury Street, Main Street (Route 122A) provides two lanes of travel in each direction separated by a double yellow centerline and 2-foot paved shoulders. The posted regulatory speed limit along Main Street (Route 122A) in the immediate study area is 35 miles per hour (mph). Land use along Main Street (Route 122A) in the immediate project area includes a mix of commercial, residential, and industrial land uses.

Salisbury Street

Salisbury Street is a north-south roadway under Local (Town) jurisdiction and is classified by MassDOT as an Urban Minor Arterial roadway. Salisbury Street connects Main Street (Route 122A) to the north with Salisbury Street in the City of Worcester to the south. In the project area Salisbury Street has a width of approximately 28 feet wide and provides one lane of travel in each direction with 2-foot paved shoulders. The posted regulatory speed limit along Salisbury Street in the immediate study area is 35 miles per hour (mph). Land use along Salisbury Street is primarily residential but also includes the Dawson Elementary School which is located approximately ¼ mile to the south.

Bailey Road

Bailey Road is a north-south roadway under Local (Town) jurisdiction and is classified by MassDOT as an Urban Local roadway. Bailey Road connects Main Street (Route 122A) to the north with Reservoir Street in the Town of Holden. In the project area Bailey Road has a width of approximately 21 feet and provides one lane of travel in each direction. The posted advisory speed limit along Bailey Road in the immediate study area is 25 miles per hour (mph). Land use along Bailey Road is includes residential land uses and undeveloped land.

Pine Tree Road

Pine Tree Road is an east-west roadway under Local (City) jurisdiction and is classified by MassDOT as an Urban Local roadway. Pine Tree Road is a "way in existence" stub road that connects several land parcels with Salisbury Street. Pine Tree Road has a width of approximately 30 feet and provides one lane of travel in each direction. There is no regulatory posted speed limit on Pine Tree Road. Land use along Pine Tree Road includes two residential apartment buildings with a total of eight (8) units and provides access to the proposed development site.

2.1.2 Intersections

Main Street (Route 122A) at Salisbury Street

Salisbury Street meets Main Street (Route 122A) to form a three-way, signalized intersection. The Main Street (Route 122A) eastbound approach to the intersection provides a through travel lane and a shared through/right travel lane. The Main Street (Route 122A) westbound approach to the intersection provides a shared left/through travel lane and a through travel lane. The Salisbury Street approach provides an exclusive left turn lane and an exclusive right turn lane on a downgrade of approximately 6%. Land use at the intersection consists of Sunnyside Motor Company, Quick Lane, and a residential home.

Main Street (Route 122A) at Bailey Road/ Mayo Drive

Bailey Road and Mayo Drive meet Main Street (Route 122A) to form a four-way, unsignalized intersection. The Main Street eastbound and westbound approaches to the intersection provide single travel lanes and operate freely. The Bailey Road northbound approach provides a single travel lane and is under STOP control. The Mayo Drive southbound approach provides a single travel lane and is under STOP Control. Land use at the intersection includes several office buildings, Lawton's Optical World, and an undeveloped lot.

2.2 EXISTING TRAFFIC VOLUMES

Traffic-volume data used in this study were obtained by manual and mechanical methods. Manual turning movement counts (TMCs) were conducted along study area roadways and intersections in May 2019. Traffic data were collected during the weekday morning (7:00 AM to 9:00 AM) and weekday evening (4:00 PM to 6:00 PM) peak periods to coincide with peak traffic activity of the proposed residential development and the adjacent streets. Automated traffic recorder counts (ATR's) were also conducted in May 2019. Traffic count data is provided in the **Appendix.**

2.2.1 Daily Traffic

Daily traffic volumes along Salisbury Street and Bailey Road in the site vicinity were obtained by mechanical methods using ATR's in May 2019. The results of the counts are summarized in **Table 1** and are discussed below.

TABLE 1
EXISTING TRAFFIC-VOLUME SUMMARY

Time Period	Daily Volume (vpd)[1]	Percent Daily Traffic[2]	Peak Hour Volume (vph)[3]	Peak Flow Direction[4]	Peak Hour Directional Volume (vph)
Salisbury Street north of Pine Tree Road					
Weekday Morning Peak Hour	6,740	7%	495	62% SB	305
Weekday Evening Peak Hour	6,740	9%	579	55% NB	316
Bailey Road south of Thorny Lea Road					
Weekday Morning Peak Hour	1,080	10%	103	66% SB	68
Weekday Evening Peak Hour	1,080	11%	115	63% SB	72

[1]Two-way daily traffic expressed in vehicles per day without seasonal adjustment.
[2]The percent of daily traffic that occurs during the peak hour.
[3]Two-way peak-hour volume expressed in vehicles per hour.
[4]NB = Northbound, SB = Southbound

As summarized in **Table 1**:

- *Salisbury Street north of Pine Tree Road:* Daily traffic volume on Salisbury Street north of Pine Tree Road is approximately 6,740 vehicles per day (vpd) on weekdays. Weekday peak hour traffic flow on Salisbury Street is approximately 7 to 9 percent of daily flow with directional flow split heavier southbound during the weekday morning peak hour and heavier northbound during the weekday evening peak hour, consistent with commuter-related travel.

- *Bailey Road south of Thorny Lea Road:* Daily traffic volume on Bailey Road south of Thorny Lea Road is approximately 1,080 vehicles per day (vpd) on weekdays. Weekday peak hour traffic flow on bailey Road is approximately 10 to 11 percent of daily flow with directional flow split heavier southbound during the weekday morning peak hour and weekday evening peak hour.

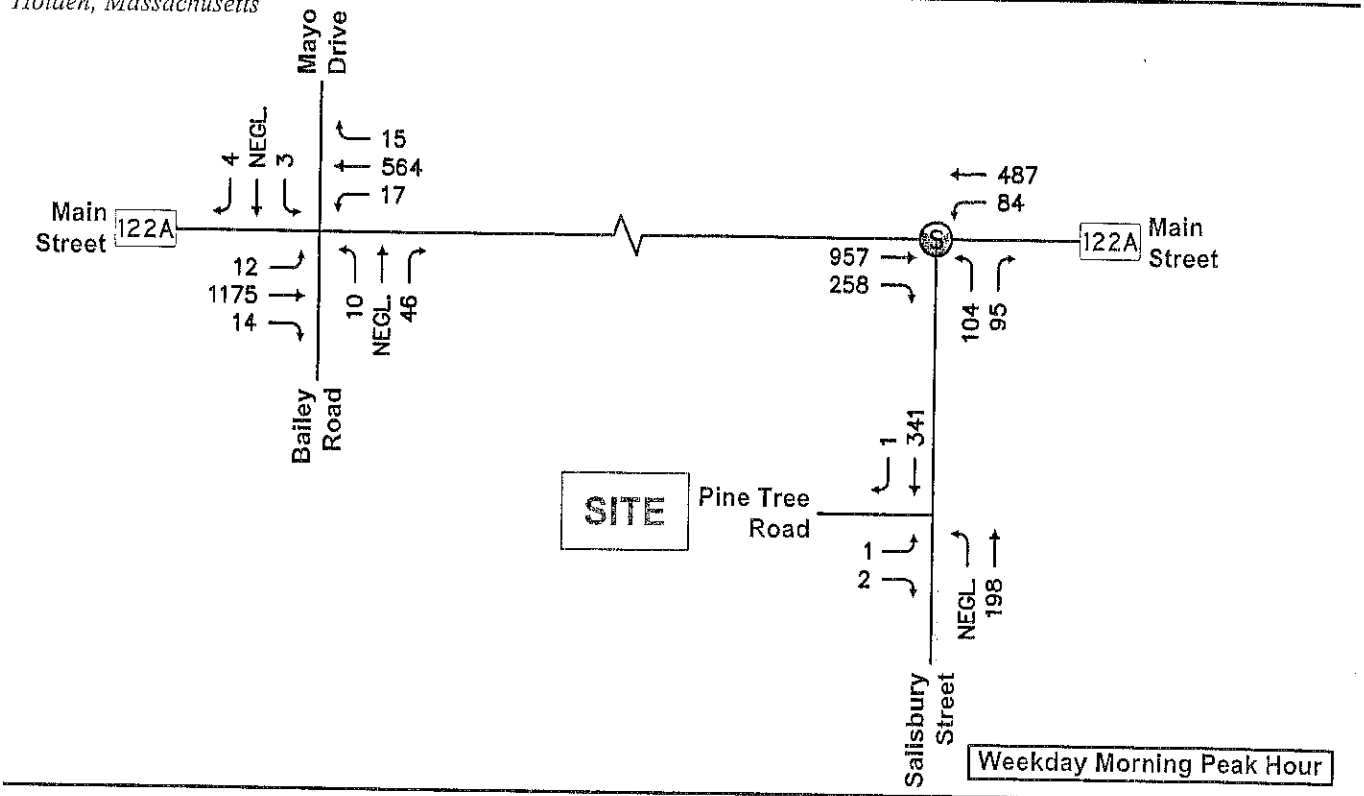
2.2.2 Peak-Hour Traffic

Manual turning movement counts (TMCs) were conducted along study area roadways and intersections in May 2019. This traffic data was collected during the weekday morning (7:00 AM to 9:00 AM) and weekday evening (4:00 PM to 6:00 PM) peak periods to coincide with peak traffic activity of the proposed residential development and the adjacent streets.

Review of MassDOT permanent count station data indicates that May is a slightly above-average traffic month. Therefore, no adjustment (reduction) in the observed traffic volumes was made as a conservative measure. Permanent count station data is provided in the **Appendix**. The resulting existing weekday morning and weekday evening peak-hour traffic volumes for study intersections are depicted in **Figure 3**.

2.2.3 Measured Travel Speeds

Vehicle speeds were obtained for Salisbury Street northbound and southbound travel directions and Bailey Road northbound and southbound travel directions. The study was performed in May 2019. **Table 2** summarizes the posted speed and observed average and 85th percentile travel speeds for the two locations and field data is provided in the **Appendix.**



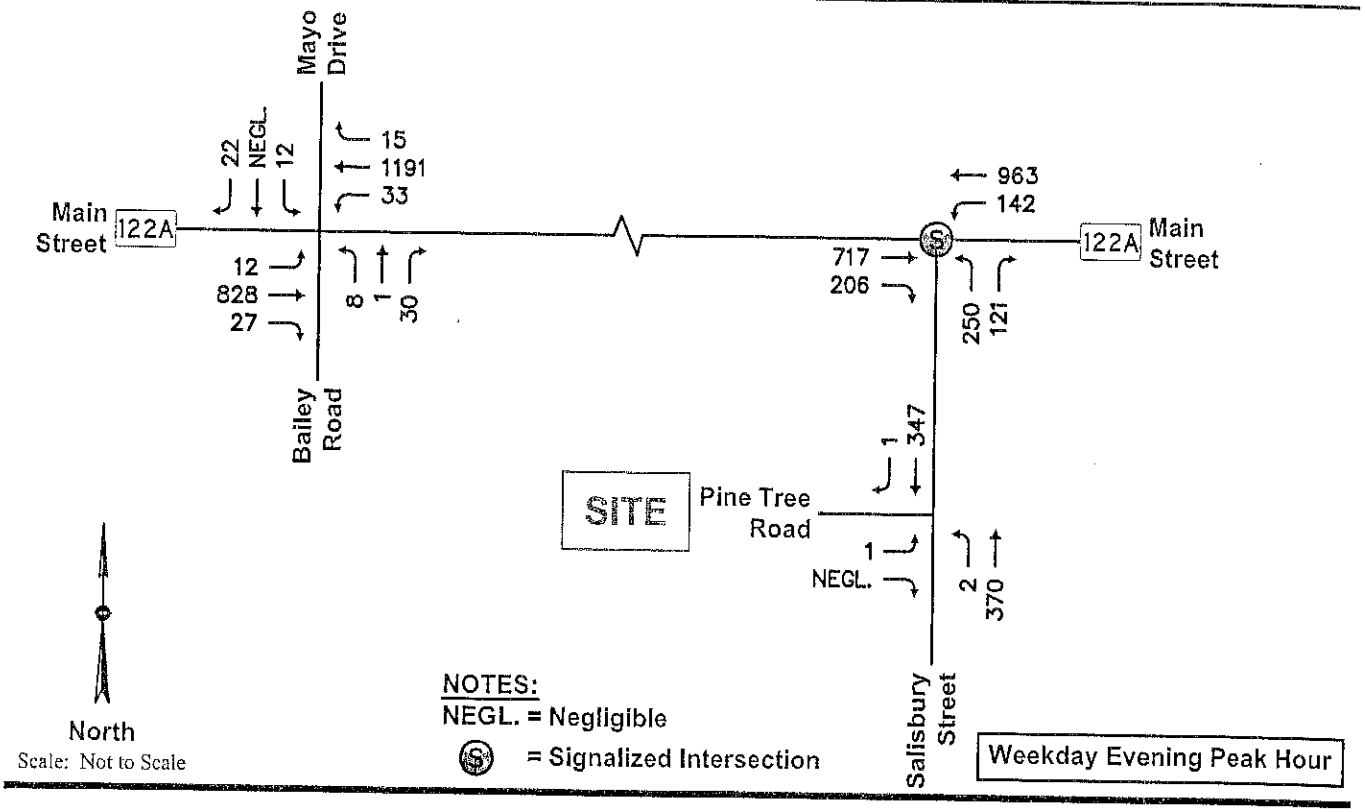


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Figure 3

2019 Baseline Conditions
Weekday Peak Hour Volumes

Date: July 2019
Dwg No. 1038 TIAS.dwg

TABLE 2
SPOT SPEED STUDY RESULTS

Approach/ Travel Direction	Travel Speeds		
	Posted	Mean[1]	85th Percentile[2]
Salisbury Street near Pine Tree Road			
Northbound	35	29	34
Southbound	35	27	31
Bailey Road near Thorny Lea Road			
Northbound	25	30	36
Southbound	25	30	36

[1] Arithmetic mean
[2] The speed at or below which 85 percent of the vehicles are traveling

As summarized in **Table 2**, the mean (average) travel speed on Salisbury Street traveling northbound is 29 mph and the 85th percentile travel speed is 34 mph. In the southbound direction, the mean travel speed is 27 mph and the 85th percentile travel speed is 31 mph. The mean (average) travel speed on Bailey Road traveling northbound and southbound is 30 mph and the 85th percentile travel speed is 36 mph.

2.3 SAFETY

In order to identify crash trends and safety characteristics for study area intersections, crash data were obtained from MassDOT for the Town of Holden for the five-year period covering 2014 through 2018 (the most recent data currently available from MassDOT). A summary of the crash data with crash rates for the study intersection with reported crashes is detailed in **Table 3** with detailed data provided in the **Appendix.**

Crash rates were calculated for the study intersection as reported in **Table 3**. This rate quantifies the number of crashes per million entering vehicles. MassDOT has determined the official District 3 (which includes the Town of Holden) crash rate to be 0.61 for unsignalized intersections and 0.89 for signalized intersections. This rate represents MassDOT's "average" crash experience for District 3 communities and serves as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the district average, some form of safety countermeasures may be warranted. A review of Highway Safety Improvement Project (HSIP) locations was also conducted.

TABLE 3
INTERSECTION CRASH SUMMARY — 2014 THROUGH 2018[1]

Data Category	Main St (Route 122A) at Bailey Rd & Mayo Dr	Main St (Route 122A) at Salisbury Street	Salisbury St at Pine Tree Rd
Traffic Control	Unsignalized	Signalized	Unsignalized
Crash Rate[2,3]	**0.23**	**0.37**	**0.00**
MHD District 3 Avg.[3]	0.61	0.89	0.61
Year:			
2014	2	2	0
2015	1	8	0
2016	4	5	0
2017	1	3	0
2018	2	3	0
Total	12	21	0
Type:			
Angle	4	3	0
Rear-End	3	12	0
Head-On	0	0	0
Sideswipe	4	5	0
Single Vehicle	1	1	0
Other/Unknown	0	0	
Severity:			
P. Damage Only	9	17	0
Personal Injury	3	4	0
Fatality	0	0	0
Other/Unknown	0	0	0
Conditions:			
Dry	7	16	0
Wet	1	3	0
Snow	4	2	0
Other	0	0	0
Time:			
7:00 to 9:00 AM	3	1	0
4:00 to 6:00 PM	0	2	0
Rest of Day	9	18	0

[1] Source: MassDOT Crash Database

[2] Crashes per million entering vehicles

[3] District 3 average = 0.61 for unsignalized intersections and 0.89 for signalized intersections

As summarized in **Table 3**:

- A total of twelve (12) crashes were reported for the unsignalized intersection of Main Street (Route 122A) and Bailey Road/Mayo. The resulting crash rate of 0.23 is lower than the District 3 average. The reported crashes included eight (8) angle/ sideswipe type collisions, three (3) rear-end type collisions and one (1) single vehicle collision. Seventy-five percent (75%) of the crashes resulted in property-damage only, generally indicative of low-speed crashes. No fatalities or pedestrian-related incidents were reported during the study period.

- A total of twenty-one (21) crashes were reported for the signalized intersection of Main Street (Route 122A) and Salisbury Street. The resulting crash rate of 0.37 is lower than the District 3 average. The reported crashes included eight (8) angle/ sideswipe type collisions, twelve (12) rear-end type collisions and one (1) single vehicle collision. Seventy-six percent (76%) of the crashes resulted in property-damage only, generally indicative of low-speed crashes. No fatalities or pedestrian-related incidents were reported during the study period.

In summary, the crash rates at the study intersections are all lower than the District 3 average crash rates and are not listed as an HSIP location. No immediate safety countermeasures are warranted based on the crash history at the study locations.

2.4 SIGHT LINE ANALYSIS

An evaluation of sight lines was conducted at the proposed site driveway locations to determine whether minimum recommended sight lines are available to safely exit onto Salisbury Street and Bailey Road. The evaluation documents existing sight lines for vehicles as they relate to Salisbury Street and Bailey Road with comparison to recommended guidelines.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[1] reference two types of sight distance which are relevant at the proposed site driveway intersections at Salisbury Street and Bailey Road: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the proposed site driveway intersections with Salisbury Street and Bailey Road were compared to recommended minimum SSD and ISD guidelines for the posted speed and observed average and 85th percentile travel speeds.

[1] *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2004.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting onto Salisbury Street or Bailey Road. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet level pavement. Adjustment factors are applied to account for roadway grades when applicable.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the northbound and southbound Salisbury Street approaches to Pine Tree Road and for the northbound and southbound Bailey Road approaches to the proposed sub-division roadway (just south of 124 Bailey Road). **Table 4** presents a summary of the available SSD as they relate to the proposed site driveways and AASHTO's recommended SSD. SSD calculations are provided in the **Appendix.**

TABLE 4
STOPPING SIGHT DISTANCE SUMMARY

Approach/ Travel Direction	Available SSD	AASHTO Recommended[1]	
		Regulatory Speed[2]	85th Percentile Observed Travel Speed[3]
Salisbury Street Approach to Pine Tree Road			
Northbound	>800 Feet	250 Feet	240 Feet
Southbound	355 ± Feet	250 Feet	210 Feet
Bailey Road Approach to Proposed Site Driveway			
Northbound	525 ± Feet	155 Feet	260 Feet
Southbound	360 ± Feet	155 Feet	260 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet.
[2]SRegulatiory Speed on Salisbury Street = 35 mph. Regulatory Speed on Bailey Road = 25 mph.
[3]85th Percentile travel speed on Salisbury Street: 34 mph NB and 31 mph SB. 85th Percentile travel speed on Bailey Road: 36 mph and SB.

As summarized in **Table 4**, analysis results indicate that, with the removal of existing the existing vegetation, trees, and physical features within the sight lines during the construction of the proposed sub-division roadways, the available sight lines to the site driveways will exceed AASHTO's recommended SSD criteria for both travel directions along Salisbury Street and Bailey Road.

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "*...If the available sight distance for an entering ...vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions...To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.*" AASHTO's ISD criteria are defined into several "cases". In this case, the proposed site driveway approaches to the intersections are proposed to be under STOP signal control and the ISD in question relates to the ability to turn left or turn right onto Salisbury Street or Bailey Road.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (8 to 14.5 feet from marked edge lines) for the northbound and southbound directions along Salisbury Street and Bailey Road. **Table 5** presents a summary of the available ISD for the departure from Pine Tree Road to Salisbury Street and the Proposed Site Driveway to Bailey Road and AASHTO's recommended ISD.

TABLE 5
INTERSECTION SIGHT DISTANCE SUMMARY

View Direction	Available ISD	AASHTO Minimum[1]	
		Regulatory Speed[2]	85th Percentile Speed[3]
Pine Tree Road Departures to Salisbury Street			
Looking North	325 ± Feet[4]	250 Feet	210 Feet
Looking South	>800 Feet	250 Feet	240 Feet
Proposed Site Driveway Departures to Bailey Road			
Looking North	340 ± Feet[5]	155 Feet	260 Feet
Looking South	510 ± Feet[5]	155 Feet	260 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet and adjustments for roadway grade if required. Minimum value as noted represents SSD per AASHTO guidance.
[2]Regulatiory Speed on Salisbury Street = 35 mph. Regulatory Speed on Bailey Road = 25 mph.
[3]85th Percentile travel speed on Salisbury Street: 34 mph NB and 31 mph SB. 85th Percentile travel speed on Bailey Road: 36 mph and SB.
[4]Assumes a position approximately 10 feet from the marked edge line to clearly see past an existing section of guardrail.
[5]Assumes clearing of vegetation within the right-of-way and the re-location of a wooden fence at 124 Bailey Road.

The results of the ISD analysis presented in **Table 5** indicate that, with the removal of existing the existing vegetation, trees, and physical features within the sight lines during the construction of the proposed sub-division roadways, the available intersection sight distance from the site driveways will satisfy AASHTO's recommended minimum criteria looking to the north and to the south onto Salisbury Street and Bailey Road.

In summary, analysis indicates that the criteria for SSD (a safety-based requirement) are satisfied for travel on Salisbury Street and Bailey Road as well as sight lines exiting Pine Tree Road onto Salisbury Street and the Proposed Site Driveway onto Bailey Road.

2.5 PUBLIC TRANSPORTATION

The Worcester Regional Transit Authority (WRTA) no longer operates fixed bus route service within the study area.

3.0 FUTURE CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. To be consistent with EEA/EOT, a five-year planning horizon was selected.

To determine the incremental impact of new site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of planned roadway improvements in the study area, the future No-Build traffic volumes and projected Build traffic volumes.

3.1 BACKGROUND TRAFFIC GROWTH

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

3.1.1 Historical Area Growth

Nearby permanent count station data published by MassDOT indicates a 0.26 percent per year growth rate. For purposes of this evaluation, a 0.5-percent compounded annual growth rate is proposed (2.5 percent increase over a 5-year horizon). This growth rate is higher than historic rates and is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area and traffic associated with other potential small developments or vacancies in the area. MassDOT permanent count station data and background growth calculations are provided in the **Attachments**.

3.1.2 Background Development-Related Growth

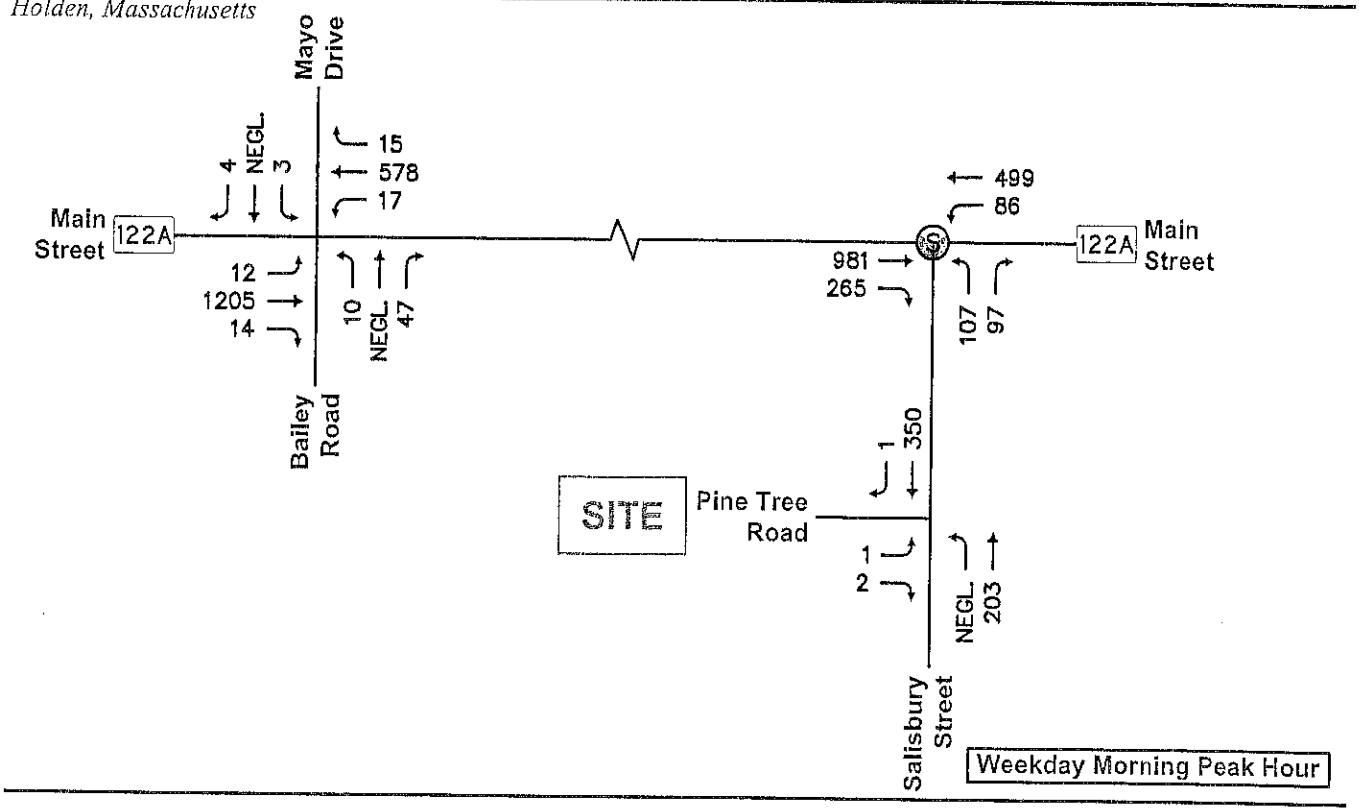
Development of future No-Build traffic volumes also considers traffic generated from specific area developments. Based on consultation with the Town of Holden Department of Growth Management and review of Massachusetts Environmental Policy Act (MEPA) files, there are several planned and or approved development projects in the vicinity of the project area that were not completed at the time the counts were conducted. Traffic associated with these developments was incorporated into the future year 2024 No-Build traffic networks. The following developments are expected to generate traffic which may to impact the study area intersections:

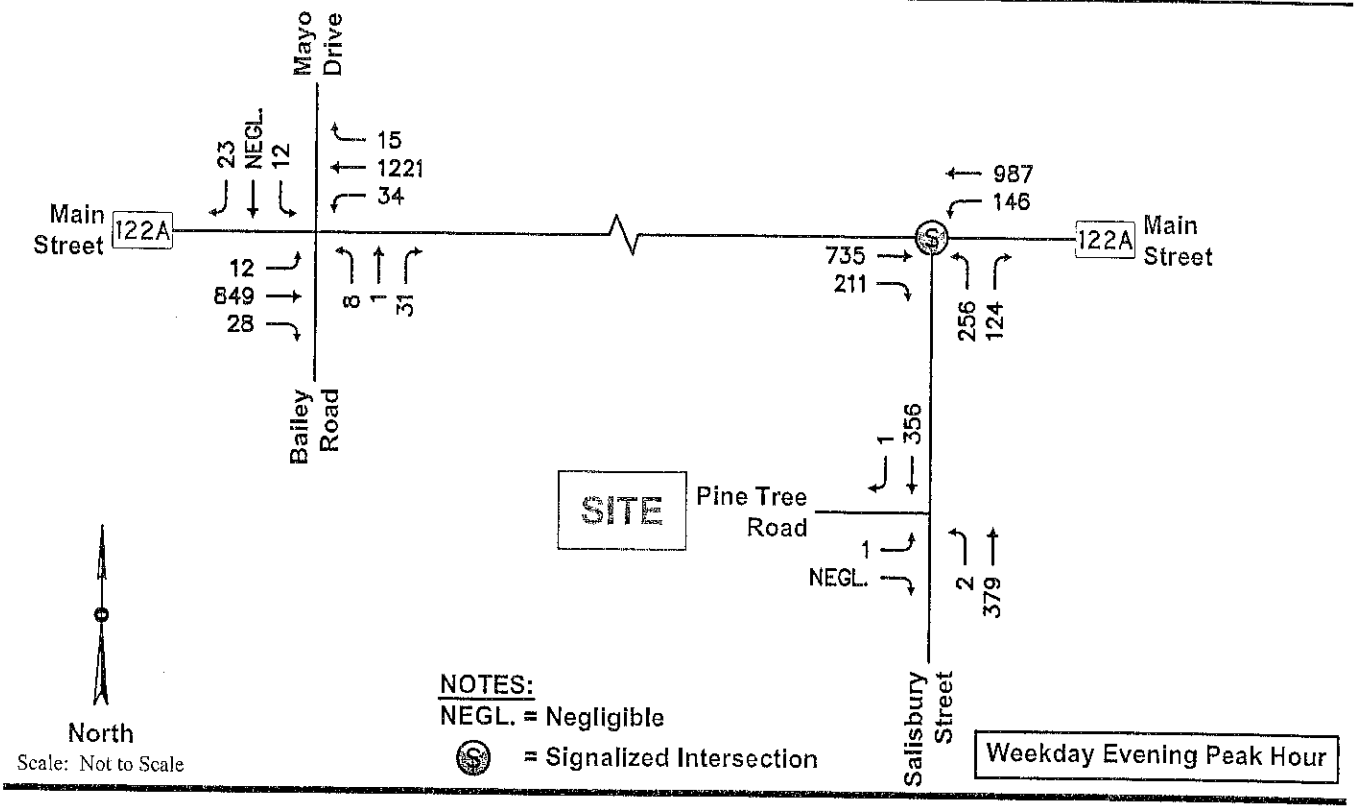
- **757 Salisbury Street:** This development includes the construction of 123 age-restricted on Salisbury Street in Worcester, Massachusetts. Traffic associated with this development are negligible and can be accounted for in the 0.5-percent compounded annual growth rate over 5 years.

- **Salisbury Hill:** This development includes the construction of 114 additional age restricted units to Salisbury Hill condominium complex in Worcester, Massachusetts. Traffic associated with this development are negligible and can be accounted for in the 0.5-percent compounded annual growth rate over 5 years.

3.2 NO-BUILD TRAFFIC VOLUMES

Future No-Build traffic volumes are developed by increasing the existing (2019) volumes by approximately 2.5 percent (0.5 percent compounded annually over 5 years) to account for normal area growth. The resulting 2024 No-Build traffic volumes are displayed in **Figure 4**.





North
Scale: Not to Scale

NOTES:
NEGL. = Negligible
S = Signalized Intersection

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Figure 4

2024 No-Build Conditions
Weekday Peak Hour Volumes

Date: July 2019
Dwg No. 1038 TIAS.dwg

3.3 SITE-GENERATED TRAFFIC

The trip generation estimates for the proposed residential are provided for the weekday morning and evening periods, which correspond to the critical weekday analysis periods for the proposed use and adjacent street traffic flow. New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation*[2] for Land Use Codes (LUCs) based on national trip rates for single-family detached housing (ITE LUC 210) and for multifamily housing (low-rise) (ITE LUC 220). **Table 6** presents the trip-generation estimate for the proposed development based on ITE.

TABLE 6
TRIP-GENERATION SUMMARY

Peak Hour/Direction	Single Family (12 Units)[1]	Multifamily (90 Units)[2]	Total
Weekday Morning Peak Hour:			
Entering	2	10	12
Exiting	7	33	40
Total	9	43	52
Weekday Evening Peak Hour:			
Entering	8	34	42
Exiting	4	20	24
Total	12	54	66
Weekday Daily (24 hours):	114	640	754

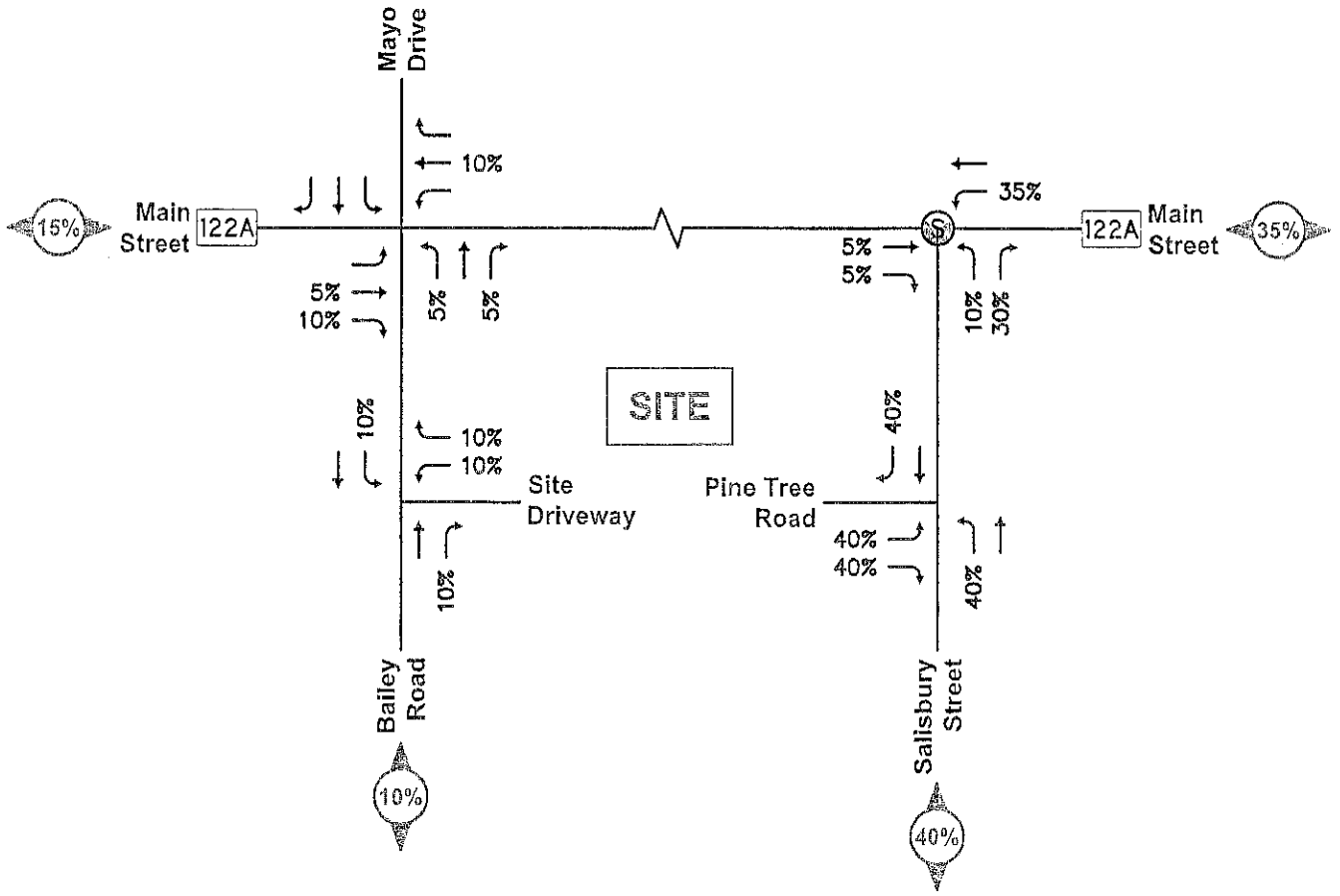
Source: ITE *Trip Generation*, Tenth Edition; 2018.
[1]Based on ITE LUC 210 (Single Family Detached) applied to 10 Units and ITE LUC 220 (Multifamily Houseing (Low-Rise) applied to 102 units).

As summarized in **Table 6**, the proposed development is estimated to generate approximately 52 vehicle trips (12 entering and 40 exiting) during the weekday morning peak hour and 66 vehicle trips (42 entering and 24 exiting) during the weekday evening peak hour. On a daily basis, the proposed development is estimated to generate approximately 754 vehicle trips on a weekday.

3.4 TRIP DISTRIBUTION AND ASSIGNMENT

The distribution for projected traffic for the proposed residential is based primarily on Census 2010 statistics for employment for residents of Holden. Existing travel patterns, volumes of the adjacent roadway system, and locations of local employment centers were also considered. The resulting trip distribution is presented in **Figure 5**. Trip distribution calculations and Census 2010 data are provided in the **Appendix.**

[2] *Trip Generation*, Tenth Edition; Institute of Transportation Engineers; Washington, DC; 2018.



North
Scale: Not to Scale

NOTES:
NEGL. = Negligible
S = Signalized Intersection

Weekday Evening Peak Hour

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Figure 5

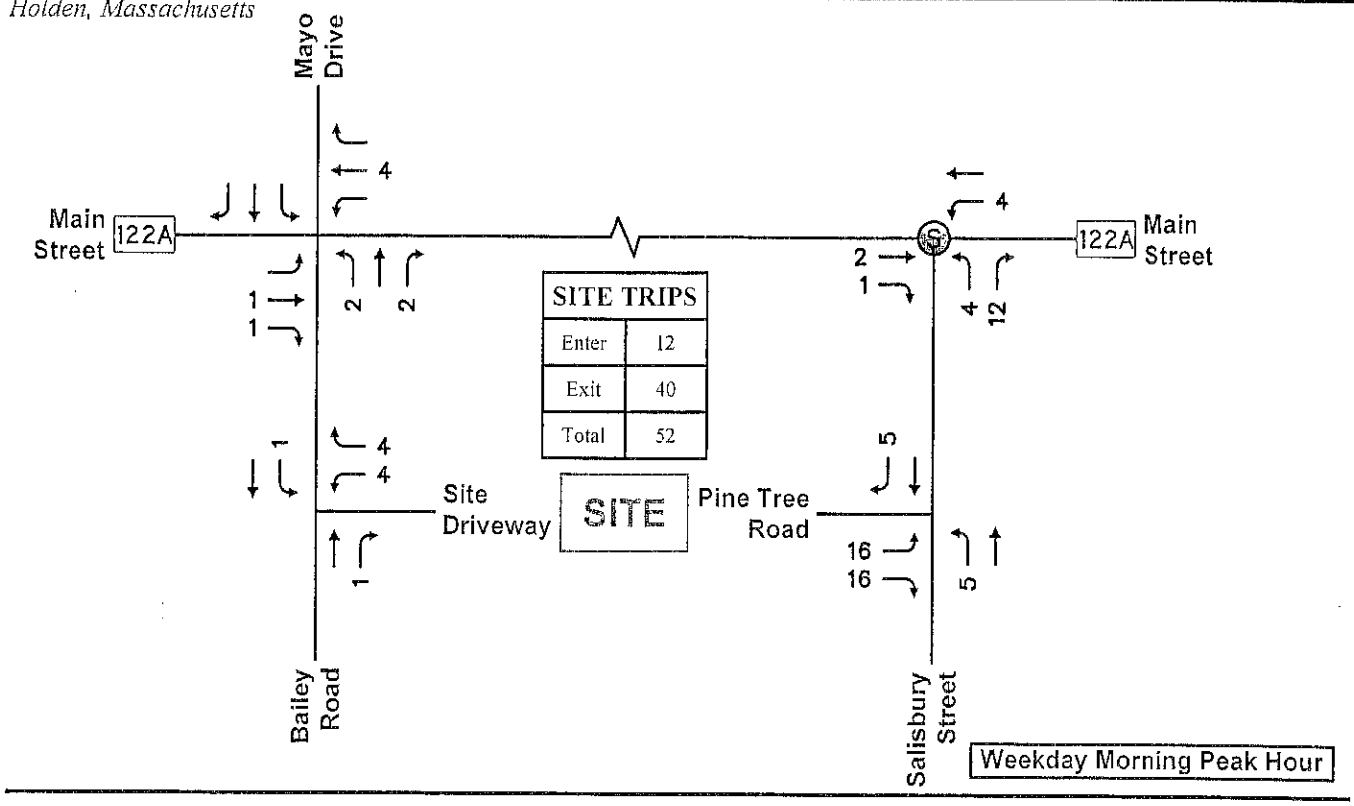
Trip Distribution
Peak Hour Traffic Volumes

Date: July 2019
Dwg No. 1038 TIAS.dwg

Development-related trips for the residential development were assigned to the roadway network using the ITE trip-generation estimates shown in **Table 6** and the distribution patterns presented in **Figure 5**. New development-related trips at each intersection approach for the weekday morning and weekday evening peak hours are quantified in **Figure 6**.

3.5 BUILD TRAFFIC VOLUMES

Future Build condition traffic volumes are derived by adding incremental traffic increases for the project to the 2024 No-Build conditions. **Figure 7** present the 2024 Build condition traffic-volume networks for the weekday morning and weekday evening peak hours.



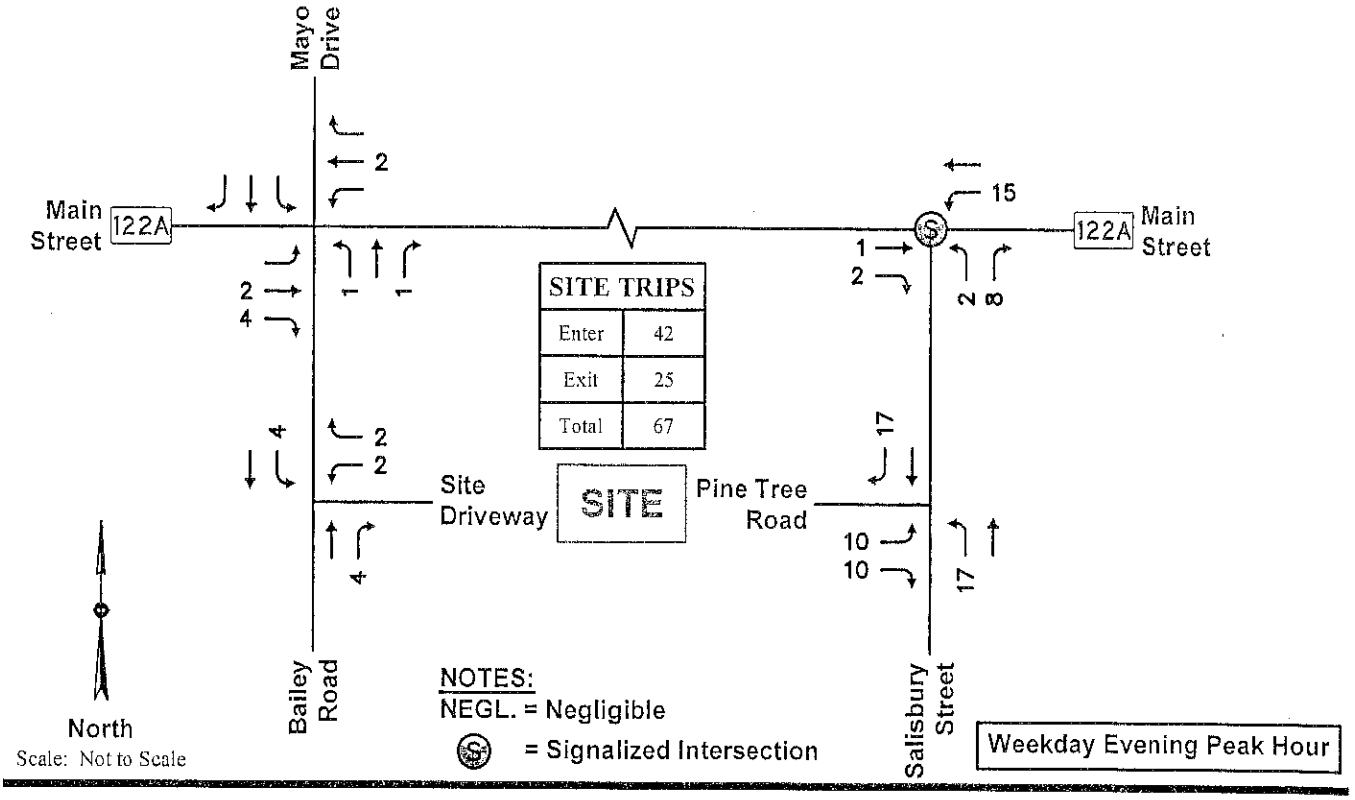


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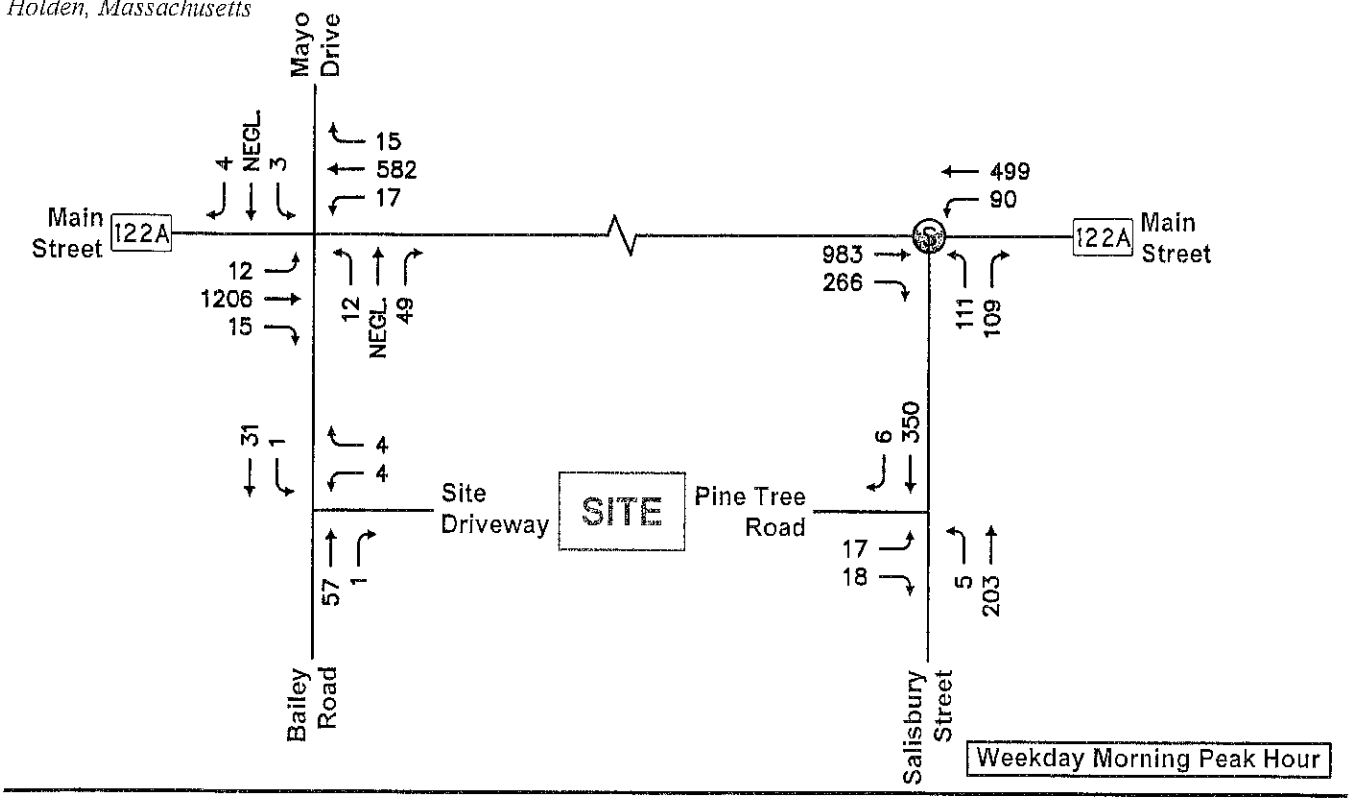
Figure 6

Site Generated Trips
Peak Hour Traffic Volumes

Date: October 2019
Dwg No. 1038 TIAS.dwg



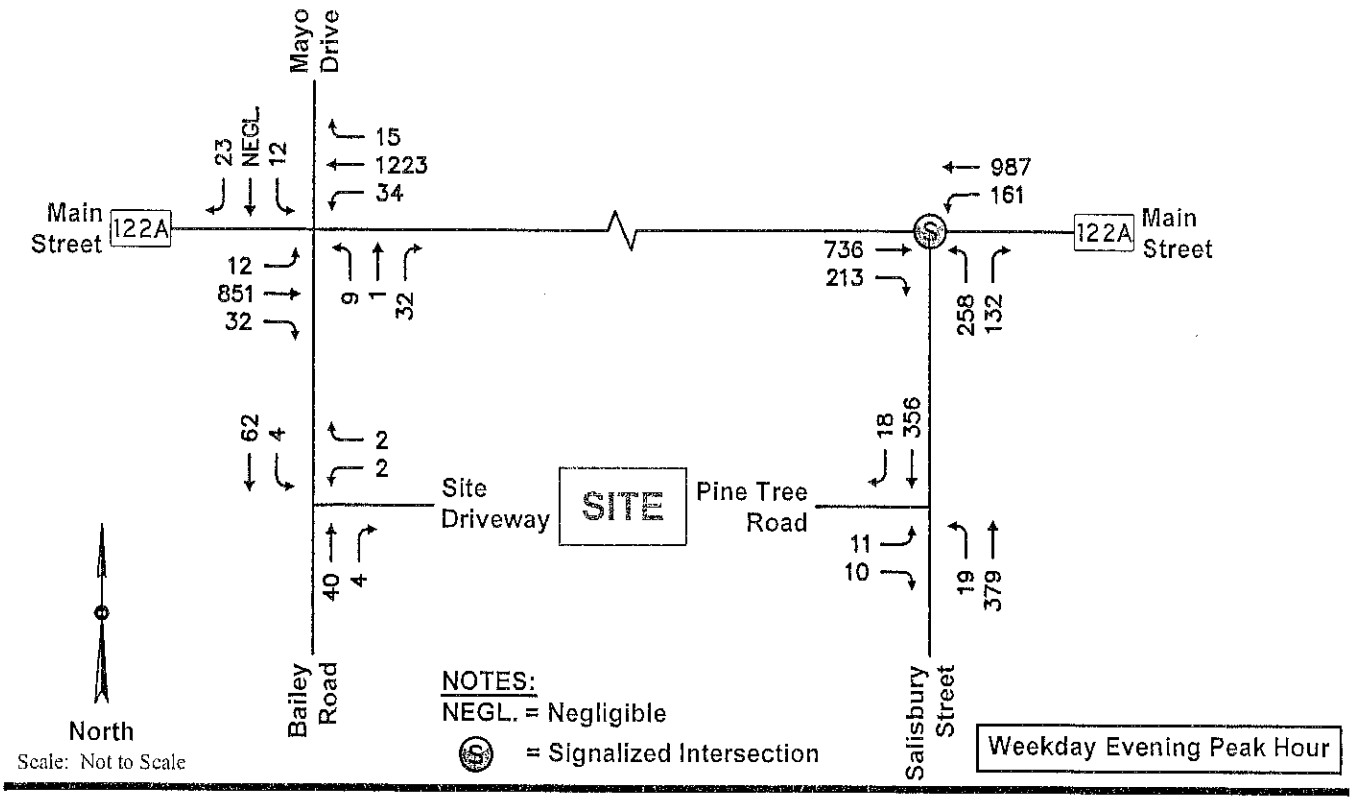


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Figure 7

2024 Build Weekday Peak Hour Traffic Volumes

Date: September 2019
Dwg No. 1038 TIAS.dwg

4.0 TRAFFIC OPERATIONS ANALYSIS

Intersection capacity analyses are presented in this section for the Existing, No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EOEEA/EOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

4.1 CAPACITY ANALYSIS PROCEDURES

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements and 80 seconds for signalized movements). The specific control delays and associated LOS designations are presented in the **Appendix.**

4.2 INTERSECTION CAPACITY ANALYSIS RESULTS

Capacity analysis results for the weekday morning and weekday evening peak hour capacity analysis results for the study intersections are described below, with detailed analysis results presented in the **Appendix**.

4.2.1 Level of Service Analysis

Level-of-Service (LOS) analyses were conducted for the Existing (Baseline), No-Build, and Build conditions for the study intersections. The results of the intersection capacity analyses for the unsignalized intersections are summarized below in **Table 7** and **Table 8** for the weekday morning and weekday evening peak hours, respectively. Detailed analysis results are presented in the **Appendix**.

TABLE 7
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY MORNING PEAK HOUR

		2019 Baseline			2024 No-Build			2024 Build		
Location	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Salisbury Street at	Eastbound	0.01	11	B	0.01	11	B	0.01	12	B
Pine Tree Road	Northbound	0.00	<5	A	0.00	<5	A	0.01	<5	A
Bailey Road at	Westbound	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.01	9	A
Proposed Site Drive	Southbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
Main Street (Route 122A)	Eastbound	0.01	<5	A	0.01	<5	A	0.01	<5	A
at Bailey Road	Westbound	0.04	<5	A	0.04	<5	A	0.04	<5	A
	Northbound	>1.0	>50	F	>1.0	>50	F	>1.0	>50	F
	Southbound	0.07	42	E	0.08	46	E	0.08	48	E
Main Street (Route 122A)	Eastbound	0.88	19	B	0.89	20	B	0.93	25	C
at Salisbury Street	Westbound	0.53	<5	A	0.54	<5	B	0.56	<5	A
	Northbound	0.23	29	C	0.24	29	C	0.26	29	C
	Overall	**0.88**	**16**	**B**	**0.89**	**17**	**B**	**0.89**	**19**	**B**

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

TABLE 8
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY EVENING PEAK HOUR

Location	Approach	2019 Baseline			2024 No-Build			2024 Build		
		v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Salisbury Street at	Eastbound	0.00	15	B	0.00	15	B	0.02	14	B
Pine Tree Road	Northbound	0.00	<5	A	0.00	<5	A	0.05	<5	A
Bailey Road at	Westbound	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.01	9	A
Proposed Site Drive	Southbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
Main Street (Route 122A)	Eastbound	0.02	<5	A	0.02	<5	A	0.02	<5	A
at Bailey Road	Westbound	0.05	<5	A	0.05	<5	A	0.05	<5	A
	Northbound	>1.0	>50	F	>1.0	>50	F	>1.0	>50	F
	Southbound	0.36	>50	F	0.39	>50	F	0.40	>50	F
Main Street (Route 122A)	Eastbound	0.79	16	B	0.80	17	B	0.80	17	B
at Salisbury Street	Westbound	0.78	11	B	0.82	12	B	0.85	14	B
	Northbound	0.19	32	C	0.19	33	C	0.20	33	C
	Overall	**0.79**	**16**	**B**	**0.82**	**17**	**B**	**0.85**	**18**	**B**

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

As shown in **Table 7** and **Table 8**:

- Operations at the proposed Site Drive intersections with Salisbury Street and Bailey Road are level-of-service (LOS) B or better during the critical peak traffic hours with only minor delays.

- The proposed development is expected to have no material change in delays at study area intersections. Operations at the signalized Main Street at Salisbury Street intersection are projected to be LOS C or better during peak hours with an overall increase in delay of 3 seconds due to the project traffic.

- The minor street approaches at the intersection of Main Street (Route 122A) and Bailey Road/ Mayo Drive currently operate with long delays during the peak hours. Likewise, left turns from Main Street (again low volumes) experience delays, resulting in use of the paved shoulders to by-pass left turning vehicles.

In summary, the proposed development is expected to have a minimal impact on the study area intersections as there will be minimal change in level of service and operations of the study intersections under future conditions as a result of development. Adequate capacity is available under future Build conditions on both Salisbury Street and Bailey Road to accommodate the site use.

5.0 SUBDIVISION ROADWAY DESIGN

This section addresses the proposed dimensioning (width) of Pine Tree Road and the other subdivision roadways relative to zoning bylaw requirements and guidelines published by the American Association of State Highway and Transportation Officials (AASHTO). Pine Tree Road is defined as a "way in existence" and will serve as the primary means of access/egress for the proposed subdivision and is proposed as a 24-foot wide subdivision roadway with a grass strip and sidewalk along the northern edge. It is the opinion of MDM that the proposed 24-foot roadway width for is appropriate for Pine Tree Road based on review of AASHTO recommended practice and guidance provided by the Institute of Transportation Engineers (ITE) and Urban Land Institute (ULI) for low volume local residential streets. This design width will also result in less environmental impact (impervious area and associated drainage runoff) and will encourage lower travel speeds that are in keeping with the residential nature of the proposed subdivision. Specific discussion of design criteria leading to this conclusion is presented below.

5.1 Roadway Classification and Design Criteria

A nominal roadway width of 28 feet is required under local zoning by-laws for a local subdivision roadway, requiring a dimensional waiver for the proposed narrower roadway width. The requested waiver (reduced roadway width) is purposely intended to avoid "over designing" the subdivision roadway and encouraging lower travel speeds that are in keeping with lower volume local residential streets. As Pine Tree Road will primarily carry traffic associated with the development and occasional service/emergency vehicles and visitor traffic, projected daily traffic volume is generally less than 700 vehicles per day (vpd).

The Urban Land Institute (ULI), American Society of Civil Engineers (ASCE) and Institute of Transportation Engineers (ITE) together have developed residential street design criteria as published in *Residential Streets, Third Edition*[3]. *Residential Streets* recommends that local streets, regardless of their average daily traffic volume, be designed for low vehicle speeds, that is, a speed of 15 to 20 miles per hour. *Residential Streets* acknowledges that overly designed streets with an undue concern with geometry more appropriate for highways encourages greater travel speeds and therefore, should be avoided. The American Association of State Highway and Transportation Officials' (AASHTO) "Green Book"[4] also provides specific design criteria for local low volume roads. Evaluation of the Pine Tree Road's alignment was applied in accordance with AASHTO guidelines for this roadway type, specifically roadway width.

Roadway Width

AASHTO guidance suggests various roadway and a graded shoulder width for new construction of local roads based on design speed and design volume (vehicles per day). The minimum recommended roadway design widths for the proposed Salisbury Pine Tree Estates subdivision for design speeds of 30 mph or less are summarized in **Table 9**.

TABLE 9
SUMMARY OF ROADWAY DESIGN WIDTHS

		AASHTO Recommended	
Roadway Segment	Estimated ADT[1]	Travel Width[2]	Shoulder Width[3]
Roadway 1 (Henry Way)	200±	18	2
Roadway 2 (Farmers Way)	500±	20	3
Pine Tree Road	600±	20	3

Source: AASHTO 2018
[1]Estimated average daily traffic in vehicles per day (vpd) based on average trip distribution patterns.
[2]Minimum width of traveled way (feet) for specific design volume (vehicles/day) and design speed ≤30 mph.
[3]Width of graded shoulder on each side of the road (feet).

As summarized in **Table 9**:

- *Pine Tree Road*: The AASHTO design criteria for Pine Tree Road is a minimum travel width of 20 feet and a graded shoulder width of 3 feet on each side of the roadway. The design width of 24 feet for Pine Tree Road (a way in existence) and associated 5 to 8-foot side grass strips along the road will satisfy the AASHTO recommended minimum roadway width criteria.

[3]*Residential Streets, Third Edition*, published by Urban Land Institute; Washington, D.C., 2001.
[4]*A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2018.

- *Subdivision Roadways*: Henry Road has projected roadway volumes that classify these roadways as very low volume local roadways following AASHTO guidance (ADT ≤400 vehicle per day). Under this classification, minimum recommended roadway width is 18 feet and a graded shoulder width of 2 feet on each side of the roadway. The AASHTO design criteria for the Farmers Way is a minimum travel width of 20 feet and a graded shoulder width of 3 feet on each side of the roadway. While the subdivision roadways have been designed to comply with the local subdivision regulations which indicate a 28 foot paved width, it is the Applicant's desire is to reduce the pavement width for these two roads to match the proposed Pine Tree Road pavement width of 24 feet – a width that exceeds recommended AASHTO criteria.

A consistent subdivision roadway width of 24 feet would minimize impervious area, provide consistency with Pine Tree Road, encourage lower travel speeds that are in keeping with the residential nature of the proposed subdivision and local roadway system, and is consistent with AASHTO recommended roadway widths for low volume local roadways.

Additional measures to encourage lower travel speeds (particularly along Pine Tree Road), may include posting of speed limit signs (15 mph) and speed "humps" or "tables" at strategic locations. The use of any such measures should be designed to complement the physical alignment of the roadway to ensure that travel within the development is in harmony with the development's design intent.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 RECOMMENDATIONS

MDM finds that travel conditions in the site vicinity along Salisbury Street and Bailey Street are generally unconstrained. Trip generation for the development is estimated at approximately 52 vehicle-trips during the weekday morning peak hour and 66 vehicle-trips during the weekday evening peak hour. Traffic impacts associated with the residential development are not expected to notably affect travel or safety conditions in the site vicinity. However, MDM recommends access-related improvements aimed at enhancing traffic operations and/or travel safety. Specific recommendations are as follows:

Pine Tree Road at Salisbury Street. The existing Pine Tree Road and Salisbury Street intersection will serve as primary access to the site. Currently, no traffic control or marked pedestrian crossing is present on the Pine Tree Road eastbound approach. MDM recommends the following improvements:

- A STOP sign (R1-1) and STOP line pavement markings is recommended on the Pine Tree Road approach to Salisbury Street. A marked crosswalk and ADA compliant ramps should be installed at the intersection across Pine Tree Road.

- A sidewalk is recommended on Pine Tree Road to connect the site with the existing sidewalk system on the western side of Salisbury Street which extends from Main Street to the Dawson Elementary School.

- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the Salisbury Street layout in vicinity of the site driveway to provide unobstructed sight lines.

Bailey Road at Proposed Site Drive. The proposed site driveway will connect the site with Bailey Road just south of the existing garage for #124 Bailey Road. MDM recommends that the Applicant implement the following items:

- A STOP sign (R1-1) and STOP line pavement markings should be installed on the Site Drive approach to Bailey Road.

- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the Bailey Road layout in vicinity of the site driveway to provide unobstructed sight lines.

6.2 CONCLUSIONS

Adequate capacity is available under future Build conditions on both Salisbury Street and Bailey Road to accommodate the site use. The project is not projected to significantly change any reported operating levels compared to future No-Build conditions. Proposed access improvements will provide ample capacity to accommodate site-generated traffic while also enhancing safety and capacity.

APPENDIX

- Traffic Volume Data
- Seasonal/ Yearly Growth Data
- Speed Data
- Crash Data
- Sight Distance Calculations
- Trip Generation
- Trip Distribution Calculations
- Capacity Analysis

□ Traffic Volume Data

MDM TRANSPORTATION CONSULTANTS, INC.

N/S: Salisbury Street
North of Site Driveway
Holden, MA

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

Start Time	09-May-19 Thu	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		0	54			2	44				
12:15		1	41			5	41				
12:30		0	43			1	63				
12:45		0	57	1	195	1	57	9	205	10	400
01:00		5	45			3	50				
01:15		0	39			1	32				
01:30		2	43			4	38				
01:45		0	45	7	172	1	40	9	160	16	332
02:00		1	46			0	46				
02:15		1	34			1	59				
02:30		0	51			1	73				
02:45		0	41	2	172	0	61	2	239	4	411
03:00		0	42			1	95				
03:15		0	61			1	48				
03:30		5	64			1	61				
03:45		0	62	5	229	0	93	3	297	8	526
04:00		0	59			3	86				
04:15		3	48			3	87				
04:30		1	70			6	69				
04:45		1	54	5	231	5	63	17	305	22	536
05:00		3	66			5	88				
05:15		7	61			14	76				
05:30		8	64			4	74				
05:45		18	72	36	263	11	78	34	316	70	579
06:00		21	62			18	67				
06:15		17	66			20	98				
06:30		28	60			26	62				
06:45		40	57	106	245	38	57	102	284	208	529
07:00		39	41			53	38				
07:15		53	42			47	60				
07:30		64	47			41	54				
07:45		74	35	230	165	52	60	193	212	423	377
08:00		70	37			72	36				
08:15		84	34			37	39				
08:30		65	49			45	33				
08:45		86	35	305	155	36	37	190	145	495	300
09:00		62	24			94	26				
09:15		47	25			48	21				
09:30		39	26			49	30				
09:45		41	11	189	86	49	21	240	98	429	184
10:00		36	10			56	13				
10:15		48	15			46	11				
10:30		43	9			33	16				
10:45		36	16	163	50	47	9	182	49	345	99
11:00		52	10			51	23				
11:15		43	5			33	13				
11:30		42	6			55	3				
11:45		41	4	178	25	53	4	192	43	370	68
Total		1227	1988			1173	2353			2400	4341
Percent		38.2%	61.8%			33.3%	66.7%			35.6%	64.4%
Combined Total		3215				3526				6741	

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA

Start Time	07-May-19 Tue	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		1	8			0	12				
12:15		0	6			0	4				
12:30		0	7			0	7				
12:45		0	3	1	24	1	6	1	29	2	53
01:00		0	10			0	11				
01:15		0	6			0	10				
01:30		0	6			0	10				
01:45		0	5	0	27	0	11	0	42	0	69
02:00		0	4			0	8				
02:15		0	8			0	11				
02:30		0	3			0	14				
02:45		0	6	0	21	0	23	0	56	0	77
03:00		0	4			0	16				
03:15		0	9			0	30				
03:30		0	12			0	16				
03:45		0	18	0	43	0	10	0	72	0	115
04:00		0	17			0	9				
04:15		2	5			0	11				
04:30		0	12			1	14				
04:45		2	14	4	48	0	18	1	52	5	100
05:00		3	6			0	8				
05:15		3	10			1	14				
05:30		5	6			1	12				
05:45		1	12	12	34	0	17	2	51	14	85
06:00		5	9			0	7				
06:15		6	8			2	19				
06:30		4	4			3	9				
06:45		6	5	21	26	7	10	12	45	33	71
07:00		9	3			7	11				
07:15		10	7			5	12				
07:30		10	1			6	7				
07:45		10	8	39	19	6	5	24	35	63	54
08:00		11	3			11	5				
08:15		10	2			11	7				
08:30		7	2			10	9				
08:45		7	3	35	10	36	5	68	26	103	36
09:00		3	1			10	6				
09:15		9	2			4	2				
09:30		6	2			9	5				
09:45		5	3	23	8	7	2	30	15	53	23
10:00		7	0			6	1				
10:15		10	0			6	0				
10:30		5	1			7	2				
10:45		5	0	27	1	8	0	27	3	54	4
11:00		5	1			8	2				
11:15		5	0			8	0				
11:30		8	2			8	0				
11:45		5	0	23	3	11	1	35	3	58	6
Total		185	264			200	429			385	693
Percent		41.2%	58.8%			31.8%	68.2%			35.7%	64.3%
Combined Total		449				629				1078	

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA

E/W: Main Street
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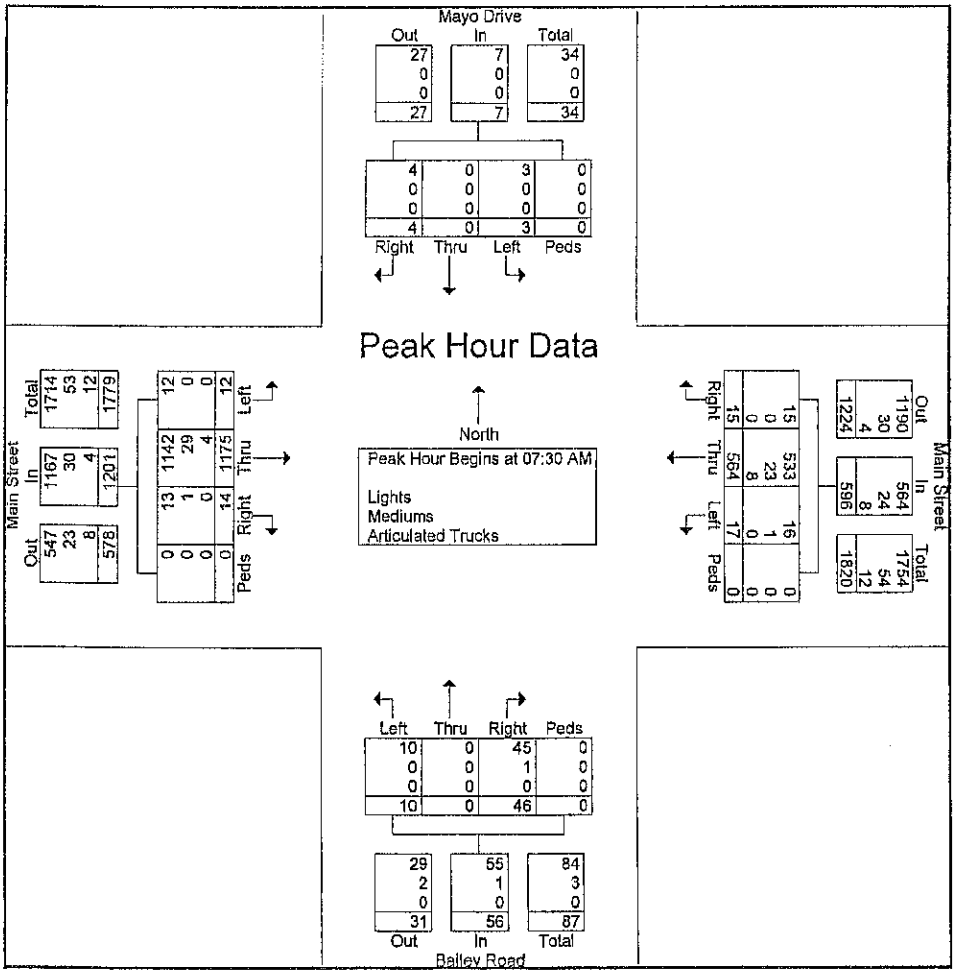
SB: Mayo Drive
Holden, MA

File Name : 435 Main St Bailey Rd 5-7-19
Site Code : 435
Start Date : 5/7/2019
Page No : 2

	Mayo Drive From North					Main Street From East					Bailey Road From South					Main Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	1	0	1	4	106	1	0	111	10	0	2	0	12	5	310	4	0	319	443
07:45 AM	1	0	0	0	1	5	151	4	0	160	7	0	5	0	12	2	287	3	0	292	465
08:00 AM	1	0	2	0	3	2	175	3	0	180	15	0	1	0	16	6	303	4	0	313	512
08:15 AM	2	0	0	0	2	4	132	9	0	145	14	0	2	0	16	1	275	1	0	277	440
Total Volume	4	0	3	0	7	15	564	17	0	596	46	0	10	0	56	14	1175	12	0	1201	1860
% App. Total	57.1	0	42.9	0		2.5	94.6	2.9	0		82.1	0	17.9	0		1.2	97.8	1	0		
PHF	.500	.000	.375	.000	.583	.750	.806	.472	.000	.828	.767	.000	.500	.000	.875	.583	.948	.750	.000	.941	.908
Lights	4	0	3	0	7	15	533	16	0	564	45	0	10	0	55	13	1142				
% Lights	100	0	100	0	100	100	94.5	94.1	0	94.6	97.8	0	100	0	98.2	92.9	97.2	100	0	97.2	96.4
Mediums	0	0	0	0	0	0	23	1	0	24	1	0	0	0	1	1	29	0	0	30	55
% Mediums																					
Articulated Trucks	0	0	0	0	0	0	8	0	0	8	0	0	0	0	0	0	4	0	0	4	12
% Articulated Trucks	0	0	0	0	0	0	1.4	0	0	1.3	0	0	0	0	0	0	0.3	0	0	0.3	0.6



MDM Transportation Consultants, Inc.

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E/W: Main Street
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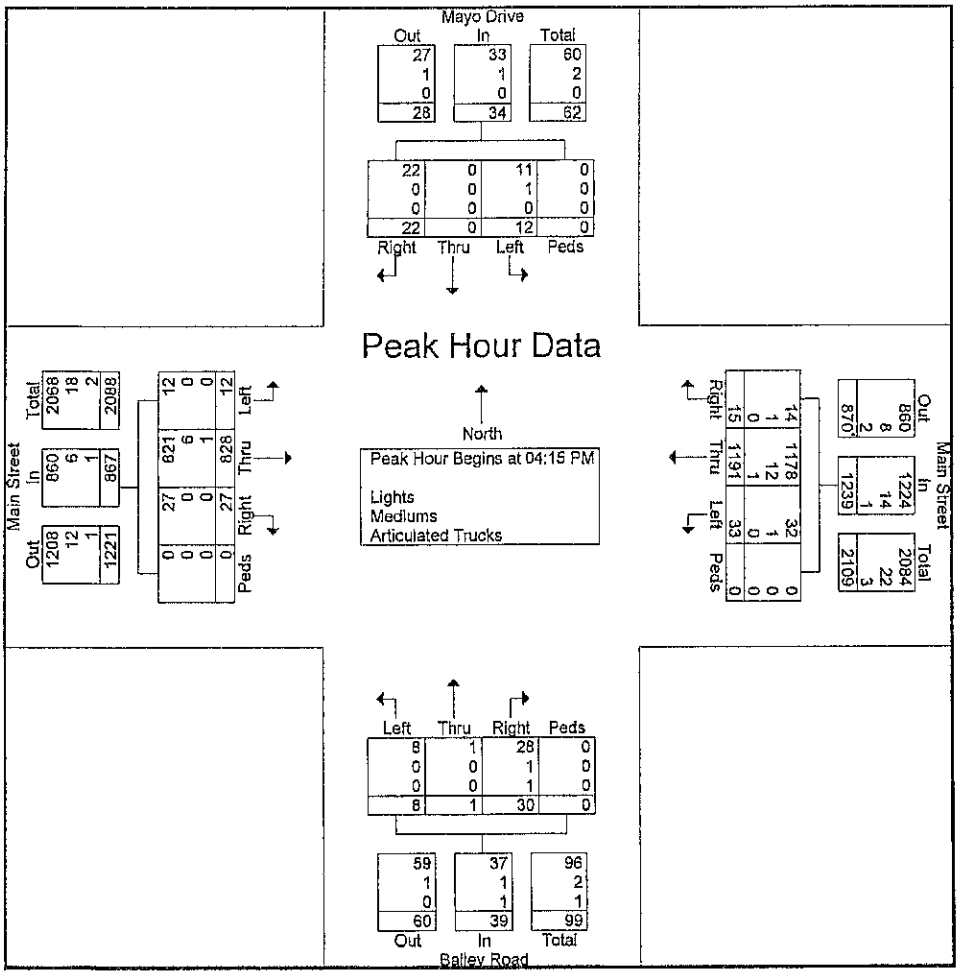
File Name : 435 Main St Bailey Rd 5-7-19
Site Code : 435
Start Date : 5/7/2019
Page No : 3

	Mayo Drive From North					Main Street From East					Bailey Road From South					Main Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	9	0	5	0	14	7	302	6	0	315	7	0	2	0	9	6	217	1	0	224	562
04:30 PM	1	0	1	0	2	1	295	9	0	305	8	0	3	0	11	8	199	4	0	211	529
04:45 PM	6	0	4	0	10	2	284	10	0	296	7	1	3	0	11	8	206	3	0	217	534
05:00 PM	6	0	2	0	8	5	310	8	0	323	8	0	0	0	8	5	206	4	0	215	554
Total Volume	22	0	12	0	34	15	1191	33	0	1239	30	1	8	0	39	27	828	12	0	867	2179
% App. Total	64.7	0	35.3	0		1.2	96.1	2.7	0		76.9	2.6	20.5	0		3.1	95.5	1.4	0		
PHF	.611	.000	.600	.000	.607	.536	.960	.825	.000	.959	.938	.250	.667	.000	.886	.844	.954	.750	.000	.968	.969
Lights	22	0	11	0	33	14	1178														
% Lights	100	0	91.7	0	97.1	93.3	98.9	97.0	0	98.8	93.3	100	100	0	94.9	100	99.2	100	0	99.2	98.9
Mediums	0	0	1	0	1	1	12	1	0	14	1	0	0	0	1	0	6	0	0	6	22
% Mediums																					
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	1	0	0	1	3
% Articulated Trucks	0	0	0	0	0	0	0.1	0	0	0.1	3.3	0	0	0	2.6	0	0.1	0	0	0.1	0.1



MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA

E/W: Main Street
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File Name : 435 Main St Bailey Rd 5-7-19
Site Code : 435
Start Date : 5/7/2019
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

	Mayo Drive From North					Main Street From East					Bailey Road From South					Main Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	1	2	5	0	8	6	164	2	0	172	10	0	3	0	13	3	275	3	0	281	474
07:15 AM	1	0	1	0	2	6	116	1	0	123	9	1	3	0	13	2	244	2	0	248	386
07:30 AM	0	0	1	0	1	4	106	1	0	111	10	0	2	0	12	5	310	4	0	319	443
07:45 AM	1	0	0	0	1	5	151	4	0	160	7	0	5	0	12	2	287	3	0	292	465
Total	3	2	7	0	12	21	537	8	0	566	36	1	13	0	50	12	1116	12	0	1140	1768
08:00 AM	1	0	2	0	3	2	175	3	0	180	15	0	1	0	16	6	303	4	0	313	512
08:15 AM	2	0	0	0	2	4	132	9	0	145	14	0	2	0	16	1	275	1	0	277	440
08:30 AM	1	0	4	0	5	4	133	7	0	144	7	1	2	0	10	8	252	6	0	266	425
08:45 AM	1	0	4	0	5	4	152	12	0	168	11	0	3	0	14	18	252	7	0	277	464
Total	5	0	10	0	15	14	592	31	0	637	47	1	8	0	56	33	1082	18	0	1133	1841
04:00 PM	7	0	4	0	11	7	293	6	0	306	9	0	6	0	15	1	203	1	0	205	537
04:15 PM	9	0	5	0	14	7	302	6	0	315	7	0	2	0	9	6	217	1	0	224	562
04:30 PM	1	0	1	0	2	1	295	9	0	305	8	0	3	0	11	8	199	4	0	211	529
04:45 PM	6	0	4	0	10	2	284	10	0	296	7	1	3	0	11	8	206	3	0	217	534
Total	23	0	14	0	37	17	1174	31	0	1222	31	1	14	0	46	23	825	9	0	857	2162
05:00 PM	6	0	2	0	8	5	310	8	0	323	8	0	0	0	8	5	206	4	0	215	554
05:15 PM	3	1	2	0	6	3	296	8	0	307	10	0	1	0	11	7	211	0	0	218	542
05:30 PM	5	0	1	0	6	1	277	8	0	286	4	0	3	0	7	7	184	3	0	194	493
05:45 PM	1	1	5	0	7	3	305	10	0	318	10	0	6	0	16	7	175	1	0	183	524
Total	15	2	10	0	27	12	1188	34	0	1234	32	0	10	0	42	26	776	8	0	810	2113
Grand Total	46	4	41	0	91	64	3491	104	0	3659	146	3	45	0	194	94	3799	47	0	3940	7884
Apprch %	50.5	4.4	45.1	0		1.7	95.4	2.8	0		75.3	1.5	23.2	0		2.4	96.4	1.2	0		
Total %	0.6	0.1	0.5	0	1.2	0.8	44.3	1.3	0	46.4	1.9	0	0.6	0	2.5	1.2	48.2	0.6	0	50	
Lights	45	4	40	0	89	61	3398										3723				
% Lights	97.8	100	97.6	0	97.8	95.3	97.3	97.1	0	97.3	97.9	100	97.8	0	97.9	98.9	98	100	0	98	97.7
Mediums	1	0	1	0	2	3	82	3	0	88	2	0	1	0	3	1	67	0	0	68	161
% Mediums																					
Articulated Trucks	0	0	0	0	0	0	11	0	0	11	1	0	0	0	1	0	9	0	0	9	21
% Articulated Trucks	0	0	0	0	0	0	0.3	0	0	0.3	0.7	0	0	0	0.5	0	0.2	0	0	0.2	0.3

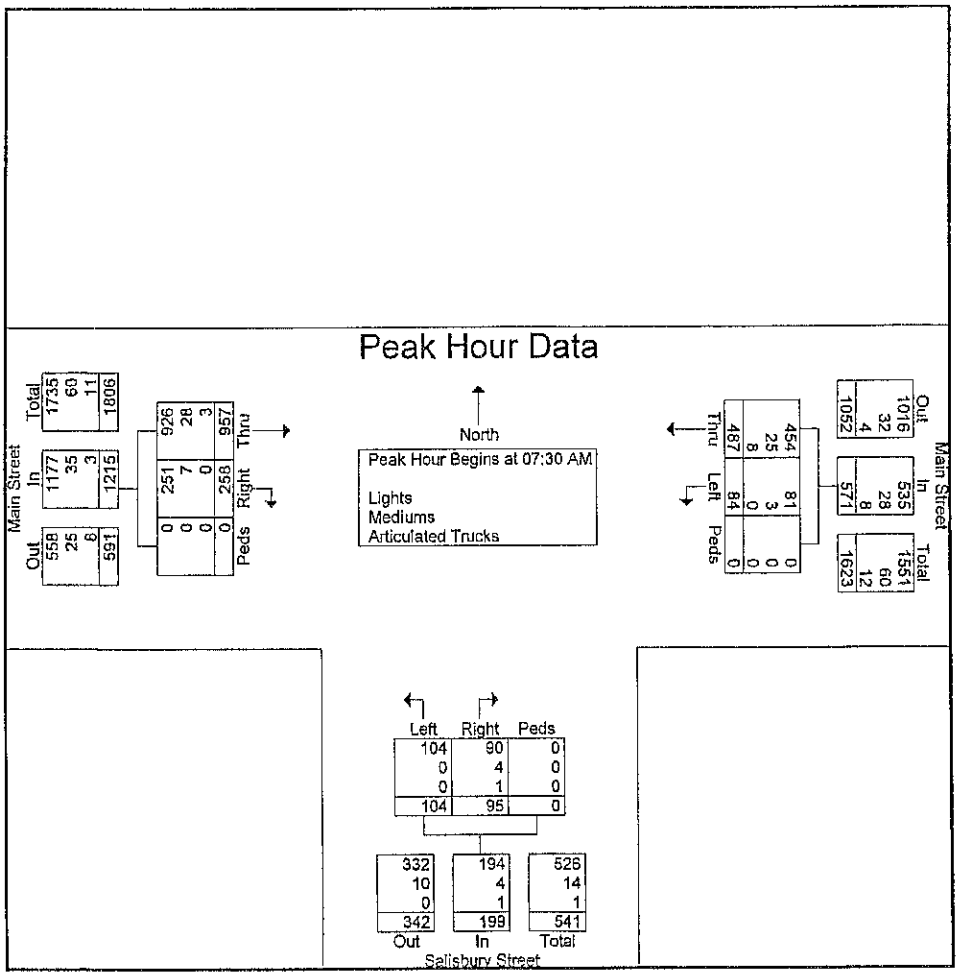
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA

E/W: Main Street
NB: Salisbury Street
Holden, MA

File Name : 435 Main Salisbury St 5-7-19
Site Code : 435
Start Date : 5/7/2019
Page No : 2

	Main Street From East				Salisbury Street From South				Main Street From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	98	15	0	113	23	16	0	39	56	252	0	308	460
07:45 AM	131	21	0	152	21	31	0	52	57	239	0	296	500
08:00 AM	151	27	0	178	25	31	0	56	82	238	0	320	554
08:15 AM	107	21	0	128	26	26	0	52	63	228	0	291	471
Total Volume	487	84	0	571	95	104	0	199	258	957	0	1215	1985
% App. Total	85.3	14.7	0		47.7	52.3	0		21.2	78.8	0		
PHF	.806	.778	.000	.802	.913	.839	.000	.888	.787	.949	.000	.949	.896
Lights	454	81	0	535	90	104	0	194	251	926	0	1177	1906
% Lights	93.2	96.4	0	93.7	94.7	100	0	97.5	97.3	96.8	0	96.9	96.0
Mediums	25	3	0	28	4	0	0	4	7	28	0	35	67
% Mediums	5.1	3.6	0	4.9	4.2	0	0	2.0	2.7	2.9	0	2.9	3.4
Articulated Trucks	8	0	0	8	1	0	0	1	0	3	0	3	12
% Articulated Trucks	1.6	0	0	1.4	1.1	0	0	0.5	0	0.3	0	0.2	0.6



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File Name : 435 Main Salisbury St 5-7-19
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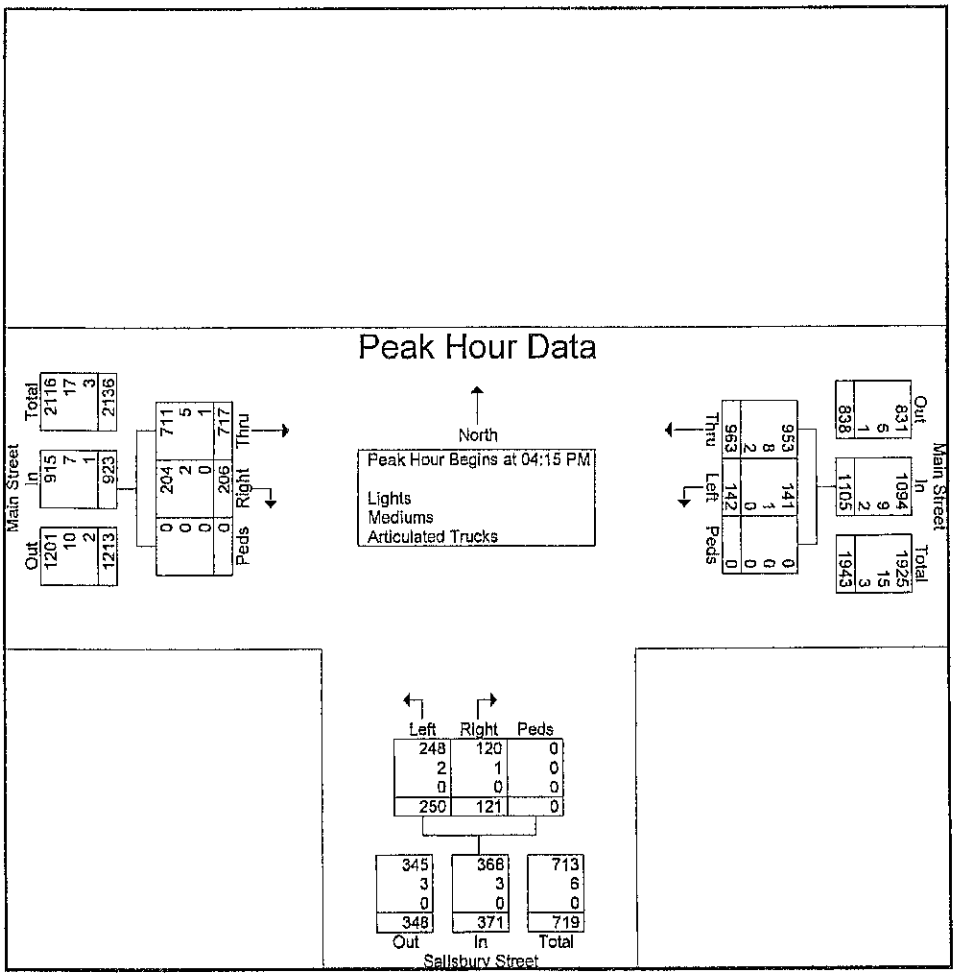
Page No : 3

	Main Street From East				Salisbury Street From South				Main Street From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	248	36	0	284	12	60	0	72	53	210	0	263	619
04:30 PM	241	29	0	270	32	63	0	95	48	175	0	223	588
04:45 PM	224	41	0	265	32	63	0	95	50	181	0	231	591
05:00 PM	250	36	0	286	45	64	0	109	55	151	0	206	601
Total Volume	963	142	0	1105	121	250	0	371	206	717	0	923	2399
% App. Total	87.1	12.9	0		32.6	67.4	0		22.3	77.7	0		
PHF	.963	.866	.000	.966	.672	.977	.000	.851	.936	.854	.000	.877	.969
Lights	953	141	0	1094	120	248	0	368	204	711	0	915	2377
% Lights	99.0	99.3	0	99.0	99.2	99.2	0	99.2	99.0	99.2	0	99.1	99.1
Mediums	8	1	0	9	1	2	0	3	2	5	0	7	19
% Mediums	0.8	0.7	0	0.8	0.8	0.8	0	0.8	1.0	0.7	0	0.8	0.8
Articulated Trucks	2	0	0	2	0	0	0	0	0	1	0	1	3
% Articulated Trucks	0.2	0	0	0.2	0	0	0	0	0	0.1	0	0.1	0.1



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Groups Printed- Lights - Mediums - Articulated Trucks

	Main Street From East				Salisbury Street From South				Main Street From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	118	10	0	128	23	45	0	68	49	239	0	288	484
07:15 AM	81	12	0	93	17	33	0	50	43	219	0	262	405
07:30 AM	98	15	0	113	23	16	0	39	56	252	0	308	460
07:45 AM	131	21	0	152	21	31	0	52	57	239	0	296	500
Total	428	58	0	486	84	125	0	209	205	949	0	1154	1849
08:00 AM	151	27	0	178	25	31	0	56	82	238	0	320	554
08:15 AM	107	21	0	128	26	26	0	52	63	228	0	291	471
08:30 AM	115	27	0	142	20	35	0	55	54	199	0	253	450
08:45 AM	122	23	0	145	30	49	0	79	59	210	0	269	493
Total	495	98	0	593	101	141	0	242	258	875	0	1133	1968
04:00 PM	254	24	0	278	26	56	0	82	46	173	0	219	579
04:15 PM	248	36	0	284	12	60	0	72	53	210	0	263	619
04:30 PM	241	29	0	270	32	63	0	95	48	175	0	223	588
04:45 PM	224	41	0	265	32	63	0	95	50	181	0	231	591
Total	967	130	0	1097	102	242	0	344	197	739	0	936	2377
05:00 PM	250	36	0	286	45	64	0	109	55	151	0	206	601
05:15 PM	244	17	0	261	18	60	0	78	40	180	0	220	559
05:30 PM	222	30	0	252	21	61	0	82	47	146	0	193	527
05:45 PM	257	35	0	292	33	53	0	86	29	156	0	185	563
Total	973	118	0	1091	117	238	0	355	171	633	0	804	2250
Grand Total	2863	404	0	3267	404	746	0	1150	831	3196	0	4027	8444
Apprch %	87.6	12.4	0		35.1	64.9	0		20.6	79.4	0		
Total %	33.9	4.8	0	38.7	4.8	8.8	0	13.6	9.8	37.8	0	47.7	
Lights	2784	397	0	3181	393	729	0	1122	812	3132	0	3944	8247
% Lights	97.2	98.3	0	97.4	97.3	97.7	0	97.6	97.7	98	0	97.9	97.7
Mediums	67	7	0	74	10	17	0	27	19	59	0	78	179
% Mediums	2.3	1.7	0	2.3	2.5	2.3	0	2.3	2.3	1.8	0	1.9	2.1
Articulated Trucks	12	0	0	12	1	0	0	1	0	5	0	5	18
% Articulated Trucks	0.4	0	0	0.4	0.2	0	0	0.1	0	0.2	0	0.1	0.2

□ Seasonal Data/ Yearly Growth

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 3293 - WORCESTER - RTE.I-190 - NORTH OF RTE.12

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
11	30,026	31,649	33,440	32,643	33,279	33,404	31,595	32,277	33,985	34,166	33,039	32,027	32,628
	4%	4%	-2%	3%	1%	1%	3%	2%	0%	0%	0%	-1%	1%
12	31,080	32,917	32,746	33,541	33,556	33,820	32,591	33,055	33,999	34,112	33,038	31,863	33,027
	1%	-8%	-2%	-1%	0%	0%	-3%	1%	1%	1%	0%	-6%	-1%
13	31,435	30,284	32,046	33,314	33,508	33,923	31,678	33,489	34,412	34,600	32,881	29,966	32,628
	-4%	1%	3%	1%	2%	4%	6%	4%	-2%	1%	-2%	5%	2%
14	30,187	30,538	33,054	33,676	34,126	35,189	33,547	34,820	33,774	35,007	32,326	31,463	33,142
	0%	2%	1%	3%	3%	3%	3%	3%	4%	4%	6%	4%	3%
17	30,278	32,762	34,539	36,645	37,243	38,257	36,152	37,974	38,157	39,047	38,345	35,181	36,215
Seasonal Adjustment Factor	*1.10*	*1.06*	*1.01*	*0.99*	*0.98*	*0.96*	*1.01*	*0.98*	*0.96*	*0.95*	*0.99*	*1.05*	
(to average month)												Growth	1.17%

STATION 307 - WESTBOROUGH - RTE.9 - EAST OF NORTHBOROUGH T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
07	47,505	47,283	49,268	49,136	*50,000*	*52,000*	*53,000*	52,322	49,031	50,571	49,662	47,007	49,732
	-4%	-2%	-3%	1%	1%	-4%	-8%	-7%	-1%	-3%	-4%	-1%	-3%
08	45,614	46,112	47,629	49,816	*50,518*	*49,936*	*48,629*	48,759	48,531	49,009	47,490	46,696	48,245
	-3%	1%	-3%	-2%	-2%	0%	-2%	-3%	-2%	-1%	0%	2%	-1%
09	44,103	46,434	46,455	49,049	*49,474*	*49,934*	*47,638*	47,056	47,762	48,663	47,379	47,564	47,626
	-1%	0%	2%	0%	0%	1%	-1%	1%	1%	1%	2%	2%	1%
11	43,244	46,150	48,016	48,943	*49,781*	*50,525*	*46,812*	48,234	48,825	49,198	49,151	49,888	48,231
	7%	2%	1%	-1%	1%	-1%	3%	4%	0%	2%	2%	-5%	1%
12	46,381	46,683	48,608	48,662	*50,126*	*49,961*	*48,380*	49,941	48,882	50,056	50,015	47,600	48,791
	0%	-1%	-2%	1%	1%	-9%	3%	-1%	2%	0%	-1%	2%	0%
13	46,393	46,220	47,421	49,359	*50,657*	*45,623*	*49,797*	49,223	49,935	50,021	49,651	48,441	48,562
Seasonal Adjustment Factor	1.07	1.04	1.01	0.99	0.97	0.98	0.99	0.99	0.99	0.98	0.99	1.01	
(to average month)												Growth	-0.65%

STATION 3140 - PAXTON - PLEASANT STREET - NORTH OF TURKEY HILL BROOK BRIDGE

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
17	4,280	4,287	4,496	4,935	5,187	5,328	5,246	5,266	5,147	5,144	4,740	*4,394*	4,871
Seasonal Adjustment Factor	*1.14*	*1.14*	*1.08*	*0.99*	*0.94*	*0.91*	*0.93*	*0.92*	*0.95*	*0.95*	*1.03*	*1.11*	
(to average month)													

Average	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Seasonal Adjustment Factor	*1.10*	*1.08*	*1.04*	*0.99*	*0.96*	*0.95*	*0.98*	*0.96*	*0.97*	*0.96*	*1.00*	*1.06*
(to average month)												

Average Yearly Growth Calculated 0.26%
Yearly Growth Factor Used 0.5%

ITALICS = ESTIMATED DATA
MADT

□ Speed Data

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA
Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/07/19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
04:00	1	0	0	1	1	1	0	0	0	0	0	0	0	0	4	37
05:00	0	0	1	4	5	2	0	0	0	0	0	0	0	0	12	35
06:00	4	1	2	3	8	3	0	0	0	0	0	0	0	0	21	34
07:00	0	4	2	8	12	8	2	2	1	0	0	0	0	0	39	39
08:00	0	2	4	5	16	8	0	0	0	0	0	0	0	0	35	36
09:00	0	1	2	5	9	6	0	0	0	0	0	0	0	0	23	37
10:00	4	0	2	12	8	1	0	0	0	0	0	0	0	0	27	33
11:00	0	2	2	12	3	4	0	0	0	0	0	0	0	0	23	35
12 PM	0	2	3	8	9	2	0	0	0	0	0	0	0	0	24	34
13:00	1	3	6	6	7	4	0	0	0	0	0	0	0	0	27	34
14:00	1	2	2	6	5	5	0	0	0	0	0	0	0	0	21	36
15:00	3	4	5	22	6	3	0	0	0	0	0	0	0	0	43	32
16:00	0	3	7	17	11	9	0	1	0	0	0	0	0	0	48	36
17:00	1	1	1	13	15	1	2	0	0	0	0	0	0	0	34	34
18:00	1	2	1	7	12	3	0	0	0	0	0	0	0	0	26	34
19:00	0	0	5	5	7	1	1	0	0	0	0	0	0	0	19	34
20:00	0	0	0	3	5	1	1	0	0	0	0	0	0	0	10	37
21:00	1	0	1	2	3	0	1	0	0	0	0	0	0	0	8	34
22:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29
23:00	0	1	0	1	1	0	0	0	0	0	0	0	0	0	3	32
Total	17	28	46	141	143	63	7	3	1	0	0	0	0	0	449	

Percentiles

15th Percentile :	22 MPH
85th Percentile :	35 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	30 MPH
10 MPH Pace Speed :	26-35 MPH
Percent in Pace :	63.3%
Number in Pace :	284
Number of Vehicles > 25 MPH :	358
Percent of Vehicles > 25 MPH :	79.7%

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA
Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/08/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
03:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29
04:00	1	0	0	0	2	1	0	0	0	0	0	0	0	0	4	37
05:00	0	0	1	3	6	6	0	0	0	0	0	0	0	0	16	38
06:00	1	1	1	1	8	2	2	0	0	0	0	0	0	0	16	38
07:00	0	5	5	5	12	5	1	0	1	0	0	0	0	0	34	36
08:00	3	4	3	8	11	5	0	0	0	0	0	0	0	0	34	34
09:00	0	4	0	5	10	1	1	0	0	0	0	0	0	0	21	34
10:00	1	1	3	7	9	4	0	0	0	0	0	0	0	0	25	35
11:00	0	4	2	5	8	3	0	0	0	0	0	0	0	0	22	34
12 PM	0	3	1	5	9	6	0	0	0	0	0	0	0	0	24	37
13:00	2	3	1	9	8	1	0	0	0	0	0	0	0	0	24	33
14:00	2	1	1	6	7	3	0	0	0	0	0	0	0	0	20	35
15:00	0	1	5	19	14	5	1	0	0	0	0	0	0	0	45	34
16:00	2	2	3	10	18	5	0	0	0	0	0	0	0	0	40	34
17:00	2	0	2	5	13	8	0	0	0	0	0	0	0	0	30	37
18:00	0	0	4	10	14	1	0	0	0	0	0	0	0	0	29	33
19:00	1	2	3	7	9	2	0	0	0	0	0	0	0	0	24	34
20:00	0	1	2	1	11	2	0	0	0	0	0	0	0	0	17	34
21:00	0	0	1	2	5	0	0	0	0	0	0	0	0	0	8	33
22:00	0	1	1	1	0	0	0	0	1	0	0	0	0	0	4	52
23:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	39
Total	15	33	39	110	174	62	5	0	2	0	0	0	0	0	440	

Percentiles

15th Percentile : 22 MPH
85th Percentile : 35 MPH
95th Percentile : 38 MPH

Statistics

Mean Speed(Average) : 30 MPH
10 MPH Pace Speed : 26-35 MPH
Percent in Pace : 64.5%
Number in Pace : 284
Number of Vehicles > 25 MPH : 353
Percent of Vehicles > 25 MPH : 80.2%

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA
Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/09/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
02:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	44
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
04:00	0	0	0	2	2	2	0	0	0	0	0	0	0	0	6	37
05:00	0	1	1	5	2	3	0	0	0	0	0	0	0	0	12	37
06:00	1	2	0	3	3	6	2	0	0	0	0	0	0	0	17	39
07:00	1	5	3	3	16	13	3	0	0	0	0	0	0	0	44	38
08:00	0	2	0	11	16	8	1	0	0	0	0	0	0	0	38	37
09:00	1	2	0	7	8	3	1	0	0	0	0	0	0	0	22	36
10:00	0	1	5	9	14	3	0	0	0	0	0	0	0	0	32	34
11:00	1	3	1	6	11	5	1	0	0	0	0	0	0	0	28	36
12 PM	1	3	0	8	14	3	0	0	0	0	0	0	0	0	29	34
13:00	1	0	0	2	9	3	0	0	0	0	0	0	0	0	15	36
14:00	0	2	2	4	10	6	0	0	0	0	0	0	0	0	24	37
15:00	3	7	7	8	14	4	0	0	0	0	0	0	0	0	43	34
16:00	1	0	3	12	11	6	0	0	0	0	0	0	0	0	33	35
17:00	2	2	2	5	18	3	1	1	0	0	0	0	0	0	34	34
18:00	0	3	0	7	12	3	0	0	0	0	0	0	0	0	25	34
19:00	0	1	1	7	16	1	0	0	0	0	0	0	0	0	26	34
20:00	2	0	1	6	3	1	1	0	0	0	0	0	0	0	14	34
21:00	0	1	1	2	4	1	0	0	0	0	0	0	0	0	9	34
22:00	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	33
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Total	14	35	27	108	184	74	11	1	0	0	0	0	0	0	454	

Percentiles	15th Percentile :	23 MPH
	85th Percentile :	36 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	30 MPH
	10 MPH Pace Speed :	26-35 MPH
	Percent in Pace :	64.3%
	Number in Pace :	292
	Number of Vehicles > 25 MPH :	378
	Percent of Vehicles > 25 MPH :	83.3%
Summary	15th Percentile :	22 MPH
	50th Percentile :	30 MPH
	85th Percentile :	35 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	30 MPH

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA
Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/07/19	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	34
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	34
05:00	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	34
06:00	0	2	1	0	4	3	2	0	0	0	0	0	0	0	12	40
07:00	0	1	3	2	8	10	0	0	0	0	0	0	0	0	24	38
08:00	0	2	7	23	20	14	2	0	0	0	0	0	0	0	68	37
09:00	2	1	2	5	15	5	0	0	0	0	0	0	0	0	30	35
10:00	0	1	4	8	8	6	0	0	0	0	0	0	0	0	27	36
11:00	2	2	5	9	12	3	2	0	0	0	0	0	0	0	35	34
12 PM	2	1	5	7	8	6	0	0	0	0	0	0	0	0	29	36
13:00	2	4	7	13	12	4	0	0	0	0	0	0	0	0	42	34
14:00	5	5	3	18	20	5	0	0	0	0	0	0	0	0	56	34
15:00	3	2	8	25	26	5	2	1	0	0	0	0	0	0	72	34
16:00	3	1	6	20	16	5	1	0	0	0	0	0	0	0	52	34
17:00	4	2	4	15	16	8	2	0	0	0	0	0	0	0	51	36
18:00	2	3	1	8	21	9	1	0	0	0	0	0	0	0	45	36
19:00	1	0	4	10	16	3	1	0	0	0	0	0	0	0	35	34
20:00	0	0	2	10	11	3	0	0	0	0	0	0	0	0	26	34
21:00	1	1	3	3	5	2	0	0	0	0	0	0	0	0	15	34
22:00	0	0	1	1	0	1	0	0	0	0	0	0	0	0	3	37
23:00	1	0	0	1	0	1	0	0	0	0	0	0	0	0	3	37
Total	28	28	66	178	222	93	13	1	0	0	0	0	0	0	629	

Percentiles

15th Percentile :	22 MPH
85th Percentile :	35 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	30 MPH
10 MPH Pace Speed :	26-35 MPH
Percent in Pace :	63.6%
Number in Pace :	400
Number of Vehicles > 25 MPH :	507
Percent of Vehicles > 25 MPH :	80.6%

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA
Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/08/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
05:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	38
06:00	1	1	1	0	3	3	0	0	0	0	0	0	0	0	9	37
07:00	1	0	4	1	7	8	0	1	0	0	0	0	0	0	22	38
08:00	2	2	5	18	29	4	3	0	0	0	0	0	0	0	63	34
09:00	1	2	1	7	8	7	0	0	0	0	0	0	0	0	26	37
10:00	0	0	3	9	11	5	0	0	0	0	0	0	0	0	28	35
11:00	4	0	1	10	8	8	1	0	0	0	0	0	0	0	32	37
12 PM	1	2	6	10	13	5	0	0	0	0	0	0	0	0	37	34
13:00	2	2	3	7	10	6	1	0	0	0	0	0	0	0	31	36
14:00	5	4	9	8	24	7	1	0	0	0	0	0	0	0	58	34
15:00	2	3	7	11	21	7	3	0	0	0	0	0	0	0	54	36
16:00	2	1	1	16	29	15	2	0	0	1	0	0	0	0	67	37
17:00	3	1	1	6	22	10	2	0	0	0	0	0	0	0	45	37
18:00	0	2	6	15	19	10	1	0	0	0	0	0	0	0	53	36
19:00	2	2	2	10	15	7	2	0	0	0	0	0	0	0	40	37
20:00	0	2	0	14	15	1	0	0	0	0	0	0	0	0	32	33
21:00	1	0	1	2	4	3	0	1	0	0	0	0	0	0	12	38
22:00	0	0	1	1	2	1	0	0	0	0	0	0	0	0	5	36
23:00	0	0	0	1	2	1	1	0	0	0	0	0	0	0	5	41
Total	27	24	52	146	243	109	17	2	0	1	0	0	0	0	621	

Percentiles

15th Percentile : 24 MPH
85th Percentile : 36 MPH
95th Percentile : 39 MPH

Statistics

Mean Speed(Average) : 31 MPH
10 MPH Pace Speed : 26-35 MPH
Percent in Pace : 62.6%
Number in Pace : 389
Number of Vehicles > 25 MPH : 518
Percent of Vehicles > 25 MPH : 83.4%

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Bailey Road
North of Thorny Lea Road
Holden, MA
Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/09/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
04:00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2	33
05:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	34
06:00	0	1	1	2	3	4	0	0	0	0	0	0	0	0	11	37
07:00	0	0	0	2	9	5	1	0	0	0	0	0	0	0	17	38
08:00	0	2	4	21	22	12	0	0	0	0	0	0	0	0	61	36
09:00	1	0	10	13	11	5	0	0	0	0	0	0	0	0	40	34
10:00	1	2	4	4	9	1	0	0	0	0	0	0	0	0	21	33
11:00	1	0	3	13	13	2	0	0	0	0	0	0	0	0	32	33
12 PM	4	1	1	3	11	7	1	0	0	0	0	0	0	0	28	37
13:00	0	0	4	10	10	4	0	0	0	0	0	0	0	0	28	34
14:00	0	3	8	7	15	10	2	0	0	0	0	0	0	0	45	37
15:00	4	4	7	15	25	8	1	3	0	0	0	0	0	0	67	36
16:00	2	0	1	20	18	11	2	1	0	0	0	0	0	0	55	37
17:00	1	4	0	13	15	11	1	0	0	0	0	0	0	0	45	37
18:00	1	5	6	15	25	5	1	0	0	0	0	0	0	0	58	34
19:00	0	3	0	11	19	3	1	0	0	0	0	0	0	0	37	34
20:00	3	3	2	12	10	4	1	0	0	0	0	0	0	0	35	34
21:00	2	0	1	4	5	3	0	0	0	0	0	0	0	0	15	36
22:00	0	0	1	1	1	1	1	0	0	0	0	0	0	0	5	41
23:00	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3	32
Total	20	29	53	168	224	97	12	4	0	0	0	0	0	0	607	

Percentiles	15th Percentile :	23 MPH
	85th Percentile :	36 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	30 MPH
	10 MPH Pace Speed :	26-35 MPH
	Percent in Pace :	64.6%
	Number in Pace :	392
	Number of Vehicles > 25 MPH :	505
	Percent of Vehicles > 25 MPH :	83.2%

Summary	15th Percentile :	23 MPH
	50th Percentile :	30 MPH
	85th Percentile :	36 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	30 MPH

MDM TRANSPORTATION CONSULTANTS, INC.

N/S: Salisbury Street
North of Proposed Site Driveway
Holden, MA
Southbound

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/07/19	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	19
03:00	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	18
04:00	0	1	0	2	1	0	0	0	0	0	0	0	0	0	4	32
05:00	0	0	9	14	6	0	0	0	0	0	0	0	0	0	29	31
06:00	3	4	26	46	26	4	0	0	0	0	0	0	0	0	109	32
07:00	12	2	46	96	50	8	0	0	0	0	0	0	0	0	214	32
08:00	10	14	69	135	62	8	0	0	0	0	0	0	0	0	298	32
09:00	7	4	57	88	52	4	0	0	0	0	0	0	0	0	212	32
10:00	2	6	35	71	40	7	1	0	0	0	0	0	0	0	162	32
11:00	4	5	42	80	41	9	0	1	0	0	0	0	0	0	182	32
12 PM	6	2	34	73	39	4	0	0	0	0	0	0	0	0	158	32
13:00	4	4	31	91	36	4	0	0	0	0	0	0	0	0	170	32
14:00	4	6	59	76	37	2	0	0	0	0	0	0	0	0	184	31
15:00	4	10	49	108	49	9	0	0	0	0	0	0	0	0	229	32
16:00	2	13	89	118	41	9	1	0	0	0	0	0	0	0	273	31
17:00	10	11	58	128	58	4	0	0	0	0	0	0	0	0	269	31
18:00	8	3	43	85	56	10	0	0	0	0	0	0	0	0	205	33
19:00	6	2	32	61	27	7	0	0	0	0	0	0	0	0	135	32
20:00	11	3	25	52	15	4	0	0	0	0	0	0	0	0	110	30
21:00	1	1	23	42	14	2	0	0	0	0	0	0	0	0	83	31
22:00	4	0	16	19	1	3	0	0	0	0	0	0	0	0	43	29
23:00	2	0	5	11	4	0	0	0	1	0	0	0	0	1	24	31
Total	101	93	748	1397	655	99	2	1	1	0	0	0	0	1	3098	

Percentiles

15th Percentile : 21 MPH
85th Percentile : 32 MPH
95th Percentile : 34 MPH

Statistics

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 21-30 MPH
Percent in Pace : 69.3%
Number in Pace : 2145
Number of Vehicles > 35 MPH : 104
Percent of Vehicles > 35 MPH : 3.4%

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Salisbury Street
North of Proposed Site Driveway
Holden, MA
Southbound

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	76		85th
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total	Percent
05/08/19	0	0	2	2	1	1	0	0	0	0	0	0	0	0	6	35
01:00	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	29
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29
03:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	24
04:00	0	0	0	3	3	1	0	0	0	0	0	0	0	0	7	34
05:00	2	0	9	11	3	3	0	0	0	0	0	0	0	0	28	33
06:00	7	1	24	47	18	9	0	0	0	0	0	0	0	0	106	33
07:00	8	1	53	86	47	9	1	0	0	0	0	0	0	0	205	32
08:00	11	11	72	147	56	6	1	0	0	0	0	0	0	0	304	31
09:00	7	3	50	90	31	3	1	0	0	0	0	0	0	0	185	31
10:00	2	3	39	70	33	10	0	0	0	0	0	0	0	0	157	32
11:00	4	2	33	74	27	4	0	0	0	0	0	0	0	0	144	31
12 PM	10	2	43	68	28	6	0	0	0	0	0	0	0	0	157	31
13:00	5	6	40	77	39	0	0	0	0	0	0	0	0	0	167	31
14:00	4	4	44	95	45	6	0	0	0	0	0	0	0	0	198	32
15:00	8	16	48	103	38	4	0	1	0	0	0	0	0	0	218	31
16:00	6	31	109	117	27	1	0	0	0	0	0	0	0	0	291	29
17:00	8	4	61	133	53	14	1	0	0	0	0	0	0	0	274	32
18:00	11	5	59	94	41	5	0	0	0	0	0	0	0	0	215	31
19:00	7	2	43	79	38	6	0	0	0	0	0	0	0	0	175	32
20:00	3	2	32	73	23	3	1	0	0	0	0	0	0	0	137	31
21:00	3	2	28	40	18	2	0	0	0	0	0	0	0	0	93	31
22:00	2	4	10	19	8	0	0	0	0	0	0	0	0	0	43	30
23:00	0	0	7	14	8	1	0	0	0	0	0	0	0	0	30	32
Total	108	99	808	1446	585	94	5	1	0	0	0	0	0	0	3146	

Percentiles

15th Percentile : 21 MPH
85th Percentile : 31 MPH
95th Percentile : 34 MPH

Statistics

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 21-30 MPH
Percent in Pace : 71.6%
Number in Pace : 2254
Number of Vehicles > 35 MPH : 100
Percent of Vehicles > 35 MPH : 3.2%

MDM TRANSPORTATION CONSULTANTS, INC.

28 Lord Road, Suite 280
Marlborough, MA
www.mdmtrans.com

N/S: Salisbury Street
North of Proposed Site Driveway
Holden, MA
Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/09/19	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29
01:00	3	0	1	3	0	0	0	0	0	0	0	0	0	0	7	28
02:00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	28
03:00	2	0	0	0	1	0	0	0	0	0	0	0	0	2	5	32
04:00	1	0	1	2	1	0	0	0	0	0	0	0	0	0	5	31
05:00	2	1	10	17	5	1	0	0	0	0	0	0	0	0	36	30
06:00	8	2	26	39	22	8	1	0	0	0	0	0	0	0	106	33
07:00	16	3	44	111	44	12	0	0	0	0	0	0	0	0	230	32
08:00	5	8	87	140	50	15	0	0	0	0	0	0	0	0	305	31
09:00	8	3	52	85	35	5	1	0	0	0	0	0	0	0	189	31
10:00	4	6	51	69	29	4	0	0	0	0	0	0	0	0	163	31
11:00	4	4	40	91	33	5	0	1	0	0	0	0	0	0	178	31
12 PM	6	8	54	87	34	4	2	0	0	0	0	0	0	0	195	31
13:00	8	6	55	70	30	3	0	0	0	0	0	0	0	0	172	31
14:00	6	4	36	93	27	5	1	0	0	0	0	0	0	0	172	31
15:00	5	8	72	98	43	2	1	0	0	0	0	0	0	0	229	31
16:00	6	12	65	110	36	2	0	0	0	0	0	0	0	0	231	30
17:00	3	4	80	120	48	7	1	0	0	0	0	0	0	0	263	31
18:00	8	2	61	107	58	9	0	0	0	0	0	0	0	0	245	32
19:00	0	4	25	89	37	10	0	0	0	0	0	0	0	0	165	33
20:00	5	4	60	55	26	5	0	0	0	0	0	0	0	0	155	31
21:00	1	5	26	46	8	0	0	0	0	0	0	0	0	0	86	29
22:00	3	1	14	24	6	2	0	0	0	0	0	0	0	0	50	30
23:00	1	0	6	11	7	0	0	0	0	0	0	0	0	0	25	32
Total	105	85	867	1469	580	99	7	1	0	0	0	0	0	2	3215	

Percentiles	15th Percentile :	21 MPH
	85th Percentile :	31 MPH
	95th Percentile :	34 MPH
Statistics	Mean Speed(Average) :	27 MPH
	10 MPH Pace Speed :	21-30 MPH
	Percent in Pace :	72.7%
	Number in Pace :	2336
	Number of Vehicles > 35 MPH :	109
	Percent of Vehicles > 35 MPH :	3.4%

Summary	15th Percentile :	21 MPH
	50th Percentile :	26 MPH
	85th Percentile :	31 MPH
	95th Percentile :	34 MPH
Statistics	Mean Speed(Average) :	27 MPH

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N/S: Salisbury Street
North of Proposed Site Driveway
Holden, MA
Northbound

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	76		85th
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total	Percent
05/07/19	0	0	0	3	5	1	0	0	0	0	0	0	0	0	9	34
01:00	0	1	0	2	1	0	0	0	0	0	0	0	0	0	4	32
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	34
03:00	0	0	0	3	0	1	0	0	0	0	0	0	0	0	4	37
04:00	1	0	1	4	4	4	0	0	0	0	0	0	0	0	14	37
05:00	0	0	1	8	22	4	2	0	0	0	0	0	0	0	37	35
06:00	2	2	6	21	51	15	2	0	0	0	0	0	0	0	99	35
07:00	3	0	9	83	84	28	3	0	0	0	0	0	0	0	210	34
08:00	5	3	18	89	84	12	0	0	0	0	0	0	0	0	211	33
09:00	2	4	29	100	77	14	2	0	0	0	0	0	0	0	228	33
10:00	4	2	15	88	87	21	1	0	0	0	0	0	0	0	218	34
11:00	2	0	13	74	82	24	3	0	0	0	0	0	0	0	198	34
12 PM	3	1	10	83	85	18	2	0	0	0	0	0	0	0	202	34
13:00	2	3	16	58	74	23	4	0	0	0	0	0	0	0	180	35
14:00	5	3	20	97	90	11	1	0	0	0	0	0	0	0	227	33
15:00	18	16	24	104	96	10	4	0	0	0	0	0	0	0	272	33
16:00	138	15	10	0	0	0	0	0	0	0	0	0	0	0	163	15
17:00	93	20	25	75	50	11	2	0	0	0	0	0	0	0	276	32
18:00	15	3	30	90	100	30	4	0	0	0	0	0	0	0	272	34
19:00	4	3	5	48	90	18	3	0	0	0	0	0	0	0	171	34
20:00	4	0	7	45	44	7	1	0	0	0	0	0	0	0	108	34
21:00	1	1	7	29	24	7	0	0	0	0	0	0	0	0	69	34
22:00	2	1	2	10	11	2	1	0	0	0	0	0	0	0	29	34
23:00	0	0	2	1	7	4	0	0	0	0	0	0	0	0	14	37
Total	304	78	250	1115	1169	265	35	0	0	0	0	0	0	0	3216	

Percentiles

15th Percentile : 22 MPH
85th Percentile : 34 MPH
95th Percentile : 37 MPH

Statistics

Mean Speed(Average) : 28 MPH
10 MPH Pace Speed : 26-35 MPH
Percent in Pace : 71.0%
Number in Pace : 2284
Number of Vehicles > 35 MPH : 300
Percent of Vehicles > 35 MPH : 9.3%

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N/S: Salisbury Street
North of Proposed Site Driveway
Holden, MA
Northbound

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	76		85th
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total	Percent
05/08/19	0	0	0	3	1	3	0	0	0	0	0	0	0	0	7	38
01:00	0	0	0	2	4	0	0	0	0	0	0	0	0	0	6	33
02:00	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	34
03:00	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3	42
04:00	0	0	0	6	5	3	0	0	0	0	0	0	0	0	14	36
05:00	1	0	1	10	11	2	2	0	0	0	0	0	0	0	27	34
06:00	4	2	5	33	48	12	2	1	0	0	0	0	0	0	107	34
07:00	4	1	8	63	79	38	3	1	0	0	0	0	0	0	197	36
08:00	6	2	14	95	88	17	1	1	0	0	0	0	0	0	224	34
09:00	29	25	34	86	49	10	0	0	0	0	0	0	0	0	233	32
10:00	0	0	15	95	70	5	2	0	0	0	0	0	0	0	187	33
11:00	0	0	15	72	76	17	1	1	0	0	0	0	0	0	182	34
12 PM	1	0	5	58	99	25	1	1	0	0	0	0	0	0	190	34
13:00	1	4	16	79	85	19	2	1	0	0	0	0	0	0	207	34
14:00	1	9	17	93	77	23	3	0	0	0	0	0	0	0	223	34
15:00	25	10	36	100	91	18	2	0	0	0	0	0	0	0	282	33
16:00	151	19	11	7	6	0	0	0	0	0	0	0	0	0	194	18
17:00	2	2	27	150	119	23	2	0	0	0	0	0	0	0	325	34
18:00	4	0	16	105	128	24	1	0	0	0	0	0	0	0	278	34
19:00	1	1	10	66	91	27	1	0	0	0	0	0	0	0	197	34
20:00	2	0	7	56	62	5	1	0	0	0	0	0	0	0	133	33
21:00	3	0	2	40	30	11	1	0	0	0	0	0	0	0	87	34
22:00	0	4	6	12	18	9	1	0	0	0	0	0	0	0	50	36
23:00	0	0	2	4	14	2	0	1	0	0	0	0	0	0	23	34
Total	235	79	247	1235	1256	294	27	7	0	0	0	0	0	0	3380	

Percentiles

15th Percentile : 23 MPH
85th Percentile : 34 MPH
95th Percentile : 37 MPH

Statistics

Mean Speed(Average) : 29 MPH
10 MPH Pace Speed : 26-35 MPH
Percent in Pace : 73.7%
Number in Pace : 2491
Number of Vehicles > 35 MPH : 328
Percent of Vehicles > 35 MPH : 9.7%

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N/S: Salisbury Street
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Holden, MA
Northbound

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	76		85th
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total	Percent
05/09/19	0	1	0	2	4	2	0	0	0	0	0	0	0	0	9	36
01:00	0	0	1	4	2	1	1	0	0	0	0	0	0	0	9	38
02:00	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	33
03:00	0	0	0	1	1	1	0	0	0	0	0	0	0	0	3	37
04:00	1	0	0	5	10	1	0	0	0	0	0	0	0	0	17	34
05:00	2	1	0	10	15	6	0	0	0	0	0	0	0	0	34	35
06:00	2	0	2	28	52	15	3	0	0	0	0	0	0	0	102	35
07:00	3	0	8	54	98	27	3	0	0	0	0	0	0	0	193	35
08:00	4	0	4	81	78	20	2	1	0	0	0	0	0	0	190	34
09:00	41	12	17	76	78	13	2	1	0	0	0	0	0	0	240	33
10:00	1	3	9	72	75	20	2	0	0	0	0	0	0	0	182	34
11:00	1	2	9	75	83	20	2	0	0	0	0	0	0	0	192	34
12 PM	0	2	14	82	83	23	1	0	0	0	0	0	0	0	205	34
13:00	5	0	10	53	72	18	1	1	0	0	0	0	0	0	160	34
14:00	0	5	29	101	80	21	2	1	0	0	0	0	0	0	239	34
15:00	4	20	31	117	104	21	0	0	0	0	0	0	0	0	297	33
16:00	3	3	45	140	96	18	0	0	0	0	0	0	0	0	305	33
17:00	55	19	25	109	87	17	4	0	0	0	0	0	0	0	316	33
18:00	7	6	20	103	121	24	3	0	0	0	0	0	0	0	284	34
19:00	0	0	9	90	91	17	5	0	0	0	0	0	0	0	212	34
20:00	5	1	4	63	55	15	2	0	0	0	0	0	0	0	145	34
21:00	1	0	6	41	41	8	1	0	0	0	0	0	0	0	98	34
22:00	2	0	2	26	13	6	0	0	0	0	0	0	0	0	49	34
23:00	1	0	5	13	16	3	4	1	0	0	0	0	0	0	43	37
Total	138	75	251	1346	1356	317	38	5	0	0	0	0	0	0	3526	

Percentiles	15th Percentile :	25 MPH
	85th Percentile :	34 MPH
	95th Percentile :	37 MPH
Statistics	Mean Speed(Average) :	30 MPH
	10 MPH Pace Speed :	26-35 MPH
	Percent in Pace :	76.6%
	Number in Pace :	2702
	Number of Vehicles > 35 MPH :	360
	Percent of Vehicles > 35 MPH :	10.2%

Summary	15th Percentile :	24 MPH
	50th Percentile :	29 MPH
	85th Percentile :	34 MPH
	95th Percentile :	37 MPH
Statistics	Mean Speed(Average) :	29 MPH

□ Crash Date

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Holden, MA COUNT DATE : May-19

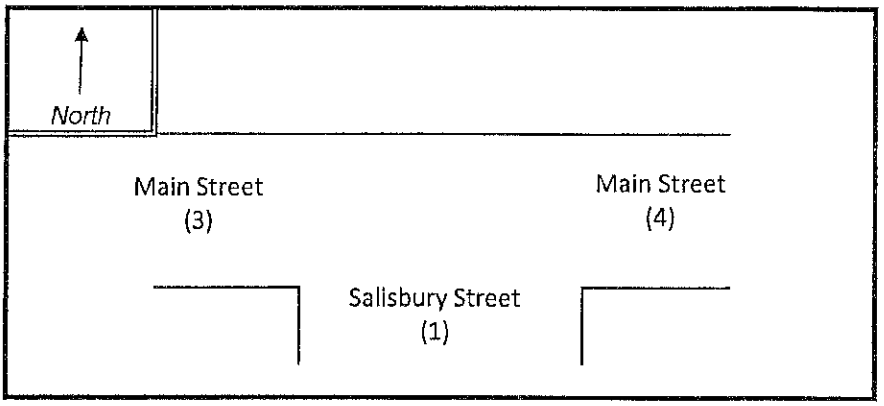
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Route 122A)

MINOR STREET(S) : Salisbury Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	371		923	1,105		2,399

" K " FACTOR : 0.077

INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME : 31,156

TOTAL # OF CRASHES : 21

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (A) : 4.20

CRASH RATE CALCULATION : 0.37

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

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.61

Project Title & Date: 1038 - Holden

Moving Massachusetts Forward. massDOT ☑ Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Holden, MA COUNT DATE : May-19

DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

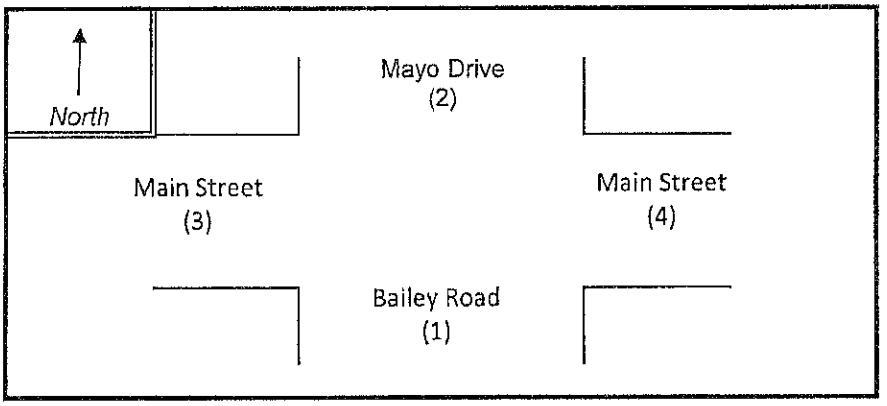
~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Route 122A)

MINOR STREET(S) : Bailey Road

Mayo Drive

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	39	34	867	1,239		2,179

" K " FACTOR : 0.077

INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME : 28,299

TOTAL # OF CRASHES : 12

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (A) : 2.40

CRASH RATE CALCULATION : 0.23

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

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.61

Project Title & Date: 1038 - Holden

massDOT

MassDOT Crash Report for HOLDEN

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance From Nearest Roadway Intersection	Distance From Nearest Milemarker	Distance From Nearest Exit	Distance From Nearest Landmark	Non Motorist Type
2014																					
[illegible]	HOLDEN	06-Feb-2014	2:45 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	V1: Turning left	V1: Northbound	V1: Collision with highway traffic sign post	V1: Passenger car	Snow	Daylight	Snow/Sleet, hail (freezing rain or drizzle)	MAYO DR / MAIN ST					
[illegible]	HOLDEN	14-Feb-2014	[illegible] AM	Property damage only (none injured)	2	0	0	Angle	V1: Travelling straight ahead / V2: Turning left	V1: Northbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Cloudy/Unknown	MAIN ST Rte 122A N / MAYO DR					
[illegible]	HOLDEN	18-May-2014	4:05 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1: Turning right / V2: Turning right	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Wet	Daylight	Rain	MAIN ST / SALISBURY ST					
[illegible]	HOLDEN	23-Jun-2014	2:49 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Northbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	MAIN ST / SALISBURY ST					
2015																					
[illegible]	HOLDEN	[illegible]-2015	12:22 PM	Non-fatal injury	2	2	0	Rear-end	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	BAILEY RD / MAIN ST					
[illegible]	HOLDEN	[illegible]-2015	3:14 PM	Property damage only (none injured)	2	0	0	Unknown	V1: Travelling straight ahead / V2: Entering traffic lane	V1: Northbound / V2: Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Cloudy		MAIN STREET Rte 122A N			[illegible] MOTORS	
[illegible]	HOLDEN	21-Jun-2015	[illegible] PM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	V1: Travelling straight ahead / V2: Changing lanes	V1: Northbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear		MAIN ST			200 feet N from RAYMOND STREET	
[illegible]	HOLDEN	[illegible]-2015	10:24 AM	Property damage only (none injured)	2	0	0	Angle	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Eastbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2: Passenger car	Dry	Daylight	Cloudy		SALISBURY ST			[illegible] LANE LOT	
[illegible]	HOLDEN	[illegible]-Feb-2015	[illegible] AM	Non-fatal injury	2	1	0	Rear-end	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	MAIN ST / SALISBURY ST					
[illegible]	HOLDEN	05-Jun-2015	12:53 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Single-unit truck (2-axle, 6-tire)	Dry	Daylight	Clear	MAIN STREET Rte 122A N / SALISBURY STREET					
[illegible]	HOLDEN	06-Jun-2015	4:13 PM	Non-fatal injury	1	1	0	Rear-end	V1: Slowing or stopped in traffic	V1: Southbound	V1: Collision with motor vehicle in traffic	V1: Passenger car	Dry	Daylight	Clear	MAIN ST / SALISBURY ST					
[illegible]	HOLDEN	25-[illegible]-2015	10:13 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Eastbound / V2: Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	MAIN ST Rte 122A / SALISBURY ST					
[illegible]	HOLDEN	29-May-2015	3:58 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Northbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear		100 feet S from intersection MAIN STREET Rte 122A N / SALISBURY STREET				
2016																					
[illegible]	HOLDEN	[illegible]-2016	11:05 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1: Turning right / V2: [illegible]	V1: Northbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	MAIN ST / MAYO DR					
[illegible]	HOLDEN	27-Jul-2016	3:13 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	MAIN ST / MAYO DR / BAILEY RD					
[illegible]	HOLDEN	16-Dec-2016	8:56 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Wet	Daylight	Rain	MAIN ST / MAYO DR					
[illegible]	HOLDEN	05-Feb-2016	2:45 AM	Non-fatal injury	2	2	0	Sideswipe, opposite direction	V1: Leaving traffic lane / V2: Travelling straight ahead	V1: Southbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2: Passenger car	Wet	Dark - lighted roadway	Clear		100 feet S from intersection of MAIN ST / BAILEY ROAD				
[illegible]	HOLDEN	13-Jan-2016	4:22 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Northbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Snowy	Dark - lighted roadway	Snow/Blowing sand, snow		844 MAIN ST				
[illegible]	HOLDEN	25-Jan-2016	12:12 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1: Southbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	Dry	Daylight	Clear	MAIN ST Rte 122A N / SALISBURY ST					
[illegible]	HOLDEN	05-Oct-2016	7:18 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Northbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	MAIN ST Rte 122A / SALISBURY ST					
[illegible]	HOLDEN	20-Dec-2016	4:27 PM	Non-fatal injury	3	2	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Travelling straight ahead	V1: Northbound / V2: Northbound / V3: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car / V3: Passenger car	Dry	Dark - lighted roadway	Clear	MAIN ST / SALISBURY ST					
[illegible]	HOLDEN	19-Dec-2016	11:39 AM	Property damage only (none injured)	2	0	0	Angle	V1: Turning left / V2: Travelling straight ahead	V1: Northbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2: Passenger car	Dry	Daylight	Cloudy	MAIN ST Rte 122A N / SALISBURY ST					
2017																					
[illegible]	HOLDEN	1-Dec-2016	12:53 PM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	V1: Entering traffic lane / V2: Travelling straight ahead	V1: E / V2: E	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Light truck(van, mini-van, pickup, sport utility)) / V2 (Passenger car)	Dry	Daylight	Clear	MAIN ST / BAILEY RD					
[illegible]	HOLDEN	4-Jan-2017	1:46 PM	Property damage only (none injured)	3	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Slowing or stopped in traffic	V1: E / V2: E / V3: E	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic) / V3 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car) / V3 (Passenger car)	Snow	Dark - lighted roadway	Snow/Sleet, hail (freezing rain or drizzle)	SALISBURY ST	MAIN STREET Rte 122A				
[illegible]	HOLDEN	11-Sep-2017	2:45 PM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: N / V2: N	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Single-unit truck (2-axle, 6-tire))	Dry	Daylight	Clear	SALISBURY STREET / MAIN STREET Rte SR122A N					
[illegible]	HOLDEN	24-Oct-2017	6:12 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1: Travelling straight ahead / V2: Turning right	V1: N / V2: N	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car)	Wet	Dark - lighted roadway	Rain	MAIN STREET Rte SR122A N / SALISBURY STREET					
2018																					
[illegible]	HOLDEN	[illegible]-Jan-2018	7:43 AM	Property damage [illegible]	2	0	0	Sideswipe, opposite direction	V1: Entering traffic lane / V2: Travelling straight ahead	V1: E / V2: N	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car)	Snow	Daylight	Snow	MAIN ST / MAYO DR					
[illegible]	HOLDEN	[illegible]-2018	[illegible] AM	Property damage [illegible]	2	0	0	Angle	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: E / V2: E	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car)	Dry	Daylight	Clear/Unknown	BAILEY RD / MAIN ST Rte 122A					
[illegible]	HOLDEN	[illegible]-2018	2:30 PM	Non-fatal injury	2	1	0	Angle	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: N / V2: W	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car)	Wet	Daylight	Cloudy/Rain	MAYO DR / MAIN ST Rte 122A N					
[illegible]	HOLDEN	22-Nov-2018	3:06 PM	Property damage [illegible]	2	0	0	Angle	V1: Travelling straight ahead / V2: Turning left	V1: S / V2: W	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car)	Dry	Daylight	Clear	MAIN ST / [illegible]					
[illegible]	HOLDEN	[illegible]-2018	[illegible] PM	Non-fatal injury	2	1	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: N / V2: N	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car)	Dry	Dark - lighted roadway	Clear	SALISBURY ST / MAIN ST					
[illegible]	HOLDEN	10-Jan-2018	2:25 PM	Property damage only (none injured)	3	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Travelling straight ahead	V1: N / V2: N / V3: N	V1 (Collision with motor vehicle in traffic) / V2 (Collision with motor vehicle in traffic) / V3 (Collision with motor vehicle in traffic)	V1 (Passenger car) / V2 (Passenger car) / V3 (Passenger car)	Dry	Daylight	Cloudy/Unknown	MAIN ST / SALISBURY ST					
[illegible]	HOLDEN	18-Aug-2018	10:24 PM	Property damage only (none injured)	2	0	0	Angle	V1: Travelling straight ahead	V1: N	V1 (Collision with motor vehicle in traffic)	V1 (Passenger car)	Wet	Dark - lighted roadway	Rain/Cloudy	MAIN ST / SALISBURY ST					

□ Sight Distance Calculations

Stopping Sight Distance - Regulatory

Salisbury Street approaches to Pine Street Road

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	117.4	246.0
Direction 2	SB	35	128.625	117.4	246.0

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	35	35
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

Salisbury Street approaches to Pine Street Road

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	34	124.95	110.8	235.7
Direction 2	SB	31	113.925	92.1	206.0

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	34	31
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Regulatory

Bailey Road approaches to Site Driveway

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	25	91.875	59.9	151.8
Direction 2	SB	25	91.875	59.9	151.8

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	25	25
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

Bailey Road approaches to Site Driveway

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	36	132.3	124.2	256.5
Direction 2	SB	36	132.3	124.2	256.5

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	36	36
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Salisbury Street

ISD = 1.47 * 40 * 7.5 = 441 ft **SAY 445 ft**
(left-turn from a stop)

ISD = 1.47 * 40 * 6.5 = 382 ft **SAY 385 ft**
(right-turn from a stop)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Bailey Road

ISD = 1.47 * 25 * 7.5 = 276 ft **SAY 280 ft**
(left-turn from a stop)

ISD = 1.47 * 25 * 6.5 = 239 ft **SAY 240 ft**
(right-turn from a stop)

□ Trip Generation Calculations

Institute of Transportation Engineers (ITE) 10th Edition
Land Use Code (LUC) 210 - Single-Family Detached Housing

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 12

AVERAGE WEEKDAY DAILY

T = 9.5* (X)
T = 9.5* 12
T = 114.00
T = 114 vehicle trips
with 50% (57 vpd) entering and 50% (57 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.74* (X)
T = 0.74 * 12
T = 8.88
T = 9 vehicle trips
with 25% (2 vph) entering and 75% (7 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.99* (X)
T = 0.99* 12
T = 11.88
T = 12 vehicle trips
with 63% (8 vph) entering and 37% (4 vph) exiting.

SATURDAY DAILY

T = 9.54* (X)
T = 9.54* 12
T = 114.48
T = 114 vehicle trips
with 50% (57 vph) entering and 50% (57 vph) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.93* (X)
T = 0.93* 12
T = 11.16
T = 11 vehicle trips
with 54% (6 vph) entering and 46% (5 vph) exiting.

Institute of Transportation Engineers (ITE) 10th Edition
Land Use Code (LUC) 220 - Multifamily Housing (Low-Rise)

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 90

AVERAGE WEEKDAY DAILY

T = 7.56 (X) - 40.86
T = 7.56* 90 - (40.86)
T = 639.54
T = 640 vehicle trips
with 50% (320 vpd) entering and 50% (320 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.95 Ln (X) - 0.51
Ln T = 0.95 Ln 90 - (0.51)
Ln T = 3.76
T = 43.16
T = 43 vehicle trips
with 23% (10 vph) entering and 77% (33 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.89 Ln (X) - 0.02
Ln T = 0.89 Ln 90 - (0.02)
Ln T = 3.98
T = 53.78
T = 54 vehicle trips
with 63% (34 vph) entering and 37% (20 vph) exiting.

SATURDAY DAILY

T = 14.01 * (X) - 521.69
T = 14.01 * 90 - (521.69)
T = 739.21
T = 740 vehicle trips
with 50% (370 vpd) entering and 50% (370 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 1.08 * (X) - 33.24
T = 1.08 * 90 - (33.24)
T = 63.96
T = 64 vehicle trips
with 50% (32 vph) entering and 50% (32 vph) exiting.

□ Trip Distribution Calculations

Journey-to-Work Distribution

Residence Town Name	Workplace Town Name	All Workers (To Framingham)	% of Total	% of Total Rounded
Holden town	Worcester city	3,046	35.46%	35.5%
Holden town	Holden town	1,363	15.87%	15.9%
Holden town	Shrewsbury town	328	3.82%	3.8%
Holden town	Westborough town	312	3.63%	3.6%
Holden town	Framingham town	273	3.18%	3.2%
Holden town	Marlborough city	223	2.60%	2.6%
Holden town	West Boylston town	208	2.42%	2.4%
Holden town	Boston city	165	1.92%	1.9%
Holden town	Sterling town	131	1.52%	1.5%
Holden town	Auburn town	122	1.42%	1.4%
Holden town	Milford town	96	1.12%	1.1%
Holden town	Leominster city	87	1.01%	1.0%
Holden town	Southborough town	85	0.99%	1.0%
Holden town	Waltham city	72	0.84%	0.8%
Holden town	Hopkinton town	69	0.80%	0.8%
Holden town	Bedford town	67	0.78%	0.8%
Holden town	Chelmsford town	61	0.71%	0.7%
Holden town	Hudson town	59	0.69%	0.7%
Holden town	Spencer town	59	0.69%	0.7%
Holden town	Burlington town	56	0.65%	0.7%
Holden town	Acton town	55	0.64%	0.6%
Holden town	Natick town	55	0.64%	0.6%
Holden town	Oxford town	54	0.63%	0.6%
Holden town	Northborough town	53	0.62%	0.6%
Holden town	Cambridge city	50	0.58%	0.6%
Holden town	Providence city	48	0.56%	0.6%
Holden town	Sudbury town	46	0.54%	0.5%
Holden town	Grafton town	45	0.52%	0.5%
Holden town	Stoneham town	43	0.50%	0.5%
Holden town	Boylston town	42	0.49%	0.5%
Holden town	Millbury town	41	0.48%	0.5%
Holden town	Nashua city	39	0.45%	0.5%
Other		1,138	13.25%	13.2%
	Total	8,591	100.00%	100%

Source: 2010 US Census Journey-to-Work Data

	To/From Routes								
	Main Street (From East)		Main Street (From West)		Bailey Road (From South)		Salisbury Street (From South)		Total
Residence									
Worcester city		0.0%		0.0%		0.0%	100%	35.5%	35.5%
Holden town	10%	1.6%	50%	7.9%	30%	4.8%	20%	3.2%	17.5%
Shrewsbury town	100%	3.8%		0.0%		0.0%		0.0%	3.8%
Westborough town	100%	3.6%		0.0%		0.0%		0.0%	3.6%
Framingham town	100%	3.2%		0.0%		0.0%		0.0%	3.2%
Marlborough city	100%	2.6%		0.0%		0.0%		0.0%	2.6%
West Boylston town	100%	2.4%		0.0%		0.0%		0.0%	2.4%
Boston city	100%	1.9%		0.0%		0.0%		0.0%	1.9%
Sterling town		0.0%	100%	1.5%		0.0%		0.0%	1.5%
Auburn town	50%	0.7%		0.0%	25%	0.4%	25%	0.4%	1.4%
Milford town	100%	1.1%		0.0%		0.0%		0.0%	1.1%
Leominster city	50%	0.5%	50%	0.5%		0.0%		0.0%	1.0%
Southborough town	100%	1.0%		0.0%		0.0%		0.0%	1.0%
Waltham city	50%	0.4%	50%	0.4%		0.0%		0.0%	0.8%
Hopkinton town	100%	0.8%		0.0%		0.0%		0.0%	0.8%
Bedford town		0.0%	100%	0.8%		0.0%		0.0%	0.8%
Chelmsford town	50%	0.4%	50%	0.4%		0.0%		0.0%	0.7%
Hudson town	50%	0.3%	50%	0.3%		0.0%		0.0%	0.7%
Spencer town		0.0%	50%	0.3%	50%	0.3%		0.0%	0.7%
Burlington town	50%	0.3%	50%	0.3%		0.0%		0.0%	0.7%
Acton town	50%	0.3%	50%	0.3%		0.0%		0.0%	0.6%
Natick town	100%	0.6%		0.0%		0.0%		0.0%	0.6%
Oxford town	50%	0.3%		0.0%	25%	0.2%	25%	0.2%	0.6%
Northborough town	100%	0.6%		0.0%		0.0%		0.0%	0.6%
Cambridge city	50%	0.3%	50%	0.3%		0.0%		0.0%	0.6%
Providence city	100%	0.6%		0.0%		0.0%		0.0%	0.6%
Sudbury town	100%	0.5%		0.0%		0.0%		0.0%	0.5%
Grafton town	100%	0.5%		0.0%		0.0%		0.0%	0.5%
Stoneham town	50%	0.3%	50%	0.3%		0.0%		0.0%	0.5%
Boylston town	100%	0.5%		0.0%		0.0%		0.0%	0.5%
Millbury town	100%	0.5%		0.0%		0.0%		0.0%	0.5%
Nashua city		0.0%	100%	0.5%		0.0%		0.0%	0.5%
		29.7%		13.8%		5.6%		39.1%	88.3%
		33.7%		15.7%		6.4%		44.3%	100%
	SAY	35%		15%		10%		40%	

□ Capacity Analysis

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements, and greater than 80 seconds for signalized movements).

Signalized Intersection Performance Measures

The six LOS designations for signalized intersections may be described as follows:

- *LOS A* describes operations with low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The LOS for signalized intersections are calculated using the operational analysis methodology of the 2010 *Highway Capacity Manual*.[1] This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. **Table A1** summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table A1
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[1]

Control (Signal) Delay per Vehicle (seconds per vehicle)	Level of Service	
	v/c ≤ 1	v/c > 1
≤10.0	A	F
10.1 to 20.0	B	F
20.1 to 35.0	C	F
35.1 to 55.0	D	F
55.1 to 80.0	E	F
>80.0	F	F

[1]Source: *Highway Capacity Manual 2010*, Transportation Research Board; Washington, DC; 2010.

[1]*Highway Capacity Manual* 2010; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersection Performance Measures

The six LOS designations for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The LOS designations of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[2] LOS is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for LOS at unsignalized intersections are also given in the *Highway Capacity Manual 2010*. **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[1]

Average Control Delay (seconds per vehicle)	Level of Service	
	v/c ≤ 1	v/c > 1
≤ 10.0	A	F
10.1 to 15.0	B	F
15.1 to 25.0	C	F
25.1 to 35.0	D	F
35.1 to 50.0	E	F
>50.0	F	F

[1]Source: *Highway Capacity Manual 2010*, Transportation Research Board; Washington, DC; 2010.

[2] ibid

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	1	2	0	213	341	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	0	0	2	5	0
Mvmt Flow	1	2	0	232	371	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	603	371	372	0	-	0
Stage 1	371	-	-	-	-	-
Stage 2	232	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	465	679	1198	-	-	-
Stage 1	702	-	-	-	-	-
Stage 2	811	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	465	679	1198	-	-	-
Mov Cap-2 Maneuver	465	-	-	-	-	-
Stage 1	702	-	-	-	-	-
Stage 2	811	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1198	-	589	-	-
HCM Lane V/C Ratio	-	-	0.006	-	-
HCM Control Delay (s)	0	-	11.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	7.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	1175	14	17	564	15	10	0	46	3	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, %	-	-2	-	-	3	-	-	9	-	-	-6	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	3	7	6	5	0	0	0	2	0	0	0
Mvmt Flow	13	1291	15	19	620	16	11	0	51	3	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	636	0	0	1307	0	0	1993	1999	1299	2016	1998	628
Stage 1	-	-	-	-	-	-	1325	1325	-	665	665	-
Stage 2	-	-	-	-	-	-	668	674	-	1351	1333	-
Critical Hdwy	4.1	-	-	4.16	-	-	8.9	8.3	7.12	5.9	5.3	5.6
Critical Hdwy Stg 1	-	-	-	-	-	-	7.9	7.3	-	4.9	4.3	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.9	7.3	-	4.9	4.3	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	957	-	-	517	-	-	17	22	143	86	118	540
Stage 1	-	-	-	-	-	-	100	117	-	565	575	-
Stage 2	-	-	-	-	-	-	323	326	-	294	351	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	957	-	-	517	-	-	16	20	143	51	106	540
Mov Cap-2 Maneuver	-	-	-	-	-	-	16	20	-	51	106	-
Stage 1	-	-	-	-	-	-	95	111	-	537	542	-
Stage 2	-	-	-	-	-	-	302	307	-	181	333	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	245.2	41.6
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	59	957	-	-	517	-	-	106
HCM Lane V/C Ratio	1.043	0.014	-	-	0.036	-	-	0.073
HCM Control Delay (s)	245.2	8.8	0	-	12.2	0	-	41.6
HCM Lane LOS	F	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	5	0	-	-	0.1	-	-	0.2

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	957	258	84	487	104	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	12	11	11
Grade (%)	-2%			1%	-6%	
Storage Length (ft)		0	0		100	0
Storage Lanes		1	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.993	0.950	
Satd. Flow (prot)	1801	1531	0	3347	1797	1531
Flt Permitted				0.576	0.950	
Satd. Flow (perm)	1801	1531	0	1942	1797	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		287				106
Link Speed (mph)	30			30	30	
Link Distance (ft)	600			500	800	
Travel Time (s)	13.6			11.4	18.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	4%	7%	0%	5%
Adj. Flow (vph)	1063	287	93	541	116	106
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1063	287	0	634	116	106
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.03	1.03	1.01	1.01	1.01	1.01
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	NA	Perm	pm+pt	NA	Prot	pt+ov
Protected Phases	2		1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	2	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	10.0	6.0	

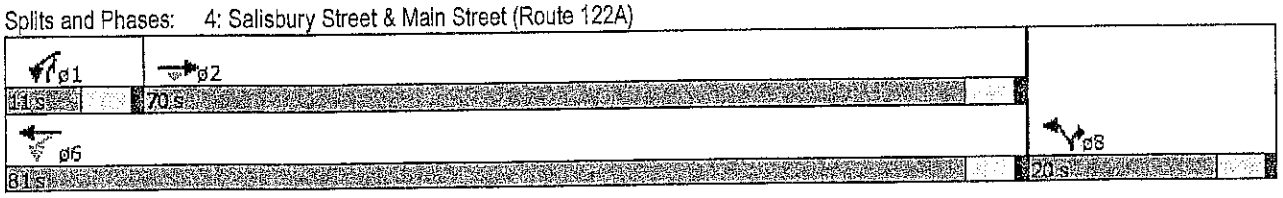
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	15.0	15.0	11.0	15.0	11.0	
Total Split (s)	70.0	70.0	11.0	81.0	20.0	
Total Split (%)	69.3%	69.3%	10.9%	80.2%	19.8%	
Maximum Green (s)	65.0	65.0	6.0	76.0	15.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	None	Min	None	
Act Effct Green (s)	60.8	60.8		69.2	11.1	22.3
Actuated g/C Ratio	0.67	0.67		0.76	0.12	0.25
v/c Ratio	0.88	0.26		0.41	0.53	0.23
Control Delay	24.0	1.4		4.1	48.3	7.6
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	24.0	1.4		4.1	48.3	7.6
LOS	C	A		A	D	A
Approach Delay	19.2			4.1	28.9	
Approach LOS	B			A	C	
90th %ile Green (s)	65.0	65.0	6.0	76.0	15.0	
90th %ile Term Code	Max	Max	Max	Hold	Max	
70th %ile Green (s)	65.0	65.0	6.0	76.0	13.5	
70th %ile Term Code	Max	Max	Max	Hold	Gap	
50th %ile Green (s)	65.0	65.0	6.0	76.0	11.6	
50th %ile Term Code	Max	Max	Max	Hold	Gap	
30th %ile Green (s)	53.8	53.8	6.0	64.8	9.4	
30th %ile Term Code	Gap	Gap	Max	Hold	Gap	
10th %ile Green (s)	53.2	53.2	0.0	53.2	7.0	
10th %ile Term Code	Dwell	Dwell	Skip	Dwell	Gap	
Queue Length 50th (ft)	480	0		44	69	0
Queue Length 95th (ft)	#897	27		72	125	40
Internal Link Dist (ft)	520			420	720	
Turn Bay Length (ft)					100	
Base Capacity (vph)	1318	1197		1701	303	442
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	0.81	0.24		0.37	0.38	0.24

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 90.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 15.8 Intersection LOS: B

Intersection Capacity Utilization 84.5%
ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 101
70th %ile Actuated Cycle: 99.5
50th %ile Actuated Cycle: 97.6
30th %ile Actuated Cycle: 84.2
10th %ile Actuated Cycle: 70.2
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Salisbury Street & Main Street (Route 122A)



Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	1	0	2	370	347	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	0	0	2	5	0
Mvmt Flow	1	0	2	402	377	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	785	378	378	0	-	0
Stage 1	378	-	-	-	-	-
Stage 2	407	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	364	673	1192	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	363	673	1192	-	-	-
Mov Cap-2 Maneuver	363	-	-	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	675	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1192	-	363	-	-
HCM Lane V/C Ratio	0.002	-	0.003	-	-
HCM Control Delay (s)	8	0	14.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection

Int Delay, s/veh 7.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	828	27	33	1191	15	8	1	30	12	0	22
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, %	-	-2	-	-	3	-	-	9	-	-	-6	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	1	0	3	1	7	0	0	7	8	0	0
Mvmt Flow	12	854	28	34	1228	15	8	1	31	12	0	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1243	0	0	881	0	0	2207	2203	868	2212	2210	1236
Stage 1	-	-	-	-	-	-	892	892	-	1304	1304	-
Stage 2	-	-	-	-	-	-	1315	1311	-	908	906	-
Critical Hdwy	4.1	-	-	4.13	-	-	8.9	8.3	7.17	5.98	5.3	5.6
Critical Hdwy Stg 1	-	-	-	-	-	-	7.9	7.3	-	4.98	4.3	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.9	7.3	-	4.98	4.3	-
Follow-up Hdwy	2.2	-	-	2.227	-	-	3.5	4	3.363	3.572	4	3.3
Pot Cap-1 Maneuver	567	-	-	763	-	-	11	15	277	63	93	267
Stage 1	-	-	-	-	-	-	217	232	-	296	359	-
Stage 2	-	-	-	-	-	-	102	120	-	435	484	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	567	-	-	763	-	-	9	12	277	45	76	267
Mov Cap-2 Maneuver	-	-	-	-	-	-	9	12	-	45	76	-
Stage 1	-	-	-	-	-	-	208	222	-	284	307	-
Stage 2	-	-	-	-	-	-	80	103	-	368	464	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.3	$ 357	61.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	36	567	-	-	763	-	-	97
HCM Lane V/C Ratio	1.117	0.022	-	-	0.045	-	-	0.361
HCM Control Delay (s)	$ 357	11.5	0	-	9.9	0	-	61.8
HCM Lane LOS	F	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	4.2	0.1	-	-	0.1	-	-	1.4

Notes

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

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	717	206	142	963	250	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	12	11	11
Grade (%)	-2%			1%	-6%	
Storage Length (ft)		0	0		100	0
Storage Lanes		1	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.994	0.950	
Satd. Flow (prot)	1837	1561	0	3535	1779	1592
Flt Permitted				0.588	0.950	
Satd. Flow (perm)	1837	1561	0	2091	1779	1592
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		212				125
Link Speed (mph)	30			30	30	
Link Distance (ft)	600			500	800	
Travel Time (s)	13.6			11.4	18.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	739	212	146	993	258	125
Shared Lane Traffic (%)						
Lane Group Flow (vph)	739	212	0	1139	258	125
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.03	1.03	1.01	1.01	1.01	1.01
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	NA	Perm	pm+pt	NA	Prot	pt+ov
Protected Phases	2		1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	2	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	10.0	6.0	

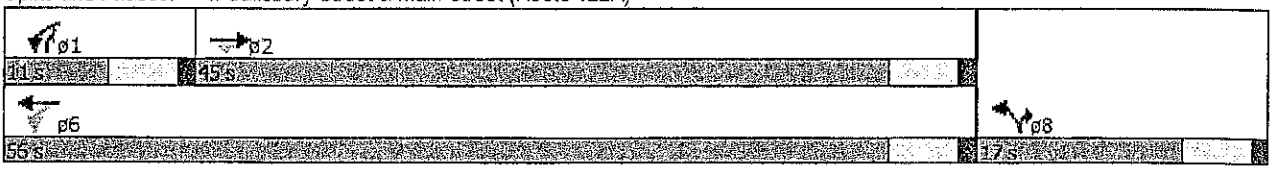
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	15.0	15.0	11.0	15.0	11.0	
Total Split (s)	45.0	45.0	11.0	56.0	17.0	
Total Split (%)	61.6%	61.6%	15.1%	76.7%	23.3%	
Maximum Green (s)	40.0	40.0	6.0	51.0	12.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	None	Min	None	
Act Effct Green (s)	31.9	31.9		40.2	11.9	23.2
Actuated g/C Ratio	0.51	0.51		0.64	0.19	0.37
v/c Ratio	0.79	0.24		0.78	0.76	0.19
Control Delay	20.3	2.1		10.9	44.8	4.9
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	20.3	2.1		10.9	44.8	4.9
LOS	C	A		B	D	A
Approach Delay	16.2			10.9	31.8	
Approach LOS	B			B	C	
90th %ile Green (s)	40.0	40.0	6.0	51.0	12.0	
90th %ile Term Code	Max	Max	Max	Max	Max	
70th %ile Green (s)	38.3	38.3	6.0	49.3	12.0	
70th %ile Term Code	Gap	Gap	Max	Hold	Max	
50th %ile Green (s)	31.3	31.3	6.0	42.3	12.0	
50th %ile Term Code	Gap	Gap	Max	Hold	Max	
30th %ile Green (s)	25.4	25.4	6.0	36.4	12.0	
30th %ile Term Code	Gap	Gap	Max	Hold	Max	
10th %ile Green (s)	25.0	25.0	0.0	25.0	10.2	
10th %ile Term Code	Dwell	Dwell	Skip	Dwell	Gap	
Queue Length 50th (ft)	232	0		98	97	0
Queue Length 95th (ft)	368	27		132	#243	34
Internal Link Dist (ft)	520			420	720	
Turn Bay Length (ft)					100	
Base Capacity (vph)	1212	1102		1811	352	649
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	0.61	0.19		0.63	0.73	0.19

Intersection Summary

Area Type: Other
Cycle Length: 73
Actuated Cycle Length: 62.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 16.2 Intersection LOS: B

Intersection Capacity Utilization 94.8%
ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 73
70th %ile Actuated Cycle: 71.3
50th %ile Actuated Cycle: 64.3
30th %ile Actuated Cycle: 58.4
10th %ile Actuated Cycle: 45.2
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Salisbury Street & Main Street (Route 122A)



Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	1	2	0	203	350	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	0	0	2	5	0
Mvmt Flow	1	2	0	221	380	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	602	381	382	0	-	0
Stage 1	381	-	-	-	-	-
Stage 2	221	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	466	671	1188	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	466	671	1188	-	-	-
Mov Cap-2 Maneuver	466	-	-	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	821	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1188	-	585	-	-
HCM Lane V/C Ratio	-	-	0.006	-	-
HCM Control Delay (s)	0	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	1205	14	17	578	15	10	0	47	3	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, %	-	-2	-	-	3	-	-	9	-	-	-6	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	3	7	6	5	0	0	0	2	0	0	0
Mvmt Flow	13	1324	15	19	635	16	11	0	52	3	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	652	0	0	1340	0	0	2041	2047	1332	2065	2047	643
Stage 1	-	-	-	-	-	-	1358	1358	-	681	681	-
Stage 2	-	-	-	-	-	-	683	689	-	1384	1366	-
Critical Hdwy	4.1	-	-	4.16	-	-	8.9	8.3	7.12	5.9	5.3	5.6
Critical Hdwy Stg 1	-	-	-	-	-	-	7.9	7.3	-	4.9	4.3	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.9	7.3	-	4.9	4.3	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	944	-	-	502	-	-	15	20	135	81	112	531
Stage 1	-	-	-	-	-	-	94	111	-	557	569	-
Stage 2	-	-	-	-	-	-	314	319	-	284	342	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	944	-	-	502	-	-	14	18	135	46	100	531
Mov Cap-2 Maneuver	-	-	-	-	-	-	14	18	-	46	100	-
Stage 1	-	-	-	-	-	-	89	105	-	527	535	-
Stage 2	-	-	-	-	-	-	293	300	-	166	324	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	297.6	45.7
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	54	944	-	-	502	-	-	96
HCM Lane V/C Ratio	1.16	0.014	-	-	0.037	-	-	0.08
HCM Control Delay (s)	297.6	8.9	0	-	12.4	0	-	45.7
HCM Lane LOS	F	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	5.4	0	-	-	0.1	-	-	0.3

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	981	265	86	499	107	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	12	11	11
Grade (%)	-2%			1%	-6%	
Storage Length (ft)		0	0		100	0
Storage Lanes		1	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.993	0.950	
Satd. Flow (prot)	1801	1531	0	3347	1797	1531
Flt Permitted				0.562	0.950	
Satd. Flow (perm)	1801	1531	0	1894	1797	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		294				108
Link Speed (mph)	30			30	30	
Link Distance (ft)	600			500	800	
Travel Time (s)	13.6			11.4	18.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	4%	7%	0%	5%
Adj. Flow (vph)	1090	294	96	554	119	108
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1090	294	0	650	119	108
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.03	1.03	1.01	1.01	1.01	1.01
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	NA	Perm	pm+pt	NA	Prot	pt+ov
Protected Phases	2		1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	2	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	10.0	6.0	

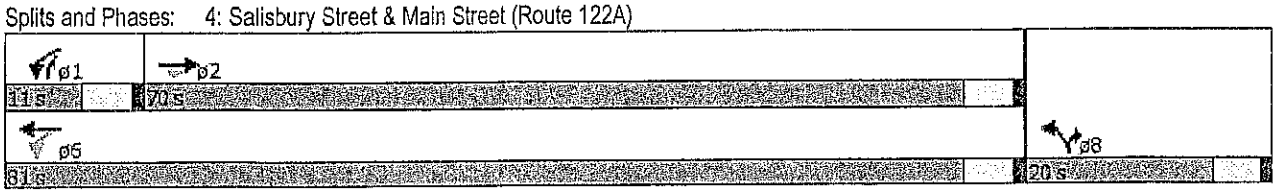
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	15.0	15.0	11.0	15.0	11.0	
Total Split (s)	70.0	70.0	11.0	81.0	20.0	
Total Split (%)	69.3%	69.3%	10.9%	80.2%	19.8%	
Maximum Green (s)	65.0	65.0	6.0	76.0	15.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	None	Min	None	
Act Effct Green (s)	62.6	62.6		71.1	11.3	22.5
Actuated g/C Ratio	0.68	0.68		0.77	0.12	0.24
v/c Ratio	0.89	0.26		0.43	0.54	0.24
Control Delay	25.5	1.4		4.2	49.3	7.5
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	25.5	1.4		4.2	49.3	7.5
LOS	C	A		A	D	A
Approach Delay	20.4			4.2	29.4	
Approach LOS	C			A	C	
90th %ile Green (s)	65.0	65.0	6.0	76.0	15.0	
90th %ile Term Code	Max	Max	Max	Hold	Max	
70th %ile Green (s)	65.0	65.0	6.0	76.0	13.7	
70th %ile Term Code	Max	Max	Max	Hold	Gap	
50th %ile Green (s)	65.0	65.0	6.0	76.0	11.7	
50th %ile Term Code	Max	Max	Max	Hold	Gap	
30th %ile Green (s)	59.1	59.1	6.0	70.1	9.8	
30th %ile Term Code	Gap	Gap	Max	Hold	Gap	
10th %ile Green (s)	57.0	57.0	0.0	57.0	7.2	
10th %ile Term Code	Dwell	Dwell	Skip	Dwell	Gap	
Queue Length 50th (ft)	513	0		46	71	0
Queue Length 95th (ft)	#935	28		74	127	41
Internal Link Dist (ft)	520			420	720	
Turn Bay Length (ft)					100	
Base Capacity (vph)	1282	1174		1639	295	438
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	0.85	0.25		0.40	0.40	0.25

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 92.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 16.7 Intersection LOS: B

Intersection Capacity Utilization 86.4%
ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 101
70th %ile Actuated Cycle: 99.7
50th %ile Actuated Cycle: 97.7
30th %ile Actuated Cycle: 89.9
10th %ile Actuated Cycle: 74.2
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Salisbury Street & Main Street (Route 122A)



Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	1	0	2	379	356	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	0	0	2	5	0
Mvmt Flow	1	0	2	412	387	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	804	388	388	0	-	0
Stage 1	388	-	-	-	-	-
Stage 2	416	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	355	665	1182	-	-	-
Stage 1	690	-	-	-	-	-
Stage 2	670	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	354	665	1182	-	-	-
Mov Cap-2 Maneuver	354	-	-	-	-	-
Stage 1	690	-	-	-	-	-
Stage 2	669	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1182	-	354	-	-
HCM Lane V/C Ratio	0.002	-	0.003	-	-
HCM Control Delay (s)	8.1	0	15.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection

Int Delay, s/veh 10.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	849	28	34	1221	15	8	1	31	12	0	23
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, %	-	-2	-	-	3	-	-	9	-	-	-6	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	1	0	3	1	7	0	0	7	8	0	0
Mvmt Flow	12	875	29	35	1259	15	8	1	32	12	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1274	0	0	904	0	0	2262	2258	890	2268	2266	1266
Stage 1	-	-	-	-	-	-	914	914	-	1337	1337	-
Stage 2	-	-	-	-	-	-	1348	1344	-	931	929	-
Critical Hdwy	4.1	-	-	4.13	-	-	8.9	8.3	7.17	5.98	5.3	5.6
Critical Hdwy Stg 1	-	-	-	-	-	-	7.9	7.3	-	4.98	4.3	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.9	7.3	-	4.98	4.3	-
Follow-up Hdwy	2.2	-	-	2.227	-	-	3.5	4	3.363	3.572	4	3.3
Pot Cap-1 Maneuver	552	-	-	748	-	-	9	13	268	59	88	257
Stage 1	-	-	-	-	-	-	209	225	-	286	350	-
Stage 2	-	-	-	-	-	-	96	114	-	426	476	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	552	-	-	748	-	-	~ 7	10	268	41	71	257
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 7	10	-	41	71	-
Stage 1	-	-	-	-	-	-	200	215	-	273	294	-
Stage 2	-	-	-	-	-	-	73	96	-	357	455	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.3	$ 521.5	67.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	29	552	-	-	748	-	-	92
HCM Lane V/C Ratio	1.422	0.022	-	-	0.047	-	-	0.392
HCM Control Delay (s)	$ 521.5	11.7	0	-	10	0	-	67.4
HCM Lane LOS	F	B	A	-	B	A	-	F
HCM 95th %tile Q(veh)	4.8	0.1	-	-	0.1	-	-	1.6

Notes

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

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	735	211	146	987	256	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	12	11	11
Grade (%)	-2%			1%	-6%	
Storage Length (ft)		0	0		100	0
Storage Lanes		1	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.994	0.950	
Satd. Flow (prot)	1837	1561	0	3535	1779	1592
Flt Permitted				0.575	0.950	
Satd. Flow (perm)	1837	1561	0	2045	1779	1592
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		218				128
Link Speed (mph)	30			30	30	
Link Distance (ft)	600			500	800	
Travel Time (s)	13.6			11.4	18.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	758	218	151	1018	264	128
Shared Lane Traffic (%)						
Lane Group Flow (vph)	758	218	0	1169	264	128
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.03	1.03	1.01	1.01	1.01	1.01
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	NA	Perm	pm+pt	NA	Prot	pt+ov
Protected Phases	2		1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	2	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	10.0	6.0	

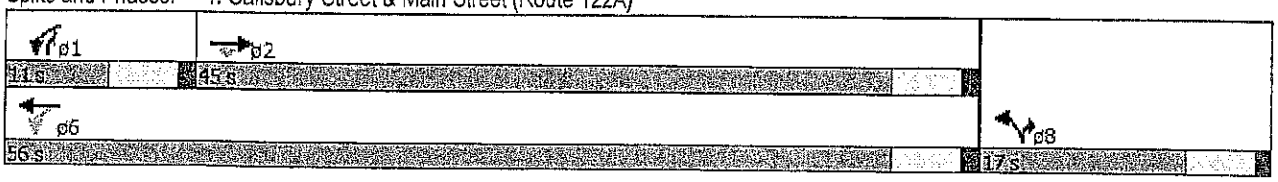
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	15.0	15.0	11.0	15.0	11.0	
Total Split (s)	45.0	45.0	11.0	56.0	17.0	
Total Split (%)	61.6%	61.6%	15.1%	76.7%	23.3%	
Maximum Green (s)	40.0	40.0	6.0	51.0	12.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	None	Min	None	
Act Effct Green (s)	32.7	32.7		41.0	12.0	23.3
Actuated g/C Ratio	0.52	0.52		0.65	0.19	0.37
v/c Ratio	0.80	0.24		0.82	0.78	0.19
Control Delay	20.8	2.1		12.1	46.9	4.9
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	20.8	2.1		12.1	46.9	4.9
LOS	C	A		B	D	A
Approach Delay	16.6			12.1	33.2	
Approach LOS	B			B	C	
90th %ile Green (s)	40.0	40.0	6.0	51.0	12.0	
90th %ile Term Code	Max	Max	Max	Max	Max	
70th %ile Green (s)	39.7	39.7	6.0	50.7	12.0	
70th %ile Term Code	Gap	Gap	Max	Hold	Max	
50th %ile Green (s)	32.4	32.4	6.0	43.4	12.0	
50th %ile Term Code	Gap	Gap	Max	Hold	Max	
30th %ile Green (s)	26.2	26.2	6.0	37.2	12.0	
30th %ile Term Code	Gap	Gap	Max	Hold	Max	
10th %ile Green (s)	25.6	25.6	0.0	25.6	10.8	
10th %ile Term Code	Dwell	Dwell	Skip	Dwell	Gap	
Queue Length 50th (ft)	242	0		102	102	0
Queue Length 95th (ft)	384	27		137	#250	34
Internal Link Dist (ft)	520			420	720	
Turn Bay Length (ft)					100	
Base Capacity (vph)	1193	1090		1759	346	643
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	0.64	0.20		0.66	0.76	0.20

Intersection Summary

Area Type: Other
Cycle Length: 73
Actuated Cycle Length: 63.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 17.1 Intersection LOS: B

Intersection Capacity Utilization 96.9%
ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 73
70th %ile Actuated Cycle: 72.7
50th %ile Actuated Cycle: 65.4
30th %ile Actuated Cycle: 59.2
10th %ile Actuated Cycle: 46.4
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Salisbury Street & Main Street (Route 122A)



Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	17	18	5	203	350	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	0	0	2	5	0
Mvmt Flow	18	20	5	221	380	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	616	384	387	0	-	0
Stage 1	384	-	-	-	-	-
Stage 2	232	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	457	668	1183	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	811	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	455	668	1183	-	-	-
Mov Cap-2 Maneuver	455	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	807	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1183	-	544	-	-
HCM Lane V/C Ratio	0.005	-	0.07	-	-
HCM Control Delay (s)	8.1	0	12.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	4	4	57	1	1	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	4	4	62	1	1	34

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	99	63	0	0	63	0
Stage 1	63	-	-	-	-	-
Stage 2	36	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	900	1002	-	-	1540	-
Stage 1	960	-	-	-	-	-
Stage 2	986	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	899	1002	-	-	1540	-
Mov Cap-2 Maneuver	899	-	-	-	-	-
Stage 1	960	-	-	-	-	-
Stage 2	985	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 948	1540	-
HCM Lane V/C Ratio	-	- 0.009	0.001	-
HCM Control Delay (s)	-	- 8.8	7.3	0
HCM Lane LOS	-	- A	A	A
HCM 95th %tile Q(veh)	-	- 0	0	-

Intersection	
Int Delay, s/veh	12.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	1206	15	17	582	15	12	0	49	3	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, %	-	-2	-	-	3	-	-	9	-	-	-6	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	3	7	6	5	0	0	0	2	0	0	0
Mvmt Flow	13	1325	16	19	640	16	13	0	54	3	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	656	0	0	1342	0	0	2047	2053	1334	2072	2053	648
Stage 1	-	-	-	-	-	-	1360	1360	-	685	685	-
Stage 2	-	-	-	-	-	-	687	693	-	1387	1368	-
Critical Hdwy	4.1	-	-	4.16	-	-	8.9	8.3	7.12	5.9	5.3	5.6
Critical Hdwy Stg 1	-	-	-	-	-	-	7.9	7.3	-	4.9	4.3	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.9	7.3	-	4.9	4.3	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	941	-	-	501	-	-	15	20	135	80	111	528
Stage 1	-	-	-	-	-	-	94	111	-	555	567	-
Stage 2	-	-	-	-	-	-	312	317	-	284	342	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	941	-	-	501	-	-	14	18	135	44	99	528
Mov Cap-2 Maneuver	-	-	-	-	-	-	14	18	-	44	99	-
Stage 1	-	-	-	-	-	-	89	105	-	524	533	-
Stage 2	-	-	-	-	-	-	291	298	-	161	323	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	$ 375.7	47.7
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	50	941	-	-	501	-	-	92
HCM Lane V/C Ratio	1.341	0.014	-	-	0.037	-	-	0.084
HCM Control Delay (s)	$ 375.7	8.9	0	-	12.5	0	-	47.7
HCM Lane LOS	F	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	6.2	0	-	-	0.1	-	-	0.3

Notes

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

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	983	266	90	499	111	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	12	11	11
Grade (%)	-2%			1%	-6%	
Storage Length (ft)		0	0		100	0
Storage Lanes		1	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.992	0.950	
Satd. Flow (prot)	1801	1531	0	3344	1797	1531
Flt Permitted				0.546	0.950	
Satd. Flow (perm)	1801	1531	0	1841	1797	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		296				116
Link Speed (mph)	30			30	30	
Link Distance (ft)	600			500	800	
Travel Time (s)	13.6			11.4	18.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	4%	7%	0%	5%
Adj. Flow (vph)	1092	296	100	554	123	121
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1092	296	0	654	123	121
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.03	1.03	1.01	1.01	1.01	1.01
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	NA	Perm	pm+pt	NA	Prot	pt+ov
Protected Phases	2		1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	2	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	10.0	6.0	

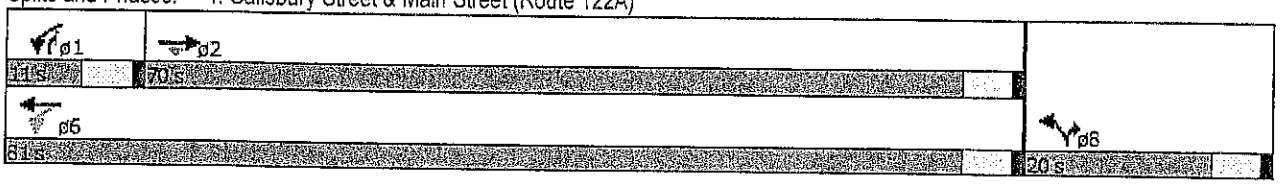
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	15.0	15.0	11.0	15.0	11.0	
Total Split (s)	70.0	70.0	11.0	81.0	20.0	
Total Split (%)	69.3%	69.3%	10.9%	80.2%	19.8%	
Maximum Green (s)	65.0	65.0	6.0	76.0	15.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	None	Min	None	
Act Effct Green (s)	60.6	60.6		71.7	11.5	22.6
Actuated g/C Ratio	0.65	0.65		0.77	0.12	0.24
v/c Ratio	0.93	0.27		0.43	0.56	0.26
Control Delay	30.9	1.5		4.2	49.9	8.1
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	30.9	1.5		4.2	49.9	8.1
LOS	C	A		A	D	A
Approach Delay	24.6			4.2	29.1	
Approach LOS	C			A	C	
90th %ile Green (s)	65.0	65.0	6.0	76.0	15.0	
90th %ile Term Code	Max	Max	Max	Hold	Max	
70th %ile Green (s)	65.0	65.0	6.0	76.0	14.0	
70th %ile Term Code	Max	Max	Max	Hold	Gap	
50th %ile Green (s)	65.0	65.0	6.0	76.0	12.0	
50th %ile Term Code	Max	Max	Max	Hold	Gap	
30th %ile Green (s)	59.9	59.9	6.0	70.9	10.0	
30th %ile Term Code	Gap	Gap	Max	Hold	Gap	
10th %ile Green (s)	48.6	48.6	6.0	59.6	7.2	
10th %ile Term Code	Dwell	Dwell	Max	Dwell	Gap	
Queue Length 50th (ft)	521	0		47	73	2
Queue Length 95th (ft)	#937	28		74	131	46
Internal Link Dist (ft)	520			420	720	
Turn Bay Length (ft)					100	
Base Capacity (vph)	1267	1165		1612	291	441
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	0.86	0.25		0.41	0.42	0.27

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 93.3
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 19.3 Intersection LOS: B

Intersection Capacity Utilization 86.8%
ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 101
70th %ile Actuated Cycle: 100
50th %ile Actuated Cycle: 98
30th %ile Actuated Cycle: 90.9
10th %ile Actuated Cycle: 76.8
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Salisbury Street & Main Street (Route 122A)



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	11	10	19	379	356	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	0	0	2	5	0
Mvmt Flow	12	11	21	412	387	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	850	397	407	0	-	0
Stage 1	397	-	-	-	-	-
Stage 2	453	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	334	657	1163	-	-	-
Stage 1	683	-	-	-	-	-
Stage 2	645	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	326	657	1163	-	-	-
Mov Cap-2 Maneuver	326	-	-	-	-	-
Stage 1	683	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1163	-	429	-	-
HCM Lane V/C Ratio	0.018	-	0.053	-	-
HCM Control Delay (s)	8.2	0	13.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	2	2	40	4	4	62
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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, %	2	2	2	2	2	2
Mvmt Flow	2	2	43	4	4	67

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	122	46	0	0	48	0
Stage 1	46	-	-	-	-	-
Stage 2	76	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	873	1023	-	-	1559	-
Stage 1	976	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	870	1023	-	-	1559	-
Mov Cap-2 Maneuver	870	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	944	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 940	1559	-
HCM Lane V/C Ratio	-	- 0.005	0.003	-
HCM Control Delay (s)	-	- 8.8	7.3	0
HCM Lane LOS	-	- A	A	A
HCM 95th %tile Q(veh)	-	- 0	0	-

Intersection

Int Delay, s/veh 12.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	12	851	32	34	1223	15	9	1	32	12	0	23
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, %	-	-2	-	-	3	-	-	9	-	-	-6	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	0	1	0	3	1	7	0	0	7	8	0	0
Mvmt Flow	12	877	33	35	1261	15	9	1	33	12	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1276	0	0	910	0	0	2270	2265	894	2275	2274	1269
Stage 1	-	-	-	-	-	-	919	919	-	1339	1339	-
Stage 2	-	-	-	-	-	-	1351	1346	-	936	935	-
Critical Hdwy	4.1	-	-	4.13	-	-	8.9	8.3	7.17	5.98	5.3	5.6
Critical Hdwy Stg 1	-	-	-	-	-	-	7.9	7.3	-	4.98	4.3	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.9	7.3	-	4.98	4.3	-
Follow-up Hdwy	2.2	-	-	2.227	-	-	3.5	4	3.363	3.572	4	3.3
Pot Cap-1 Maneuver	551	-	-	744	-	-	~ 9	13	266	58	87	256
Stage 1	-	-	-	-	-	-	207	223	-	286	349	-
Stage 2	-	-	-	-	-	-	95	113	-	424	474	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	551	-	-	744	-	-	~ 7	10	266	40	70	256
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 7	10	-	40	70	-
Stage 1	-	-	-	-	-	-	198	213	-	273	292	-
Stage 2	-	-	-	-	-	-	72	95	-	353	453	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.3	$ 579.9	69.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	28	551	-	-	744	-	-	90
HCM Lane V/C Ratio	1.546	0.022	-	-	0.047	-	-	0.401
HCM Control Delay (s)	$ 579.9	11.7	0	-	10.1	0	-	69.5
HCM Lane LOS	F	B	A	-	B	A	-	F
HCM 95th %tile Q(veh)	5.1	0.1	-	-	0.1	-	-	1.6

Notes

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

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	736	213	161	987	258	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	12	11	11
Grade (%)	-2%			1%	-6%	
Storage Length (ft)		0	0		100	0
Storage Lanes		1	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.993	0.950	
Satd. Flow (prot)	1837	1561	0	3531	1779	1592
Flt Permitted				0.557	0.950	
Satd. Flow (perm)	1837	1561	0	1981	1779	1592
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		220				136
Link Speed (mph)	30			30	30	
Link Distance (ft)	600			500	800	
Travel Time (s)	13.6			11.4	18.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	759	220	166	1018	266	136
Shared Lane Traffic (%)						
Lane Group Flow (vph)	759	220	0	1184	266	136
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.03	1.03	1.01	1.01	1.01	1.01
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	NA	Perm	pm+pt	NA	Prot	pt+ov
Protected Phases	2		1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	2	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	10.0	10.0	6.0	10.0	6.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	15.0	15.0	11.0	15.0	11.0	
Total Split (s)	45.0	45.0	11.0	56.0	17.0	
Total Split (%)	61.6%	61.6%	15.1%	76.7%	23.3%	
Maximum Green (s)	40.0	40.0	6.0	51.0	12.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	None	Min	None	
Act Effct Green (s)	33.0	33.0		41.4	12.1	23.4
Actuated g/C Ratio	0.52	0.52		0.65	0.19	0.37
v/c Ratio	0.80	0.24		0.85	0.79	0.20
Control Delay	20.7	2.1		13.7	47.6	4.8
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	20.7	2.1		13.7	47.6	4.8
LOS	C	A		B	D	A
Approach Delay	16.5			13.7	33.2	
Approach LOS	B			B	C	
90th %ile Green (s)	40.0	40.0	6.0	51.0	12.0	
90th %ile Term Code	Max	Max	Max	Max	Max	
70th %ile Green (s)	40.0	40.0	6.0	51.0	12.0	
70th %ile Term Code	Hold	Hold	Max	Max	Max	
50th %ile Green (s)	32.7	32.7	6.0	43.7	12.0	
50th %ile Term Code	Hold	Hold	Max	Gap	Max	
30th %ile Green (s)	26.2	26.2	6.0	37.2	12.0	
30th %ile Term Code	Gap	Gap	Max	Hold	Max	
10th %ile Green (s)	26.4	26.4	0.0	26.4	11.1	
10th %ile Term Code	Dwell	Dwell	Skip	Dwell	Gap	
Queue Length 50th (ft)	243	0		104	104	0
Queue Length 95th (ft)	385	27		139	#252	35
Internal Link Dist (ft)	520			420	720	
Turn Bay Length (ft)					100	
Base Capacity (vph)	1183	1084		1709	343	644
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	0.64	0.20		0.69	0.78	0.21

Intersection Summary

Area Type: Other
Cycle Length: 73
Actuated Cycle Length: 63.7
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 17.8 Intersection LOS: B

Intersection Capacity Utilization 97.5%
ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 73
70th %ile Actuated Cycle: 73
50th %ile Actuated Cycle: 65.7
30th %ile Actuated Cycle: 59.2
10th %ile Actuated Cycle: 47.5
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Salisbury Street & Main Street (Route 122A)