Transportation Impact Assessment

Proposed Multifamily Residential Development
School Street
Manchester-By-The-Sea, Massachusetts

Prepared for:

SLV School Street, LLC
Needham, Massachusetts

September 2020

Prepared by:

Vanasse & Associates inc
Transportation Engineers & Planners

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Dear Reviewer:

This letter shall certify that this *Transportation Impact Assessment* has been prepared under my direct supervision and responsible charge. I am a Registered Professional Engineer (P.E.) in the Commonwealth of Massachusetts (Massachusetts P.E. No. 38871, Civil) and hold Certification as a Professional Traffic Operations Engineer (PTOE) from the Transportation Professional Certification Board, Inc. (TPCB), an independent affiliate of the Institute of Transportation Engineers (ITE) (PTOE Certificate No. 993). I am also a Fellow of the Institute of Transportation Engineers (FITE).

Sincerely,

VANASSE & ASSOCIATES, INC.

Jeffrey S. Dirk

Jeffrey S. Dirk, P.E., PTOE, FITE
Partner

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EXECUTIVE SUMMARY

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a 157-unit multifamily residential community to be located off School Street in Manchester-by-the-Sea, Massachusetts (hereafter referred to as the Project). This assessment was prepared in consultation with the Town of Manchester-by-the-Sea and the Massachusetts Department of Transportation (MassDOT), and was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports.

Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the Institute of Transportation Engineers (ITE),[1] the Project is expected to generate approximately 854 vehicle trips on an average weekday (two-way, 24-hour volume), with 53 vehicle trips expected during the weekday morning peak-hour and 68 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), acknowledging that one or more movements from the Route 128 off-ramps to School Street are predicted to operate at or over capacity (i.e., level-of-service (LOS) "E" of "F", respectively) independent of the Project, with Project-related impacts at the ramp intersections generally characterized by a predicted increase in motorist delays that resulted in an increase in vehicle queuing by up to four (4) vehicles;

3. All movements at the Project site driveway intersection with School Street are predicted to operate at LOS B or better during the peak hours with negligible vehicle queuing;

4. No apparent safety deficiencies were noted with respect to the motor vehicle crash history at the study area intersections, with all of the intersections found to have motor vehicle crash rates that are below the MassDOT average crash rates for similar intersections; and

5. The available lines of sight at the Project site driveway intersection with School Street were found to exceed the recommended minimum sight distances to function in a safe and efficient manner.

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

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any deficiencies identified at off-site locations evaluated in conjunction with this study. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the Project site will be provided by way of a new driveway that will intersect west side of School Street approximately 135 feet north of Atwater Street. The driveway has been designed as a boulevard-type access starting at School Street and extending into the Project site for a distance of approximately 700 feet before transitioning to a non-divided access. The following recommendations are offered with respect to the design and operation of the Project site access and internal circulation, many of which are reflected on the Site Plans:

- The boulevard section of the Project site driveway should provide two (2) 14-foot wide (minimum) travel lanes separated by a 6-foot wide (minimum) raised median with openings or traversable areas provided along the median every 200-feet to allow for emergency vehicles to cross the median when necessary. The non-boulevard section of the driveway should be a minimum of 22-feet in width and designed to accommodate the turning and maneuvering requirements of the largest anticipated responding emergency vehicle.

- Where perpendicular parking is proposed, the drive aisle behind the parking should be a minimum of 23-feet in order to facilitate parking maneuvers.

- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.

- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[2]

- Americans with Disabilities Act (ADA) compliant wheelchair ramps should be provided at all pedestrian crossings that are to be constructed or modified as a part of the Project.

- Signs and landscaping to be installed as a part of the Project within the sight triangle areas of the Project site driveway should be designed and maintained so as not to restrict lines of sight.

- Snow windrows within sight triangle areas of the Project site driveway should be promptly removed where such accumulations would impede sight lines.

- Consideration should be given to providing accommodations for electric vehicle charging for residents of the Project.

[2] *Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

Off-Site

School Street at the Route 128 Ramps

Operating conditions for movements from the Route 128 north and southbound ramps to School Street are currently or are predicted to operate at or over capacity independent of the Project. Project-related impacts at the ramp intersections were generally defined by a predicted increase in motorist delays that resulted in an increase in vehicle queuing of up to four (4) vehicles. In an effort to identify potential improvement measures for the ramp intersections, the Project proponent will conduct an improvement study for the Route 128 north and southbound ramp intersections with School Street that will include performing a detailed Traffic Signal Warrants Analysis (TSWA) in accordance with the methodology defined in the MUTCD[3] and preparing conceptual improvement plans depicting the recommended improvements. This information will be formatted to allow the Town to apply for state funding for the recommended improvement strategies. The improvement study will be conducted in consultation with the Town and MassDOT, and will be provided to the Town prior to the issuance of a Certificate of Occupancy for the Project.

Transportation Demand Management

Regularly scheduled public transportation services are provided to the Town of Manchester-by-the Sea, but are not available in the vicinity of the Project site. The Massachusetts Bay Transportation Authority (MBTA) provides Commuter Rail service to North Station in Boston on the Newburyport/Rockport Line from Manchester-by-the Sea Station, which is located at 40 Beach Street (an approximate 7-minute driving distance to the south of the Project site). In an effort to reduce the overall number of automobile trips in the area and to integrate the Project into the available transportation resources, the following Transportation Demand Management (TDM) measures will be implemented as a part of the Project:

- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location and/or otherwise made available to residents;
- A "welcome packet" will be provided to new residents detailing available public transportation services, bicycle and walking alternatives, and commuter options available;
- Pedestrian accommodations will be incorporated into the Project and consist of sidewalks and ADA compliant wheelchair ramps at all pedestrian crossings that are to be constructed or modified as a part of the Project;
- Work-at-home workspaces will be provided to support telecommuting by residents of the Project;
- An internal mail room will be provided within the building; and
- Bicycle parking will be provided consisting of both an exterior bicycle rack located proximate to the building entrance and weather protected bicycle parking within the proposed parking garage.

With implementation of the aforementioned recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing and improved transportation system.

[3]Ibid.

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a multifamily residential community to be located off School Street in Manchester-by-the-Sea, Massachusetts (hereafter referred to as the Project). This study evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project, along School Street and at major intersections along this roadway through which Project-related traffic will travel.

PROJECT DESCRIPTION

The Project will entail the construction of a 157-unit multifamily residential community to be located off School Street in Manchester-by-the-Sea, Massachusetts. The Project site is located along the west side of School Street, north of Route 128 Exit 15 and generally opposite Atwater Avenue, and encompasses approximately 23.2± acres of land that is bounded by areas of open and wooded space to the north; Yankee Division Highway (Route 128) and areas of open and wooded space to the south; School Street and areas of open and wooded space to the east; and Old School Street and areas of open and wooded space to the west. Figure 1 depicts the Project site location in relation to the existing roadway network. The Project site currently consist of areas of open and wooded space.

Access to the Project site will be provided by way of a new driveway that will intersect west side of School Street approximately 135 feet north of Atwater Street. The driveway has been designed as a boulevard-type access starting at School Street and extending into the Project site for a distance of approximately 700 feet before transitioning to a non-divided access.

On-site parking will be provided for 237 vehicles and includes four (4) accessible handicap parking spaces, or an approximate parking ratio of 1.51 spaces per unit. This parking ratio is consistent with the off-street parking ratio that is specified in Section, 6.2 *Off-Street Parking and Driveway/Curb Cut Regulations*, of the Town Zoning By-Law.[4]

[4]The Zoning By-Law requires that 6.0 parking spaces be provided for 4 residential units, or a parking ratio of 1.5 spaces per unit.

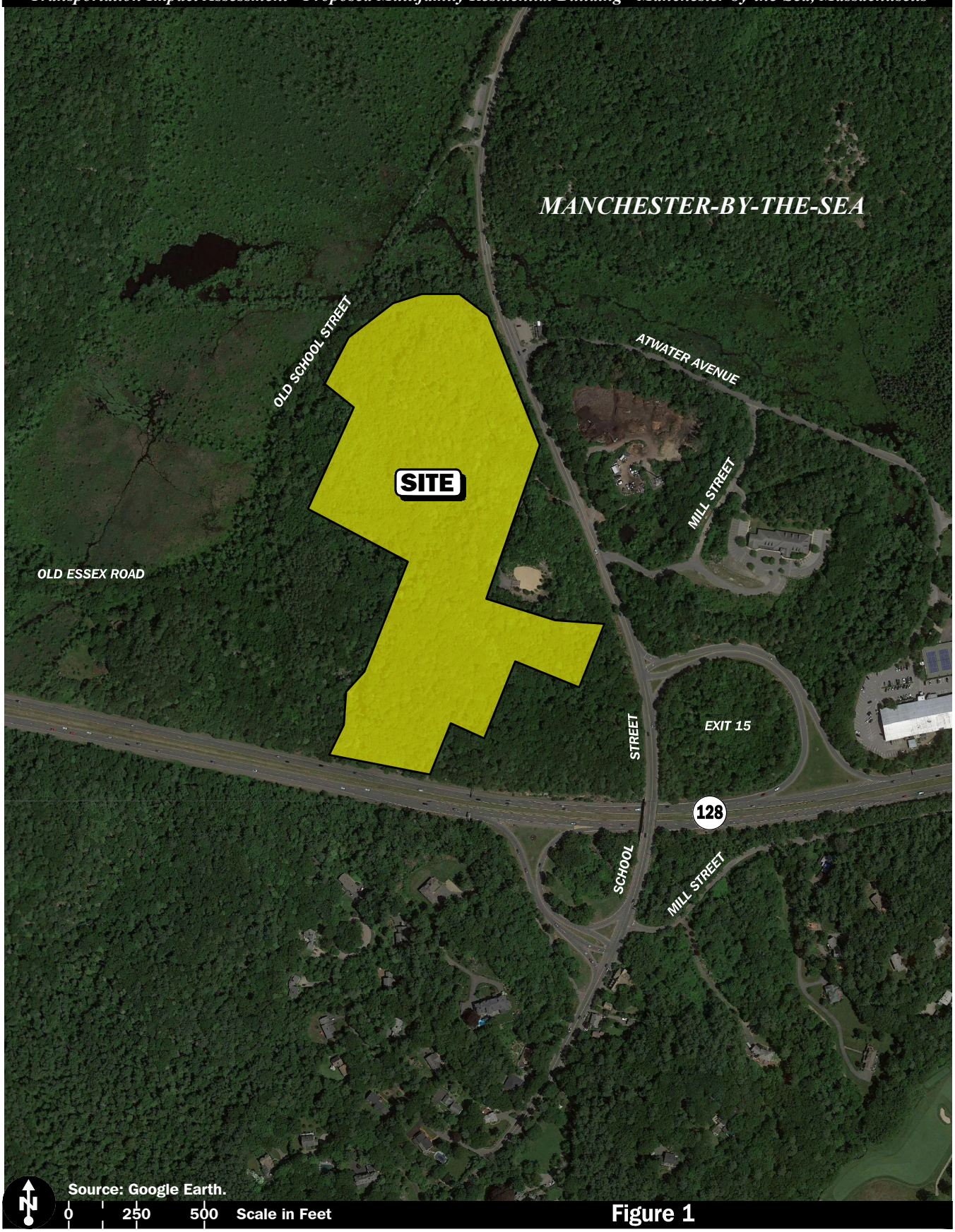

Figure 1

Site Location Map

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STUDY METHODOLOGY

This study was prepared in consultation with the Town of Manchester-by-the-Sea and the Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics; pedestrian and bicycle facilities; observations of traffic flow; and collection of daily and peak-period traffic counts.

In the second stage of the study, future traffic conditions were projected and analyzed. Specific travel demand forecasts for the Project were assessed along with future traffic demands due to expected traffic growth independent of the Project. A seven-year time horizon was selected for analyses consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. The traffic analysis conducted in stage two identifies existing or projected future roadway capacity, traffic safety, and site access issues.

The third stage of the study presents and evaluates measures to address traffic and safety issues, if any, identified in stage two of the study.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in July 2020. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area that was assessed for the Project consisted of School Street and the following intersections:

1. School Street at Atwater Street
2. School Street at the Route 128 Northbound Ramps (Exit 15)
3. School Street at the Route 128 Southbound Ramps (Exit 15)

The following describes the study area roadway and intersections.

Roadway

School Street

- School Street is a two-lane, urban minor arterial under Town jurisdiction that traverses the study area in a general north-south alignment between Union Street/Central Street (Route 127) and Old School Street, where School Street becomes Southern Avenue
- Provides a 12 to 18-foot wide travel lane that are separated by a double-yellow centerline with 2 to 12-foot wide marked shoulders
- The posted speed limit is 35 miles per hour (mph) within the study area
- A sidewalk is provided along one or both sides of School Street between Route 127 and the Route 128 southbound ramps
- Land use within the study area consists of the Project site, residential properties and areas of open and wooded space

Intersections

Table 1 and Figure 2 summarize lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in July 2020.

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Rte. 128 NB Ramps/ School St./ Mill St.	S	1 general purpose travel lane on School St. approaches; 1 left-turn lane and 1 approach lane on Rte. 128 NB off-ramp that separates into channelized left and right-turn lanes approaching School St.; 1 general purpose travel lane on Mill St.	Yes; 2-11 feet on School St., 2-feet on Rte. 128 NB ramps and 1 foot on Mill St.	Yes; sidewalk along east side of school St.	Yes; Shared traveled-way along School St.[b]
Rte. 128 SB Ramps/ School St	S	1 general purpose travel lane on School St. approaches; 1 approach lane on Rte. 128 SB off-ramp that separates into channelized left and right-turn lanes approaching School St.	Yes; 2-11 feet on School St. and 2-feet on Rte. 128 SB ramps	Yes; east side of School St. south of intersection	Yes; Shared traveled-way along School St.
School St./ Atwater St.	S	1 general purpose lane on all approaches	Yes; 2 feet on School St.	No	Yes; Shared traveled-way

[a]TS = traffic signal control; S = STOP-sign control.
[b]Combined shoulder and travel lane width equal to or exceed 14 feet.
NB= northbound; SB= southbound; EB= eastbound; WB = westbound

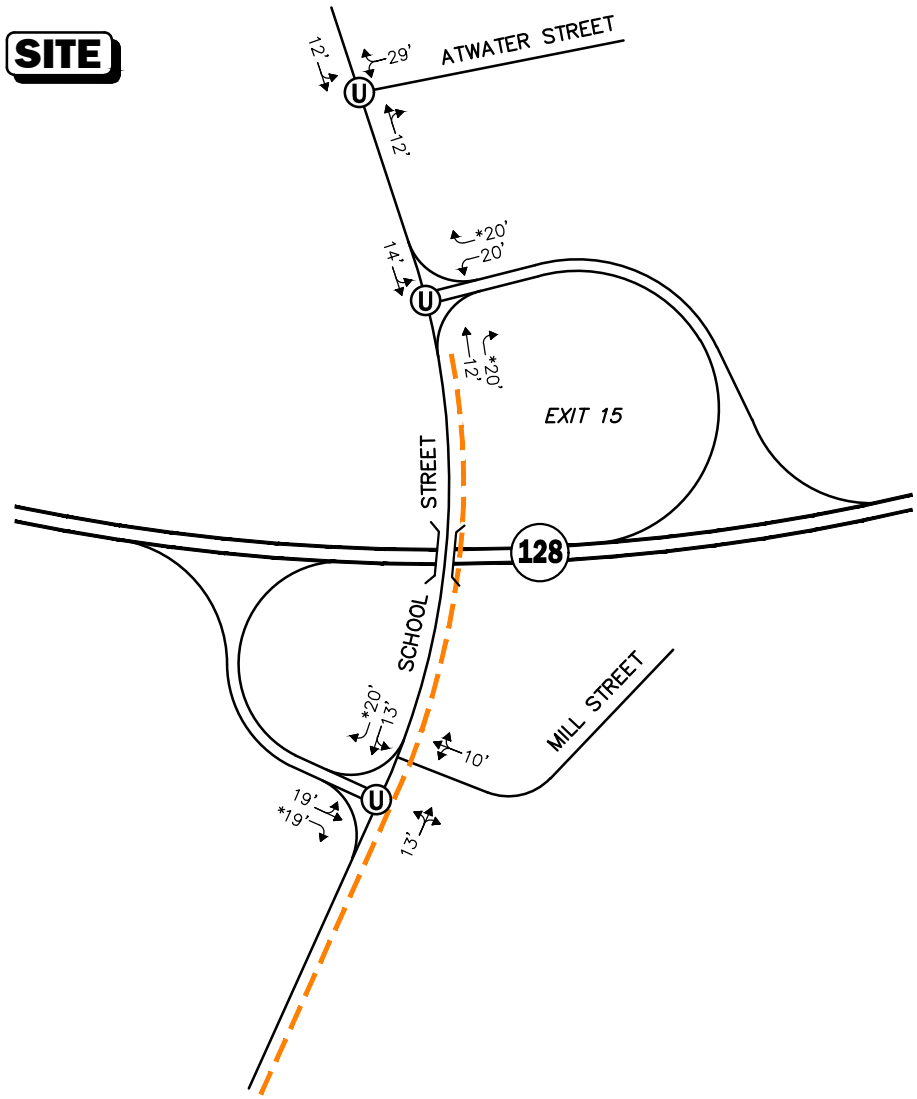
EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts and manual turning movement and vehicle classification counts (TMCs) were completed in July 2020. The ATR counts were conducted on July 7th through July 10th, 2020 (Tuesday through Friday, inclusive) on School Street in the vicinity of the Project site in order to record traffic volumes over an extended period, with weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak-period manual TMCs performed at the study intersections on Tuesday, July 7, 2020 and Thursday, July 9, 2020. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for both the Project and the adjacent roadway network.

Traffic-Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, traffic volume data from MassDOT Continuous Count Station No. 35 located on Route 128 in Beverly were reviewed.[5] Based on a review of this data, it was determined that traffic volumes for the month of July are approximately 14.0 percent above average-month conditions and, therefore, the July traffic volumes were not adjusted downward in order to provide a conservative (above-average) analysis condition.

[5]MassDOT Traffic Volumes for the Commonwealth of Massachusetts; 2020.



Legend:

- Unsignalized Intersection
- Sidewalk
- Crosswalk
- XX' Lane Use and Travel Lane Width Width
- *XX' Channelized Right-Turn

Note: Not to scale.

Figure 2

Existing Intersection Lane Use, Travel Lane Width and Pedestrian Facilities

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In order to account for the impact on traffic volumes and trip patterns resulting from the "safer-at-home" order and the phased "Reopening Massachusetts" plan that was issued by the Governor on May 18, 2020, in response to the COVID-19 pandemic, traffic volumes were collected on School Street in the vicinity of Hidden Ledge Road in July 2020 which were compared to October 2016 traffic volumes that were obtained from a traffic study conducted by Manchester-by-the Sea Police Department at the same location. The July and October traffic volumes were both adjusted to average-month conditions and the 2016 traffic volumes were expanded to 2020 by applying a background traffic growth rate of 1.0 percent per year (discussion follows). Based on this pre and post COVID-19 traffic count data comparison, the traffic volume data that was collected as a part of this assessment were adjusted upward by 30 percent in order to account for the reduced traffic volumes resulting from the phased "Reopening Massachusetts" plan and the absence of school related traffic.

The 2020 Existing traffic volumes are summarized in Table 2, with the weekday morning and evening peak-hour traffic volumes graphically depicted on Figure 3. Note that the peak-hour traffic volumes presented in Table 2 were obtained from Figure 3.

Table 2
2020 EXISTING TRAFFIC VOLUMES

Location/Peak Hour	AWT[a]	VPH[b]	K Factor[c]	Directional Distribution[d]
School Street in the vicinity of the Project site:	7,310	--	--	--
Weekday Morning (8:00 – 9:00 AM)	--	388	5.3	57.0% SB
Weekday Evening (4:30 – 5:30 PM)	--	601	8.2	51.0% SB

[a]Average weekday traffic in vehicles per day.
[b]Vehicles per hour.
[c]Percent of daily traffic occurring during the peak hour.
[d]Percent traveling in peak direction.
NB = northbound, SB= southbound

As can be seen in Table 2, School Street in the vicinity of the Project site accommodates approximately 7,310 vehicles on an average weekday (two-way, 24-hour volume), with 388 vehicles per hour (vph) accommodated during the weekday morning peak-hour (8:00 to 9:00 AM) and 601 vph accommodated during the weekday evening peak-hour (4:30 to 5:30 PM).

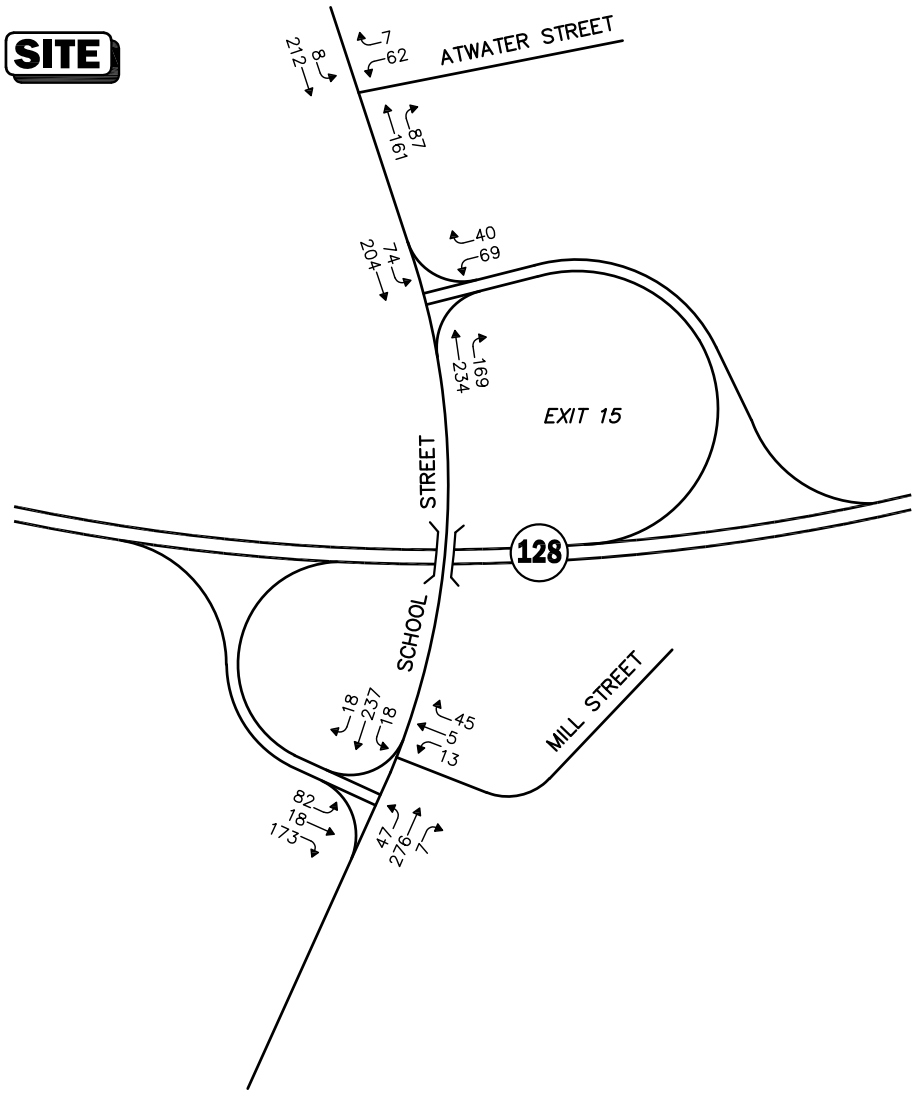
PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in July 2020. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadway and at the study intersections. A sidewalk is provided along one or both sides of School Street between Route 127 and the Route 128 southbound ramps.

Formal bicycle facilities are not provided within the study area; however, School Street provides sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared traveled-way configuration (i.e., motor vehicles and bicyclists sharing the roadway).[6]

[6]A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared traveled-way condition.

WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



WEEKDAY EVENING PEAK HOUR (4:30-5:30 PM)

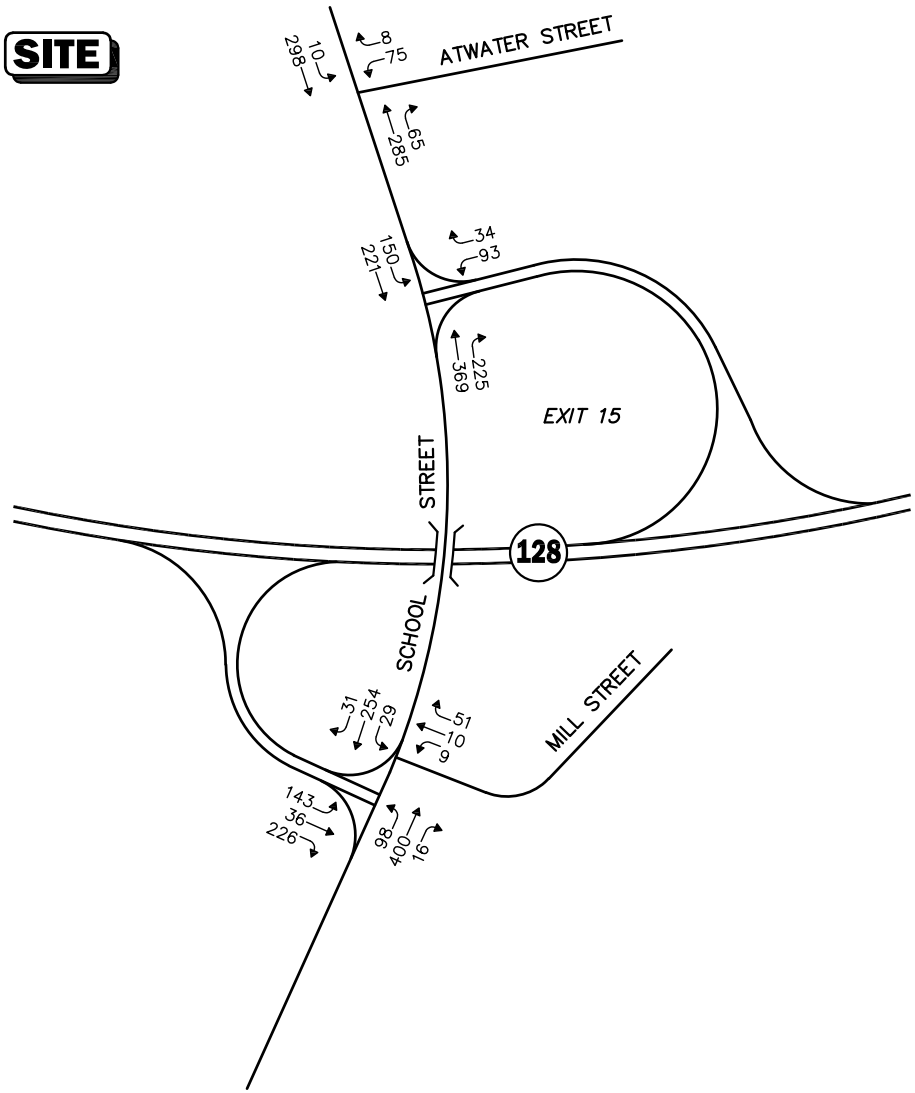


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Figure 3

2020 Existing
Peak Hour Traffic Volumes

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PUBLIC TRANSPORTATION

Regularly scheduled public transportation services are provided to the Town of Manchester-by-the Sea, but are not available in the vicinity of the Project site. The Massachusetts Bay Transportation Authority (MBTA) provides Commuter Rail service to North Station in Boston on the Newburyport/Rockport Line from Manchester-by-the Sea Station, which is located at 40 Beach Street (an approximate 7-minute driving distance to the south of the Project site).

SPOT SPEED MEASUREMENTS

Vehicle travel speed measurements were performed on School Street in the vicinity of the Project site in conjunction with the ATR counts. Table 3 summarizes the vehicle travel speed measurements.

Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS

	School Street	
	Northbound	Southbound
Mean Travel Speed (mph)	39	38
85th Percentile Speed (mph)	43	43
Posted Speed Limit (mph)	35	35

mph = miles per hour.

As can be seen in Table 3, the mean vehicle travel speed along School Street in the vicinity of the Project site was found to be 39 mph in the northbound direction and 38 mph southbound. The measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be 43 mph in both the north and southbound directions, which is 8 mph above the posted speed limit on School Street in the vicinity of the Project site (35 mph). The 85th percentile speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2013 through 2017, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, roadway and weather conditions, and day of occurrence, and presented in Table 4.

Table 4
MOTOR VEHICLE CRASH DATA SUMMARY[a]

	School Street at Atwater Street	School Street at Route 128 Southbound Ramp	School Street at Route 128 Northbound Ramp
Traffic Control Type:[b]	U	U	U
Year:			
2013	0	1	0
2014	0	0	2
2015	1	2	0
2016	0	2	0
2017	1	1	1
Total	2	6	3
Average	0.40	1.20	0.60
Rate[c]	0.12	0.25	0.10
MassDOT Crash Rate:[d]	0.57/0.57	0.57/0.57	0.57/0.57
Significant?[e]	No	No	No
Type:			
Angle	0	3	2
Rear-End	0	0	0
Head-On	0	1	0
Sideswipe	0	1	0
Single Vehicle Crash	2	1	1
Unknown/Other	0	0	0
Total	2	6	3
Conditions:			
Clear	1	5	3
Cloudy	1	0	0
Rain	0	0	0
Snow/Ice	0	1	0
Not Reported	0	0	0
Total	2	6	3
Lighting:			
Daylight	2	5	2
Dawn/Dusk	0	0	0
Dark (Road Lit)	0	0	0
Dark (Road Unlit)	0	1	1
Total	2	6	3
Day of Week:			
Monday through Friday	0	6	3
Saturday	1	0	0
Sunday	1	0	0
Total	2	0	0
Severity:			
Property Damage Only	0	3	1
Personal Injury	0	3	1
Not Reported	2	0	1
Fatality	0	0	0
Total	2	6	3

[a]Source: MassDOT Safety Management/Traffic Operations Unit records, 2013 through 2017.
[b]Traffic Control Type: U = unsignalized; TS = traffic signal.
[c]Crash rate per million vehicles entering the intersection.
[d]Statewide/District crash rate.
[e]The intersection crash rate is significant if it is found to exceed the MassDOT statewide and/or District crash rate for the MassDOT Highway Division District in which the Project is located (District 4).

As it can be seen in Table 4, the study area intersections were found to have averaged approximately one (1) or fewer reported motor vehicle crashes over the five-year review period, the majority of which occurred on a weekday, under clear weather conditions during daylight, and involved angle or rear-end type collisions that resulted in property damage only. All of the study intersections were found to have a motor vehicle crash rate below the MassDOT statewide and District average crash rates for an unsignalized intersection for the MassDOT Highway Division District in which the intersections are located (District 4). A review of the MassDOT statewide High Crash Location List indicated that there are no locations along School Street that are included on MassDOT's Highway Safety Improvement Program (HSIP) listing as high crash locations. In addition, no fatal motor vehicle crashes were reported to have occurred at the study area intersections over the five-year review period.

The detailed MassDOT Crash Rate Worksheets are provided in the Appendix.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2027, which reflects a seven-year planning horizon consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. Independent of the Project, traffic volumes on the roadway network in the year 2027 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2027 No-Build traffic volumes reflect 2027 Build traffic volume conditions with the Project.

FUTURE TRAFFIC GROWTH

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, potential population growth and development external to the study area would not be accounted for in the resulting traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

The Town Planner for the Town of Manchester-by-the-Sea was contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. Based on this consultation, no developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate (discussion follows).

General Background Traffic Growth

Traffic-volume data compiled by MassDOT from the closest permanent count stations to the Project site were reviewed in order to determine general traffic growth trends in the area. This data indicates that traffic volumes have fluctuated over the past several years, with the average growth rate found to be approximately 0.63 percent per year. In order to provide a prudent planning condition for the Project, a slightly higher 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

The Town of Manchester-by-the-Sea and MassDOT were contacted in order to determine if there were any planned future roadway improvement projects expected to be complete by 2027 within the study area. Based on these discussions, no roadway improvement projects aside from routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

The 2027 No-Build condition peak-hour traffic-volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2020 Existing peak-hour traffic volumes. The resulting 2027 No-Build weekday morning and evening peak-hour traffic volumes are shown on Figure 4.

PROJECT-GENERATED TRAFFIC

Design year (2027 Build) traffic volumes for the study area roadways were determined by estimating Project-generated traffic volumes and assigning those volumes on the study roadways. The following sections describe the methodology used to develop the anticipated traffic characteristics of the Project.

As proposed, the Project will entail the construction of a 157-unit multifamily residential community. In order to develop the traffic characteristics of the Project, trip-generation statistics published by the ITE[7] for a similar land use as that proposed were used. ITE Land Use Code (LUC) 221, *Multifamily Housing (Mid-Rise)*, was used to develop the traffic characteristics of the Project, the results of which are summarized in Table 5.

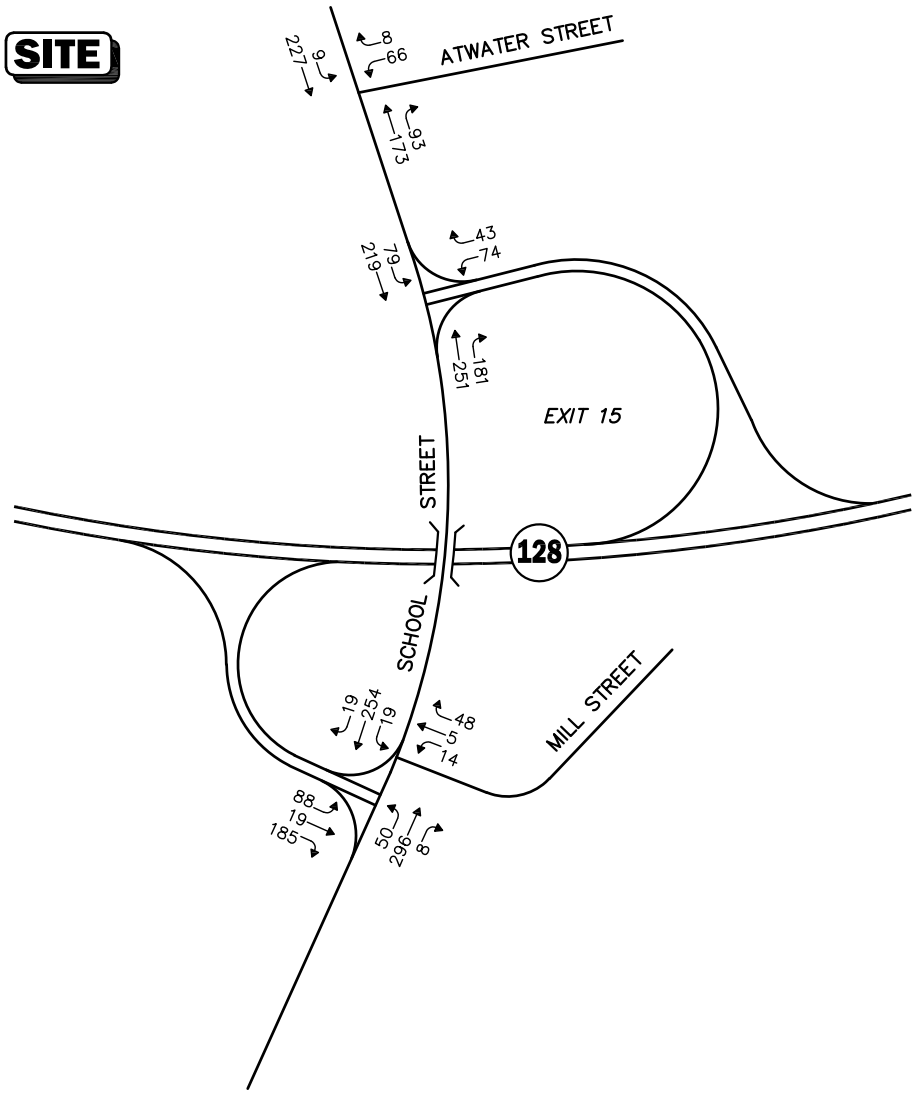
Table 5
TRIP GENERATION SUMMARY[a]

Time Period	Vehicle Trips		
	Entering	Exiting	Total
Average Weekday:	427	427	854
Weekday Morning Peak-Hour:	14	39	53
Weekday Evening Peak-Hour:	41	27	68

[a]Based on ITE LUC 221, *Multifamily Housing (Mid-Rise).*

[7]Ibid 1.

WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



WEEKDAY EVENING PEAK HOUR (4:30-5:30 PM)

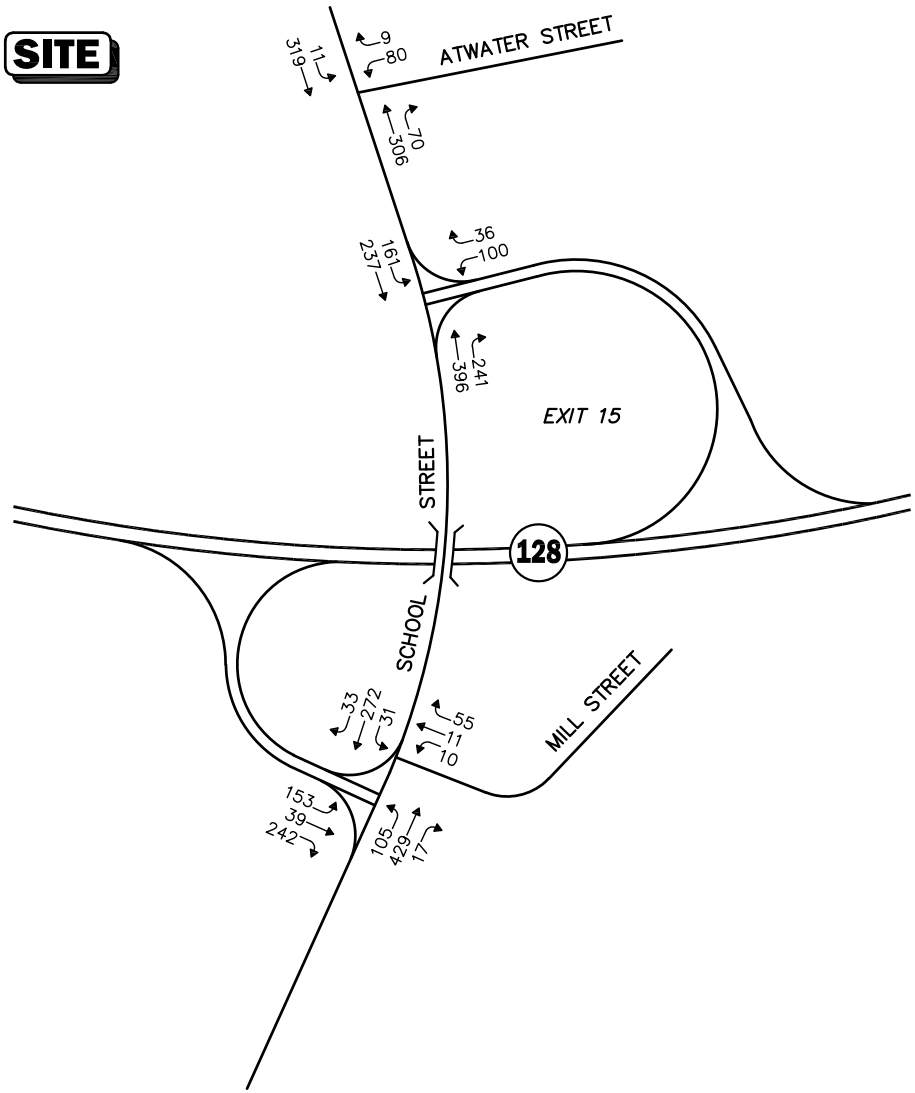


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Figure 4

2027 No-Build
Peak Hour Traffic Volumes

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Project-Generated Traffic Volume Summary

As can be seen in Table 5, the Project is expected to generate approximately 854 vehicle trips on an average weekday (two-way, 24-hour volume, or 427 vehicles entering and 427 exiting), with 53 vehicle trips (14 vehicles entering and 39 exiting) expected during the weekday morning peak-hour and 68 vehicle trips (41 vehicles entering and 27 exiting) expected during the weekday evening peak-hour.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of generated trips to and from the Project site was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Manchester-by-the-Sea and then refined based on existing traffic patterns within the study area. This methodology is consistent with the residential nature of the Project and the predominant land use within the study area. The general trip distribution for the Project is graphically depicted on Figure 5. The additional traffic expected to be generated by the Project was assigned on the study area roadway network as shown on Figure 6.

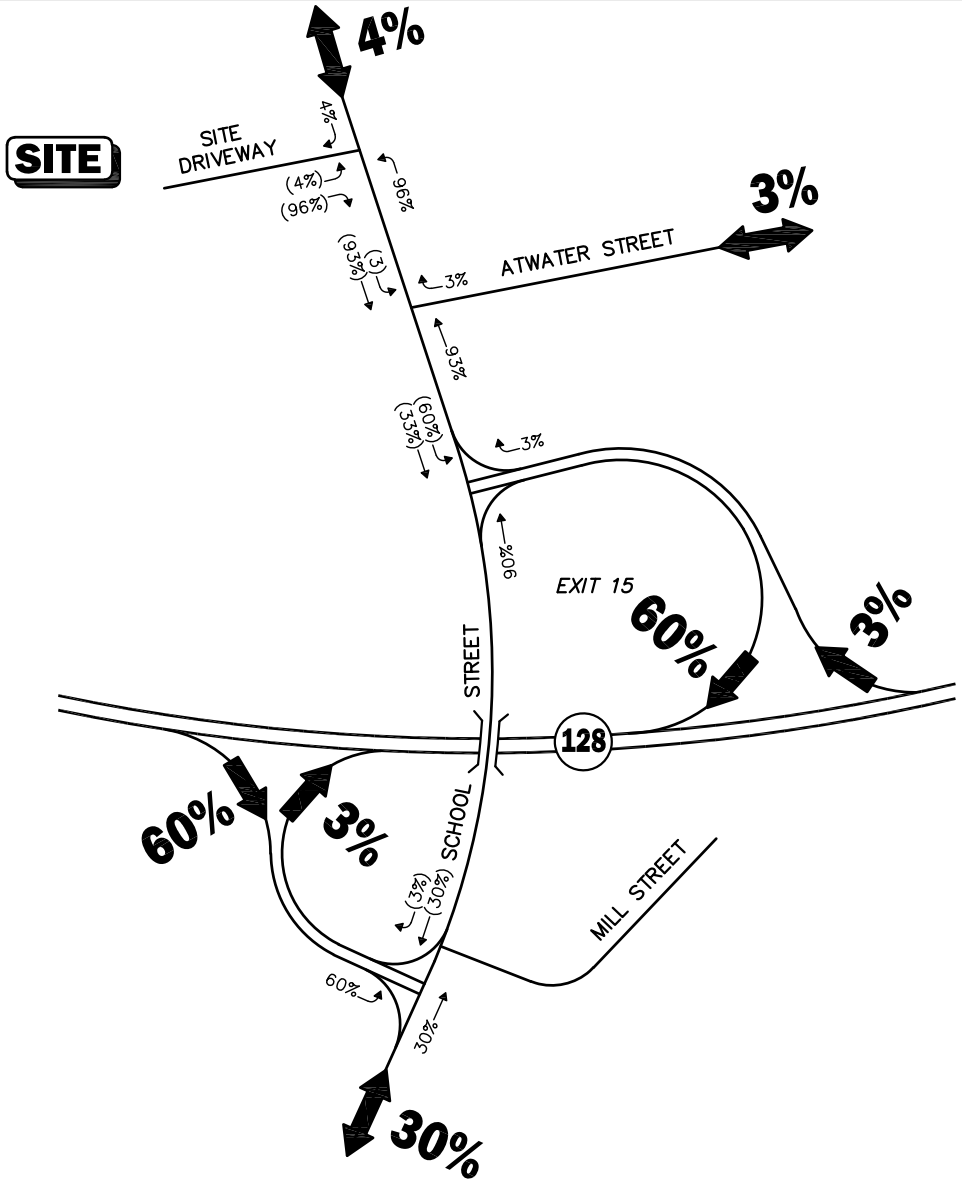
FUTURE TRAFFIC VOLUMES - BUILD CONDITION

The 2027 Build condition traffic volumes consist of the 2027 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The 2027 Build weekday morning and evening peak-hour traffic-volumes are graphically depicted on Figure 7.

A summary of peak-hour projected traffic-volume changes outside of the study area that is the subject of this assessment is shown in Table 6. These changes are a result of the construction of the Project.

Table 6
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	2020 Existing	2027 No-Build	2027 Build	Traffic Volume Increase Over No-Build	Percent Increase Over No-Build
School Street, north of Site Roadway:					
Weekday Morning	388	417	420	3	0.7
Weekday Evening	601	645	648	3	0.5
Route 128 Northbound Ramp:					
Weekday Morning	343	366	375	9	2.5
Weekday Evening	544	583	609	26	4.5
Route 128 Southbound Ramp:					
Weekday Morning	352	377	401	24	6.4
Weekday Evening	502	538	555	17	3.2
Mill Street, east of School Street:					
Weekday Morning	106	113	113	0	0.0
Weekday Evening	151	163	163	0	0.0
School Street, south of Mill Street and Route 128 Northbound Ramp:					
Weekday Morning	753	807	823	16	2.0
Weekday Evening	1,003	1,075	1,096	21	1.9



Legend:

XX	Entering Trips
(XX)	Exiting Trips

Not to Scale

Figure 5

Trip Distribution Map

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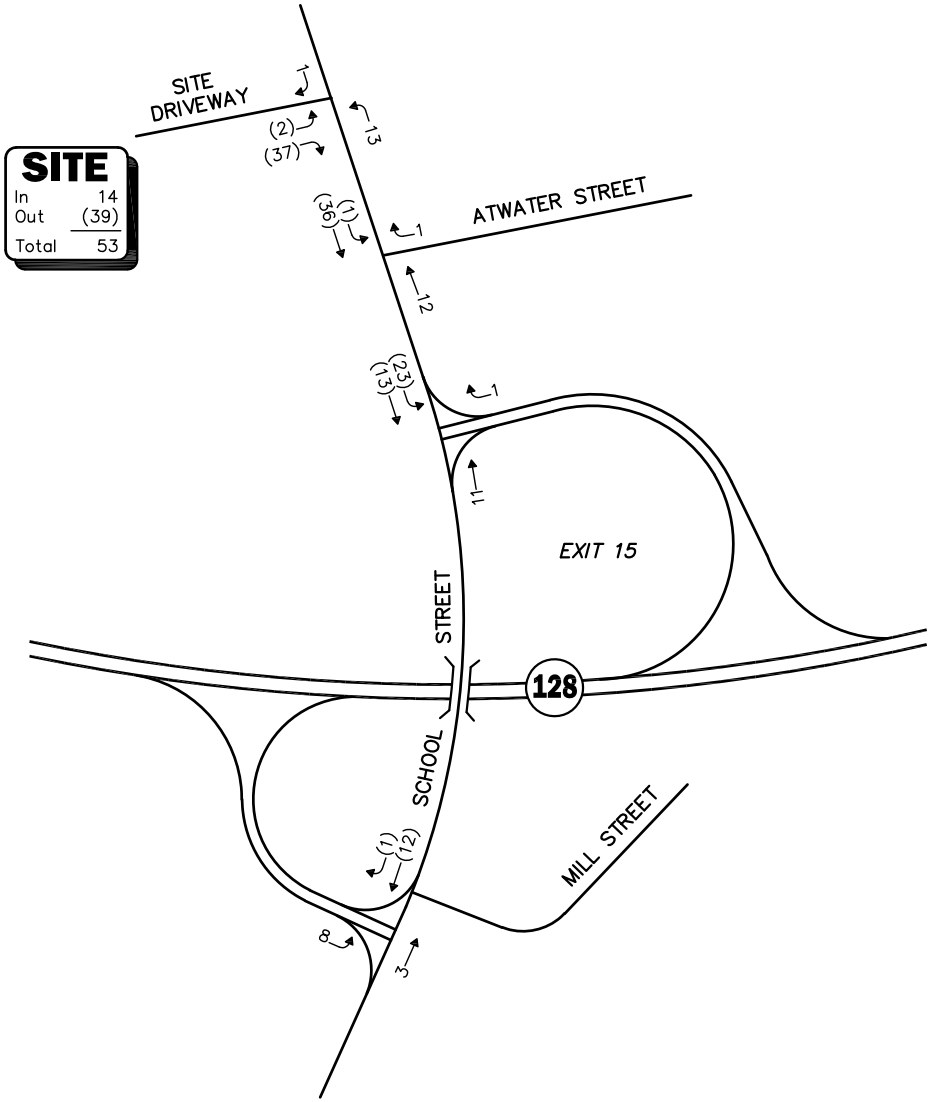
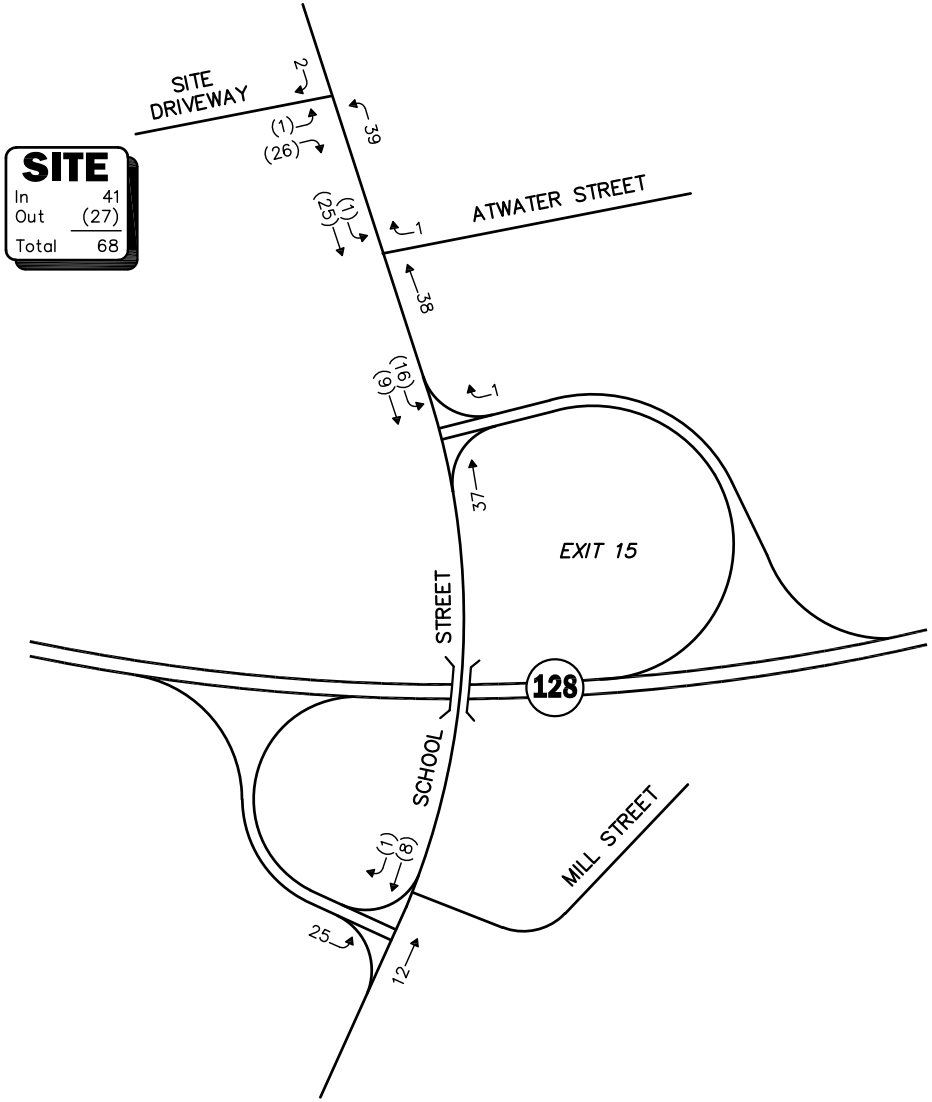
WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not to Scale

Figure 6

Project-Generated Peak Hour Traffic Volumes

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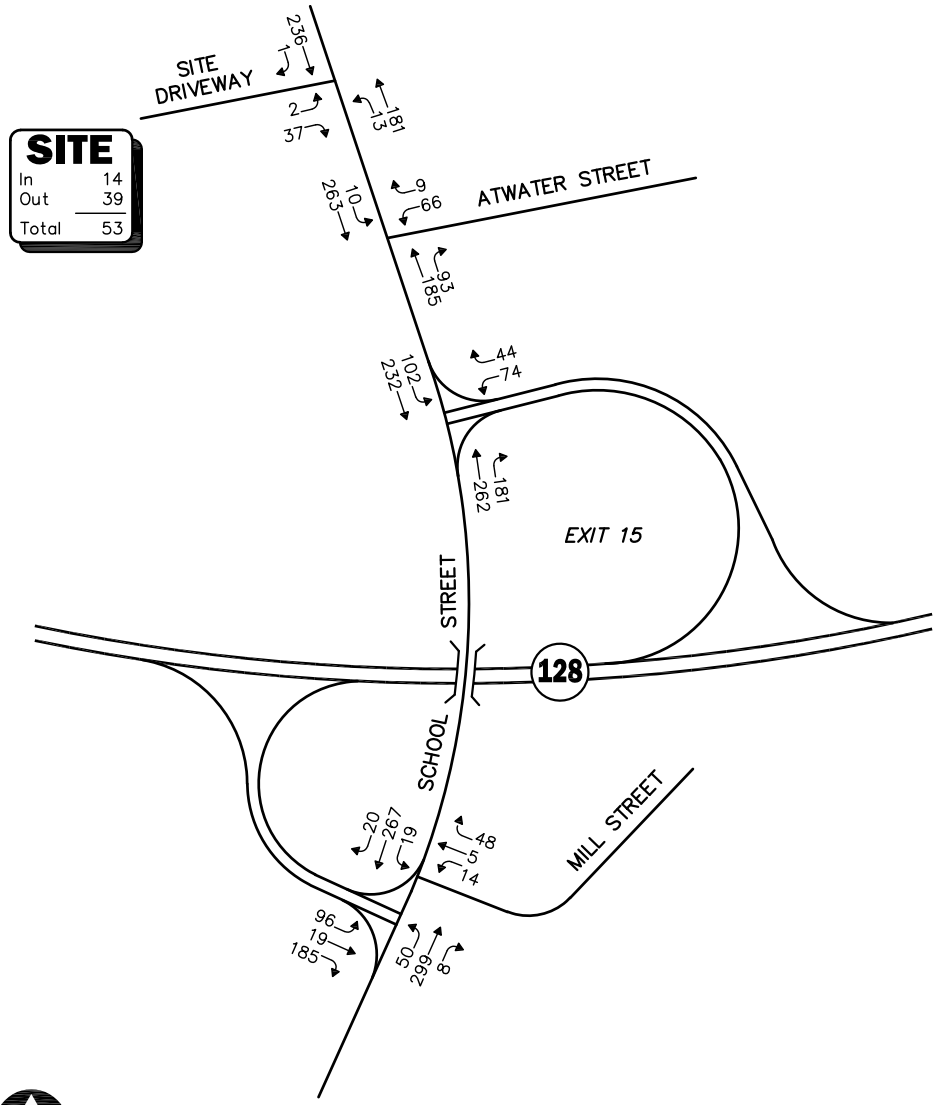
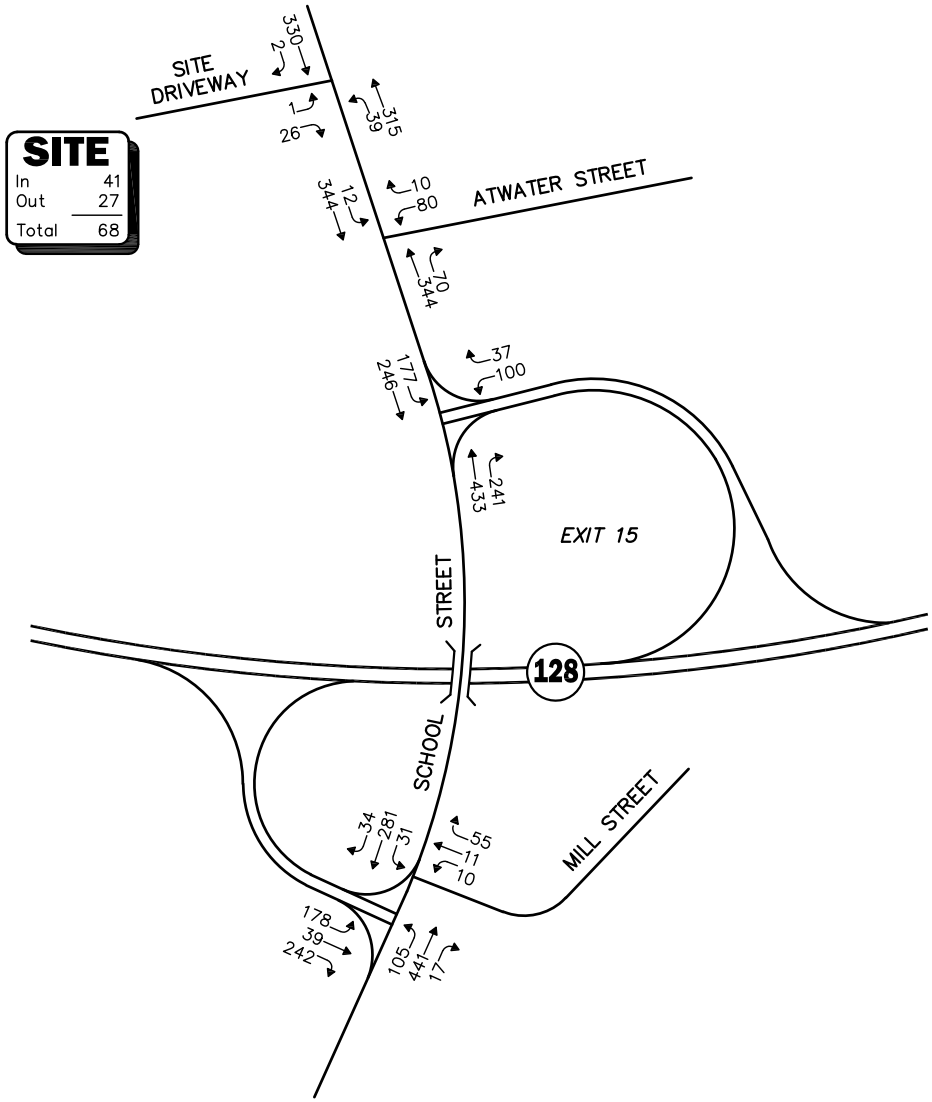
WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



WEEKDAY EVENING PEAK HOUR (4:30-5:30 PM)



Not to Scale

Figure 7

2027 Build
Peak Hour Traffic Volumes

Vanasse & Associates inc

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As shown in Table 6, Project-related traffic-volume increases outside of the study area relative to 2027 No-Build conditions are anticipated to range from 0.0 to 6.4 percent during the peak periods, with vehicle increases shown to range from 0 to 26 vehicles. ***When distributed over the peak-hour, the predicted traffic volume increases would not result in a significant impact (increase) on motorist delays or vehicle queuing outside of the immediate study area that is the subject of this assessment.***

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build and Build traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.[8] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

[8]The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual;* Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersections

The six levels of service 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 levels of service of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[9] Level of service 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 level of service at unsignalized intersections are also given in the 2010 *Highway Capacity Manual*. Table 7 summarizes the relationship between level of service and average control delay for two-way stop controlled and all-way stop controlled intersections.

Table 7
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

Level-Of-Service by Volume-to-Capacity Ratio		Average Control Delay
v/c ≤ 1.0	v/c > 1.0	(Seconds Per Vehicle)
A	F	≤10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	>50.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 19-2.

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

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro® intersection capacity analysis software which is based upon the methodology and procedures presented in the 2010 *Highway Capacity Manual*. The Synchro® vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro® reports both the average (50th percentile) the 95th percentile vehicle queue. For unsignalized intersections, Synchro® reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three minutes out of sixty minutes during the peak one hour of the day (during the remaining fifty-seven minutes, the vehicle queue length will be less than the 95th percentile queue length).

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2020 Existing, 2027 No-Build and 2027 Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized on Table 8, with the detailed analysis results presented in the Appendix.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area. For context, we note that an LOS of "D" or better is generally defined as "acceptable" operating conditions.

Unsignalized Intersections:

School Street/Route 128 Southbound Ramp **–** All movements were shown to operate at LOS C or better during the morning peak hour with minimal vehicle queuing (approximately one (1) vehicle). During the weekday evening peak-hour, left-turn movements from Route 128 southbound ramp are currently operating at LOS D under Existing conditions and were shown to degrade from LOS D to LOS E under No-Build conditions as a result of traffic volume increasers independent of the Project. With addition of the Project related traffic, motorist delays for left-turn movements from Route 128 southbound ramp were shown to increase resulting in a degradation in LOS from LOS E to LOS F; however, the resulting increase in vehicle queuing was shown to be minimal (one (1) vehicle).

School Street/Route 128 Northbound Ramps/Mill Street **–** Under 2020 Existing conditions, critical movements at this unsignalized intersection (left-turn/through movements from Route 128 northbound ramp) are predicted to operate at LOS D during the weekday morning peak-hour and at LOS F during the weekday evening peak-hour. Under 2027 No-Build conditions, the critical movements were shown to degrade to LOS E during the weekday morning peak-hour and to continue operating at LOS F during the weekday evening peak-hour. With the addition of Project-related traffic, operating conditions for the critical movements were shown to degrade from LOS E to LOS F during the weekday morning peak-hour with vehicle queues increasing by approximately one (1) vehicle and to remain at LOS F during the weekday evening peak-hour with vehicle queues predicted to increase by up to four (4) vehicles. All movements along School Street approaching the intersection were shown to operate at LOS A under all analysis conditions.

School Street/ Atwater Street **–** All movements at this intersection were shown to operate at LOS D or better during the peak hours, with Project-related impacts defined as an increase in average motorist delay of up to 4.9 seconds with no predicted increase in vehicle queuing.

School Street/Project Site Driveway **–** All movements exiting the Project site were shown to operate at LOS B or better during the peak hours with negligible vehicle queuing. All movements along School Street were shown to operate at LOS A during the peak hours also with negligible vehicle queuing predicted.

Table 8
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Unsignalized Intersection/ Peak Hour/Movement	2020 Existing				2027 No-Build				2027 Build			
	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
School Street/Route 128 Southbound Ramp:												
Weekday Morning Peak-Hour:												
Route 128 Southbound Ramp WB LT	69	17.6	C	1	74	19.3	C	1	74	22.4	C	1
Route 128 Southbound Ramp WB RT	40	10.2	B	0	43	10.4	B	0	44	10.5	B	0
School Street NB TH	234	0.0	A	0	251	0.0	A	0	262	0.0	A	0
School Street NB RT	169	0.0	A	0	181	0.0	A	0	181	0.0	A	0
School Street SB LT/RT	278	2.1	A	0	298	2.2	A	0	334	2.5	A	0
Weekday Evening Peak-Hour:												
Route 128 Southbound Ramp WB LT	93	32.5	D	2	100	41.9	E	3	100	>50.0	F	4
Route 128 Southbound Ramp WB RT	34	10.9	B	0	36	11.1	B	0	37	11.5	B	0
School Street NB TH	369	0.0	A	0	396	8.7	A	0	433	9.0	A	0
School Street NB RT	225	0.0	A	0	241	0.0	A	0	241	0.0	A	0
School Street SB LT/RT	371	3.5	A	1	398	3.5	A	1	423	3.8	A	1
School Street/Route 128 Northbound Ramp/Mill Street:												
Weekday Morning Peak-Hour:												
Route 128 Northbound Ramp EB LT/TH	100	32.6	D	3	107	42.0	E	4	115	50.0	F	5
Route 128 Northbound Ramp EB RT	173	12.1	B	1	185	12.7	B	2	185	12.9	B	2
Mill Street WB LT/TH/RT	63	15.5	C	1	67	17.1	C	1	67	17.6	C	1
School Street NB LT/TH/RT	330	1.1	A	0	354	1.1	A	0	357	1.1	A	0
School Street SB LT/TH	255	0.0	A	0	274	0.0	A	0	286	0.0	A	0
School Street SB RT	18	0.0	A	0	19	0.0	A	0	20	0.0	A	0
Weekday Evening Peak-Hour:												
Route 128 Northbound Ramp EB LT/TH	179	>50.0	F	12	192	>50.0	F	16	217	>50.0	F	20
Route 128 Northbound Ramp EB RT	226	12.2	B	2	242	12.8	B	2	242	12.9	B	2
Mill Street WB LT/TH/RT	80	22.5	C	2	76	28.8	D	2	76	30.3	D	2
School Street NB LT/TH/RT	514	1.5	A	0	551	1.6	A	0	563	1.6	A	0
School Street SB LT/TH	283	0.0	A	0	304	0.0	A	0	312	0.0	A	0
School Street SB RT	31	0.0	A	0	33	0.0	A	0	34	0.0	A	0

See note at the end of the table

Table 8 (Continued)
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Unsignalized Intersection/ Peak Hour/Movement	2020 Existing				2027 No-Build				2027 Build			
	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
School Street/Atwater Street:												
Weekday Morning Peak-Hour:												
Atwater Street WB LT/RT	69	14.5	B	1	74	15.5	C	1	75	16.7	C	1
School Street NB TH/RT	248	0.0	A	0	266	0.0	A	0	278	0.0	A	0
School Street SB LT/TH	220	0.3	A	0	236	0.3	A	0	273	0.3	A	0
Weekday Evening Peak-Hour:												
Atwater Street WB LT/RT	83	21.3	C	2	89	24.6	C	3	90	29.5	D	3
School Street NB TH/RT	350	0.0	A	0	376	0.0	A	0	414	0.0	A	0
School Street SB LT/TH	308	0.3	A	0	330	0.3	A	0	356	0.3	A	0
School Street/Project Site Driveway:												
Weekday Morning Peak-Hour:												
Site Driveway EB LT/RT	--	--	--	--	--	--	--	--	39	10.0	B	0
School Street NB LT/TH	--	--	--	--	--	--	--	--	194	0.5	A	0
School Street SB TH/RT	--	--	--	--	--	--	--	--	237	0.0	A	0
Weekday Evening Peak-Hour:												
Site Driveway EB LT/RT	--	--	--	--	--	--	--	--	27	10.7	B	0
School Street NB LT/TH	--	--	--	--	--	--	--	--	354	0.9	A	0
School Street SB TH/RT	--	--	--	--	--	--	--	--	332	0.8	A	0

[a]Demand in vehicles per hour.
[b]Average control delay per vehicle (in seconds).
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

SIGHT DISTANCE EVALUATION

Sight distance measurements were performed at the Project site driveway intersection with School Street in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)[10] requirements. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 9 presents the measured SSD and ISD at the subject intersection.

[10] *A Policy on Geometric Design of Highway and Streets,* 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2018.

Table 9
SIGHT DISTANCE MEASUREMENTS[a]

Intersection/Sight Distance Measurement	Feet		
	Required Minimum (SSD)	Desirable (ISD)[b]	Measured[c]
School Street at the Project Driveway			
Stopping Sight Distance:			
School Street approaching from the north	360	--	551
School Street approaching from the south	360	--	650+
Intersection Sight Distance:			
Looking to the north from the Project Driveway	360	430	596
Looking to the south from the Project Driveway	360	500	650+

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets,* 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2018; and based on a 45 mph approach speed on School Street.

[b]Values shown are the intersection sight distance for a vehicle turning right or left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

As can be seen in Table 9, the available lines of sight to and from the Project site driveway intersection with School Street were shown to exceed the recommended minimum sight distances to function in a safe (SSD) and efficient (ISD) manner based on a 45 mph approach speed, which is slightly above the measured 85th percentile vehicle travel speed (43 mph) and 10 mph above the posted speed limit (35 mph).

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

VAI has conducted a TIA in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a 157-unit multifamily residential community to be located off School Street in Manchester-By-The-Sea, Massachusetts. The following specific areas have been evaluated as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE,[11] the Project is expected to generate approximately 854 vehicle trips on an average weekday (two-way, 24-hour volume), with 53 vehicle trips expected during the weekday morning peak-hour and 68 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), acknowledging that one or more movements from the Route 128 off-ramps to School Street are predicted to operate at or over capacity (i.e., LOS "E" of "F", respectively) independent of the Project, with Project-related impacts at the ramp intersections generally characterized by a predicted increase in motorist delays that resulted in an increase in vehicle queuing by up to four (4) vehicles;

3. All movements at the Project site driveway intersection with School Street are predicted to operate at LOS B or better during the peak hours with negligible vehicle queuing;

4. No apparent safety deficiencies were noted with respect to the motor vehicle crash history at the study area intersections, with all of the intersections found to have motor vehicle crash rates that are below the MassDOT average crash rates for similar intersections; and

5. The available lines of sight at the Project site driveway intersection with School Street were found to exceed the recommended minimum sight distances to function in a safe and efficient manner.

[11] Ibid 1.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any deficiencies identified at off-site locations evaluated in conjunction with this study. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the Project site will be provided by way of a new driveway that will intersect west side of School Street approximately 135 feet north of Atwater Street. The driveway has been designed as a boulevard-type access starting at School Street and extending into the Project site for a distance of approximately 700 feet before transitioning to a non-divided access. The following recommendations are offered with respect to the design and operation of the Project site access and internal circulation, many of which are reflected on the Site Plans:

- The boulevard section of the Project site driveway should provide two (2) 14-foot wide (minimum) travel lanes separated by a 6-foot wide (minimum) raised median with openings or traversable areas provided along the median every 200-feet to allow for emergency vehicles to cross the median when necessary. The non-boulevard section of the driveway should be a minimum of 22-feet in width and designed to accommodate the turning and maneuvering requirements of the largest anticipated responding emergency vehicle.

- Where perpendicular parking is proposed, the drive aisle behind the parking should be a minimum of 23-feet in order to facilitate parking maneuvers.

- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.

- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[12]

- Americans with Disabilities Act (ADA) compliant wheelchair ramps should be provided at all pedestrian crossings that are to be constructed or modified as a part of the Project.

- Signs and landscaping to be installed as a part of the Project within the sight triangle areas of the Project site driveway should be designed and maintained so as not to restrict lines of sight.

- Snow windrows within sight triangle areas of the Project site driveway should be promptly removed where such accumulations would impede sight lines.

[12]Ibid 2.

- Consideration should be given to providing accommodations for electric vehicle charging for residents of the Project.

Off-Site

School Street at the Route 128 Ramps

Operating conditions for movements from the Route 128 north and southbound ramps to School Street are currently or are predicted to operate at or over capacity independent of the Project. Project-related impacts at the ramp intersections were generally defined by a predicted increase in motorist delays that resulted in an increase in vehicle queuing of up to four (4) vehicles. In an effort to identify potential improvement measures for the ramp intersections, the Project proponent will conduct an improvement study for the Route 128 north and southbound ramp intersections with School Street that will include performing a detailed Traffic Signal Warrants Analysis (TSWA) in accordance with the methodology defined in the MUTCD[13] and preparing conceptual improvement plans depicting the recommended improvements. This information will be formatted to allow the Town to apply for state funding for the recommended improvement strategies. The improvement study will be conducted in consultation with the Town and MassDOT, and will be provided to the Town prior to the issuance of a Certificate of Occupancy for the Project.

Transportation Demand Management

Regularly scheduled public transportation services are provided to the Town of Manchester-by-the Sea, but are not available in the vicinity of the Project site. The MBTA provides Commuter Rail service to North Station in Boston on the Newburyport/Rockport Line from Manchester-by-the Sea Station, which is located at 40 Beach Street (an approximate 7-minute driving distance to the south of the Project site). In an effort to reduce the overall number of automobile trips in the area and to integrate the Project into the available transportation resources, the following Transportation Demand Management (TDM) measures will be implemented as a part of the Project:

- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location and/or otherwise made available to residents;
- A "welcome packet" will be provided to new residents detailing available public transportation services, bicycle and walking alternatives, and commuter options available;
- Pedestrian accommodations will be incorporated into the Project and consist of sidewalks and ADA compliant wheelchair ramps at all pedestrian crossings that are to be constructed or modified as a part of the Project;
- Work-at-home workspaces will be provided to support telecommuting by residents of the Project;
- An internal mail room will be provided within the building; and
- Bicycle parking will be provided consisting of both an exterior bicycle rack located proximate to the building entrance and weather protected bicycle parking within the proposed parking garage.

[13] Ibid.

With implementation of the aforementioned recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing and improved transportation system.

APPENDIX

PROJECT SITE PLAN
AUTOMATIC TRAFFIC RECORDER COUNT DATA
MANUAL TURNING MOVEMENT COUNT DATA
TRAIL MAPS
SEASONAL ADJUSTMENT DATA
VEHICLE TRAVEL SPEED DATA
PUBLIC TRANSPORTATION SCHEDULES
MOTOR VEHICLE CRASH DATA
CRASH RATE WORKSHEETS
GENERAL BACKGROUND TRAFFIC GROWTH
TRIP-GENERATION CALCULATIONS
TRIP-DISTRIBUTION CALCULATIONS
CAPACITY ANALYSIS WORKSHEETS

PROJECT SITE PLAN

CONSERVATION AREA
BOARDWALK

OLD SCHOOL STREET TRAIL & ACCESS ROAD

SCHOOL STREET

B

3

APARTMENT GROUP A

SOUTH AMENITY
COURTYARD

NORTH
AMENITY
COURTYARD

4

AMENITY SPACE

A

2

A

APARTMENT GROUP B

55' - 0"

125' - 0"

DROP OFF

1

B

SCHOOL STREET

SITE LAYOUT PLAN | EMBARC

A8

AUTOMATIC TRAFFIC RECORDER COUNT DATA

Vanasse & Associates

35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
Location: N of Atwater Avenue
City: Manchester By The Sea, MA

Site Code: 00844101

Start	06-Jul-20		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	Southboun	Northbou	Southbo	Northbou	Southbo	Northbou	Southbo	Northbou	Southbo	Northbou	Southbo	Northbou	Southbo	Northbou	Southbo	Northbou
12:00 AM	*	*	*	*	6	5	2	2	6	9	*	*	*	*	5	5
01:00	*	*	*	*	2	4	2	6	2	1	*	*	*	*	2	4
02:00	*	*	*	*	3	4	2	1	2	3	*	*	*	*	2	3
03:00	*	*	*	*	4	3	4	2	3	1	*	*	*	*	4	2
04:00	*	*	*	*	9	4	6	2	4	4	*	*	*	*	6	3
05:00	*	*	*	*	28	18	22	23	25	15	*	*	*	*	25	19
06:00	*	*	*	*	94	65	86	61	92	62	*	*	*	*	91	63
07:00	*	*	155	127	157	129	165	142	**144**	**141**	*	*	*	*	155	135
08:00	*	*	**191**	115	164	135	172	141	*	*	*	*	*	*	**176**	130
09:00	*	*	158	151	169	153	**181**	153	*	*	*	*	*	*	169	152
10:00	*	*	171	175	163	164	178	193	*	*	*	*	*	*	171	177
11:00	*	*	181	**225**	**178**	**185**	155	**231**	*	*	*	*	*	*	171	**214**
12:00 PM	*	*	212	252	**230**	213	203	219	*	*	*	*	*	*	215	228
01:00	*	*	201	216	201	212	243	229	*	*	*	*	*	*	215	219
02:00	*	*	**251**	221	226	205	234	210	*	*	*	*	*	*	**237**	212
03:00	*	*	243	**289**	220	246	247	**261**	*	*	*	*	*	*	237	**265**
04:00	*	*	237	279	218	**261**	228	248	*	*	*	*	*	*	228	263
05:00	*	*	193	262	198	220	**253**	224	*	*	*	*	*	*	215	235
06:00	*	*	182	177	168	144	175	197	*	*	*	*	*	*	175	173
07:00	*	*	155	87	89	88	141	133	*	*	*	*	*	*	128	103
08:00	*	*	118	76	87	64	141	82	*	*	*	*	*	*	115	74
09:00	*	*	69	48	51	38	79	60	*	*	*	*	*	*	66	49
10:00	*	*	28	17	21	26	30	38	*	*	*	*	*	*	26	27
11:00	*	*	20	12	14	16	12	18	*	*	*	*	*	*	15	15
Lane	0	0	2765	2729	2700	2602	2961	2876	278	236	0	0	0	0	2849	2770
Day	0		5494		5302		5837		514		0		0		5619	
AM Peak	-	-	08:00	11:00	11:00	11:00	09:00	11:00	07:00	07:00	-	-	-	-	08:00	11:00
Vol.	-	-	191	225	178	185	181	231	144	141	-	-	-	-	176	214
PM Peak	-	-	14:00	15:00	12:00	16:00	17:00	15:00	-	-	-	-	-	-	14:00	15:00
Vol.	-	-	251	289	230	261	253	261	-	-	-	-	-	-	237	265

Comb. Total	0	5494	5302	5837	514	0	0	5619

ADT ADT 5,619 AADT 5,619

School Street @ Hidden Ledge Road

October 4th, 2016 - October 12th, 2016

Traffic Study

Total Vehicles (#)	66783	9540/day
Inbound (Total #)	34782	4969/day
Outbound (Total #)	32001	4572/day

Speed (MPH)	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99
Vehicles (by speed range)	239	727	3473	20550	32233	8543	672	89	51	27	28	18	16	22	41

Inbound (Average Speed)	**30.61**
Outbound (Average Speed)	**31.53**
Combined Average Speed	***31.07***

The extemely high speeds are cause by two vehicles (travelling in opposite directions) crossing the tubes at the same time.

Vehicle Classifications	
Motorcycle	537
Passenger Car	56058
Pickup Truck/Van	7377
Buses	324
Single Unit - 2 Axles, 6 Tires	1645
Single Unit - 2 Axles, 6 Tires	616
Single Unit Truck - 3 Axles	69
Single Unit Truck - 4 Axles	71
Single Unit Truck 4 Axles or less	65
Double Unit - 5 Axles	14
Double Unit - 6 Axles or more	0
Multi-Unit - 5 Axles or less	3
Multi - Unit - 6 Axles	4

Manchester by-the-Sea Police Department
10 Central Street
Manchester by-the-Sea, MA 01944
p. 978-526-1212 f. 978-526-2002

Prepared by: Ofc Ryan Machain

MANUAL TURNING MOVEMENT COUNT DATA

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 1

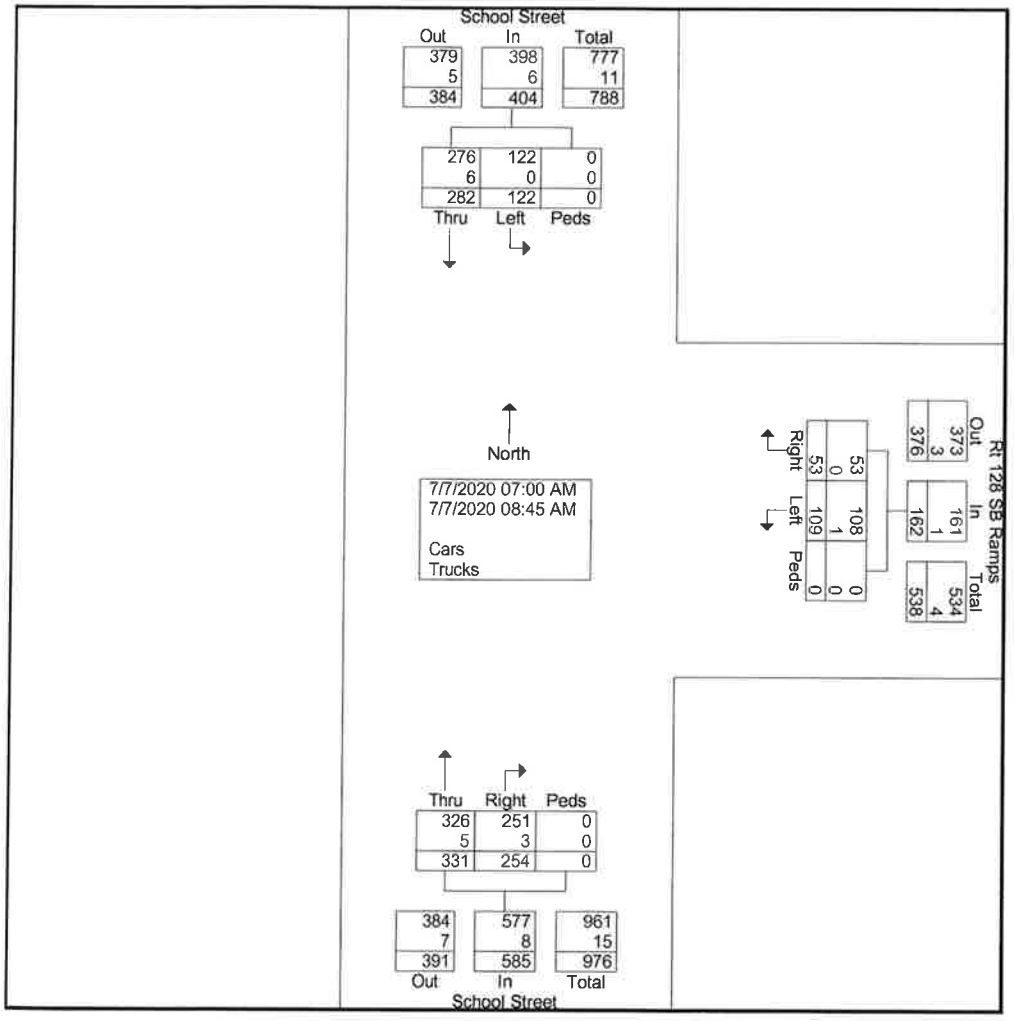
Groups Printed- Cars - Trucks

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	19	18	0	37	5	5	0	10	20	29	0	49	96
07:15 AM	35	13	0	48	2	10	0	12	36	66	0	102	162
07:30 AM	31	16	0	47	11	12	0	23	24	31	0	55	125
07:45 AM	45	17	0	62	10	15	0	25	31	54	0	85	172
Total	130	64	0	194	28	42	0	70	111	180	0	291	555
08:00 AM	46	11	0	57	8	16	0	24	39	29	0	68	149
08:15 AM	33	19	0	52	6	16	0	22	32	39	0	71	145
08:30 AM	25	18	0	43	2	18	0	20	37	36	0	73	136
08:45 AM	48	10	0	58	9	17	0	26	35	47	0	82	166
Total	152	58	0	210	25	67	0	92	143	151	0	294	596
Grand Total	282	122	0	404	53	109	0	162	254	331	0	585	1151
Apprch %	69.8	30.2	0		32.7	67.3	0		43.4	56.6	0		
Total %	24.5	10.6	0	35.1	4.6	9.5	0	14.1	22.1	28.8	0	50.8	
Cars	276	122	0	398	53	108	0	161	251	326	0	577	1136
% Cars	97.9	100	0	98.5	100	99.1	0	99.4	98.8	98.5	0	98.6	98.7
Trucks	6	0	0	6	0	1	0	1	3	5	0	8	15
% Trucks	2.1	0	0	1.5	0	0.9	0	0.6	1.2	1.5	0	1.4	1.3

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 2



Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 3

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	35	13	0	48	2	10	0	12	36	**66**	0	**102**	162
07:30 AM	31	16	0	47	**11**	12	0	23	24	31	0	55	125
07:45 AM	45	**17**	0	**62**	10	15	0	**25**	31	54	0	85	**172**
08:00 AM	**46**	11	0	57	8	**16**	0	24	**39**	29	0	68	149
Total Volume	157	57	0	214	31	53	0	84	130	180	0	310	608
% App. Total	73.4	26.6	0		36.9	63.1	0		41.9	58.1	0		
PHF	.853	.838	.000	.863	.705	.828	.000	.840	.833	.682	.000	.760	.884
Cars	153	57	0	210	31	53	0	84	128	175	0	303	597
% Cars	97.5	100	0	98.1	100	100	0	100	98.5	97.2	0	97.7	98.2
Trucks	4	0	0	4	0	0	0	0	2	5	0	7	11
% Trucks	2.5	0	0	1.9	0	0	0	0	1.5	2.8	0	2.3	1.8

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School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
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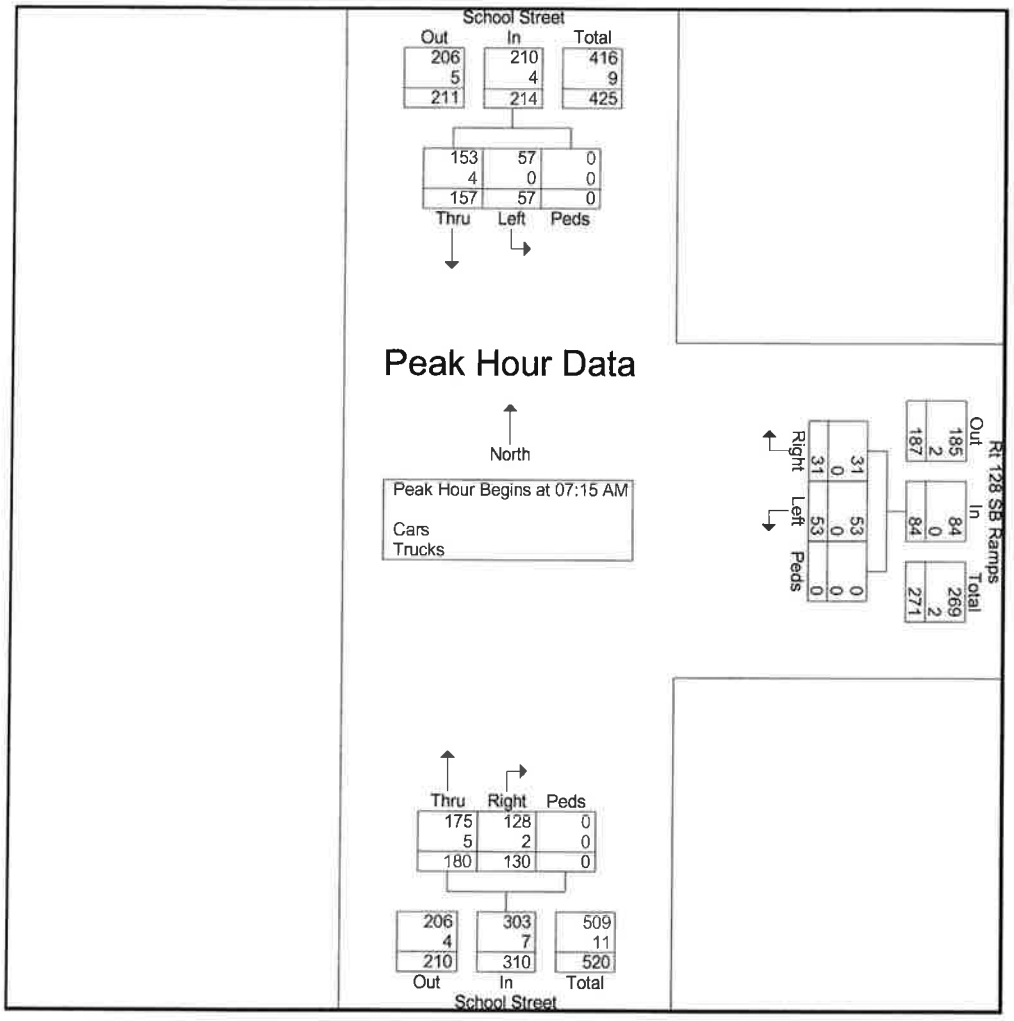
Page No : 4



Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 1

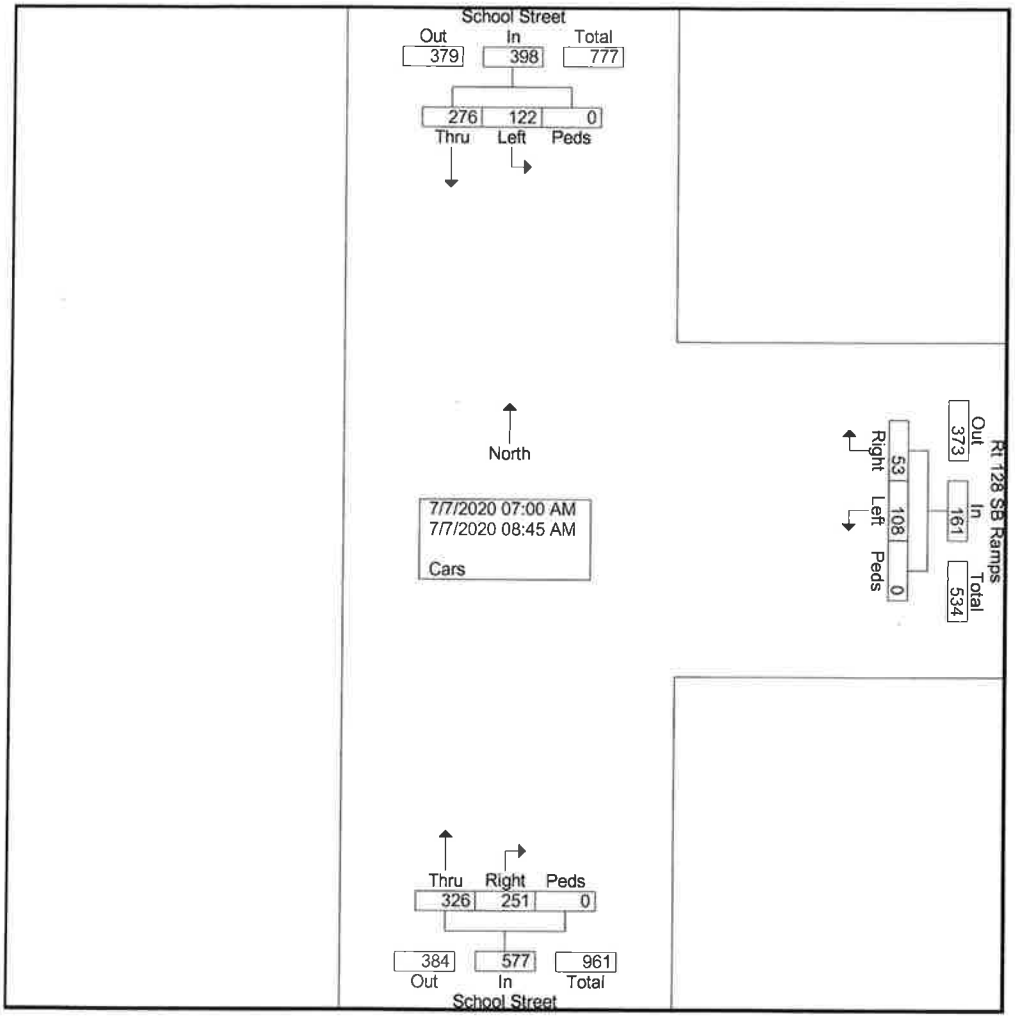
Groups Printed- Cars

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	18	18	0	36	5	5	0	10	20	29	0	49	95
07:15 AM	34	13	0	47	2	10	0	12	36	66	0	102	161
07:30 AM	30	16	0	46	11	12	0	23	24	28	0	52	121
07:45 AM	45	17	0	62	10	15	0	25	31	53	0	84	171
Total	127	64	0	191	28	42	0	70	111	176	0	287	548
08:00 AM	44	11	0	55	8	16	0	24	37	28	0	65	144
08:15 AM	33	19	0	52	6	16	0	22	32	39	0	71	145
08:30 AM	25	18	0	43	2	17	0	19	36	36	0	72	134
08:45 AM	47	10	0	57	9	17	0	26	35	47	0	82	165
Total	149	58	0	207	25	66	0	91	140	150	0	290	588
Grand Total	276	122	0	398	53	108	0	161	251	326	0	577	1136
Apprch %	69.3	30.7	0		32.9	67.1	0		43.5	56.5	0		
Total %	24.3	10.7	0	35	4.7	9.5	0	14.2	22.1	28.7	0	50.8	

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 2

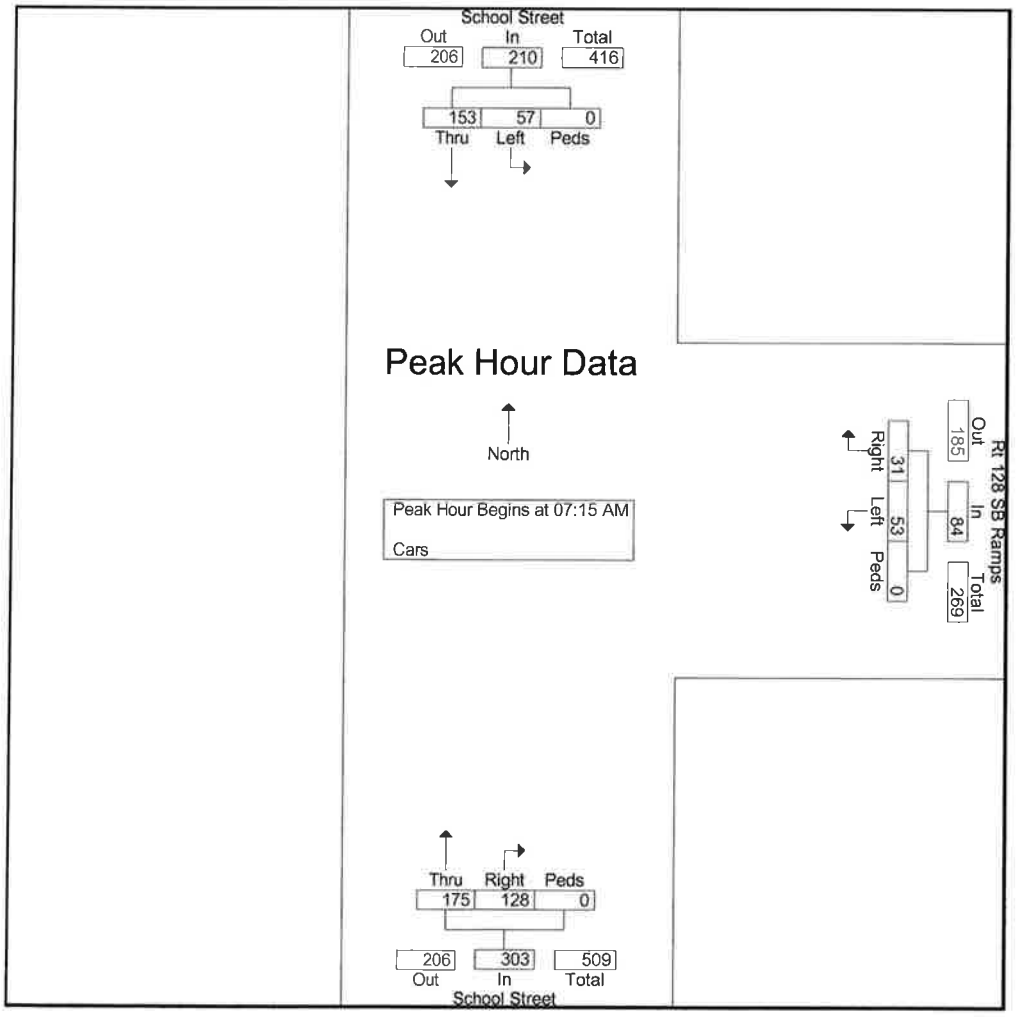


Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 3

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	34	13	0	47	2	10	0	12	36	**66**	0	**102**	161
07:30 AM	30	16	0	46	**11**	12	0	23	24	28	0	52	121
07:45 AM	**45**	**17**	0	**62**	10	15	0	**25**	31	53	0	84	**171**
08:00 AM	44	11	0	55	8	**16**	0	24	**37**	28	0	65	144
Total Volume	153	57	0	210	31	53	0	84	128	175	0	303	597
% App. Total	72.9	27.1	0		36.9	63.1	0		42.2	57.8	0		
PHF	.850	.838	.000	.847	.705	.828	.000	.840	.865	.663	.000	.743	.873



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School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 1

Groups Printed- Trucks

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
07:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
07:30 AM	1	0	0	1	0	0	0	0	0	3	0	3	4
07:45 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	3	0	0	3	0	0	0	0	0	4	0	4	7
08:00 AM	2	0	0	2	0	0	0	0	2	1	0	3	5
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
08:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	3	0	0	3	0	1	0	1	3	1	0	4	8
Grand Total	6	0	0	6	0	1	0	1	3	5	0	8	15
Apprch %	100	0	0		0	100	0		37.5	62.5	0		
Total %	40	0	0	40	0	6.7	0	6.7	20	33.3	0	53.3	

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School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
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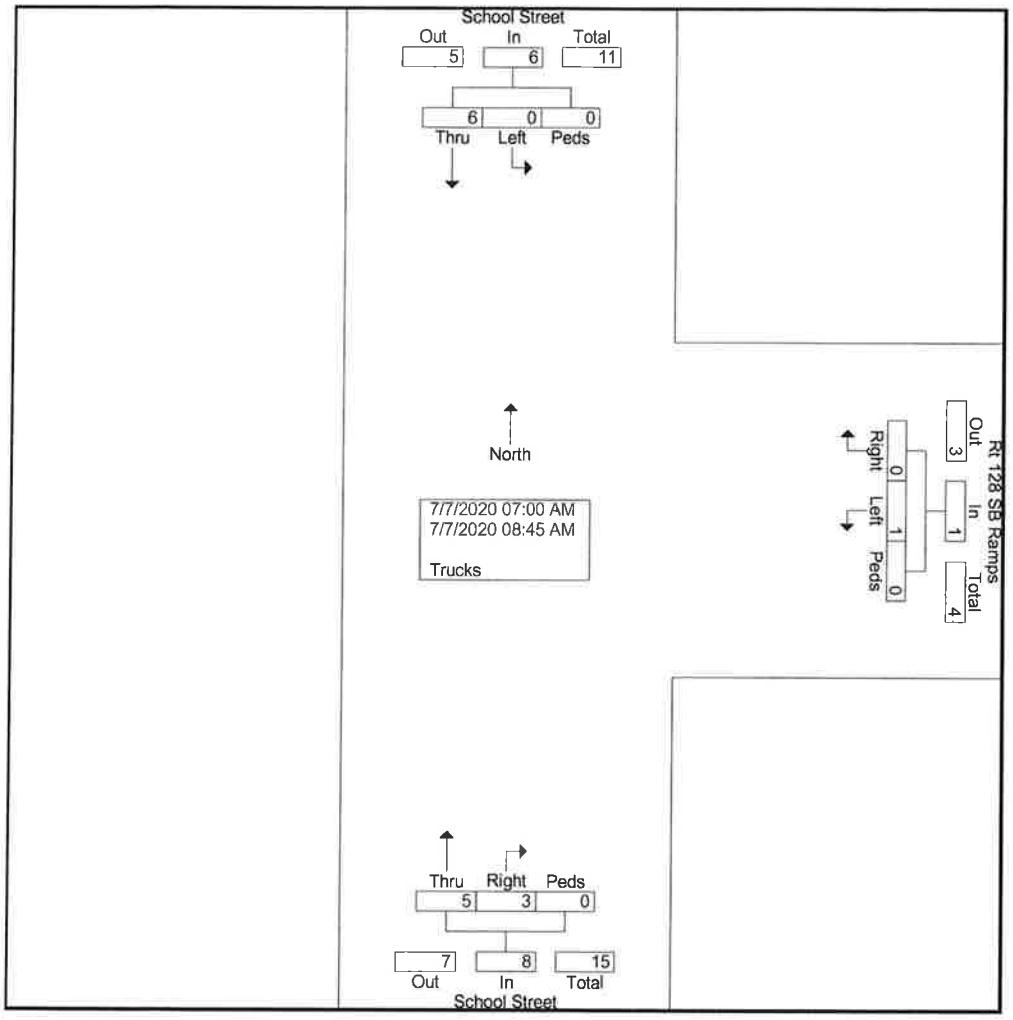

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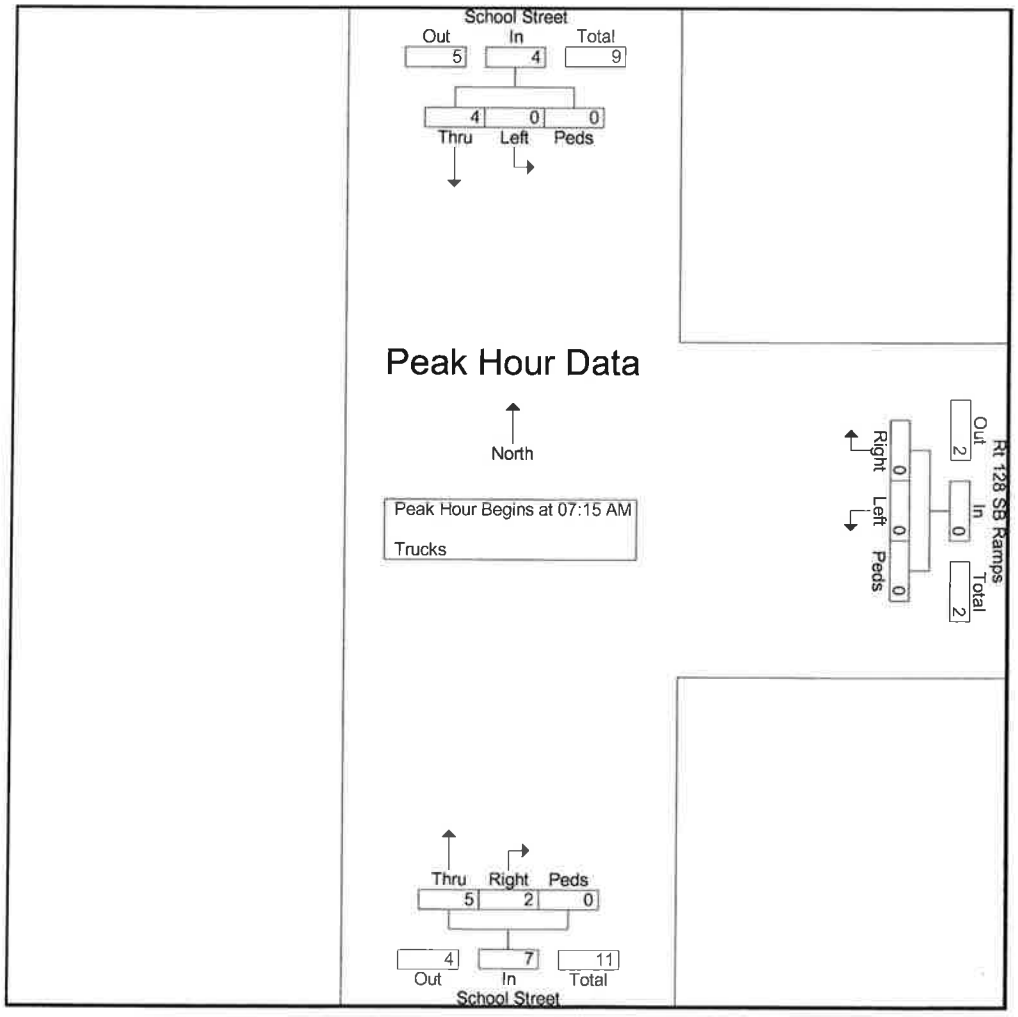
School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101am
Site Code : 00844101
Start Date : 7/7/2020
Page No : 3

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
07:30 AM	1	0	0	1	0	0	0	0	0	**3**	0	**3**	4
07:45 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:00 AM	**2**	0	0	**2**	0	0	0	0	**2**	1	0	3	**5**
Total Volume	4	0	0	4	0	0	0	0	2	5	0	7	11
% App. Total	100	0	0		0	0	0		28.6	71.4	0		
PHF	.500	.000	.000	.500	.000	.000	.000	.000	.250	.417	.000	.583	.550



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School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 1

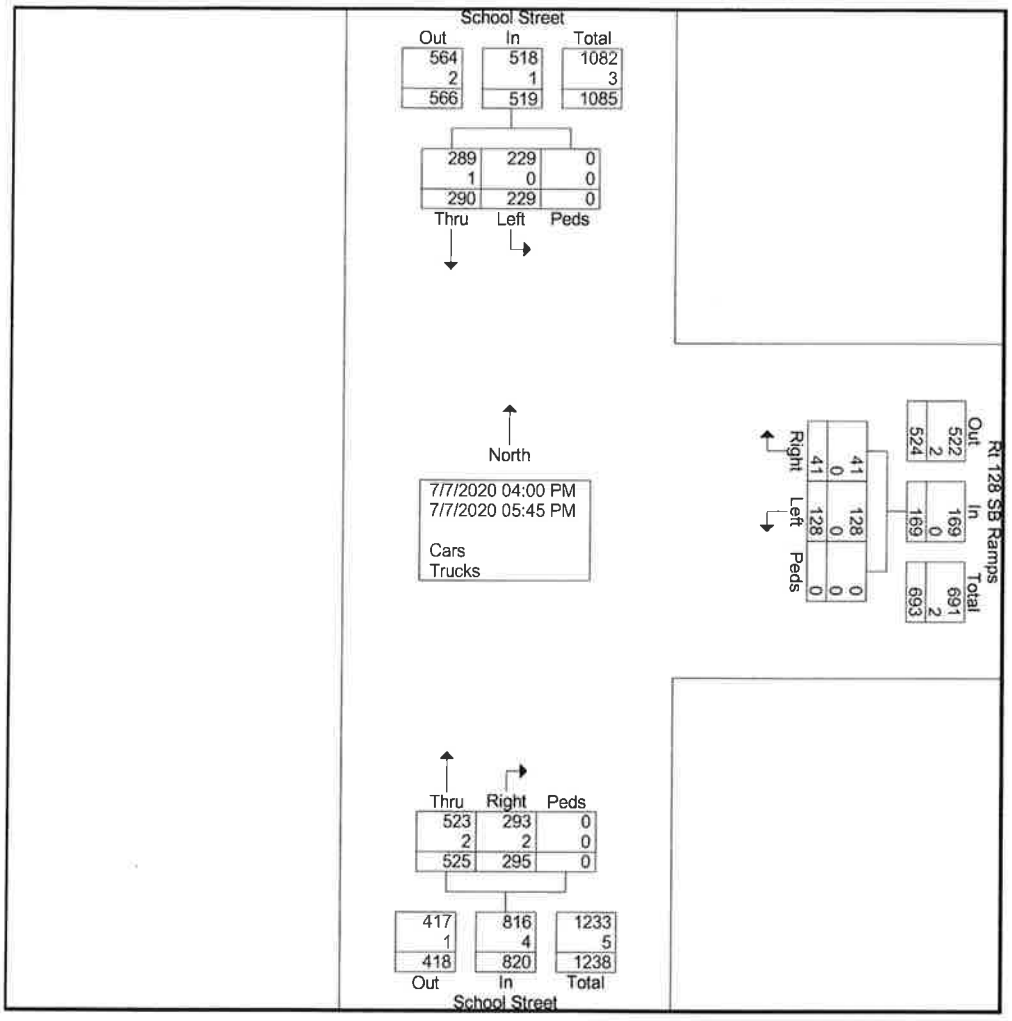
Groups Printed- Cars - Trucks

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	46	22	0	68	11	17	0	28	56	65	0	121	217
04:15 PM	35	28	0	63	4	17	0	21	41	73	0	114	198
04:30 PM	40	32	0	72	4	17	0	21	45	79	0	124	217
04:45 PM	44	33	0	77	7	19	0	26	31	67	0	98	201
Total	165	115	0	280	26	70	0	96	173	284	0	457	833
05:00 PM	43	30	0	73	4	14	0	18	36	74	0	110	201
05:15 PM	33	28	0	61	5	18	0	23	42	66	0	108	192
05:30 PM	26	26	0	52	4	13	0	17	23	51	0	74	143
05:45 PM	23	30	0	53	2	13	0	15	21	50	0	71	139
Total	125	114	0	239	15	58	0	73	122	241	0	363	675
Grand Total	290	229	0	519	41	128	0	169	295	525	0	820	1508
Apprch %	55.9	44.1	0		24.3	75.7	0		36	64	0		
Total %	19.2	15.2	0	34.4	2.7	8.5	0	11.2	19.6	34.8	0	54.4	
Cars	289	229	0	518	41	128	0	169	293	523	0	816	1503
% Cars	99.7	100	0	99.8	100	100	0	100	99.3	99.6	0	99.5	99.7
Trucks	1	0	0	1	0	0	0	0	2	2	0	4	5
% Trucks	0.3	0	0	0.2	0	0	0	0	0.7	0.4	0	0.5	0.3

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 2



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School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

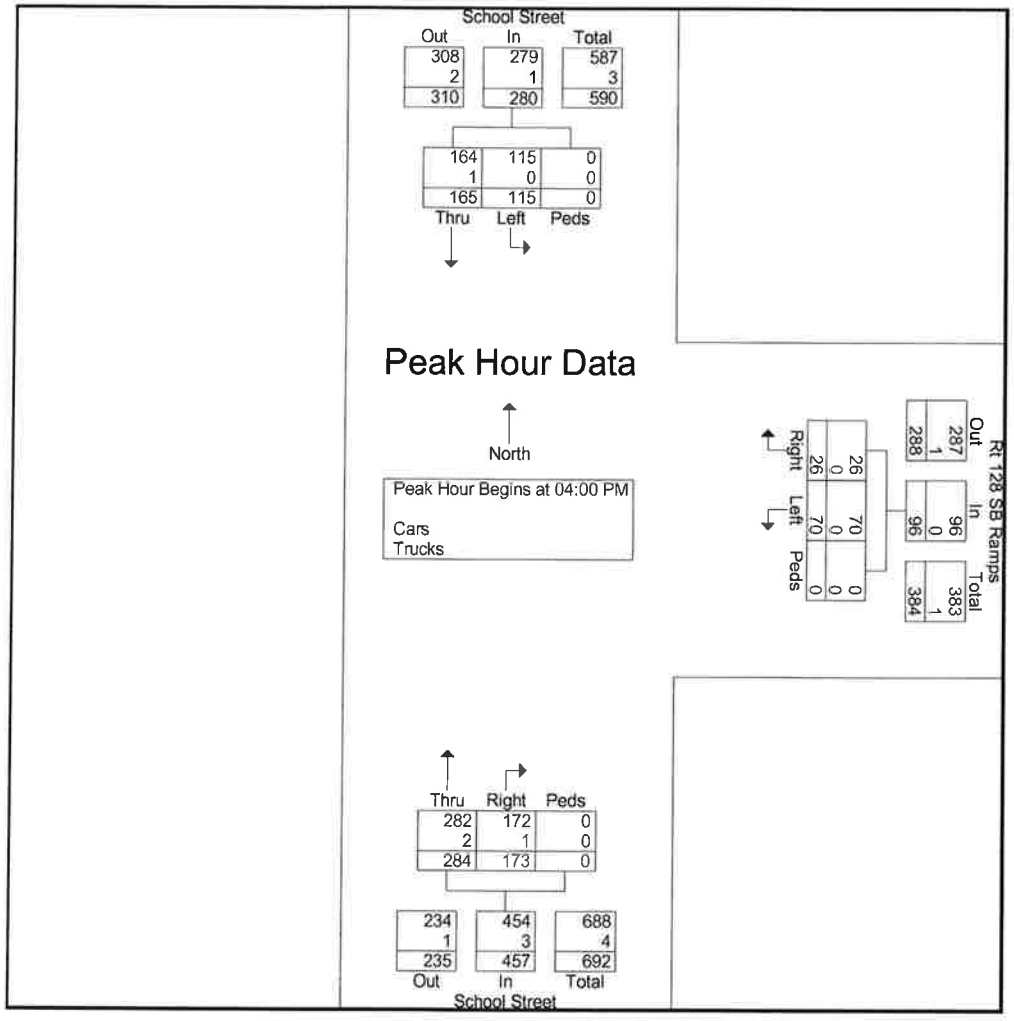
File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 3

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	**46**	22	0	68	**11**	17	0	**28**	**56**	65	0	121	**217**
04:15 PM	35	28	0	63	4	17	0	21	41	73	0	114	198
04:30 PM	40	32	0	72	4	17	0	21	45	**79**	0	**124**	217
04:45 PM	44	**33**	0	**77**	7	**19**	0	26	31	67	0	98	201
Total Volume	165	115	0	280	26	70	0	96	173	284	0	457	833
% App. Total	58.9	41.1	0		27.1	72.9	0		37.9	62.1	0		
PHF	.897	.871	.000	.909	.591	.921	.000	.857	.772	.899	.000	.921	.960
Cars	164	115	0	279	26	70	0	96	172	282	0	454	829
% Cars	99.4	100	0	99.6	100	100	0	100	99.4	99.3	0	99.3	99.5
Trucks	1	0	0	1	0	0	0	0	1	2	0	3	4
% Trucks	0.6	0	0	0.4	0	0	0	0	0.6	0.7	0	0.7	0.5

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 4



Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 1

Groups Printed- Cars

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	46	22	0	68	11	17	0	28	56	64	0	120	216
04:15 PM	34	28	0	62	4	17	0	21	40	73	0	113	196
04:30 PM	40	32	0	72	4	17	0	21	45	79	0	124	217
04:45 PM	44	33	0	77	7	19	0	26	31	66	0	97	200
Total	164	115	0	279	26	70	0	96	172	282	0	454	829
05:00 PM	43	30	0	73	4	14	0	18	36	74	0	110	201
05:15 PM	33	28	0	61	5	18	0	23	42	66	0	108	192
05:30 PM	26	26	0	52	4	13	0	17	22	51	0	73	142
05:45 PM	23	30	0	53	2	13	0	15	21	50	0	71	139
Total	125	114	0	239	15	58	0	73	121	241	0	362	674
Grand Total	289	229	0	518	41	128	0	169	293	523	0	816	1503
Apprch %	55.8	44.2	0		24.3	75.7	0		35.9	64.1	0		
Total %	19.2	15.2	0	34.5	2.7	8.5	0	11.2	19.5	34.8	0	54.3	

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
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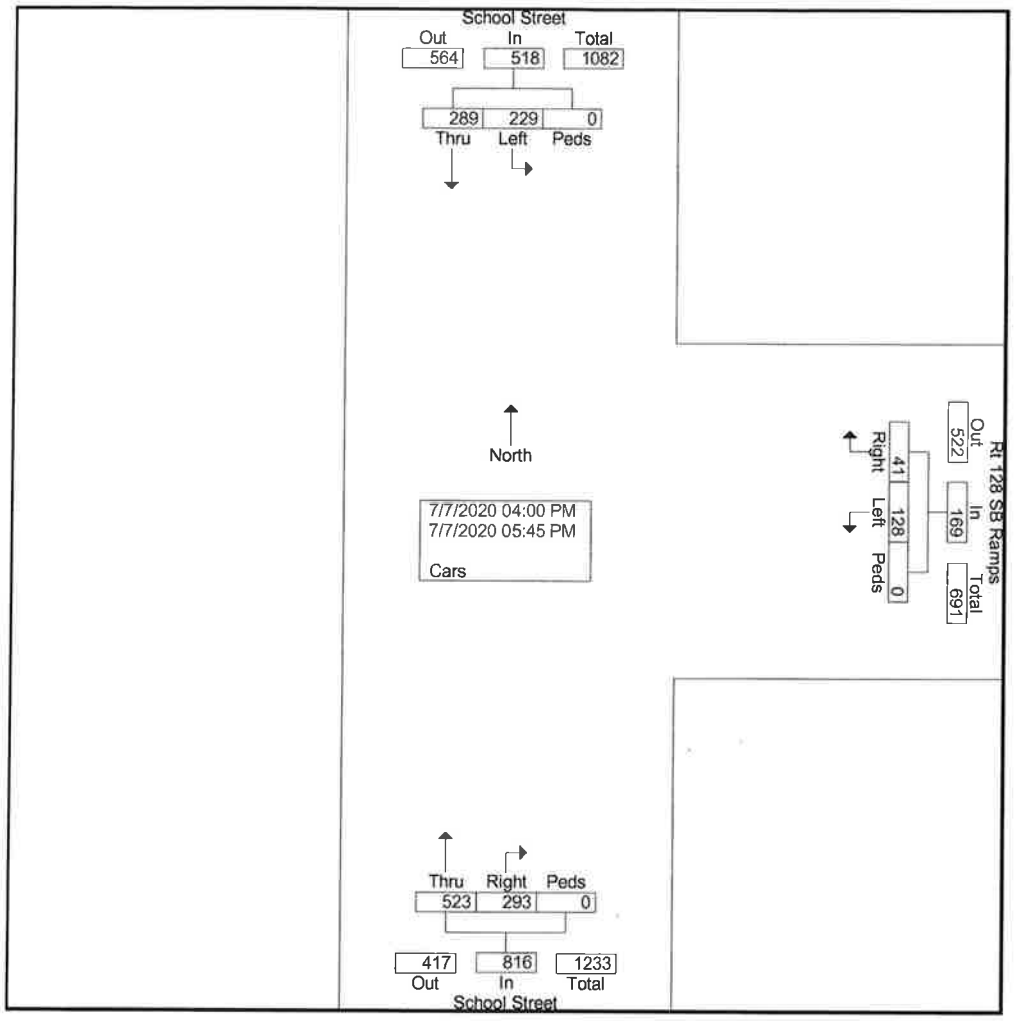
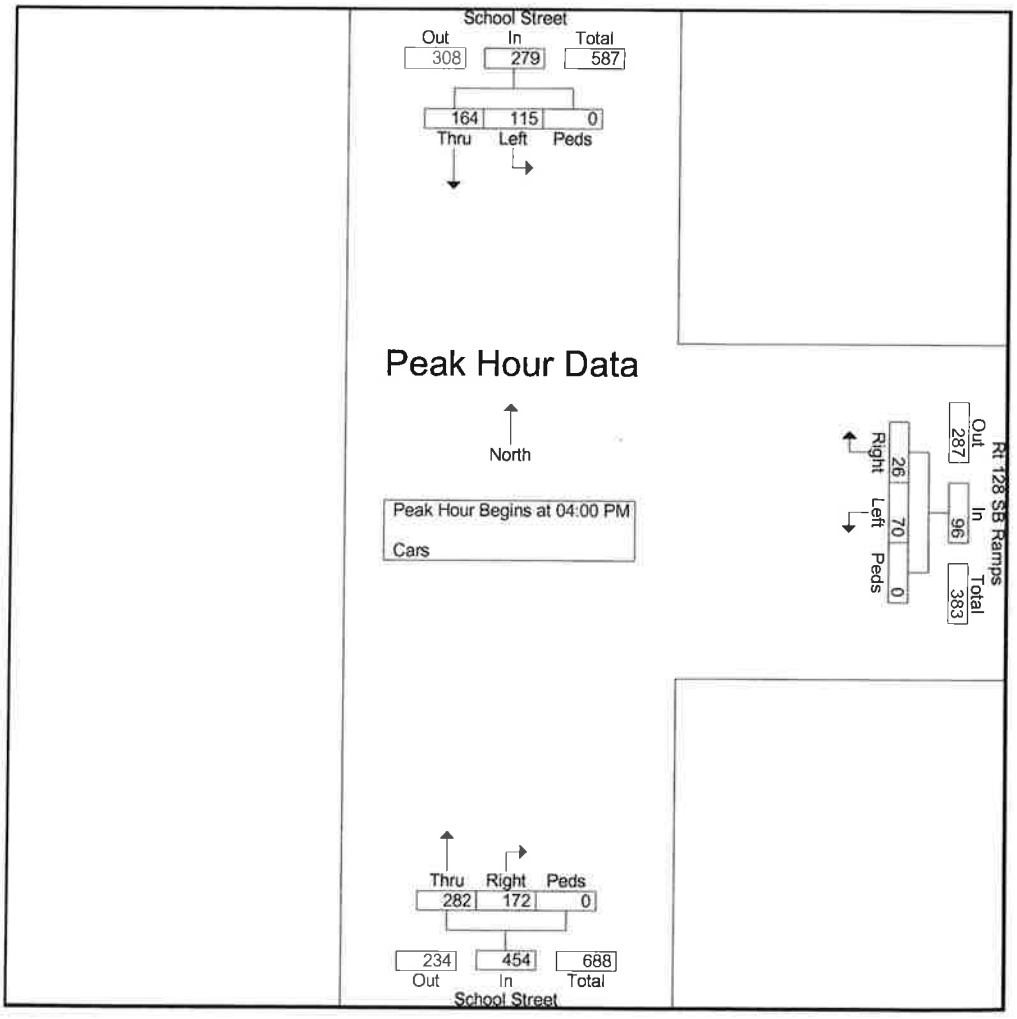


Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 3

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	**46**	22	0	68	**11**	17	0	**28**	**56**	64	0	120	216
04:15 PM	34	28	0	62	4	17	0	21	40	73	0	113	196
04:30 PM	40	32	0	72	4	17	0	21	45	**79**	0	**124**	**217**
04:45 PM	44	**33**	0	**77**	7	**19**	0	26	31	66	0	97	200
Total Volume	164	115	0	279	26	70	0	96	172	282	0	454	829
% App. Total	58.8	41.2	0		27.1	72.9	0		37.9	62.1	0		
PHF	.891	.871	.000	.906	.591	.921	.000	.857	.768	.892	.000	.915	.955



Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 1

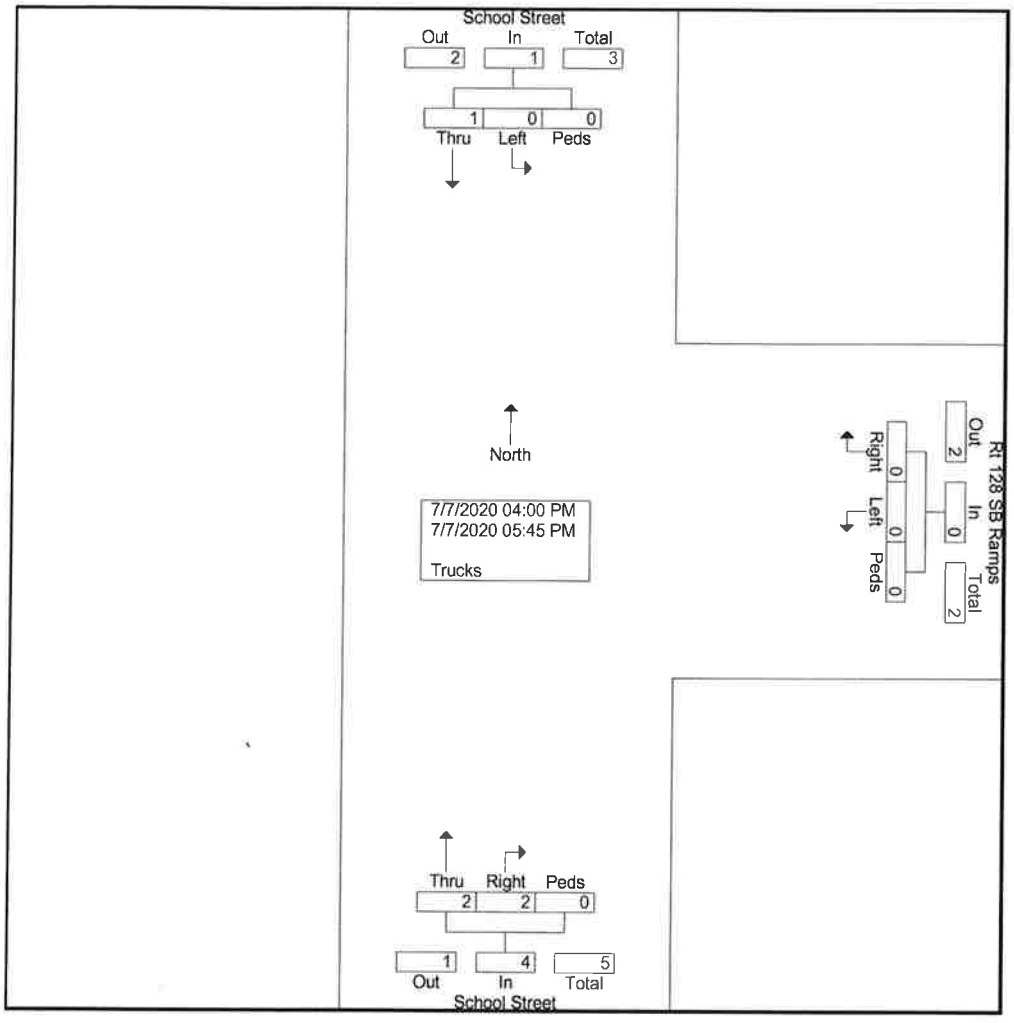
Groups Printed- Trucks

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
04:15 PM	1	0	0	1	0	0	0	0	1	0	0	1	2
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	1	0	0	1	0	0	0	0	1	2	0	3	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	1	1
Grand Total	1	0	0	1	0	0	0	0	2	2	0	4	5
Apprch %	100	0	0		0	0	0		50	50	0		
Total %	20	0	0	20	0	0	0	0	40	40	0	80	

Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 2

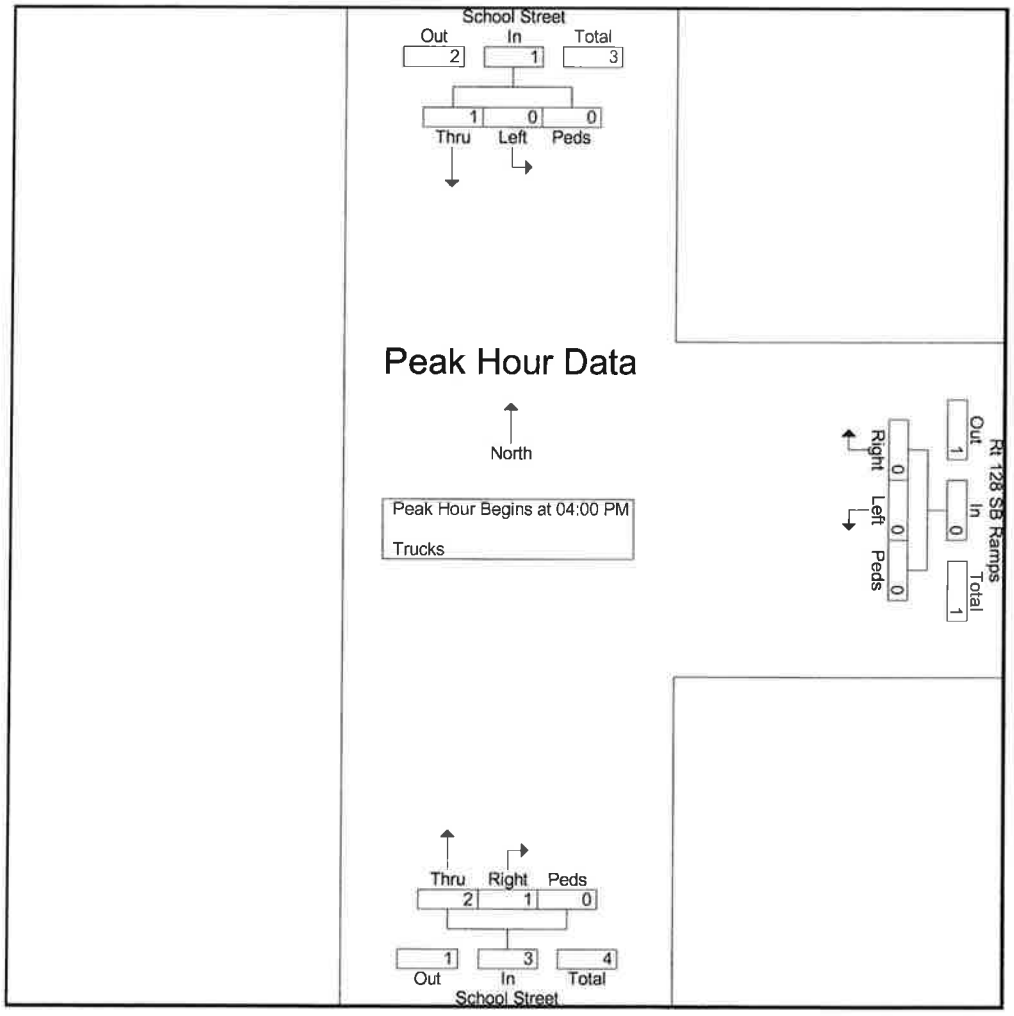


Vanasse & Associates

School Street at Rt 128 SB Ramps
Manchester By The Sea, MA
Weather: Clear

File Name : 844101pm
Site Code : 08884101
Start Date : 7/7/2020
Page No : 3

	School Street From North				Rt 128 SB Ramps From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
04:15 PM	**1**	0	0	**1**	0	0	0	0	**1**	0	0	1	**2**
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	1	0	0	1	0	0	0	0	1	2	0	3	4
% App. Total	100	0	0		0	0	0		33.3	66.7	0		
PHF	.250	.000	.000	.250	.000	.000	.000	.000	.250	.500	.000	.750	.500



Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 1

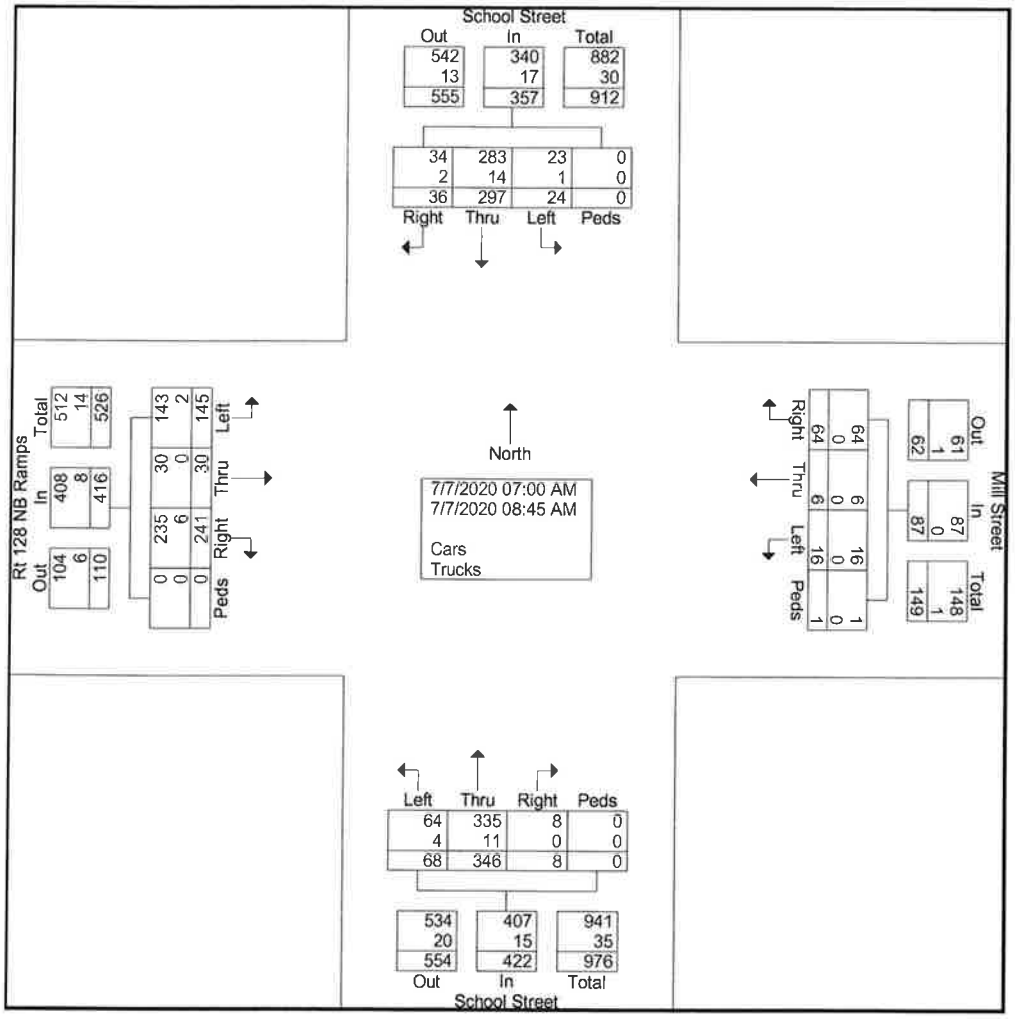
Groups Printed- Cars - Trucks

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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	4	21	1	0	26	5	0	0	0	5	0	29	7	0	36	21	2	13	0	36	103
07:15 AM	5	33	3	0	41	11	1	0	1	13	0	49	9	0	58	27	3	37	0	67	179
07:30 AM	4	35	2	0	41	3	0	4	0	7	3	45	4	0	52	19	3	13	0	35	135
07:45 AM	10	43	5	0	58	11	1	2	0	14	0	45	12	0	57	41	8	22	0	71	200
Total	23	132	11	0	166	30	2	6	1	39	3	168	32	0	203	108	16	85	0	209	617
08:00 AM	2	34	2	0	38	3	2	1	0	6	1	37	3	0	41	12	1	9	0	22	107
08:15 AM	2	45	3	0	50	8	0	3	0	11	2	47	10	0	59	38	5	15	0	58	178
08:30 AM	5	36	2	0	43	13	1	3	0	17	1	47	14	0	62	38	1	16	0	55	177
08:45 AM	4	50	6	0	60	10	1	3	0	14	1	47	9	0	57	45	7	20	0	72	203
Total	13	165	13	0	191	34	4	10	0	48	5	178	36	0	219	133	14	60	0	207	665
Grand Total	36	297	24	0	357	64	6	16	1	87	8	346	68	0	422	241	30	145	0	416	1282
Apprch %	10.1	83.2	6.7	0		73.6	6.9	18.4	1.1		1.9	82	16.1	0		57.9	7.2	34.9	0		
Total %	2.8	23.2	1.9	0	27.8	5	0.5	1.2	0.1	6.8	0.6	27	5.3	0	32.9	18.8	2.3	11.3	0	32.4	
Cars	34	283	23	0	340	64	6	16	1	87	8	335	64	0	407	235	30	143	0	408	1242
% Cars	94.4	95.3	95.8	0	95.2	100	100	100	100	100	100	96.8	94.1	0	96.4	97.5	100	98.6	0	98.1	96.9
Trucks	2	14	1	0	17	0	0	0	0	0	0	11	4	0	15	6	0	2	0	8	40
% Trucks	5.6	4.7	4.2	0	4.8	0	0	0	0	0	0	3.2	5.9	0	3.6	2.5	0	1.4	0	1.9	3.1

Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 2



Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

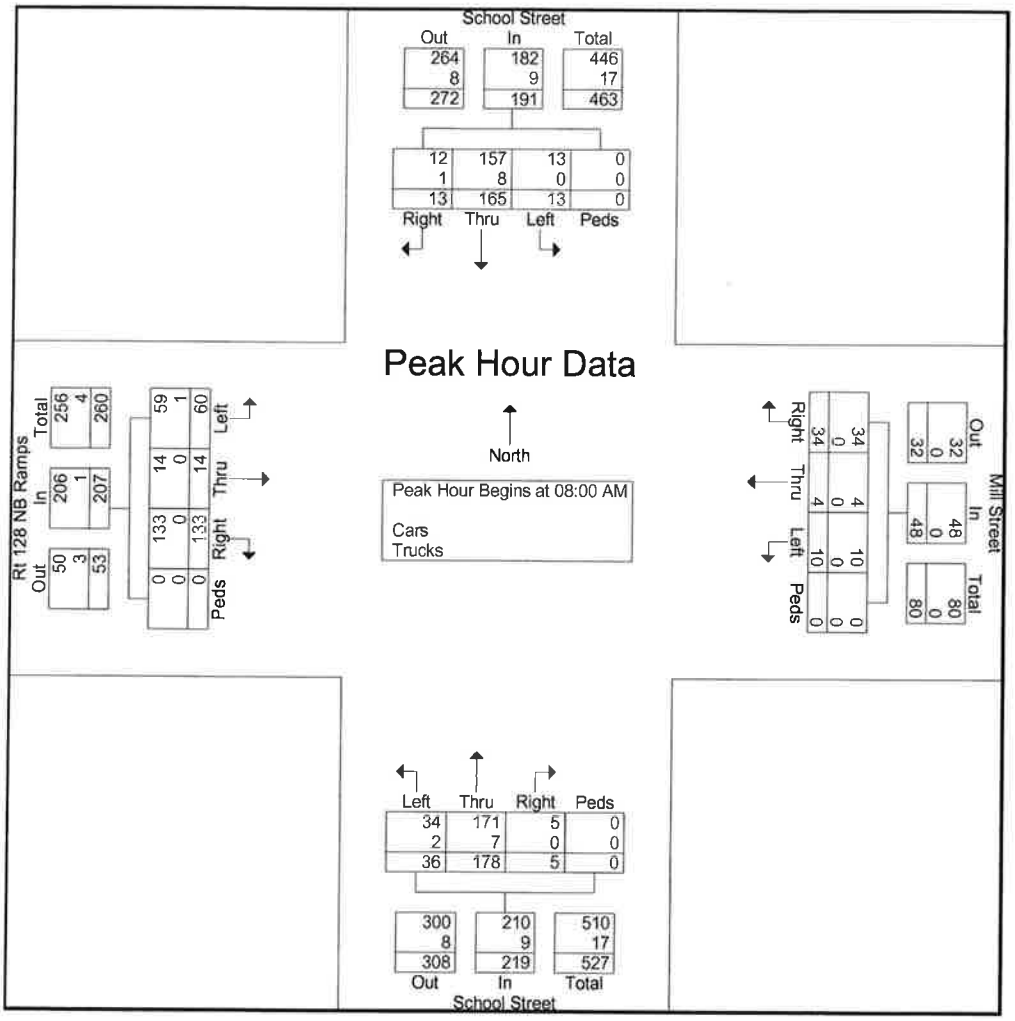
File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 3

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	2	34	2	0	38	3	**2**	1	0	6	1	37	3	0	41	12	1	9	0	22	107
08:15 AM	2	45	3	0	50	8	0	**3**	0	11	**2**	**47**	10	0	59	38	5	15	0	58	178
08:30 AM	**5**	36	2	0	43	**13**	1	3	0	**17**	1	47	**14**	0	**62**	38	1	16	0	55	177
08:45 AM	4	**50**	**6**	0	**60**	10	1	3	0	14	1	47	9	0	57	**45**	**7**	**20**	0	**72**	**203**
Total Volume	13	165	13	0	191	34	4	10	0	48	5	178	36	0	219	133	14	60	0	207	665
% App. Total	6.8	86.4	6.8	0		70.8	8.3	20.8	0		2.3	81.3	16.4	0		64.3	6.8	29	0		
PHF	.650	.825	.542	.000	.796	.654	.500	.833	.000	.706	.625	.947	.643	.000	.883	.739	.500	.750	.000	.719	.819
Cars	12	157	13	0	182	34	4	10	0	48	5	171	34	0	210	133	14	59	0	206	646
% Cars	92.3	95.2	100	0	95.3	100	100	100	0	100	100	96.1	94.4	0	95.9	100	100	98.3	0	99.5	97.1
Trucks	1	8	0	0	9	0	0	0	0	0	0	7	2	0	9	0	0	1	0	1	19
% Trucks	7.7	4.8	0	0	4.7	0	0	0	0	0	0	3.9	5.6	0	4.1	0	0	1.7	0	0.5	2.9

Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 4



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School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 1

Groups Printed- Cars

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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	4	19	0	0	23	5	0	0	0	5	0	29	6	0	35	20	2	13	0	35	98
07:15 AM	5	32	3	0	40	11	1	0	1	13	0	49	9	0	58	24	3	36	0	63	174
07:30 AM	3	32	2	0	37	3	0	4	0	7	3	42	4	0	49	18	3	13	0	34	127
07:45 AM	10	43	5	0	58	11	1	2	0	14	0	44	11	0	55	40	8	22	0	70	197
Total	22	126	10	0	158	30	2	6	1	39	3	164	30	0	197	102	16	84	0	202	596
08:00 AM	2	31	2	0	35	3	2	1	0	6	1	34	3	0	38	12	1	9	0	22	101
08:15 AM	2	43	3	0	48	8	0	3	0	11	2	47	10	0	59	38	5	15	0	58	176
08:30 AM	4	34	2	0	40	13	1	3	0	17	1	45	13	0	59	38	1	16	0	55	171
08:45 AM	4	49	6	0	59	10	1	3	0	14	1	45	8	0	54	45	7	19	0	71	198
Total	12	157	13	0	182	34	4	10	0	48	5	171	34	0	210	133	14	59	0	206	646
Grand Total	34	283	23	0	340	64	6	16	1	87	8	335	64	0	407	235	30	143	0	408	1242
Apprch %	10	83.2	6.8	0		73.6	6.9	18.4	1.1		2	82.3	15.7	0		57.6	7.4	35	0		
Total %	2.7	22.8	1.9	0	27.4	5.2	0.5	1.3	0.1	7	0.6	27	5.2	0	32.8	18.9	2.4	11.5	0	32.9	

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School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
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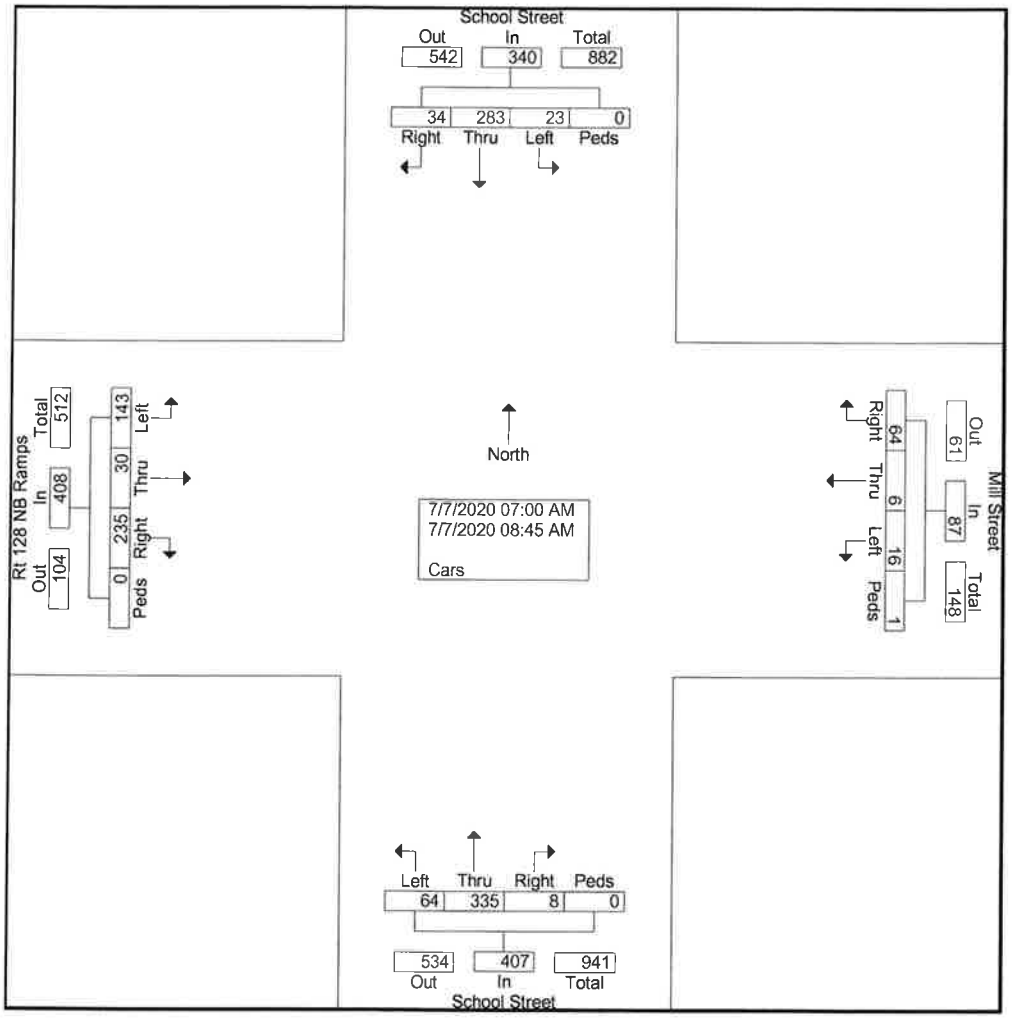
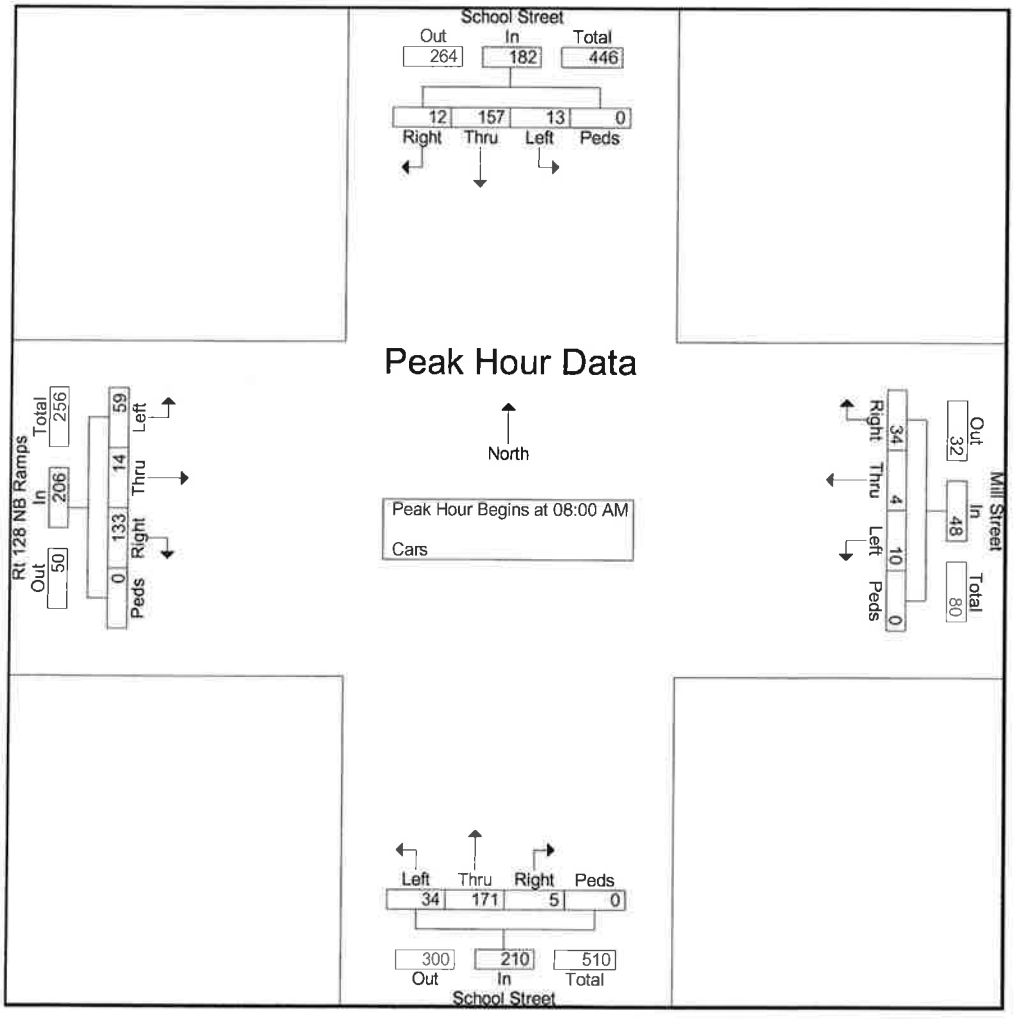


Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 3

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	2	31	2	0	35	3	**2**	1	0	6	1	34	3	0	38	12	1	9	0	22	101
08:15 AM	2	43	3	0	48	8	0	**3**	0	11	**2**	**47**	10	0	**59**	38	5	15	0	58	176
08:30 AM	**4**	34	2	0	40	**13**	1	3	0	**17**	1	45	**13**	0	59	38	1	16	0	55	171
08:45 AM	4	**49**	**6**	0	**59**	10	1	3	0	14	1	45	8	0	54	**45**	**7**	**19**	0	**71**	**198**
Total Volume	12	157	13	0	182	34	4	10	0	48	5	171	34	0	210	133	14	59	0	206	646
% App. Total	6.6	86.3	7.1	0		70.8	8.3	20.8	0		2.4	81.4	16.2	0		64.6	6.8	28.6	0		
PHF	.750	.801	.542	.000	.771	.654	.500	.833	.000	.706	.625	.910	.654	.000	.890	.739	.500	.776	.000	.725	.816



Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
Page No : 1

Groups Printed- Trucks

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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	0	2	1	0	3	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	5
07:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	1	0	4	5
07:30 AM	1	3	0	0	4	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	8
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	3
Total	1	6	1	0	8	0	0	0	0	0	0	4	2	0	6	6	0	1	0	7	21
08:00 AM	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
08:15 AM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
08:30 AM	1	2	0	0	3	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	6
08:45 AM	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	0	0	1	0	1	5
Total	1	8	0	0	9	0	0	0	0	0	0	7	2	0	9	0	0	1	0	1	19
Grand Total	2	14	1	0	17	0	0	0	0	0	0	11	4	0	15	6	0	2	0	8	40
Apprch %	11.8	82.4	5.9	0		0	0	0	0		0	73.3	26.7	0		75	0	25	0		
Total %	5	35	2.5	0	42.5	0	0	0	0	0	0	27.5	10	0	37.5	15	0	5	0	20	

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School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
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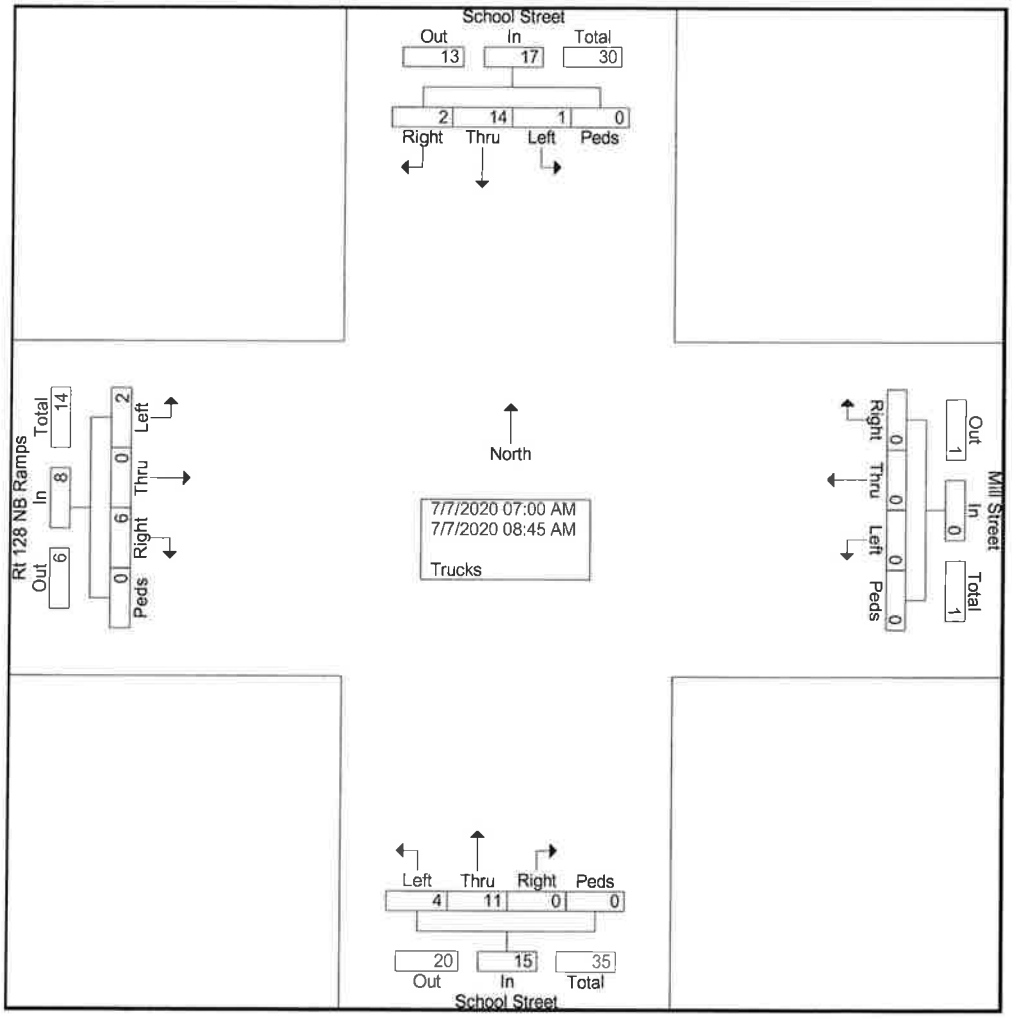

Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102am
Site Code : 00844102
Start Date : 7/7/2020
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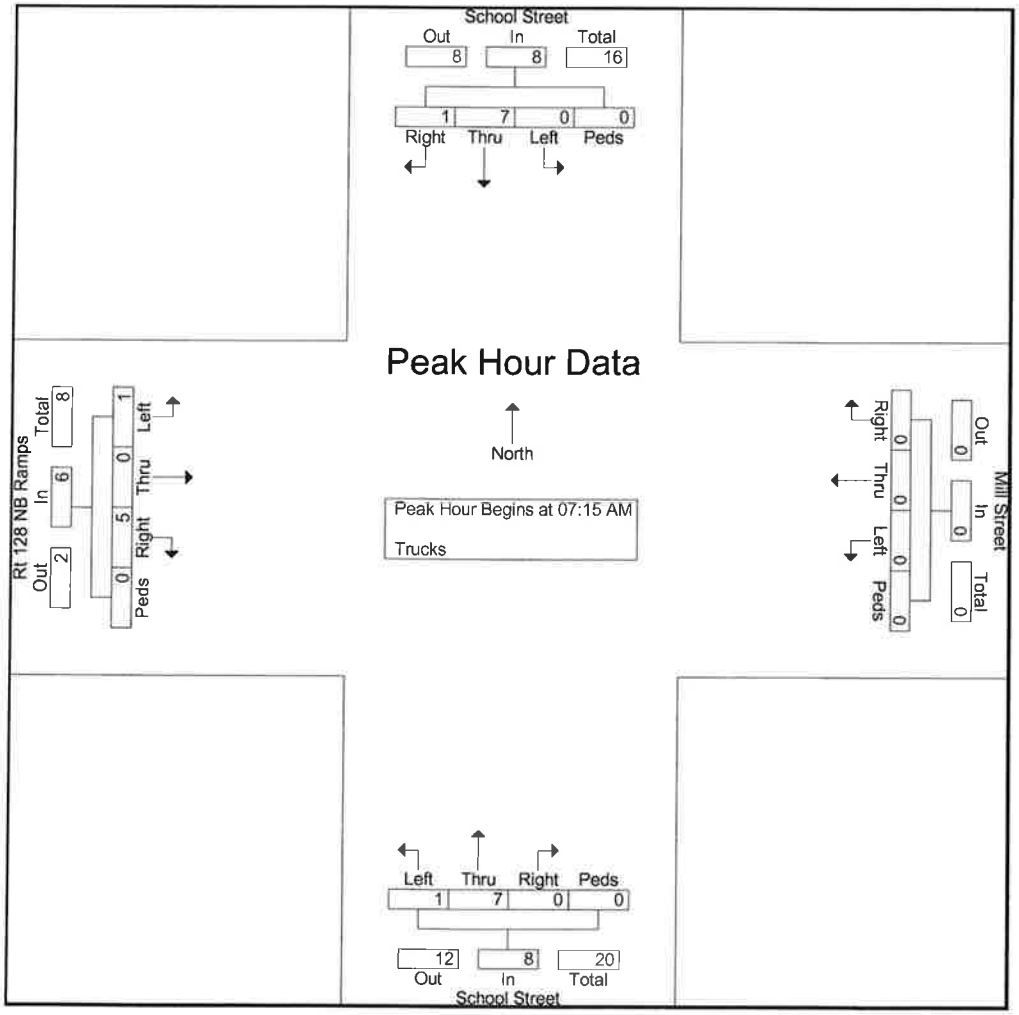
	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	**3**	0	**1**	0	**4**	5
07:30 AM	**1**	**3**	0	0	**4**	0	0	0	0	0	0	**3**	0	0	**3**	1	0	0	0	1	**8**
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	**1**	0	2	1	0	0	0	1	3
08:00 AM	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
Total Volume	1	7	0	0	8	0	0	0	0	0	0	7	1	0	8	5	0	1	0	6	22
% App. Total	12.5	87.5	0	0		0	0	0	0		0	87.5	12.5	0		83.3	0	16.7	0		
PHF	.250	.583	.000	.000	.500	.000	.000	.000	.000	.000	.000	.583	.250	.000	.667	.417	.000	.250	.000	.375	.688



Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 1

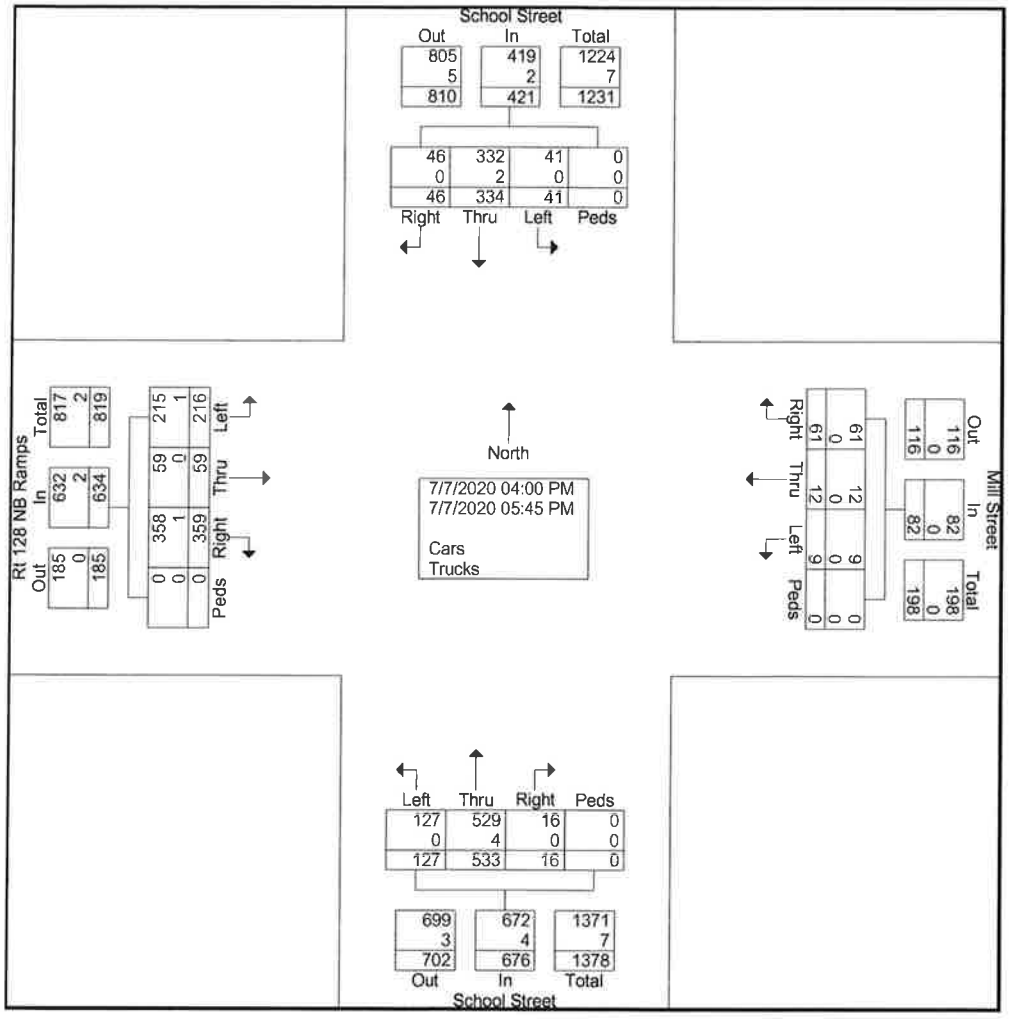
Groups Printed- Cars - Trucks

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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
04:00 PM	9	52	8	0	69	17	1	4	0	22	3	89	17	0	109	48	5	18	0	71	271
04:15 PM	4	43	7	0	54	9	2	1	0	12	5	78	18	0	101	51	12	23	0	86	253
04:30 PM	5	44	4	0	53	8	3	2	0	13	3	79	24	0	106	31	6	33	0	70	242
04:45 PM	6	56	3	0	65	5	2	0	0	7	1	58	16	0	75	44	5	35	0	84	231
Total	24	195	22	0	241	39	8	7	0	54	12	304	75	0	391	174	28	109	0	311	997
05:00 PM	9	40	3	0	52	8	1	0	0	9	2	75	17	0	94	49	10	24	0	83	238
05:15 PM	5	40	8	0	53	6	1	1	0	8	1	66	10	0	77	51	8	29	0	88	226
05:30 PM	5	29	5	0	39	5	2	0	0	7	1	52	11	0	64	50	6	23	0	79	189
05:45 PM	3	30	3	0	36	3	0	1	0	4	0	36	14	0	50	35	7	31	0	73	163
Total	22	139	19	0	180	22	4	2	0	28	4	229	52	0	285	185	31	107	0	323	816
Grand Total	46	334	41	0	421	61	12	9	0	82	16	533	127	0	676	359	59	216	0	634	1813
Apprch %	10.9	79.3	9.7	0		74.4	14.6	11	0		2.4	78.8	18.8	0		56.6	9.3	34.1	0		
Total %	2.5	18.4	2.3	0	23.2	3.4	0.7	0.5	0	4.5	0.9	29.4	7	0	37.3	19.8	3.3	11.9	0	35	
Cars	46	332	41	0	419	61	12	9	0	82	16	529	127	0	672	358	59	215	0	632	1805
% Cars	100	99.4	100	0	99.5	100	100	100	0	100	100	99.2	100	0	99.4	99.7	100	99.5	0	99.7	99.6
Trucks	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	1	0	1	0	2	8
% Trucks	0	0.6	0	0	0.5	0	0	0	0	0	0	0.8	0	0	0.6	0.3	0	0.5	0	0.3	0.4

Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 2



Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

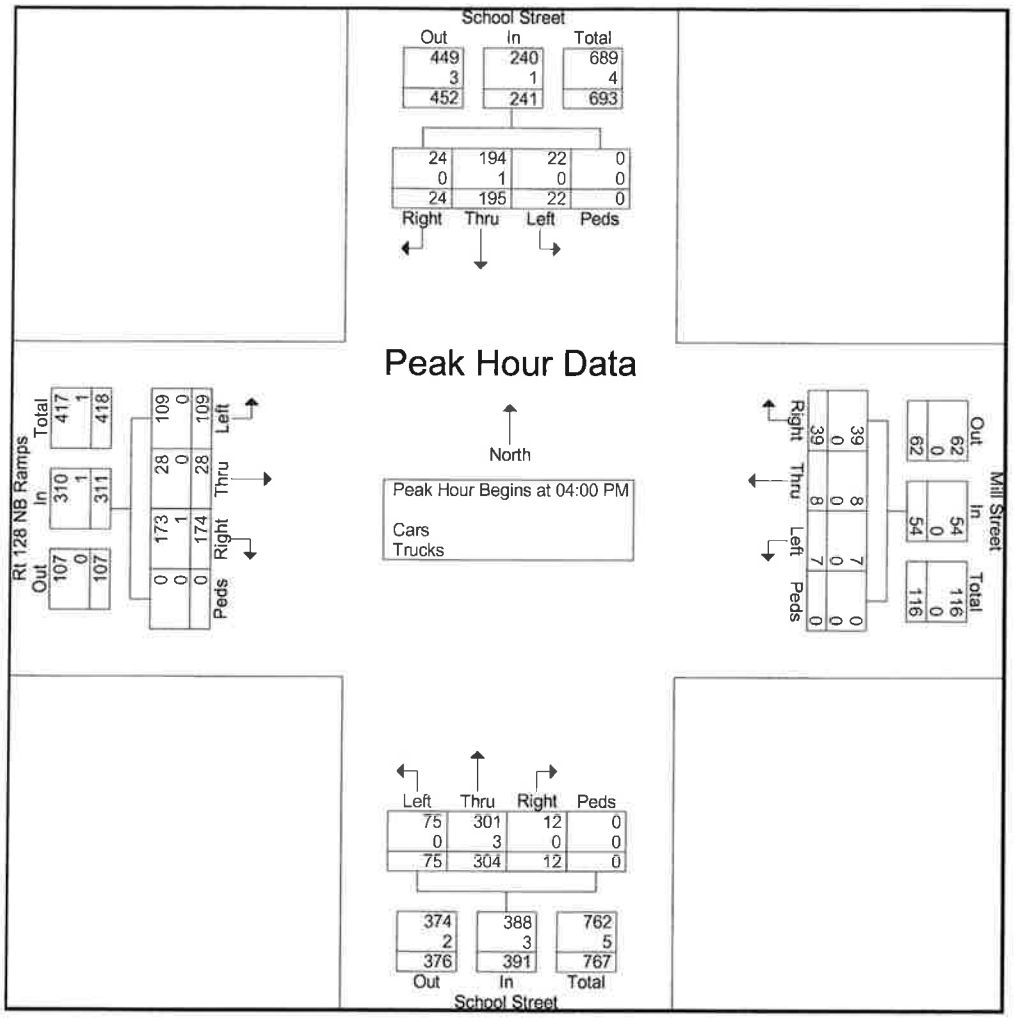
File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 3

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**9**	52	**8**	0	**69**	**17**	1	**4**	0	**22**	3	**89**	17	0	**109**	48	5	18	0	71	**271**
04:15 PM	4	43	7	0	54	9	2	1	0	12	**5**	78	18	0	101	**51**	**12**	23	0	**86**	253
04:30 PM	5	44	4	0	53	8	**3**	2	0	13	3	79	**24**	0	106	31	6	33	0	70	242
04:45 PM	6	**56**	3	0	65	5	2	0	0	7	1	58	16	0	75	44	5	**35**	0	84	231
Total Volume	24	195	22	0	241	39	8	7	0	54	12	304	75	0	391	174	28	109	0	311	997
% App. Total	10	80.9	9.1	0		72.2	14.8	13	0		3.1	77.7	19.2	0		55.9	9	35	0		
PHF	.667	.871	.688	.000	.873	.574	.667	.438	.000	.614	.600	.854	.781	.000	.897	.853	.583	.779	.000	.904	.920
Cars	24	194	22	0	240	39	8	7	0	54	12	301	75	0	388	173	28	109	0	310	992
% Cars	100	99.5	100	0	99.6	100	100	100	0	100	100	99.0	100	0	99.2	99.4	100	100	0	99.7	99.5
Trucks	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	5
% Trucks	0	0.5	0	0	0.4	0	0	0	0	0	0	1.0	0	0	0.8	0.6	0	0	0	0.3	0.5

Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 4



Vanasse & Associates

School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 1

Groups Printed- Cars

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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
04:00 PM	9	52	8	0	69	17	1	4	0	22	3	87	17	0	107	47	5	18	0	70	268
04:15 PM	4	42	7	0	53	9	2	1	0	12	5	78	18	0	101	51	12	23	0	86	252
04:30 PM	5	44	4	0	53	8	3	2	0	13	3	79	24	0	106	31	6	33	0	70	242
04:45 PM	6	56	3	0	65	5	2	0	0	7	1	57	16	0	74	44	5	35	0	84	230
Total	24	194	22	0	240	39	8	7	0	54	12	301	75	0	388	173	28	109	0	310	992
05:00 PM	9	39	3	0	51	8	1	0	0	9	2	75	17	0	94	49	10	24	0	83	237
05:15 PM	5	40	8	0	53	6	1	1	0	8	1	66	10	0	77	51	8	29	0	88	226
05:30 PM	5	29	5	0	39	5	2	0	0	7	1	51	11	0	63	50	6	23	0	79	188
05:45 PM	3	30	3	0	36	3	0	1	0	4	0	36	14	0	50	35	7	30	0	72	162
Total	22	138	19	0	179	22	4	2	0	28	4	228	52	0	284	185	31	106	0	322	813
Grand Total	46	332	41	0	419	61	12	9	0	82	16	529	127	0	672	358	59	215	0	632	1805
Apprch %	11	79.2	9.8	0		74.4	14.6	11	0		2.4	78.7	18.9	0		56.6	9.3	34	0		
Total %	2.5	18.4	2.3	0	23.2	3.4	0.7	0.5	0	4.5	0.9	29.3	7	0	37.2	19.8	3.3	11.9	0	35	

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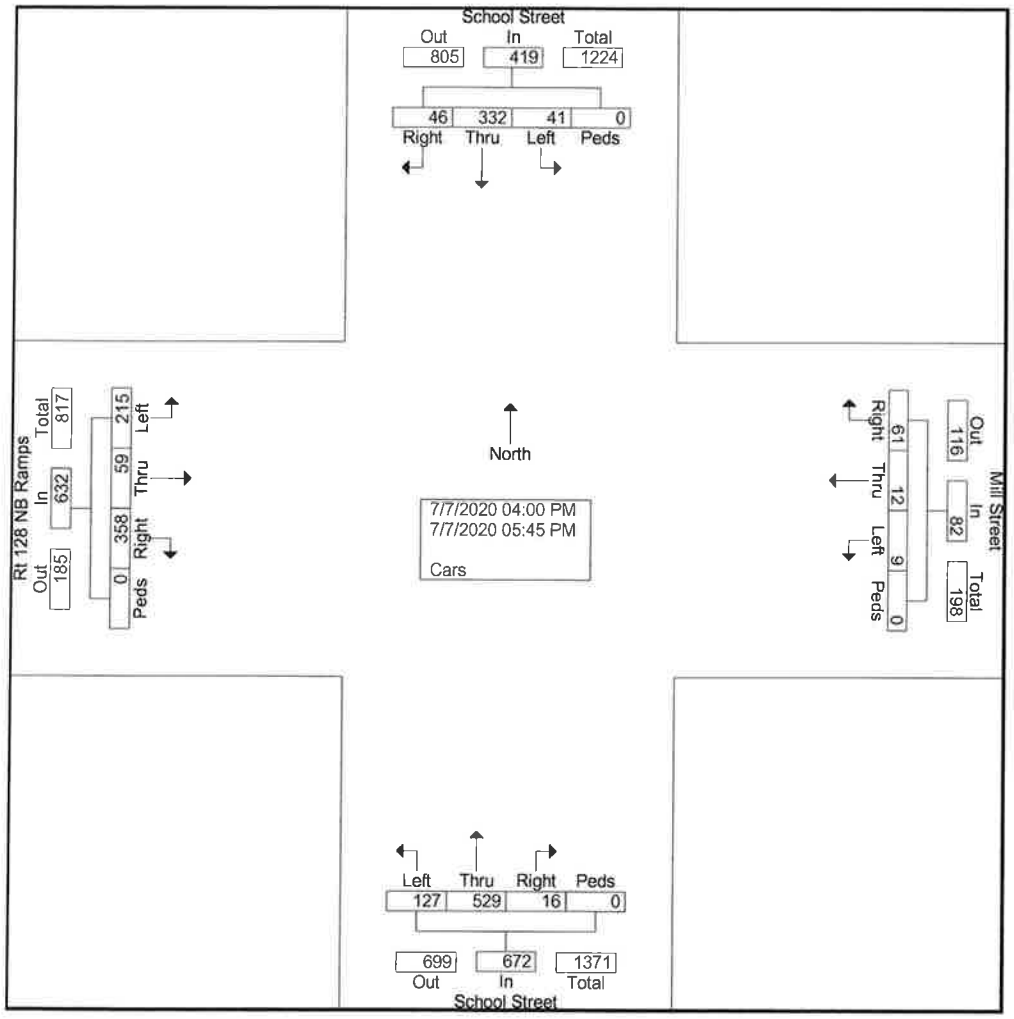
School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 2



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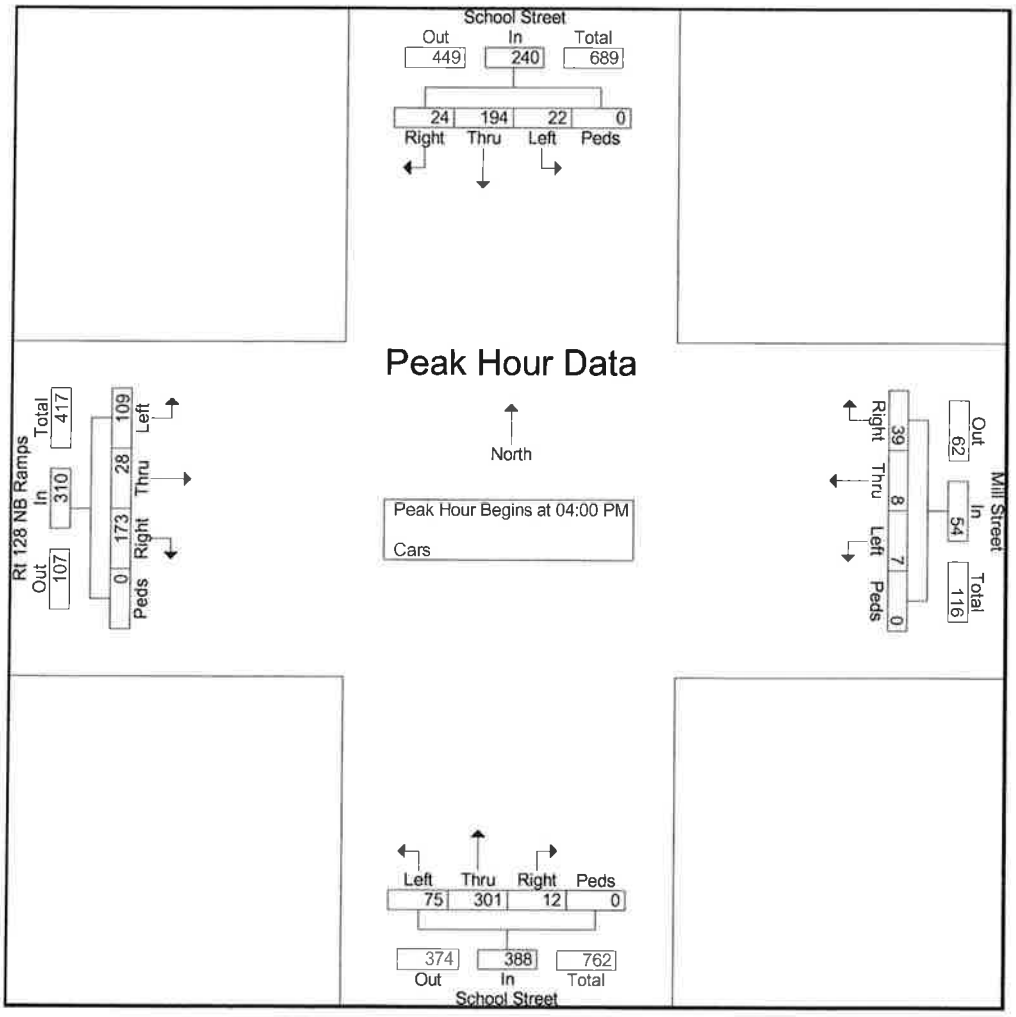
School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 3

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**9**	52	**8**	0	**69**	**17**	1	**4**	0	**22**	3	**87**	17	0	**107**	47	5	18	0	70	**268**
04:15 PM	4	42	7	0	53	9	2	1	0	12	**5**	78	18	0	101	**51**	**12**	23	0	**86**	252
04:30 PM	5	44	4	0	53	8	**3**	2	0	13	3	79	**24**	0	106	31	6	33	0	70	242
04:45 PM	6	**56**	3	0	65	5	2	0	0	7	1	57	16	0	74	44	5	**35**	0	84	230
Total Volume	24	194	22	0	240	39	8	7	0	54	12	301	75	0	388	173	28	109	0	310	992
% App. Total	10	80.8	9.2	0		72.2	14.8	13	0		3.1	77.6	19.3	0		55.8	9	35.2	0		
PHF	.667	.866	.688	.000	.870	.574	.667	.438	.000	.614	.600	.865	.781	.000	.907	.848	.583	.779	.000	.901	.925



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School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 1

Groups Printed- Trucks

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	3
04:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	5
05:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	3
Grand Total	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	1	0	1	0	2	8
Apprch %	0	100	0	0		0	0	0	0		0	100	0	0		50	0	50	0		
Total %	0	25	0	0	25	0	0	0	0	0	0	50	0	0	50	12.5	0	12.5	0	25	

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School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
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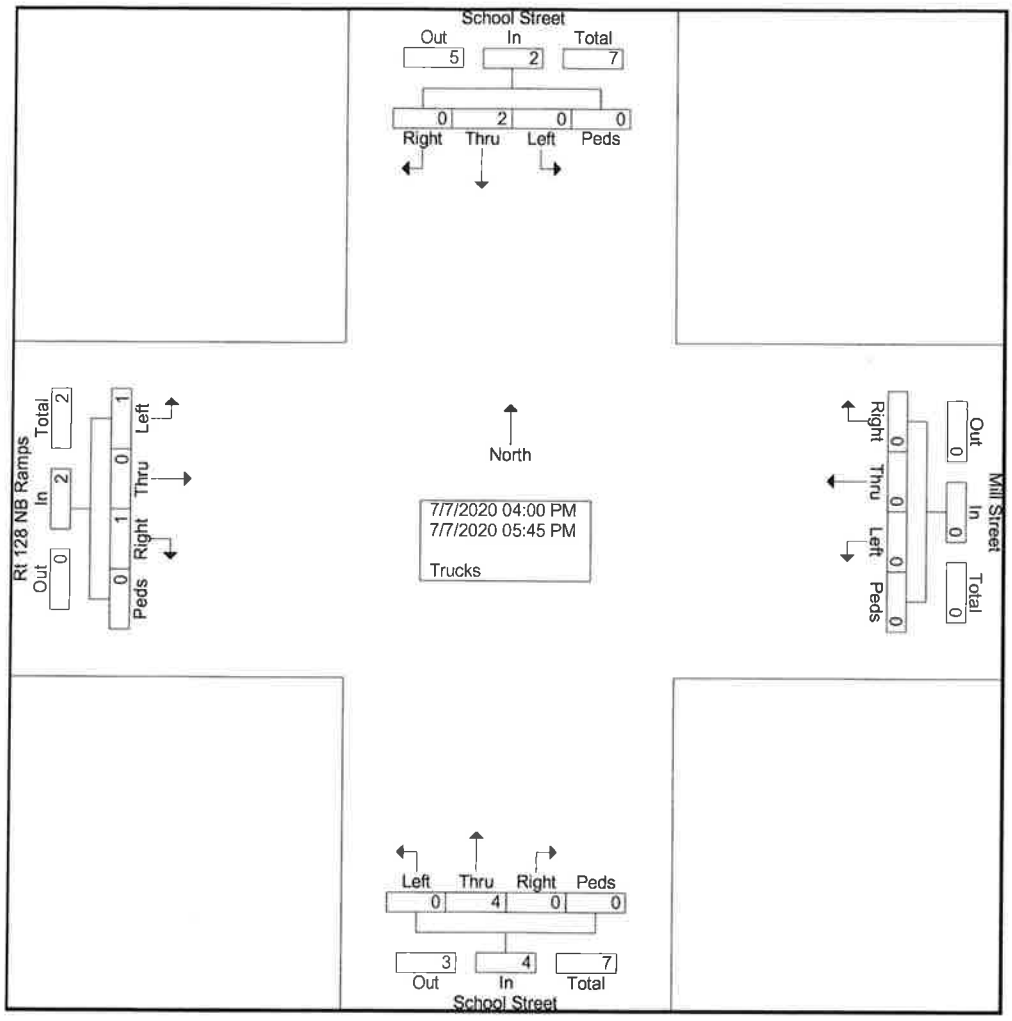

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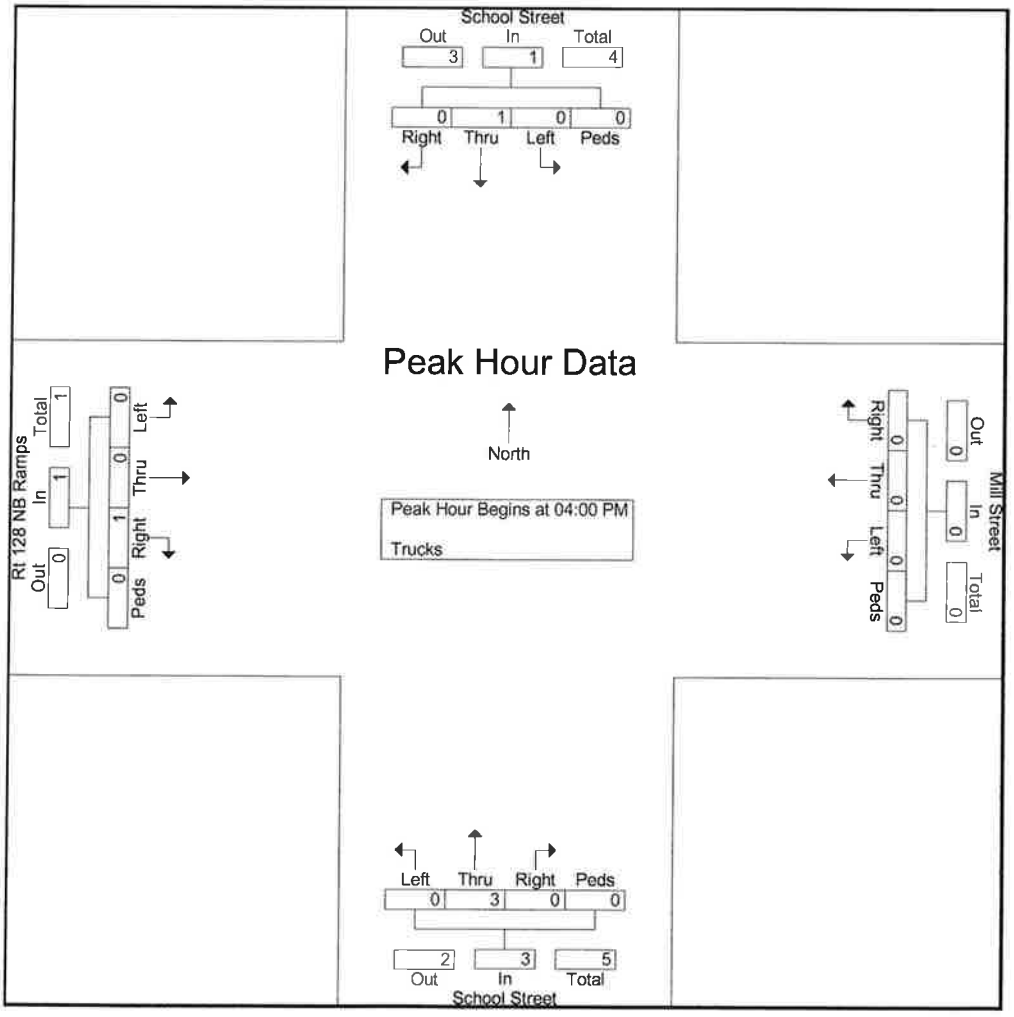
School St at Rt 128 NB Ramps / Mill St
Manchester By The Sea, MA
Weather: Clear

File Name : 844102pm
Site Code : 00844102
Start Date : 7/7/2020
Page No : 3

	School Street From North					Mill Street From East					School Street From South					Rt 128 NB Ramps 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 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	**2**	0	0	**2**	**1**	0	0	0	**1**	**3**
04:15 PM	0	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total Volume	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	5
% App. Total	0	100	0	0		0	0	0	0		0	100	0	0		100	0	0	0		
PHF	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.375	.000	.000	.375	.250	.000	.000	.000	.250	.417



Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 1

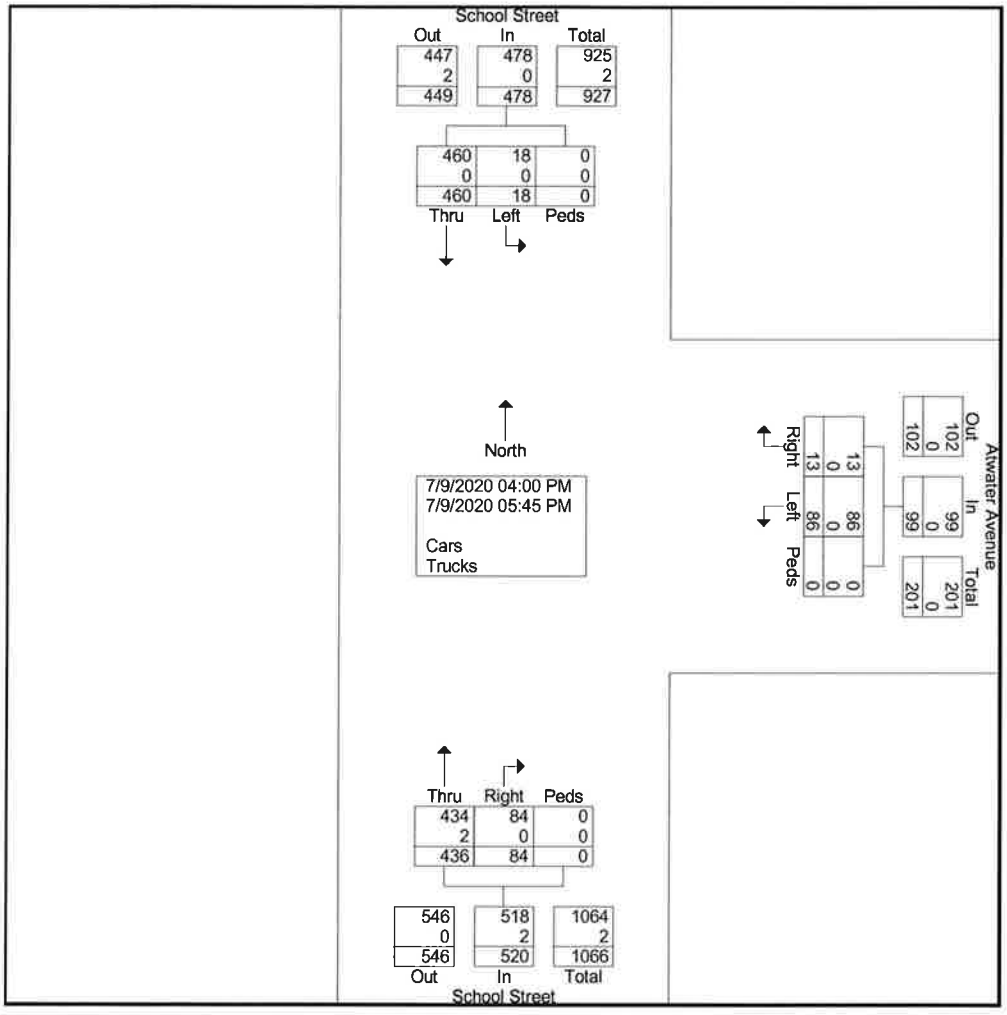
Groups Printed- Cars - Trucks

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	62	4	0	66	1	7	0	8	10	43	0	53	127
04:15 PM	61	2	0	63	2	10	0	12	13	62	0	75	150
04:30 PM	46	1	0	47	0	14	0	14	17	61	0	78	139
04:45 PM	46	4	0	50	1	7	0	8	17	53	0	70	128
Total	215	11	0	226	4	38	0	42	57	219	0	276	544
05:00 PM	61	2	0	63	4	27	0	31	10	42	0	52	146
05:15 PM	76	1	0	77	1	10	0	11	6	63	0	69	157
05:30 PM	57	2	0	59	1	4	0	5	7	59	0	66	130
05:45 PM	51	2	0	53	3	7	0	10	4	53	0	57	120
Total	245	7	0	252	9	48	0	57	27	217	0	244	553
Grand Total	460	18	0	478	13	86	0	99	84	436	0	520	1097
Apprch %	96.2	3.8	0		13.1	86.9	0		16.2	83.8	0		
Total %	41.9	1.6	0	43.6	1.2	7.8	0	9	7.7	39.7	0	47.4	
Cars	460	18	0	478	13	86	0	99	84	434	0	518	1095
% Cars	100	100	0	100	100	100	0	100	100	99.5	0	99.6	99.8
Trucks	0	0	0	0	0	0	0	0	0	2	0	2	2
% Trucks	0	0	0	0	0	0	0	0	0	0.5	0	0.4	0.2

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 2



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School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

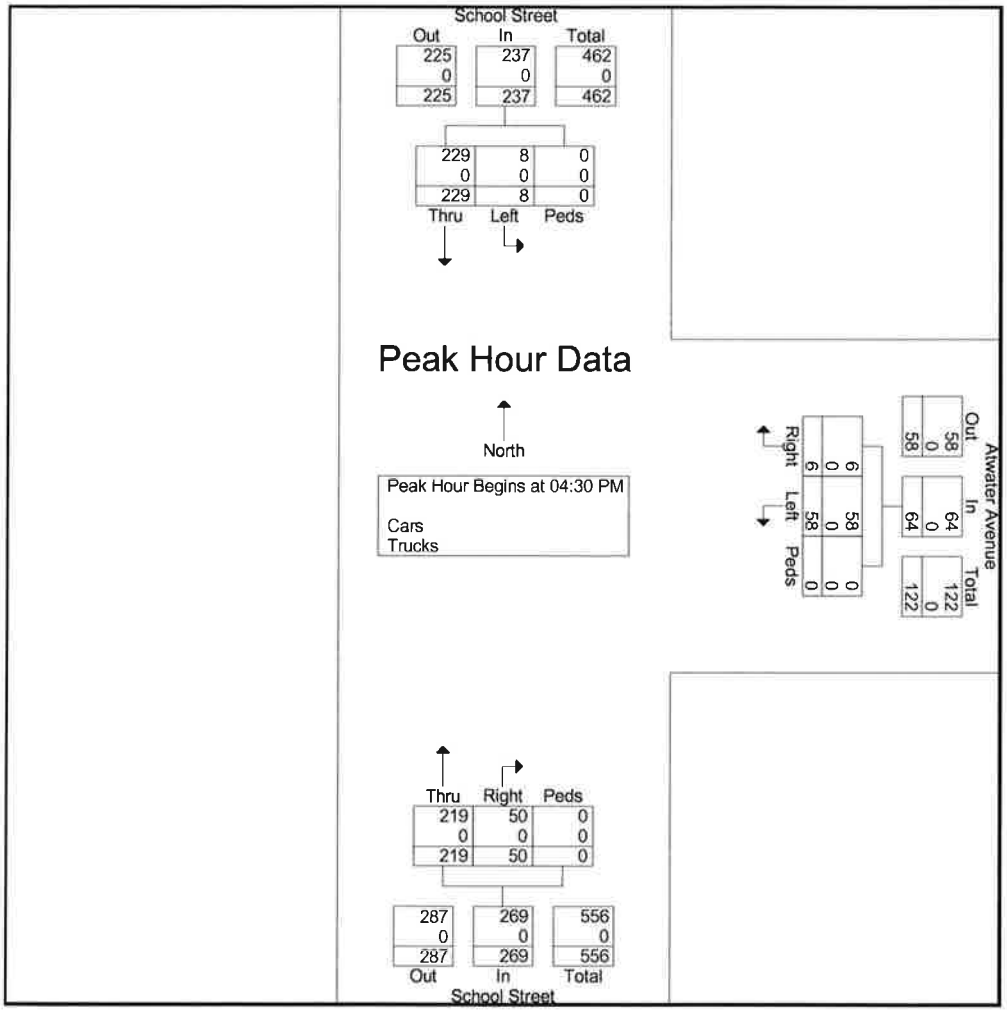
File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 3

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	46	1	0	47	0	14	0	14	**17**	61	0	**78**	139
04:45 PM	46	**4**	0	50	1	7	0	8	17	53	0	70	128
05:00 PM	61	2	0	63	**4**	**27**	0	**31**	10	42	0	52	146
05:15 PM	**76**	1	0	**77**	1	10	0	11	6	**63**	0	69	**157**
Total Volume	229	8	0	237	6	58	0	64	50	219	0	269	570
% App. Total	96.6	3.4	0		9.4	90.6	0		18.6	81.4	0		
PHF	.753	.500	.000	.769	.375	.537	.000	.516	.735	.869	.000	.862	.908
Cars	229	8	0	237	6	58	0	64	50	219	0	269	570
% Cars	100	100	0	100	100	100	0	100	100	100	0	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 4



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School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 1

Groups Printed- Cars

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	62	4	0	66	1	7	0	8	10	41	0	51	125
04:15 PM	61	2	0	63	2	10	0	12	13	62	0	75	150
04:30 PM	46	1	0	47	0	14	0	14	17	61	0	78	139
04:45 PM	46	4	0	50	1	7	0	8	17	53	0	70	128
Total	215	11	0	226	4	38	0	42	57	217	0	274	542
05:00 PM	61	2	0	63	4	27	0	31	10	42	0	52	146
05:15 PM	76	1	0	77	1	10	0	11	6	63	0	69	157
05:30 PM	57	2	0	59	1	4	0	5	7	59	0	66	130
05:45 PM	51	2	0	53	3	7	0	10	4	53	0	57	120
Total	245	7	0	252	9	48	0	57	27	217	0	244	553
Grand Total	460	18	0	478	13	86	0	99	84	434	0	518	1095
Apprch %	96.2	3.8	0		13.1	86.9	0		16.2	83.8	0		
Total %	42	1.6	0	43.7	1.2	7.9	0	9	7.7	39.6	0	47.3	

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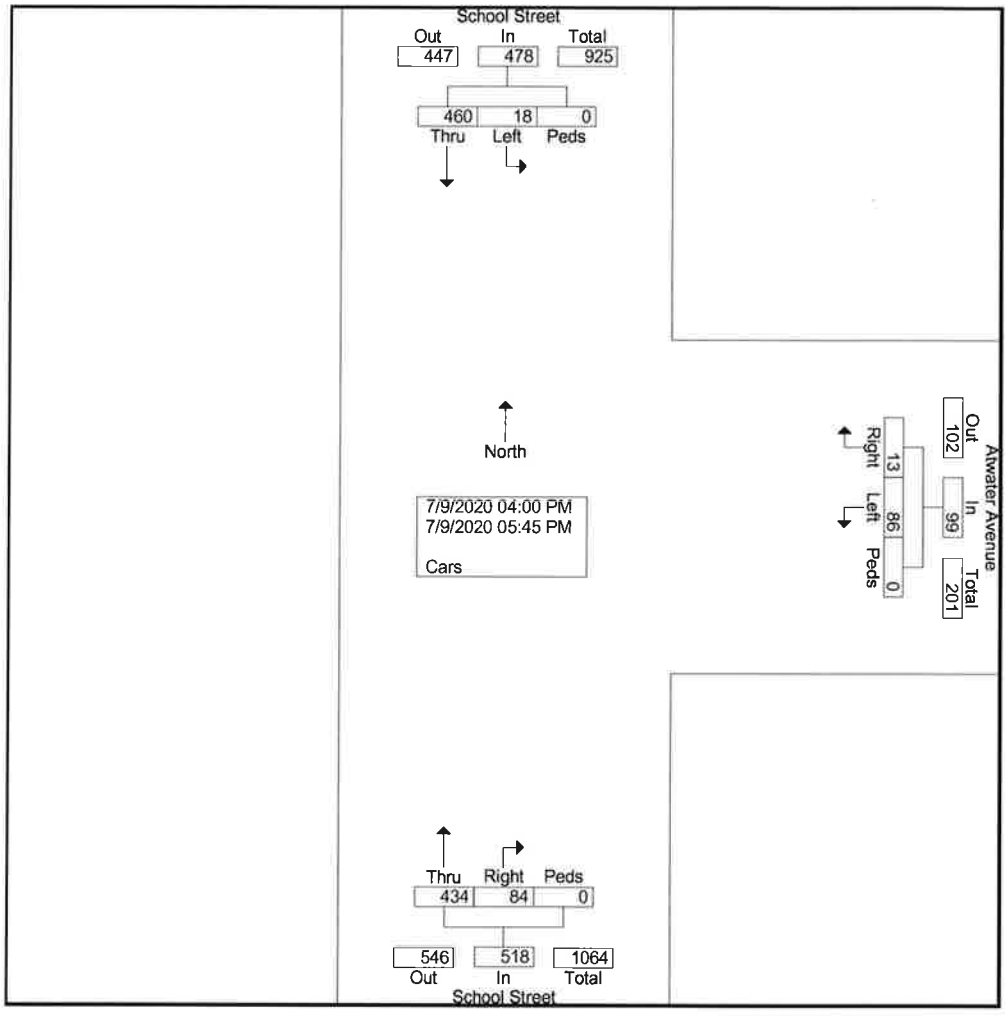
School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 2



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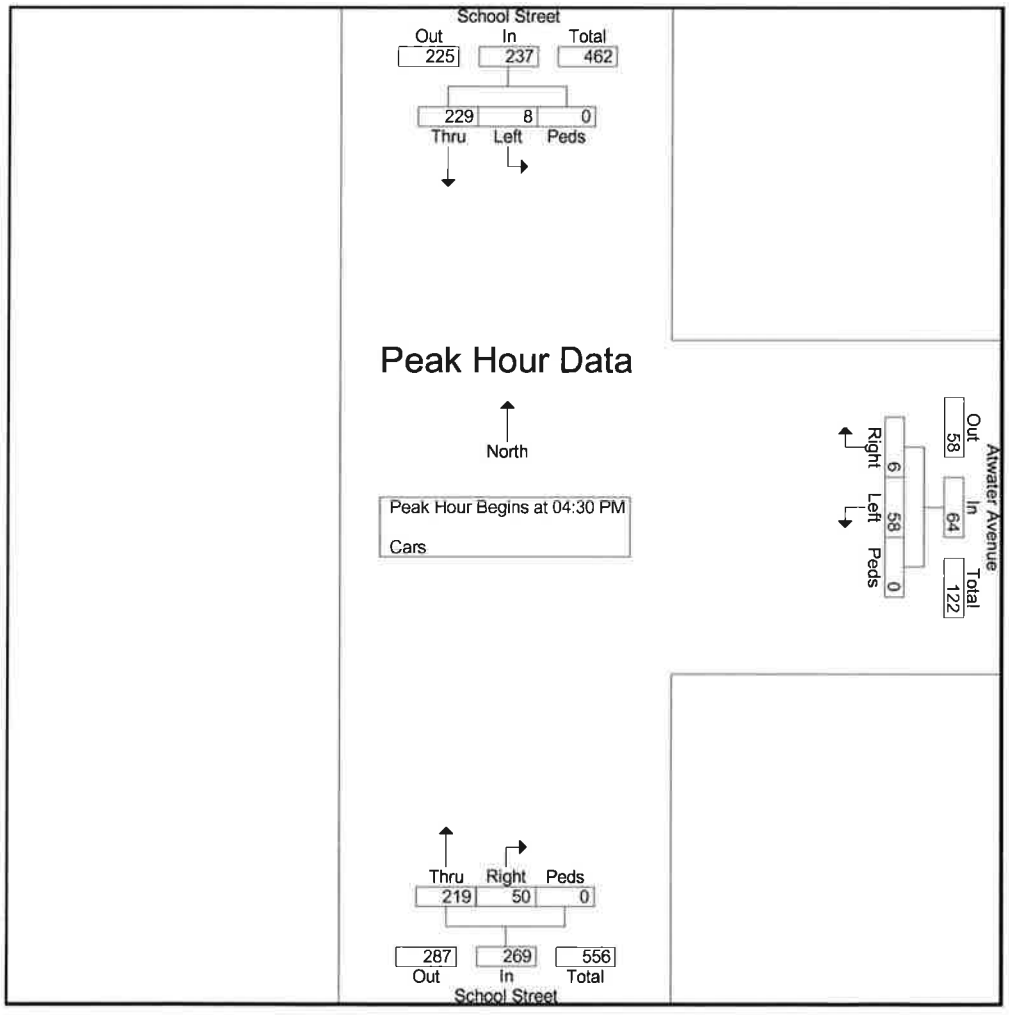
School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 3

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	46	1	0	47	0	14	0	14	**17**	61	0	**78**	139
04:45 PM	46	**4**	0	50	1	7	0	8	17	53	0	70	128
05:00 PM	61	2	0	63	**4**	**27**	0	**31**	10	42	0	52	146
05:15 PM	**76**	1	0	**77**	1	10	0	11	6	**63**	0	69	**157**
Total Volume	229	8	0	237	6	58	0	64	50	219	0	269	570
% App. Total	96.6	3.4	0		9.4	90.6	0		18.6	81.4	0		
PHF	.753	.500	.000	.769	.375	.537	.000	.516	.735	.869	.000	.862	.908



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School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 1

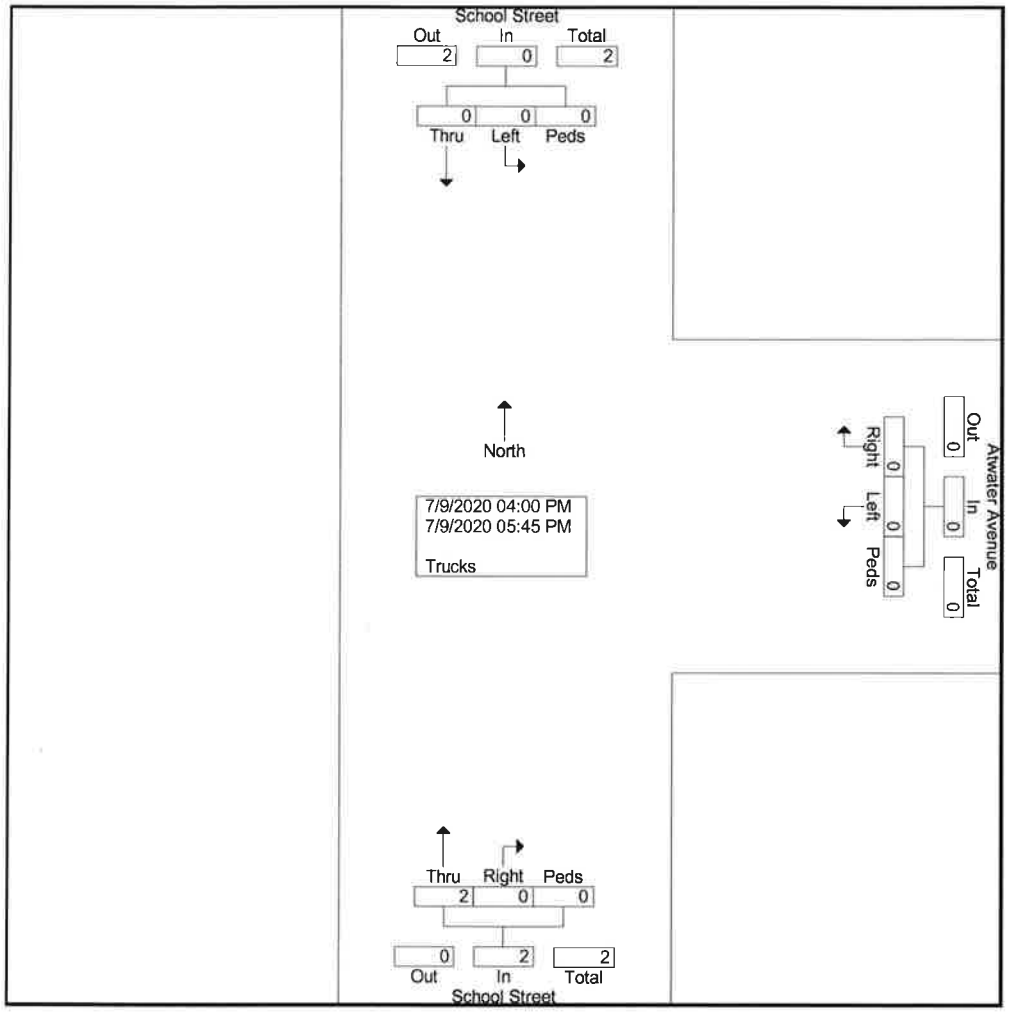
Groups Printed- Trucks

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	2	0	2	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	2	0	2	2
Apprch %	0	0	0		0	0	0		0	100	0		
Total %	0	0	0	0	0	0	0	0	0	100	0	100	

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 2

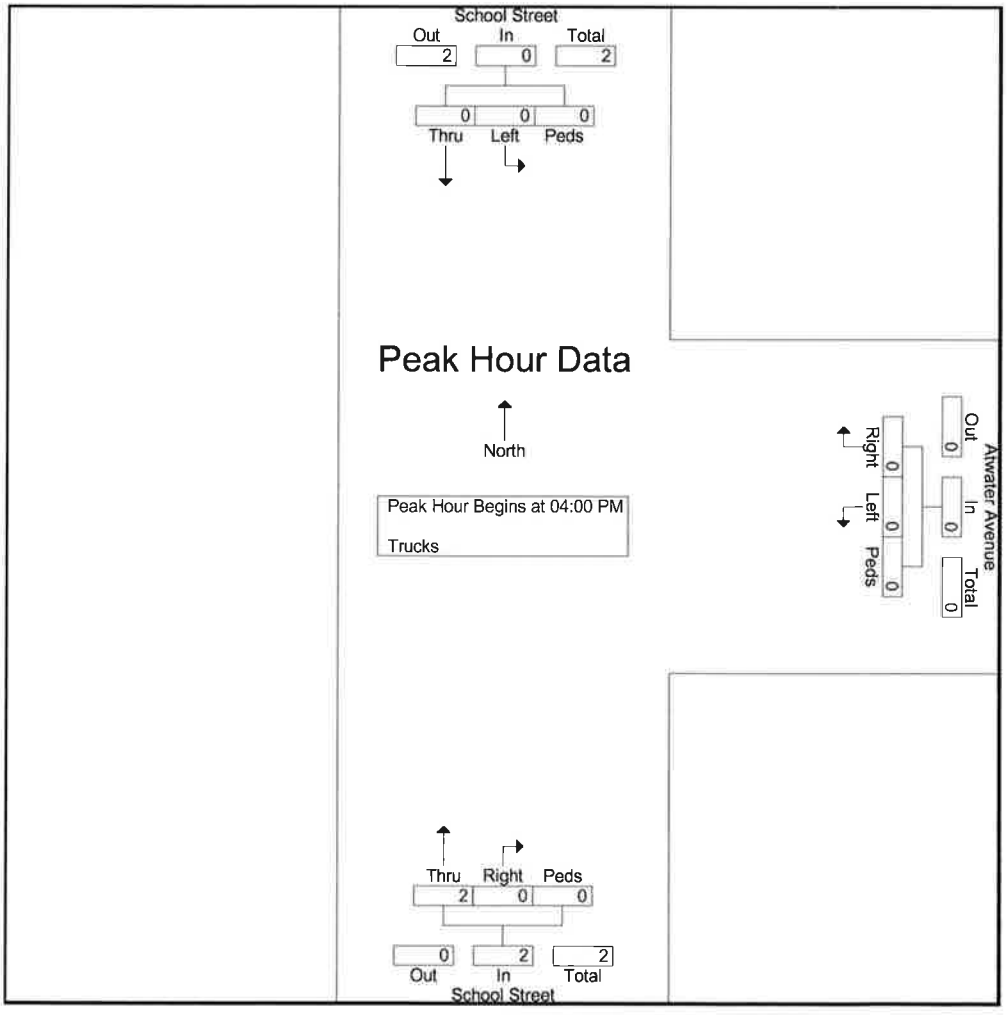


Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103pm
Site Code : 00844103
Start Date : 7/9/2020
Page No : 3

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	0	0	0	0	0	0	0	0	**2**	0	**2**	**2**
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	2	0	2	2
% App. Total	0	0	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250



Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 1

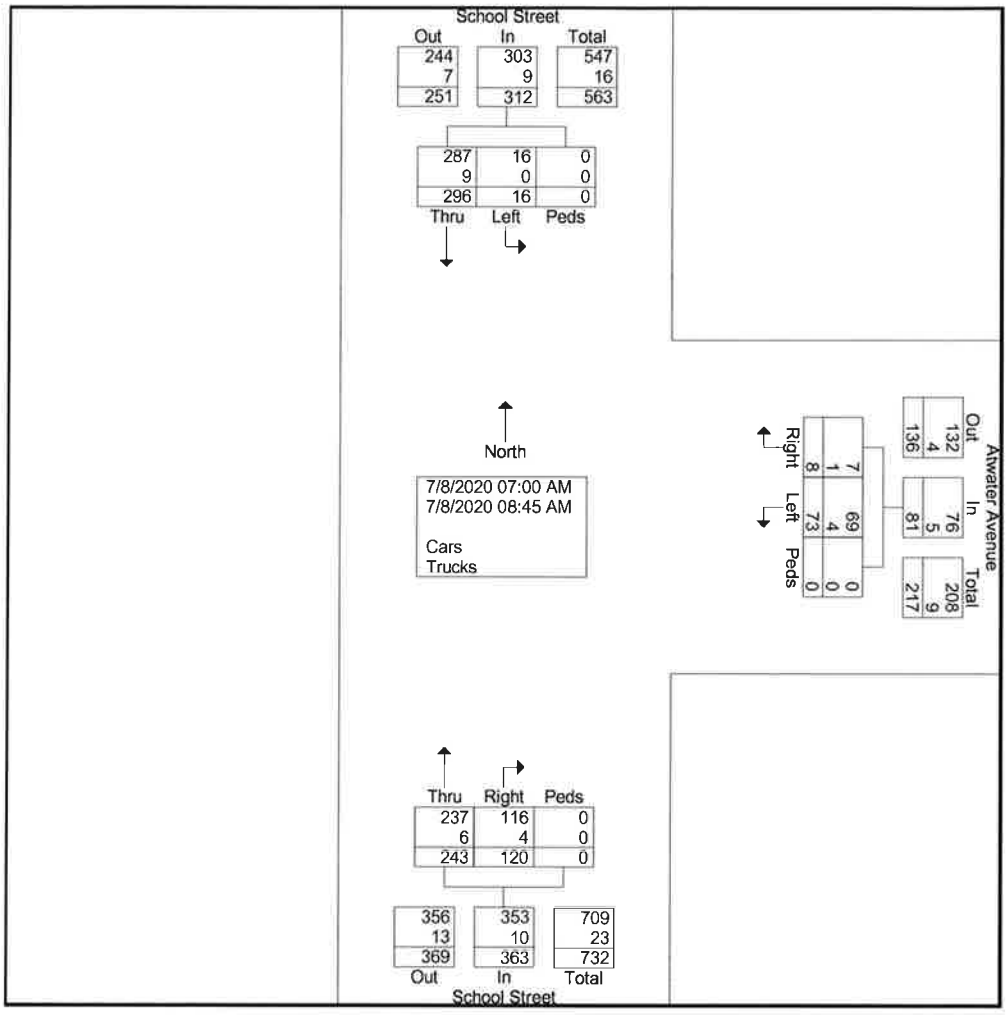
Groups Printed- Cars - Trucks

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	21	4	0	25	0	5	0	5	9	14	0	23	53
07:15 AM	25	1	0	26	2	7	0	9	20	42	0	62	97
07:30 AM	42	0	0	42	1	15	0	16	12	30	0	42	100
07:45 AM	50	4	0	54	2	21	0	23	21	31	0	52	129
Total	138	9	0	147	5	48	0	53	62	117	0	179	379
08:00 AM	46	1	0	47	0	5	0	5	14	21	0	35	87
08:15 AM	29	2	0	31	1	9	0	10	13	30	0	43	84
08:30 AM	42	2	0	44	1	5	0	6	10	34	0	44	94
08:45 AM	41	2	0	43	1	6	0	7	21	41	0	62	112
Total	158	7	0	165	3	25	0	28	58	126	0	184	377
Grand Total	296	16	0	312	8	73	0	81	120	243	0	363	756
Apprch %	94.9	5.1	0		9.9	90.1	0		33.1	66.9	0		
Total %	39.2	2.1	0	41.3	1.1	9.7	0	10.7	15.9	32.1	0	48	
Cars	287	16	0	303	7	69	0	76	116	237	0	353	732
% Cars	97	100	0	97.1	87.5	94.5	0	93.8	96.7	97.5	0	97.2	96.8
Trucks	9	0	0	9	1	4	0	5	4	6	0	10	24
% Trucks	3	0	0	2.9	12.5	5.5	0	6.2	3.3	2.5	0	2.8	3.2

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 2



Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

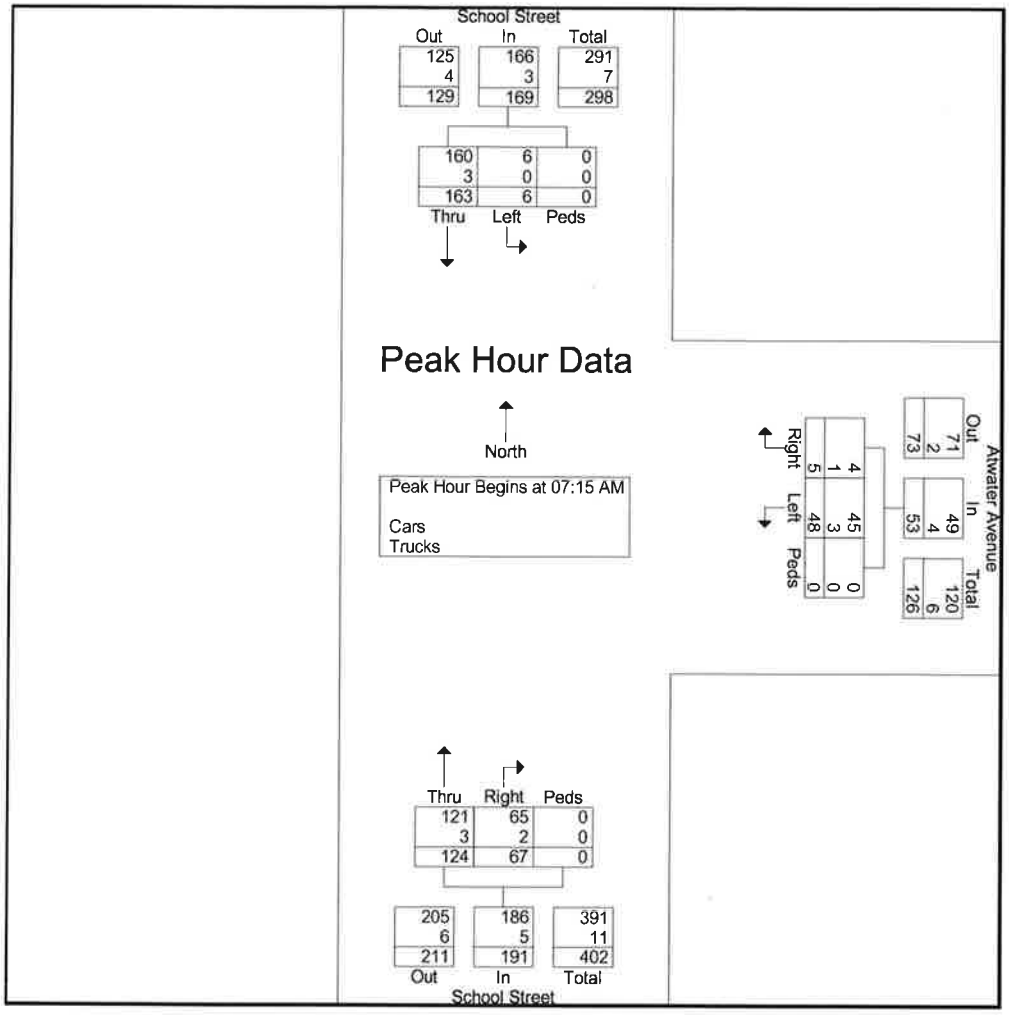
File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 3

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	25	1	0	26	**2**	7	0	9	20	**42**	0	**62**	97
07:30 AM	42	0	0	42	1	15	0	16	12	30	0	42	100
07:45 AM	**50**	**4**	0	**54**	2	**21**	0	**23**	**21**	31	0	52	**129**
08:00 AM	46	1	0	47	0	5	0	5	14	21	0	35	87
Total Volume	163	6	0	169	5	48	0	53	67	124	0	191	413
% App. Total	96.4	3.6	0		9.4	90.6	0		35.1	64.9	0		
PHF	.815	.375	.000	.782	.625	.571	.000	.576	.798	.738	.000	.770	.800
Cars	160	6	0	166	4	45	0	49	65	121	0	186	401
% Cars	98.2	100	0	98.2	80.0	93.8	0	92.5	97.0	97.6	0	97.4	97.1
Trucks	3	0	0	3	1	3	0	4	2	3	0	5	12
% Trucks	1.8	0	0	1.8	20.0	6.3	0	7.5	3.0	2.4	0	2.6	2.9

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 4



Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 1

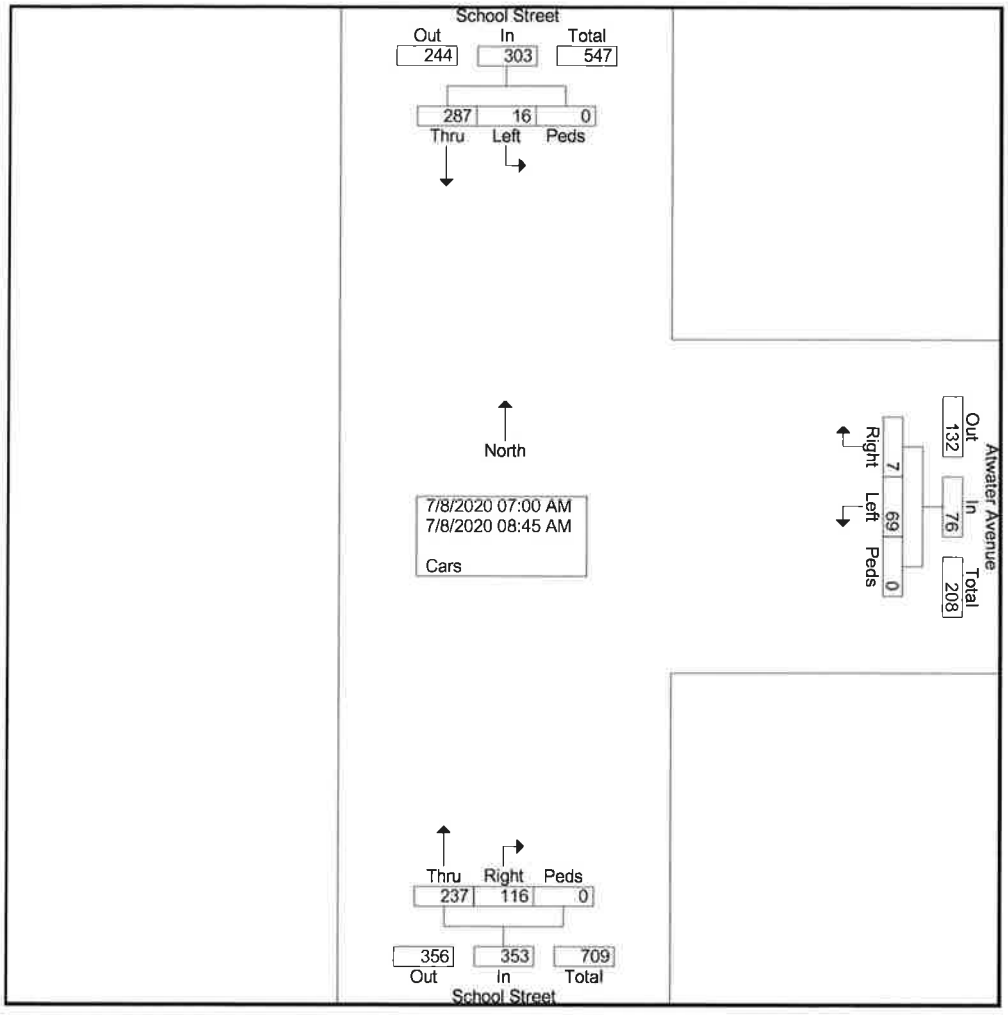
Groups Printed- Cars

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	20	4	0	24	0	5	0	5	8	14	0	22	51
07:15 AM	25	1	0	26	1	6	0	7	20	42	0	62	95
07:30 AM	42	0	0	42	1	15	0	16	12	30	0	42	100
07:45 AM	48	4	0	52	2	20	0	22	19	28	0	47	121
Total	135	9	0	144	4	46	0	50	59	114	0	173	367
08:00 AM	45	1	0	46	0	4	0	4	14	21	0	35	85
08:15 AM	29	2	0	31	1	9	0	10	12	29	0	41	82
08:30 AM	41	2	0	43	1	4	0	5	10	33	0	43	91
08:45 AM	37	2	0	39	1	6	0	7	21	40	0	61	107
Total	152	7	0	159	3	23	0	26	57	123	0	180	365
Grand Total	287	16	0	303	7	69	0	76	116	237	0	353	732
Apprch %	94.7	5.3	0		9.2	90.8	0		32.9	67.1	0		
Total %	39.2	2.2	0	41.4	1	9.4	0	10.4	15.8	32.4	0	48.2	

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 2

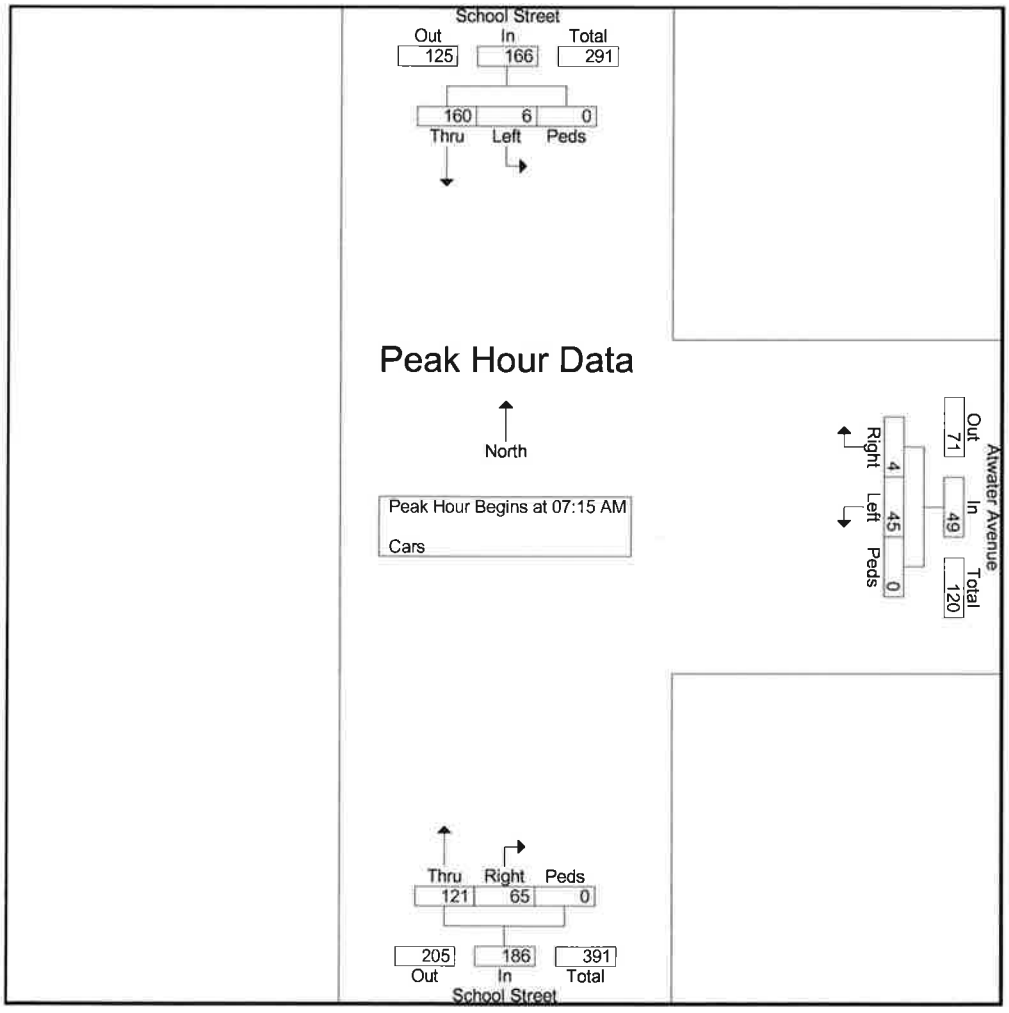


Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 3

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	25	1	0	26	1	6	0	7	**20**	**42**	0	**62**	95
07:30 AM	42	0	0	42	1	15	0	16	12	30	0	42	100
07:45 AM	**48**	**4**	0	**52**	**2**	**20**	0	**22**	19	28	0	47	**121**
08:00 AM	45	1	0	46	0	4	0	4	14	21	0	35	85
Total Volume	160	6	0	166	4	45	0	49	65	121	0	186	401
% App. Total	96.4	3.6	0		8.2	91.8	0		34.9	65.1	0		
PHF	.833	.375	.000	.798	.500	.563	.000	.557	.813	.720	.000	.750	.829



Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 1

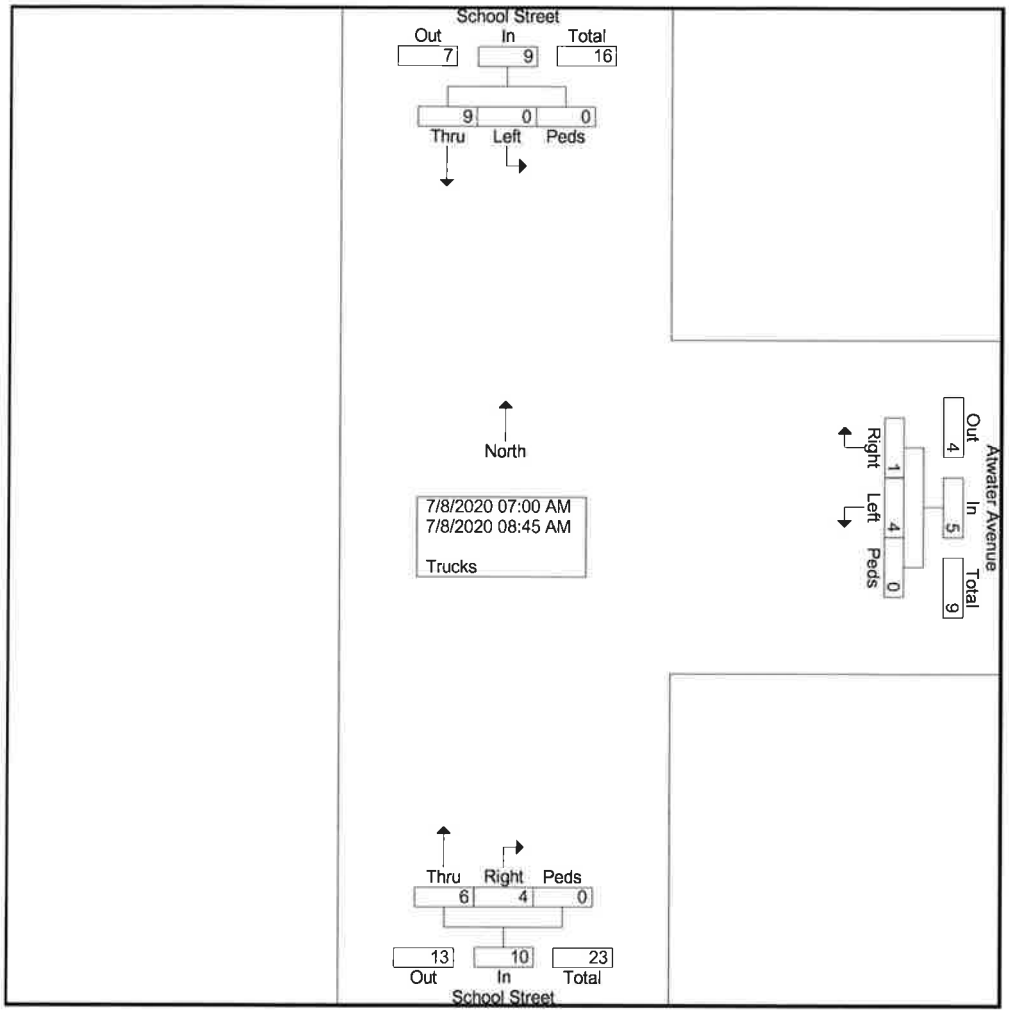
Groups Printed- Trucks

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	1	0	0	1	0	0	0	0	1	0	0	1	2
07:15 AM	0	0	0	0	1	1	0	2	0	0	0	0	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	2	0	0	2	0	1	0	1	2	3	0	5	8
Total	3	0	0	3	1	2	0	3	3	3	0	6	12
08:00 AM	1	0	0	1	0	1	0	1	0	0	0	0	2
08:15 AM	0	0	0	0	0	0	0	0	1	1	0	2	2
08:30 AM	1	0	0	1	0	1	0	1	0	1	0	1	3
08:45 AM	4	0	0	4	0	0	0	0	0	1	0	1	5
Total	6	0	0	6	0	2	0	2	1	3	0	4	12
Grand Total	9	0	0	9	1	4	0	5	4	6	0	10	24
Apprch %	100	0	0		20	80	0		40	60	0		
Total %	37.5	0	0	37.5	4.2	16.7	0	20.8	16.7	25	0	41.7	

Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 2

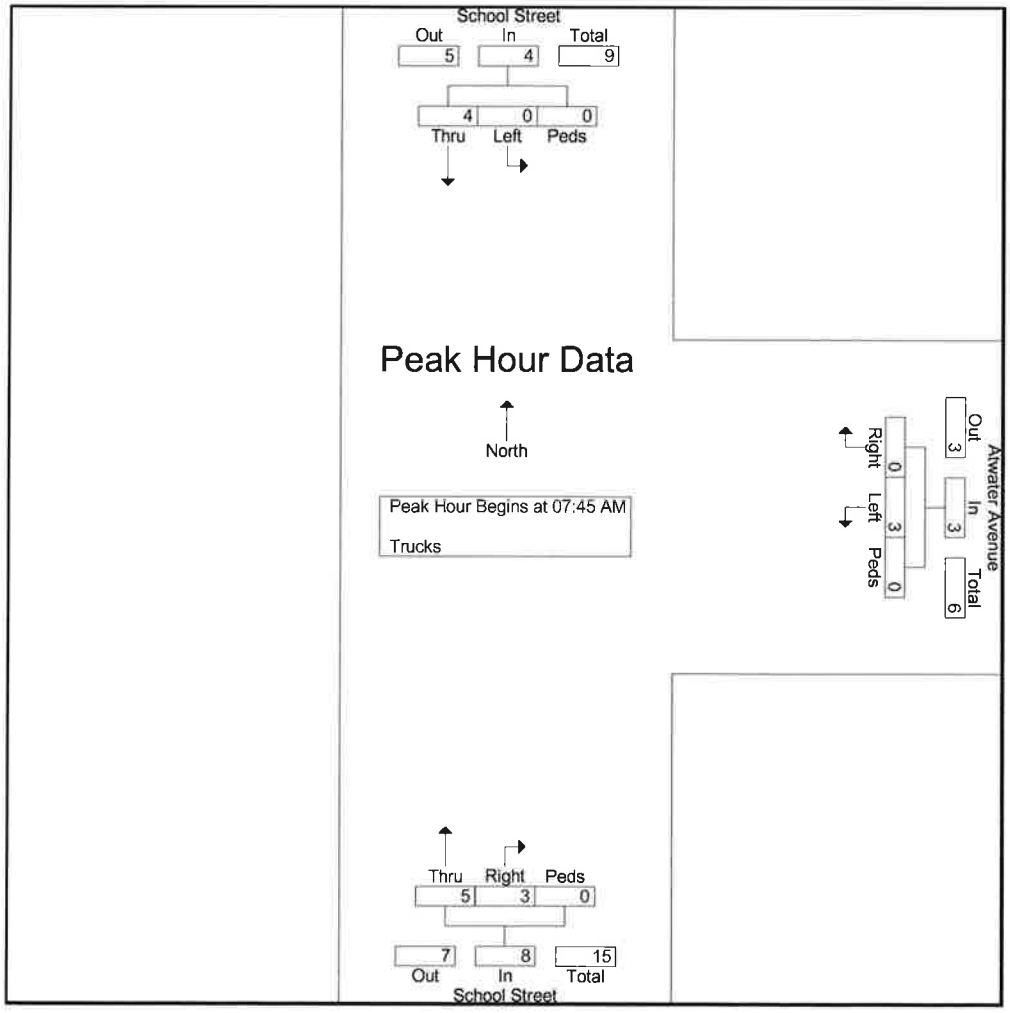


Vanasse & Associates

School Street at Atwater Avenue
Manchester By The Sea, MA
Weather: Clear

File Name : 844103am
Site Code : 00844103
Start Date : 7/8/2020
Page No : 3

	School Street From North				Atwater Avenue From East				School Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45 AM													
07:45 AM	**2**	0	0	**2**	0	**1**	0	**1**	**2**	**3**	0	**5**	**8**
08:00 AM	1	0	0	1	0	1	0	1	0	0	0	0	2
08:15 AM	0	0	0	0	0	0	0	0	1	1	0	2	2
08:30 AM	1	0	0	1	0	1	0	1	0	1	0	1	3
Total Volume	4	0	0	4	0	3	0	3	3	5	0	8	15
% App. Total	100	0	0		0	100	0		37.5	62.5	0		
PHF	.500	.000	.000	.500	.000	.750	.000	.750	.375	.417	.000	.400	.469



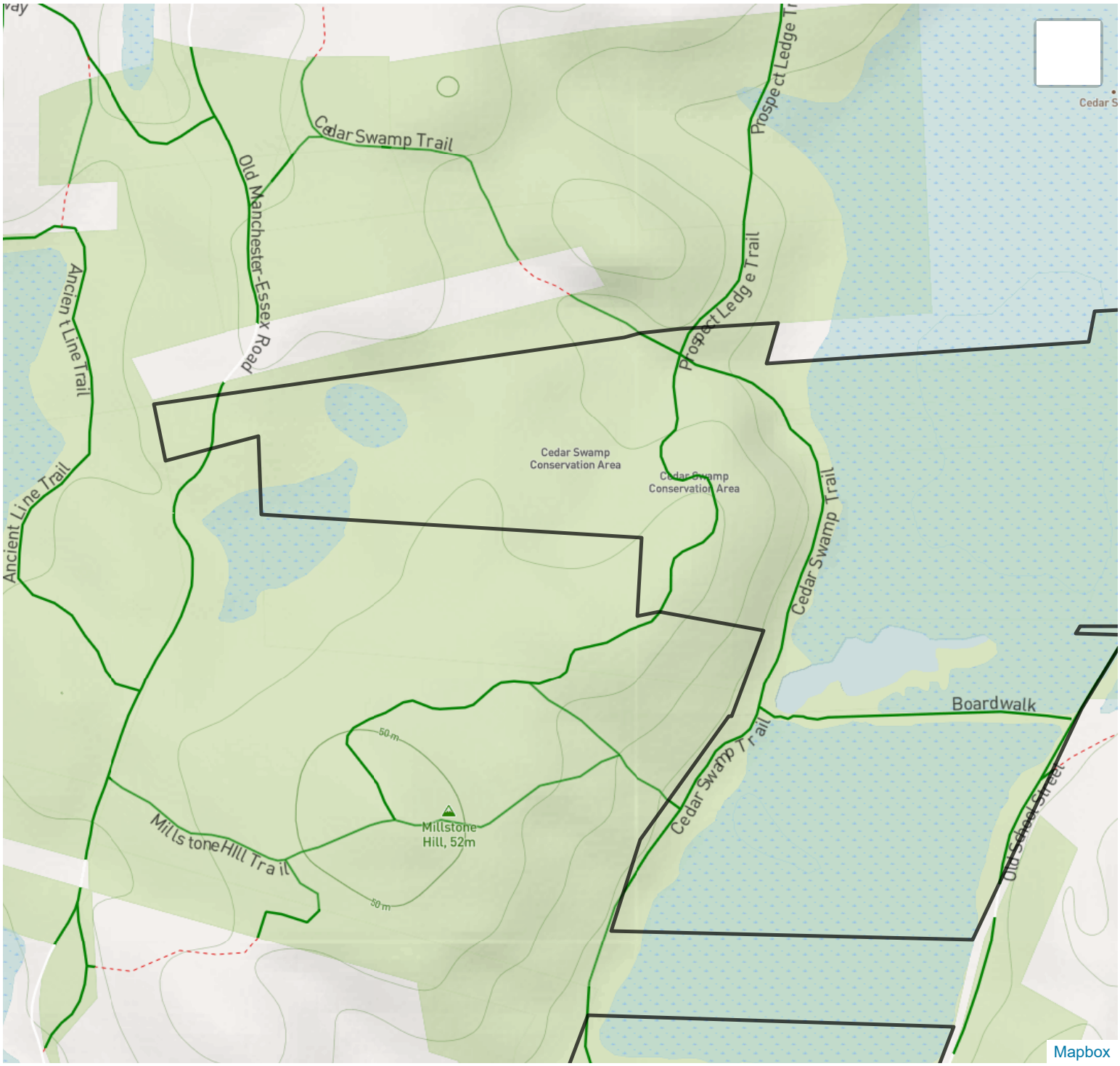
TRAIL MAPS

Cedar Swamp Conservation Area - Manchester-by-the-Sea - MA

The Cedar Swamp Conservation Area recreation ground is owned by the Milton Land Conservation Trust. It is 66 acres. This property is open to the public.

The property has 1.0 miles of public trails.

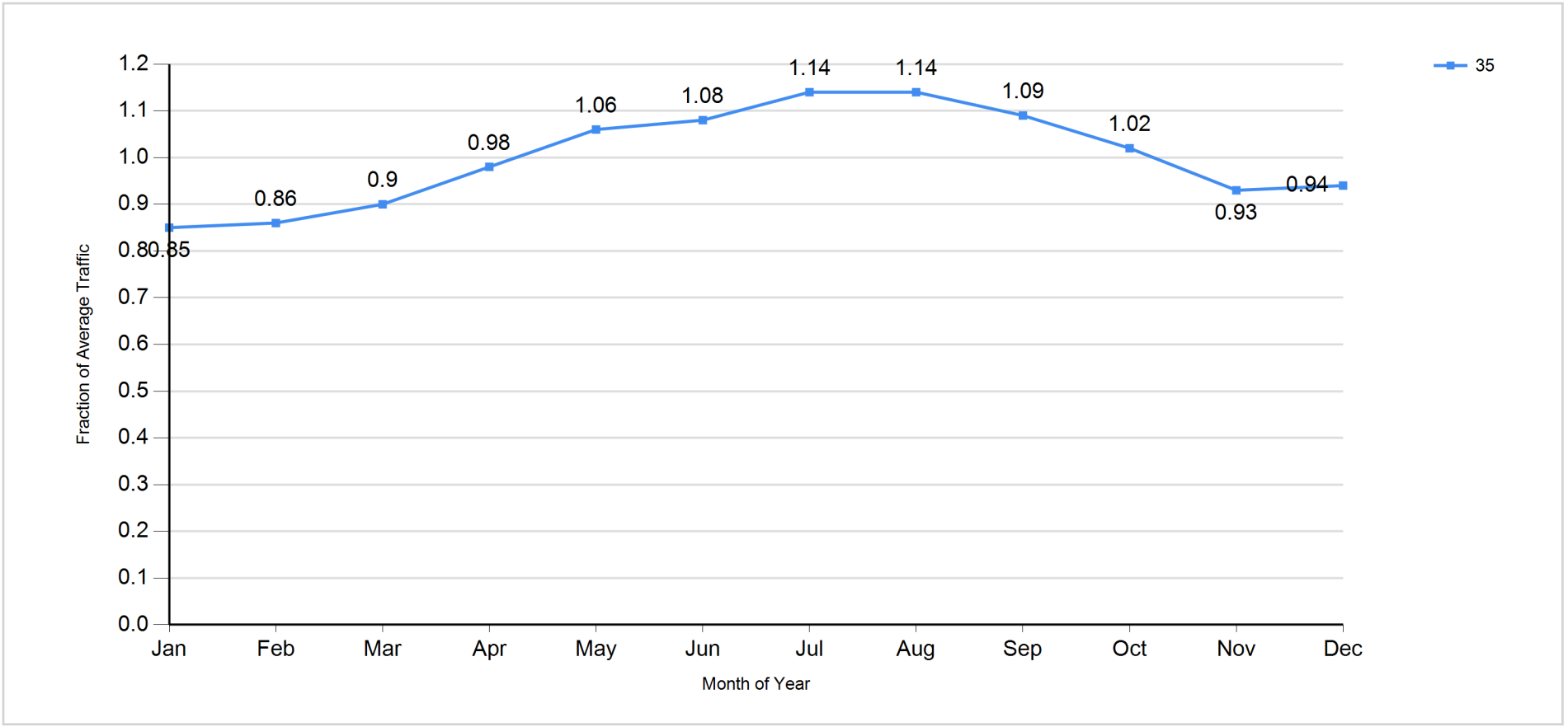
Trail Map



SEASONAL ADJUSTMENT DATA

Massachusetts Highway Department

Traffic Pattern by Month for 1/1/2015 - 12/31/2015



Traffic Pattern by Month for 1/1/2015 - 12/31/2015

Factor Group	Station	Weight	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
U2	35	1	0.852	0.860	0.900	0.977	1.061	1.076	1.143	1.141	1.089	1.019	0.926	0.936
	Average of Weighted Factors		**0.852**	**0.860**	**0.900**	**0.977**	**1.061**	**1.076**	**1.143**	**1.141**	**1.089**	**1.019**	**0.926**	**0.936**

VEHICLE SPEED DATA

Vanasse & Associates

35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
Location: N of Atwater Avenue
City: Manchester By The Sea, MA

Site Code: 00844101

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	95th Percent
07/07/20	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	2	3	2	2	18	67	47	**13**	**1**	0	0	0	0	0	155	44	47
08:00	1	**6**	4	**13**	27	**80**	**50**	10	0	0	0	0	0	0	**191**	43	45
09:00	3	1	**7**	9	24	76	34	4	0	0	0	0	0	0	158	42	44
10:00	**9**	1	2	9	**45**	68	30	7	0	0	0	0	0	0	171	41	44
11:00	7	3	4	5	31	77	47	5	1	**1**	0	0	0	0	181	42	44
12 PM	9	2	1	5	39	94	53	9	0	0	0	0	0	0	212	42	44
13:00	15	3	6	11	14	80	66	6	0	0	0	0	0	0	201	43	44
14:00	**18**	2	8	6	36	**124**	49	8	0	0	0	0	0	0	**251**	41	44
15:00	10	**7**	10	**12**	**44**	101	45	12	**2**	0	0	0	0	0	243	42	45
16:00	10	5	**13**	10	31	113	45	9	1	0	0	0	0	0	237	42	44
17:00	3	1	4	8	28	66	**70**	13	0	0	0	0	0	0	193	43	46
18:00	2	3	2	9	20	72	62	10	1	**1**	0	0	0	0	182	43	46
19:00	0	0	0	1	11	60	61	**22**	0	0	0	0	0	0	155	44	48
20:00	1	0	0	2	14	58	33	9	1	0	0	0	0	0	118	43	47
21:00	0	0	2	2	10	30	17	6	2	0	0	0	0	0	69	44	48
22:00	0	0	0	0	4	9	8	5	2	0	0	0	0	0	28	47	51
23:00	0	0	0	0	1	9	8	2	0	0	0	0	0	0	20	44	47
Total	90	37	65	104	397	1184	725	150	11	2	0	0	0	0	2765		
Percent	3.3%	1.3%	2.4%	3.8%	14.4%	42.8%	26.2%	5.4%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	08:00	09:00	08:00	10:00	08:00	08:00	07:00	07:00	11:00					08:00		
Vol.	9	6	7	13	45	80	50	13	1	1					191		
PM Peak	14:00	15:00	16:00	15:00	15:00	14:00	17:00	19:00	15:00	18:00					14:00		
Vol.	18	7	13	12	44	124	70	22	2	1					251		

Vanasse & Associates

35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
Location: N of Atwater Avenue
City: Manchester By The Sea, MA

Site Code: 00844101

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	95th Percent
07/08/20	0	0	0	0	2	1	2	0	1	0	0	0	0	0	6	50	53
01:00	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	48	49
02:00	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3	38	39
03:00	0	0	0	0	0	2	0	2	0	0	0	0	0	0	4	48	49
04:00	0	0	0	1	1	4	3	0	0	0	0	0	0	0	9	42	44
05:00	0	0	0	0	4	9	12	2	1	0	0	0	0	0	28	44	49
06:00	1	1	3	4	9	27	37	11	0	**1**	0	0	0	0	94	44	48
07:00	0	**3**	**9**	6	29	69	36	5	0	0	0	0	0	0	157	42	44
08:00	0	1	2	**20**	24	63	43	9	2	0	0	0	0	0	164	43	46
09:00	7	1	4	9	22	69	49	8	0	0	0	0	0	0	169	43	44
10:00	7	2	1	8	**31**	61	35	**15**	**3**	0	0	0	0	0	163	44	48
11:00	**9**	3	3	4	19	**72**	**54**	12	2	0	0	0	0	0	**178**	43	47
12 PM	11	2	4	**13**	28	**106**	54	12	0	0	0	0	0	0	**230**	42	45
13:00	4	2	6	6	23	84	64	11	1	0	0	0	0	0	201	43	45
14:00	**13**	2	6	10	**45**	82	57	10	1	0	0	0	0	0	226	42	44
15:00	10	**5**	8	11	32	71	**70**	13	0	0	0	0	0	0	220	43	45
16:00	8	5	**11**	1	19	87	67	**19**	1	0	0	0	0	0	218	44	47
17:00	7	0	2	4	22	79	65	16	**3**	0	0	0	0	0	198	44	47
18:00	0	1	0	5	8	78	62	12	2	0	0	0	0	0	168	44	47
19:00	0	0	0	2	5	34	34	13	1	0	0	0	0	0	89	45	48
20:00	0	0	0	4	14	30	27	11	1	0	0	0	0	0	87	44	48
21:00	0	0	0	3	4	22	16	5	1	0	0	0	0	0	51	44	48
22:00	0	0	0	0	0	9	9	3	0	0	0	0	0	0	21	44	48
23:00	0	0	0	0	5	2	7	0	0	0	0	0	0	0	14	43	44
Total	77	28	59	111	347	1064	803	190	20	1	0	0	0	0	2700		
Percent	2.9%	1.0%	2.2%	4.1%	12.9%	39.4%	29.7%	7.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	07:00	07:00	08:00	10:00	11:00	11:00	10:00	10:00	06:00					11:00		
Vol.	9	3	9	20	31	72	54	15	3	1					178		
PM Peak	14:00	15:00	16:00	12:00	14:00	12:00	15:00	16:00	17:00						12:00		
Vol.	13	5	11	13	45	106	70	19	3						230		

Vanasse & Associates
35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
Location: N of Atwater Avenue
City: Manchester By The Sea, MA

Site Code: 00844101

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	95th Percent
07/09/20	0	0	0	0	1	0	0	0	**1**	0	0	0	0	0	2	53	54
01:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	44	44
02:00	0	0	1	0	0	0	0	1	0	0	0	0	0	0	2	48	49
03:00	0	0	1	0	1	0	2	0	0	0	0	0	0	0	4	43	44
04:00	0	0	0	0	0	6	0	0	0	0	0	0	0	0	6	39	39
05:00	0	0	0	0	0	11	8	2	1	0	0	0	0	0	22	44	49
06:00	0	2	4	6	4	23	36	11	0	0	0	0	0	0	86	44	48
07:00	0	0	**5**	2	23	65	55	**14**	1	0	0	0	0	0	165	44	47
08:00	2	0	5	10	22	59	**68**	6	0	0	0	0	0	0	172	43	44
09:00	3	**3**	3	**15**	25	**69**	54	9	0	0	0	0	0	0	**181**	43	44
10:00	10	1	5	4	**26**	62	60	10	0	0	0	0	0	0	178	43	45
11:00	**14**	2	1	2	17	62	44	13	0	0	0	0	0	0	155	43	47
12 PM	10	**4**	**10**	5	29	88	52	4	1	0	0	0	0	0	203	42	44
13:00	7	2	6	10	42	**108**	53	13	2	0	0	0	0	0	243	42	46
14:00	9	3	8	10	**59**	85	49	10	1	0	0	0	0	0	234	42	44
15:00	7	2	6	12	26	97	**79**	16	2	0	0	0	0	0	247	43	46
16:00	**11**	4	10	**16**	34	84	61	7	1	0	0	0	0	0	228	42	44
17:00	4	3	4	14	56	102	59	10	1	0	0	0	0	0	**253**	42	44
18:00	0	1	1	3	20	51	73	20	**4**	**1**	**1**	0	0	0	175	44	49
19:00	0	0	0	3	24	51	39	**22**	1	1	0	0	0	0	141	45	48
20:00	2	0	0	3	21	56	40	19	0	0	0	0	0	0	141	44	48
21:00	0	0	0	1	13	33	24	8	0	0	0	0	0	0	79	44	47
22:00	0	0	0	1	6	11	8	4	0	0	0	0	0	0	30	44	48
23:00	0	0	0	0	0	6	3	1	2	0	0	0	0	0	12	50	53
Total	79	27	70	117	449	1129	869	200	18	2	1	0	0	0	2961		
Percent	2.7%	0.9%	2.4%	4.0%	15.2%	38.1%	29.3%	6.8%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	09:00	07:00	09:00	10:00	09:00	08:00	07:00	00:00						09:00		
Vol.	14	3	5	15	26	69	68	14	1						181		
PM Peak	16:00	12:00	12:00	16:00	14:00	13:00	15:00	19:00	18:00	18:00	18:00				17:00		
Vol.	11	4	10	16	59	108	79	22	4	1	1				253		

Vanasse & Associates
35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
Location: N of Atwater Avenue
City: Manchester By The Sea, MA

Site Code: 00844101

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	95th Percent
07/10/20	0	0	0	0	0	1	1	3	0	**1**	0	0	0	0	6	55	58
01:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	38	39
02:00	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2	43	44
03:00	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3	42	44
04:00	0	0	0	0	0	3	1	0	0	0	0	0	0	0	4	42	43
05:00	0	0	0	2	0	12	9	2	0	0	0	0	0	0	25	44	46
06:00	0	0	**4**	**14**	**5**	**34**	**28**	**6**	**1**	0	0	0	0	0	**92**	43	46
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
14:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	0	0	4	16	7	53	41	11	1	1	0	0	0	0	134		
Percent	0.0%	0.0%	3.0%	11.9%	5.2%	39.6%	30.6%	8.2%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%			
AM Peak			06:00	06:00	06:00	06:00	06:00	06:00	06:00	00:00					06:00		
Vol.			4	14	5	34	28	6	1	1					92		
PM Peak																	
Vol.																	
Grand Total	246	92	198	348	1200	3430	2438	551	50	6	1	0	0	0	8560		
Percent	2.9%	1.1%	2.3%	4.1%	14.0%	40.1%	28.5%	6.4%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	31 MPH
50th Percentile :	38 MPH
85th Percentile :	43 MPH
95th Percentile :	46 MPH

Statistics

10 MPH Pace Speed :	36-45 MPH
Number in Pace :	5868
Percent in Pace :	68.6%
Number of Vehicles > 35 MPH :	6476
Percent of Vehicles > 35 MPH :	75.7%
Mean Speed(Average) :	38 MPH

Vanasse & Associates
35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
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Site Code: 00844101

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	95th Percent
07/07/20	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	0	**1**	2	2	7	59	44	11	1	0	0	0	0	0	127	44	47
08:00	**2**	1	3	4	12	45	38	9	1	0	0	0	0	0	115	44	47
09:00	2	1	5	**12**	20	73	32	6	0	0	0	0	0	0	151	42	44
10:00	1	1	5	8	18	66	61	14	1	0	0	0	0	0	175	44	47
11:00	1	0	**7**	10	**32**	**88**	**69**	**15**	**3**	0	0	0	0	0	**225**	43	47
12 PM	3	3	6	10	31	112	71	15	1	0	0	0	0	0	252	43	46
13:00	1	0	5	2	21	98	76	13	0	0	0	0	0	0	216	43	45
14:00	**5**	**4**	3	10	31	97	60	9	**2**	0	0	0	0	0	221	43	44
15:00	0	1	7	**21**	**43**	121	77	19	0	0	0	0	0	0	**289**	43	46
16:00	1	1	5	11	42	115	**91**	13	0	0	0	0	0	0	279	43	44
17:00	3	0	**10**	7	24	**122**	71	**25**	0	0	0	0	0	0	262	43	47
18:00	0	2	6	7	12	89	49	11	1	0	0	0	0	0	177	43	46
19:00	0	0	1	2	8	29	36	10	1	0	0	0	0	0	87	44	48
20:00	1	0	1	0	5	37	27	5	0	0	0	0	0	0	76	43	46
21:00	0	0	0	0	3	28	11	6	0	0	0	0	0	0	48	44	48
22:00	0	0	0	0	3	11	3	0	0	0	0	0	0	0	17	40	43
23:00	0	0	0	0	0	5	3	3	1	0	0	0	0	0	12	48	51
Total	20	15	66	106	312	1195	819	184	12	0	0	0	0	0	2729		
Percent	0.7%	0.5%	2.4%	3.9%	11.4%	43.8%	30.0%	6.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	07:00	11:00	09:00	11:00	11:00	11:00	11:00	11:00						11:00		
Vol.	2	1	7	12	32	88	69	15	3						225		
PM Peak	14:00	14:00	17:00	15:00	15:00	17:00	16:00	17:00	14:00						15:00		
Vol.	5	4	10	21	43	122	91	25	2						289		

Vanasse & Associates
35 New England Business Center Dr, Suite 140
Andover, MA 01810

Vanasse & Associates
Location: School Street
Location: N of Atwater Avenue
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Site Code: 00844101

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	95th Percent
07/08/20	0	0	0	0	0	2	0	2	1	0	0	0	0	0	5	51	53
01:00	0	0	0	0	2	2	0	0	0	0	0	0	0	0	4	38	39
02:00	0	0	0	0	2	1	1	0	0	0	0	0	0	0	4	42	43
03:00	0	0	1	0	0	0	1	1	0	0	0	0	0	0	3	47	49
04:00	0	0	0	0	0	1	3	0	0	0	0	0	0	0	4	44	44
05:00	0	0	2	1	0	5	6	4	0	0	0	0	0	0	18	46	48
06:00	0	**3**	4	0	2	17	23	11	**4**	0	**1**	0	0	0	65	47	52
07:00	0	2	5	5	11	62	33	9	1	**1**	0	0	0	0	129	43	47
08:00	3	2	2	7	21	45	45	8	2	0	0	0	0	0	135	43	47
09:00	4	1	**8**	5	**28**	54	42	9	2	0	0	0	0	0	153	43	46
10:00	1	1	5	5	26	**74**	46	4	1	1	0	0	0	0	164	42	44
11:00	**5**	1	1	**9**	26	65	**65**	**12**	1	0	0	0	0	0	**185**	43	46
12 PM	3	1	**8**	**12**	**33**	77	62	16	1	0	0	0	0	0	213	43	46
13:00	3	2	4	7	26	89	70	9	**2**	0	0	0	0	0	212	43	45
14:00	2	2	4	5	28	99	53	12	0	0	0	0	0	0	205	43	45
15:00	1	1	5	7	26	108	76	21	1	0	0	0	0	0	246	44	47
16:00	**7**	**3**	2	3	26	**121**	86	12	1	0	0	0	0	0	**261**	43	44
17:00	1	2	7	3	16	79	**87**	**23**	2	0	0	0	0	0	220	44	48
18:00	0	0	3	2	13	51	60	13	2	0	0	0	0	0	144	44	47
19:00	0	0	0	1	9	30	36	11	0	**1**	0	0	0	0	88	44	48
20:00	0	0	0	1	6	24	25	6	2	0	0	0	0	0	64	44	49
21:00	0	0	0	2	10	12	11	3	0	0	0	0	0	0	38	43	46
22:00	0	0	0	0	2	10	11	3	0	0	0	0	0	0	26	44	47
23:00	0	0	0	0	1	9	3	2	1	0	0	0	0	0	16	46	50
Total	30	21	61	75	314	1037	845	191	24	3	1	0	0	0	2602		
Percent	1.2%	0.8%	2.3%	2.9%	12.1%	39.9%	32.5%	7.3%	0.9%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	06:00	09:00	11:00	09:00	10:00	11:00	11:00	06:00	07:00	06:00				11:00		
Vol.	5	3	8	9	28	74	65	12	4	1	1				185		
PM Peak	16:00	16:00	12:00	12:00	12:00	16:00	17:00	17:00	13:00	19:00					16:00		
Vol.	7	3	8	12	33	121	87	23	2	1					261		

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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	95th Percent
07/09/20	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	43	44
01:00	0	0	0	0	3	1	2	0	0	0	0	0	0	0	6	42	44
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39	39
03:00	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2	48	49
04:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	44	44
05:00	0	0	1	0	0	8	5	7	2	0	0	0	0	0	23	48	52
06:00	1	2	1	0	6	20	15	14	2	0	0	0	0	0	61	47	49
07:00	0	**4**	**5**	5	11	46	53	15	2	**1**	0	0	0	0	142	44	48
08:00	1	2	3	**10**	13	68	37	5	2	0	0	0	0	0	141	43	44
09:00	1	3	4	4	25	70	42	4	0	0	0	0	0	0	153	42	44
10:00	3	3	3	6	**29**	81	61	6	1	0	0	0	0	0	193	43	44
11:00	**6**	4	2	7	19	**87**	**75**	**27**	**4**	0	0	0	0	0	**231**	44	48
12 PM	**4**	2	3	7	26	87	73	16	0	**1**	0	0	0	0	219	43	46
13:00	2	2	4	**13**	24	84	84	13	3	0	0	0	0	0	229	43	46
14:00	3	0	**11**	10	23	76	68	17	2	0	0	0	0	0	210	44	47
15:00	3	0	3	7	37	**111**	**85**	14	1	0	0	0	0	0	**261**	43	45
16:00	1	2	3	10	**45**	103	73	10	0	1	0	0	0	0	248	43	44
17:00	0	0	7	2	27	103	79	6	0	0	0	0	0	0	224	43	44
18:00	0	**3**	3	4	13	63	83	**26**	1	1	0	0	0	0	197	44	48
19:00	0	0	3	0	13	50	46	17	**4**	0	0	0	0	0	133	45	49
20:00	2	0	0	2	10	40	25	3	0	0	0	0	0	0	82	43	44
21:00	0	0	0	0	7	31	15	5	2	0	0	0	0	0	60	44	49
22:00	0	0	0	2	2	15	13	5	1	0	0	0	0	0	38	45	49
23:00	0	0	0	0	2	7	6	2	1	0	0	0	0	0	18	45	50
Total	27	27	56	89	336	1152	944	213	28	4	0	0	0	0	2876		
Percent	0.9%	0.9%	1.9%	3.1%	11.7%	40.1%	32.8%	7.4%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	07:00	07:00	08:00	10:00	11:00	11:00	11:00	11:00	07:00					11:00		
Vol.	6	4	5	10	29	87	75	27	4	1					231		
PM Peak	12:00	18:00	14:00	13:00	16:00	15:00	15:00	18:00	19:00	12:00					15:00		
Vol.	4	3	11	13	45	111	85	26	4	1					261		

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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	95th Percent
07/10/20	0	0	0	0	0	1	4	4	0	0	0	0	0	0	9	48	49
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39	39
02:00	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3	47	49
03:00	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	49	49
04:00	0	0	0	0	0	3	0	0	**1**	0	0	0	0	0	4	52	53
05:00	0	**1**	1	0	1	6	6	0	0	0	0	0	0	0	15	43	44
06:00	**1**	0	**4**	**2**	**2**	**22**	**22**	**8**	1	0	0	0	0	0	**62**	44	48
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
14:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	1	1	5	2	3	34	33	14	2	0	0	0	0	0	95		
Percent	1.1%	1.1%	5.3%	2.1%	3.2%	35.8%	34.7%	14.7%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	05:00	06:00	06:00	06:00	06:00	06:00	06:00	04:00						06:00		
Vol.	1	1	4	2	2	22	22	8	1						62		
PM Peak																	
Vol.																	
Grand Total	78	64	188	272	965	3418	2641	602	66	7	1	0	0	0	8302		
Percent	0.9%	0.8%	2.3%	3.3%	11.6%	41.2%	31.8%	7.3%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	33 MPH
50th Percentile :	38 MPH
85th Percentile :	43 MPH
95th Percentile :	47 MPH

Statistics

10 MPH Pace Speed :	36-45 MPH
Number in Pace :	6059
Percent in Pace :	73.0%
Number of Vehicles > 35 MPH :	6735
Percent of Vehicles > 35 MPH :	81.1%
Mean Speed(Average) :	39 MPH

PUBLIC TRANSPORTATION SCHEDULES

NEWBURYPORT/ROCKPORT LINE

Summer 2020 schedule, effective June 22, 2020

Monday to Friday

Inbound to Boston

ZONE	STATION	TRAIN #	AM								PM																	
	Bikes Allowed		100	150	7152	7104	156	7106	7160	108	110	164	112	166	114	168	116	170	118	172	120	122	7174	176	124	178	126	180	128	182
8	Rockport	♿	B 4:45	-	-	B 6:05	-	B 7:05	-	B 8:05	B 9:10	-	B 10:50	-	B 12:20	-	B 1:40	-	B 3:20	-	B 4:53	B 5:35	-	-	B 7:05	-	B 8:35	-	B 10:20	-
7	Gloucester	♿	B 4:52	-	-	B 6:12	-	B 7:12	-	B 8:12	B 9:17	-	B 10:57	-	B 12:27	-	B 1:47	-	B 3:27	-	B 5:00	B 5:42	-	-	B 7:12	-	B 8:42	-	B 10:27	-
7	West Gloucester	♿	5:08	-	-	6:28	-	7:28	-	8:28	9:33	-	11:13	-	12:43	-	2:03	-	3:43	-	5:17	5:58	-	-	7:28	-	8:58	-	10:43	-
6	Manchester	♿	5:15	-	-	6:35	-	7:35	-	8:35	9:40	-	11:20	-	12:50	-	2:10	-	3:50	-	5:24	6:05	-	-	7:35	-	9:05	-	10:50	-
5	Beverly Farms	♿	5:22	-	-	6:42	-	7:42	-	8:42	f 9:47	-	f 11:27	-	f 12:57	-	f 2:17	-	f 3:57	-	f 5:31	f 6:12	-	-	f 7:42	-	f 9:12	-	f 10:57	-
5	Prides Crossing		-	-	-	f 6:44	-	f 7:44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Montserrat	♿	5:28	-	-	6:49	-	7:49	-	8:48	f 9:53	-	f 11:33	-	f 1:03	-	f 2:23	-	f 4:03	-	f 5:37	f 6:18	-	-	f 7:48	-	f 9:18	-	f 11:03	-
8	Newburyport	♿	-	5:20	6:00	-	7:00	-	8:00	-	-	10:00	-	11:40	-	1:10	-	2:55	-	4:42	-	-	6:15	7:08	-	8:09	-	9:22	-	11:03
7	Rowley	♿	-	5:25	6:05	-	7:05	-	8:05	-	-	f 10:05	-	f 11:45	-	f 1:15	-	f 3:00	-	f 4:47	-	-	f 6:20	f 7:13	-	f 8:14	-	f 9:27	-	f 11:08
6	Ipswich	♿	-	5:31	6:12	-	7:12	-	8:12	-	-	10:11	-	11:51	-	1:21	-	3:06	-	4:53	-	-	6:26	7:19	-	8:20	-	9:33	-	11:14
5	Hamilton/Wenham	♿	-	5:37	6:18	-	7:18	-	8:18	-	-	f 10:17	-	f 11:57	-	f 1:27	-	f 3:12	-	f 4:59	-	-	f 6:39	f 7:25	-	f 8:26	-	f 9:39	-	f 11:20
5	North Beverly	♿	-	5:41	6:23	-	7:23	-	8:23	-	-	f 10:21	-	f 12:01	-	f 1:31	-	f 3:16	-	f 5:03	-	-	-	f 7:29	-	f 8:30	-	f 9:43	-	f 11:24
4	Beverly	♿	5:33	5:47	6:28	6:54	7:28	7:54	8:29	8:54	9:58	10:27	11:38	12:07	1:08	1:37	2:28	3:21	4:08	5:10	5:42	6:25	6:47	7:35	7:53	8:36	9:23	9:49	11:08	11:30
3	Salem	♿	5:37	5:51	6:32	6:58	7:33	7:58	8:33	8:58	10:02	10:31	11:42	12:11	1:12	1:41	2:32	3:26	4:12	5:15	5:49	6:29	6:51	7:39	7:57	8:40	9:27	9:53	11:12	11:34
3	Swampscott	♿	5:45	5:59	6:40	7:06	7:41	8:06	8:41	9:06	10:10	10:39	11:50	12:19	1:20	1:49	2:40	3:34	4:20	5:23	5:58	6:37	-	7:47	8:05	8:48	9:35	10:01	11:20	-
2	Lynn	♿	5:49	6:03	6:44	7:10	7:45	8:10	8:45	9:10	10:14	10:43	11:54	12:23	1:24	1:53	2:44	3:38	4:24	5:27	6:02	6:42	-	7:51	8:09	8:52	9:39	10:05	11:24	-
2	River Works		f 5:52	f 6:06	f 6:47	f 7:13	f 7:48	f 8:13	f 8:48	-	-	-	-	-	-	-	f 2:47	f 3:41	f 4:27	f 5:30	f 6:05	f 6:46	-	-	-	-	f 9:42	-	f 11:27	-
1A	Chelsea		5:59	6:13	6:54	7:20	7:55	8:20	8:55	9:19	f 10:23	f 10:52	f 12:03	f 12:32	f 1:33	f 2:02	f 2:54	f 3:48	f 4:34	f 5:37	f 6:12	f 6:53	-	f 8:00	f 8:18	f 9:01	f 9:49	f 10:14	f 11:34	-
1A	North Station	♿	6:12	6:25	7:07	7:33	8:08	8:32	9:07	9:32	10:35	11:03	12:15	12:43	1:45	2:13	3:06	3:59	4:46	5:50	6:24	7:05	7:17	8:11	8:30	9:12	10:01	10:25	11:46	12:00

Trains in purple box indicate peak period trains.

Monday to Friday

Outbound from Boston

ZONE	STATION	TRAIN #	AM								PM																	AM	
	Bikes Allowed		153	7101	103	157	105	159	107	161	109	163	111	165	113	115	7167	7119	171	121	175	123	177	125	179	127	181	129	183
1A	North Station	♿	6:26	6:35	7:50	8:10	8:35	9:40	10:35	11:20	12:00	1:20	1:50	3:15	3:30	4:15	4:40	5:15	5:40	6:25	6:45	7:15	7:52	8:45	9:30	10:20	10:50	12:10	12:15
1A	Chelsea		-	f 6:46	f 8:01	f 8:21	f 8:46	f 9:51	f 10:46	f 11:31	f 12:11	f 1:31	f 2:01	3:26	3:41	4:26	4:51	5:26	5:51	6:36	6:56	f 7:26	f 8:03	f 8:56	f 9:41	f 10:31	f 11:01	f 12:21	f 12:26
2	River Works		-	f 6:53	f 8:08	f 8:28	-	-	-	-	-	-	f 2:08	f 3:34	f 3:49	f 4:34	-	-	f 5:59	f 6:44	f 7:04	f 7:33	-	-	-	f 10:38	-	-	-
2	Lynn	♿	-	6:55	8:11	8:31	8:55	10:00	10:55	11:40	12:20	1:40	2:11	3:37	3:51	4:37	5:00	5:35	6:02	6:47	7:07	7:36	8:12	9:05	9:50	10:41	11:10	12:30	12:35
3	Swampscott	♿	-	7:00	8:16	8:36	9:00	10:05	11:00	11:45	12:25	1:45	2:16	3:42	3:56	4:42	5:05	5:40	6:07	6:52	7:12	7:41	8:17	9:10	9:55	10:46	11:15	12:35	12:40
3	Salem	♿	6:52	7:07	8:23	8:43	9:07	10:12	11:07	11:52	12:32	1:52	2:23	3:49	4:03	4:49	5:12	5:47	6:14	6:59	7:19	7:48	8:24	9:17	10:02	10:53	11:22	12:42	12:47
4	Beverly	♿	6:56	7:11	8:27	8:47	9:11	10:16	11:11	11:56	12:36	1:56	2:27	3:54	4:07	4:53	5:16	5:51	6:18	7:03	7:24	7:52	8:28	9:21	10:06	10:57	11:26	12:46	12:51
5	North Beverly	♿	f 7:00	-	-	f 8:51	-	f 10:20	-	f 12:00	-	f 2:00	-	3:59	-	-	5:22	-	6:23	-	7:30	-	8:33	-	f 10:10	-	f 11:30	-	f 12:55
5	Hamilton/Wenham	♿	f 7:04	-	-	f 8:55	-	f 10:24	-	f 12:04	-	f 2:04	-	4:03	-	-	5:26	-	6:27	-	7:34	-	8:38	-	f 10:14	-	f 11:34	-	f 12:59
6	Ipswich	♿	7:15	-	-	9:03	-	10:30	-	12:10	-	2:10	-	4:09	-	-	5:32	-	6:33	-	7:40	-	8:44	-	10:20	-	11:40	-	1:05
7	Rowley	♿	-	-	-	f 9:09	-	f 10:36	-	f 12:16	-	f 2:16	-	4:16	-	-	5:39	-	6:40	-	7:47	-	f 8:50	-	f 10:26	-	f 11:46	-	f 1:11
8	Newburyport	♿	7:30	-	-	9:17	-	10:44	-	12:24	-	2:24	-	4:25	-	-	5:48	-	6:49	-	7:55	-	8:58	-	10:34	-	11:54	-	1:19
4	Montserrat	♿	-	f 7:15	f 8:31	-	f 9:15	-	f 11:15	-	f 12:40	-	f 2:31	-	4:12	4:57	-	5:55	-	7:07	-	f 7:56	-	f 9:25	-	f 11:01	-	f 12:50	-
5	Prides Crossing		-	-	-	-	-	-	-	-	-	-	-	-	f 4:16	-	-	f 5:59	-	f 7:11	-	f 8:00	-	-	-	-	-	-	-
5	Beverly Farms	♿	-	f 7:21	f 8:37	-	f 9:21	-	f 11:21	-	f 12:46	-	f 2:37	-	4:20	5:03	-	6:03	-	7:15	-	f 8:04	-	f 9:31	-	f 11:07	-	f 12:56	-
6	Manchester	♿	-	7:26	8:42	-	9:26	-	11:26	-	12:51	-	2:42	-	4:25	5:08	-	6:09	-	7:20	-	8:09	-	9:36	-	11:12	-	1:01	-
7	West Gloucester	♿	-	B 7:32	B 8:48	-	B 9:32	-	B 11:32	-	B 12:57	-	B 2:48	-	B 4:31	B 5:15	-	B 6:15	-	B 7:26	-	B 8:15	-	B 9:42	-	B 11:18	-	B 1:07	-
7	Gloucester	♿	-	B 7:46	B 9:02	-	B 9:46	-	B 11:46	-	B 1:11	-	B 3:02	-	B 4:45	B 5:29	-	B 6:29	-	B 7:40	-	B 8:29	-	B 9:56	-	B 11:32	-	B 1:21	-
8	Rockport	♿	-	B 7:53	B 9:09	-	B 9:53	-	B 11:53	-	B 1:18	-	B 3:09	-	B 4:52	B 5:36	-	B 6:36	-	B 7:47	-	B 8:36	-	B 10:03	-	B 11:39	-	B 1:28	-

Trains in purple box indicate peak period trains.

Saturday & Sunday

Inbound to Boston

ZONE	STATION	SATURDAY TRAIN # / SUNDAY TRAIN #	AM					PM									
	Bikes Allowed		1100 / 2100	1150 / 2150	1102 / 2102	1152 / 2152	1104 / 2104	1154 / 2154	1106 / 2106	1156 / 2156	1108 / 2108	1158 / 2158	1110 / 2110	1160 / 2160	1112 / 2112
8	Rockport	♿	B 6:50	-	B 9:50	-	B 11:50	-	B 1:50	-	B 5:00	-	B 7:20	-	B 9:50
7	Gloucester	♿	B 6:57	-	B 9:57	-	B 11:57	-	B 1:57	-	B 5:07	-	B 7:27	-	B 9:57
7	West Gloucester	♿	7:13	-	10:13	-	12:13	-	2:13	-	5:23	-	7:43	-	10:13
6	Manchester	♿	7:20	-	10:20	-	12:20	-	2:20	-	5:30	-	7:50	-	10:20
5	Beverly Farms	♿	f 7:26	-	f 10:26	-	f 12:26	-	f 2:26	-	f 5:36	-	f 7:56	-	f 10:26
4	Montserrat	♿	f 7:32	-	f 10:32	-	f 12:32	-	f 2:32	-	f 5:42	-	f 8:02	-	f 10:32
8	Newburyport	♿	-	8:52	-	10:52	-	12:52	-	2:52	-	5:52	-	9:00	-
7	Rowley	♿	-	8:58	-	10:58	-	12:58	-	2:58	-	5:58	-	9:06	-
6	Ipswich	♿	-	9:05	-	11:05	-	1:05	-	3:05	-	6:05	-	9:13	-
5	Hamilton/Wenham	♿	-	9:12	-	11:12	-	1:12	-	3:12	-	6:12	-	9:20	-
5	North Beverly	♿	-	f 9:15	-	f 11:15	-	f 1:15	-	f 3:15	-	f 6:15	-	f 9:23	-
4	Beverly	♿	7:38	9:20	10:38	11:20	12:38	1:20	2:38	3:20	5:48	6:20	8:08	9:28	10:38
3	Salem	♿	7:42	9:24	10:42	11:24	12:42	1:24	2:42	3:24	5:52	6:24	8:12	9:32	10:42
3	Swampscott	♿	7:49	9:30	10:49	11:30	12:49	1:30	2:49	3:30	5:59	6:30	8:19	9:38	10:49
2	Lynn	♿	7:54	9:34	10:54	11:34	12:54	1:34	2:54	3:34	6:04	6:34	8:24	9:42	10:54
1A	Chelsea		f 8:03	f 9:44	f 11:03	f 11:44	f 1:03	f 1:44	f 3:03	f 3:44	f 6:13	f 6:44	f 8:33	f 9:52	f 11:03
1A	North Station	♿	8:15	9:56	11:15	11:56	1:15	1:56	3:15	3:56	6:25	6:56	8:45	10:04	11:15

Saturday & Sunday

Outbound from Boston

ZONE	STATION	SATURDAY TRAIN # / SUNDAY TRAIN #	AM				PM								
	Bikes Allowed		1101 / 2101	1151 / 2151	1103 / 2103	1153 / 2153	1105 / 2105	1155 / 2155	1107 / 2107	1157 / 2157	1109 / 2109	1159 / 2159	1111 / 2111	1161 / 2161	1113 / 2113
1A	North Station	♿	8:30	9:30	10:20	11:30	12:20	1:30	2:20	4:30	5:30	7:15	8:30	10:20	11:30
1A	Chelsea		f 8:41	f 9:41	f 10:31	f 11:41	f 12:31	f 1:41	f 2:31	f 4:41	f 5:41	f 7:26	f 8:41	f 10:31	f 11:41
2	Lynn	♿	8:51	9:51	10:41	11:51	12:41	1:51	2:41	4:51	5:51	7:36	8:51	10:41	11:51
3	Swampscott	♿	8:54	9:54	10:44	11:54	12:44	1:54	2:44	4:54	5:54	7:39	8:54	10:44	11:54
3	Salem	♿	9:01	10:01	10:51	12:01	12:51	2:01	2:51	5:01	6:01	7:46	9:01	10:51	12:01
4	Beverly	♿	9:05	10:05	10:55	12:05	12:55	2:05	2:55	5:05	6:05	7:50	9:05	10:55	12:05
5	North Beverly	♿	-	f 10:09	-	f 12:09	-	f 2:09	-	f 5:09	-	f 7:54	-	f 10:59	-
5	Hamilton/Wenham	♿	-	10:13	-	12:13	-	2:13	-	5:13	-	7:58	-	11:03	-
6	Ipswich	♿	-	10:20	-	12:20	-	2:20	-	5:20	-	8:05	-	11:10	-
7	Rowley	♿	-	10:28	-	12:28	-	2:28	-	5:28	-	8:13	-	11:18	-
8	Newburyport	♿	-	10:35	-	12:35	-	2:35	-	5:35	-	8:20	-	11:25	-
4	Montserrat	♿	f 9:09	-	f 10:59	-	f 12:59	-	f 2:59	-	f 6:09	-	f 9:09	-	f 12:09
5	Beverly Farms	♿	f 9:14	-	f 11:04	-	f 1:04	-	f 3:04	-	f 6:14	-	f 9:14	-	f 12:14
6	Manchester	♿	9:20	-	11:10	-	1:10	-	3:10	-	6:20	-	9:20	-	12:20
7	West Gloucester	♿	B 9:27	-	B 11:17	-	B 1:17	-	B 3:17	-	B 6:27	-	B 9:27	-	B 12:27
7	Gloucester	♿	B 9:41	-	B 11:31	-	B 1:31	-	B 3:31	-	B 6:41	-	B 9:41	-	B 12:41
8	Rockport	♿	B 9:48	-	B 11:38	-	B 1:38	-	B 3:38	-	B 6:48	-	B 9:48	-	B 12:48

Keep in Mind:

This schedule will be effective from June 22, 2020 and will replace the schedule of October 21, 2019

Presidents' Day and 4th of July operate on a **Saturday service schedule.**

New Year's Day, Memorial Day, Labor Day, Thanksgiving Day, and Christmas Day operate on a **Sunday service schedule**.

For all other holiday schedules, please check MBTA.com/holidays or call 617-222-3200.

For the latest information regarding weekend disruptions, visit MBTA.com/weekend.

Times in purple with "f" indicate a flag stop: Passengers must tell the conductor that they wish to leave. Passengers waiting to board must be visible on the platform for the train to stop.

Times in blue indicate an early departure (L stop): The train may leave ahead of schedule at these stops.

Bikes: Bicycles are allowed on trains with the bicycle symbol shown below the train number.

High level platform and bridge plate available. Visit mbta.com/accessibility for more information.

B: Due to construction activities for the Gloucester Drawbridge Replacement project, bus shuttles will replace train service between Rockport, Gloucester, and West Gloucester stations on the Rockport Line.

Buses depart at the times shown. Bicycles cannot be taken on substitute bus service.

MOTOR VEHICLE CRASH DATA

Crash Number	City Town Name	Crash Date	Crash Severity	Crash Time	Crash Year	Crash Hour	First Harmful Event	Is Geocoded	Light Conditions	Manner of Collision	MassDOT District	Road Surface Condition	Roadway Junction Type	RPA Abbreviation	Total Fatalities	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	First Harmful Event Location	Hit and Run	Most Harmful Event (All Vehicles)	Road Contributing Circumstance	School Bus Related	Speed Limit	Latitude	Longitude
3999238	MANCHESTER	01/17/2015	Not Reported	11:30 AM	2015	11:00AM to 11:59AM	Collision with utility pole	Yes	Daylight	Single vehicle crash	4	Dry	T-intersection	MAPC	0	No controls	V1: Travelling straight ahead	V1: E	Clear/Clear	Roadside	No hit and run	V1:(Collision with utility pole)	None	No, school bus not involved	40	42.5947223	-70.76702923
4378033	MANCHESTER	05/28/2017	Not Reported	4:44 PM	2017	04:00PM to 04:59PM	Collision with pedestrian	Yes	Daylight	Single vehicle crash	4	Dry	Not at junction	MAPC	0	No controls	V1: Slowing or stopped in traffic	V1: Not Reported	Cloudy/Cloudy	Roadway	No hit and run	V1:(Collision with pedestrian)	None	No, school bus not involved	40	42.5947223	-70.76702923
3371997	MANCHESTER	03/07/2013	Property damage only (none injured)	1:10 PM	2013	01:00PM to 01:59PM	Collision with guardrail	Yes	Daylight	Single vehicle crash	4	Snow	Not at junction	MAPC	0	No controls	V1: Travelling straight ahead	V1: S	Snow/Snow	Roadway	No hit and run	V1:(Collision with guardrail)	Not reported	No, school bus not involved	10	42.59195788	-70.765514
4065438	MANCHESTER	07/07/2015	Property damage only (none injured)	12:30 PM	2015	12:00PM to 12:59PM	Collision with motor vehicle in traffic	Yes	Daylight	Sideswipe, opposite direction	4	Dry	On-ramp	MAPC	0	No controls	V1: Turning left / V2: Travelling straight ahead	V1: S / V2: N	Clear/Clear	Roadway	No hit and run	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	None	No, school bus not involved	40	42.59155179	-70.76536034
4065439	MANCHESTER	07/07/2015	Non-fatal injury	5:58 PM	2015	05:00PM to 05:59PM	Collision with motor vehicle in traffic	Yes	Daylight	Angle	4	Dry	T-intersection	MAPC	0	Stop signs	V1: Turning left / V2: Turning left	V1: U / V2: Not Reported	Clear/Clear	Roadway	No hit and run	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	None	No, school bus not involved	40	42.59155179	-70.76536034
4275094	MANCHESTER	10/10/2016	Non-fatal injury	6:15 AM	2016	06:00AM to 06:59AM	Collision with motor vehicle in traffic	Yes	Dark - roadway not lighted	Head-on	4	Wet	T-intersection	MAPC	0	No controls	V1: Travelling straight ahead / V2: Turning left	V1: N / V2: S	Clear/Unknown	Roadway	No hit and run	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	Road surface condition (wet, icy, snow, slush, etc.)	No, school bus not involved	40	42.59155179	-70.76536034
4301598	MANCHESTER	11/23/2016	Non-fatal injury	9:24 AM	2016	09:00AM to 09:59AM	Collision with pedalcycle (bicycle, tricycle, unicycle, pedal car)	Yes	Daylight	Angle	4	Dry	On-ramp	MAPC	0	No controls	V1: Turning left	V1: Not Reported	Clear/Clear	Roadway	No hit and run	V1:(Collision with cyclist (bicycle, tricycle, unicycle, pedal car))	None	No, school bus not involved	40	42.59155179	-70.76536034
4378034	MANCHESTER	05/31/2017	Property damage only (none injured)	3:58 PM	2017	03:00PM to 03:59PM	Collision with motor vehicle in traffic	Yes	Daylight	Angle	4	Dry	T-intersection	MAPC	0	No controls	V1: Slowing or stopped in traffic / V2: Turning left	V1: S / V2: Not Reported	Clear/Clear	Roadway	No hit and run	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	None	No, school bus not involved	40	42.59155179	-70.76536034
3922115	MANCHESTER	08/15/2014	Property damage only (none injured)	8:00 AM	2014	08:00AM to 08:59AM	Collision with motor vehicle in traffic	Yes	Daylight	Angle	4	Dry	Off-ramp	MAPC	0	Stop signs	V1: Turning left / V2: Turning left	V1: N / V2: E	Clear/Clear	Roadway		V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	None	No, school bus not involved	40	42.58879053	-70.76575803
3984511	MANCHESTER	12/15/2014	Not Reported	8:07 AM	2014	08:00AM to 08:59AM	Collision with guardrail	Yes	Daylight	Single vehicle crash	4	Dry	Not at junction	MAPC	0	No controls	V1: Travelling straight ahead	V1: S	Clear/Clear	Roadway	No hit and run		None	No, school bus not involved	40	42.58904173	-70.76562109
4470610	MANCHESTER	12/07/2017	Non-fatal injury	4:45 PM	2017	04:00PM to 04:59PM	Collision with motor vehicle in traffic	Yes	Dark - roadway not lighted	Angle	4	Dry	T-intersection	MAPC	0	Stop signs	V1: Turning left / V2: Travelling straight ahead	V1: E / V2: S	Clear/Clear	Roadway	No hit and run	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	None	No, school bus not involved	40	42.58879535	-70.7657577

CRASH RATE WORKSHEETS

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Manchester by the sea COUNT DATE : 2020

DISTRICT : 4 UNSIGNALIZED : x SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : School Street ST #

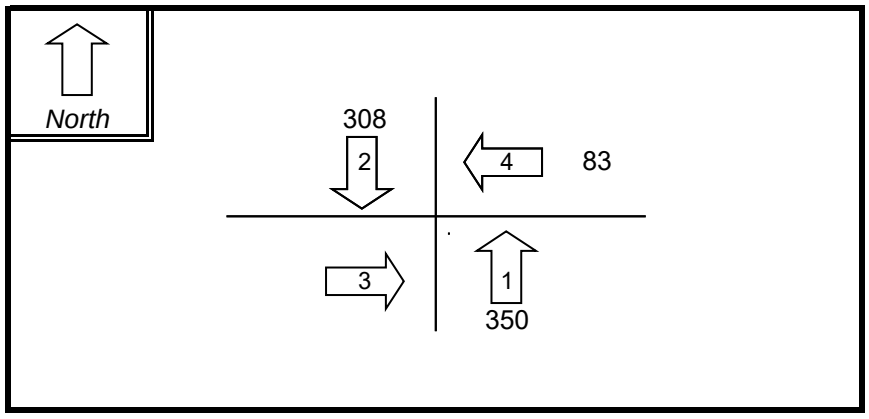
MINOR STREET(S) : Atwater Street ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB		EB		
VOLUMES (PM) :	350	308		83		**741**

" K " FACTOR : **0.082** APPROACH ADT : **9,037** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 2 # OF YEARS : 5 AVERAGE # OF ACCIDENTS (**A**) : **0.40**

CRASH RATE CALCULATION : **0.12** RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : Accident Rate for District 4 signalized intersections = 0.73

Accident Rate for District 4 unsignalized intersections = 0.57

Statewide Accident Rate for Signalized Inteserction = 0.78 and Unsignalized/Inteserction = 0.57

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Manchester by the sea COUNT DATE : 2020

DISTRICT : 4 UNSIGNALIZED : x SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : School Street ST #

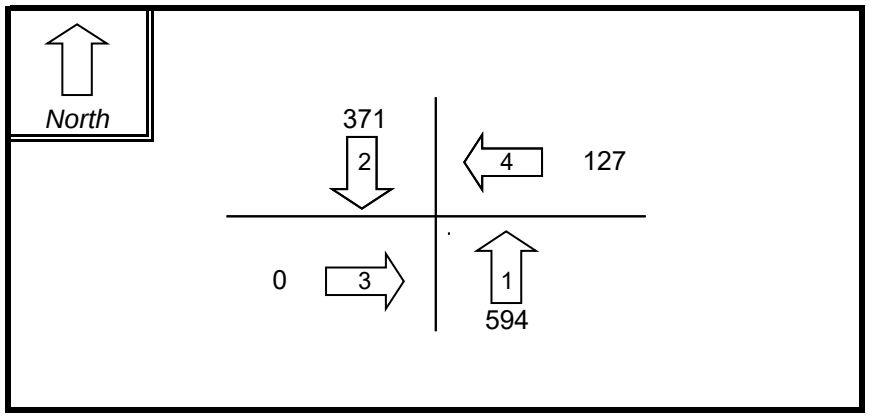
MINOR STREET(S) : Route 128 Southbound Ramp ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB		WB		
VOLUMES (PM) :	594	371		127		**1,092**

" K " FACTOR : **0.082** APPROACH ADT : **13,317** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 6 # OF YEARS : 5 AVERAGE # OF ACCIDENTS (**A**) : **1.20**

CRASH RATE CALCULATION : **0.25** RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : Accident Rate for District 4 signalized intersections = 0.73

Accident Rate for District 4 unsignalized intersections = 0.57

Statewide Accident Rate for Signalized Inteserction = 0.78 and Unsignalized/Inteserction = 0.57

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Manchester by the sea COUNT DATE : 2020

DISTRICT : 4 UNSIGNALIZED : x SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : School Street ST #

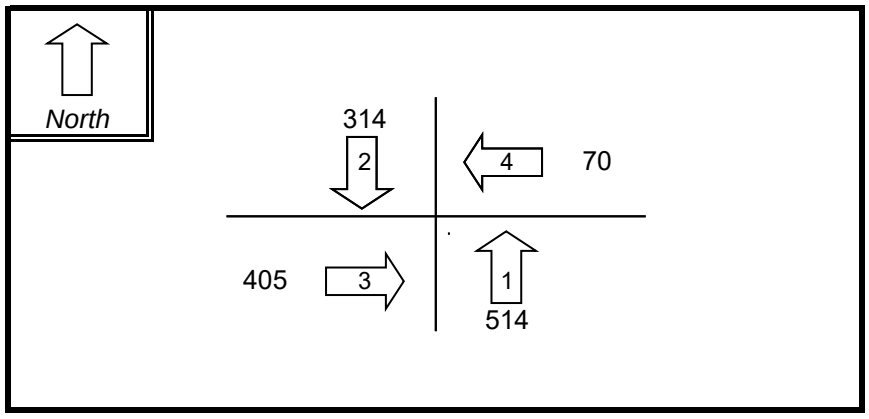
MINOR STREET(S) : Route 128 Northbound Ramp ST #

ST #

ST #

ST #

INTERSECTION DIAGRAM
(Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (PM) :	514	314	405	70		1,303

" K " FACTOR : **0.082** APPROACH ADT : **15,890** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : 3 # OF YEARS : 5 AVERAGE # OF ACCIDENTS (**A**) : **0.60**

CRASH RATE CALCULATION : **0.10** RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : Accident Rate for District 4 signalized intersections = 0.73

Accident Rate for District 4 unsignalized intersections = 0.57

Statewide Accident Rate for Signalized Inteserction = 0.78 and Unsignalized/Inteserction = 0.57

GENERAL BACKGROUND TRAFFIC GROWTH

General Background Traffic Growth - Daily Traffic Volumes

Station Number	ROUTE/STREET	LOCATION	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average Annual Growth Rate
5086	YANKEE DIVISION HIGHWAY	Gloucester	34,637		33,547	34,458	35,530	39,390	33,864	35,604	36,194	36,377	35,677	**0.63%**
35	YANKEE DIVISION HIGHWAY	Beverly	45,036	45,248	47,108	44,768			47,763	47,788	47,451	51,386	51,900	**1.36%**
														0.99%

Adjusted Rate: 1.0%

TRIP-GENERATION CALCULATIONS

Land Use: 221
Multifamily Housing (Mid-Rise)

Description

Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors). Multifamily housing (low-rise) (Land Use 220), multifamily housing (high-rise) (Land Use 222), off-campus student apartment (Land Use 225), and mid-rise residential with 1st-floor commercial (Land Use 231) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the mid-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the six sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.46 residents per occupied dwelling unit.

For the five sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 95.7 percent of the total dwelling units were occupied.

Time-of-day distribution data for this land use are presented in Appendix A. For the eight general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 4:45 and 5:45 p.m., respectively.

For the four dense multi-use urban sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:15 and 5:15 p.m., respectively. For the three center city core sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 6:45 and 7:45 a.m. and 5:00 and 6:00 p.m., respectively.

For the six sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.46 residents per occupied dwelling unit.

For the five sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 95.7 percent of the units were occupied.

The average numbers of person trips per vehicle trip at the five center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 1.84 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.94 during Weekday, AM Peak Hour of Generator
- 2.07 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.59 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 32 dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.90 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.90 during Weekday, AM Peak Hour of Generator
- 2.00 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.08 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 13 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.56 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.88 during Weekday, AM Peak Hour of Generator
- 1.70 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.07 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Delaware, District of Columbia, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, Ontario, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Virginia, and Wisconsin.

Source Numbers

168, 188, 204, 305, 306, 321, 357, 390, 436, 525, 530, 579, 638, 818, 857, 866, 901, 904, 910, 912, 918, 934, 936, 939, 944, 947, 948, 949, 959, 963, 964, 966, 967, 969, 970

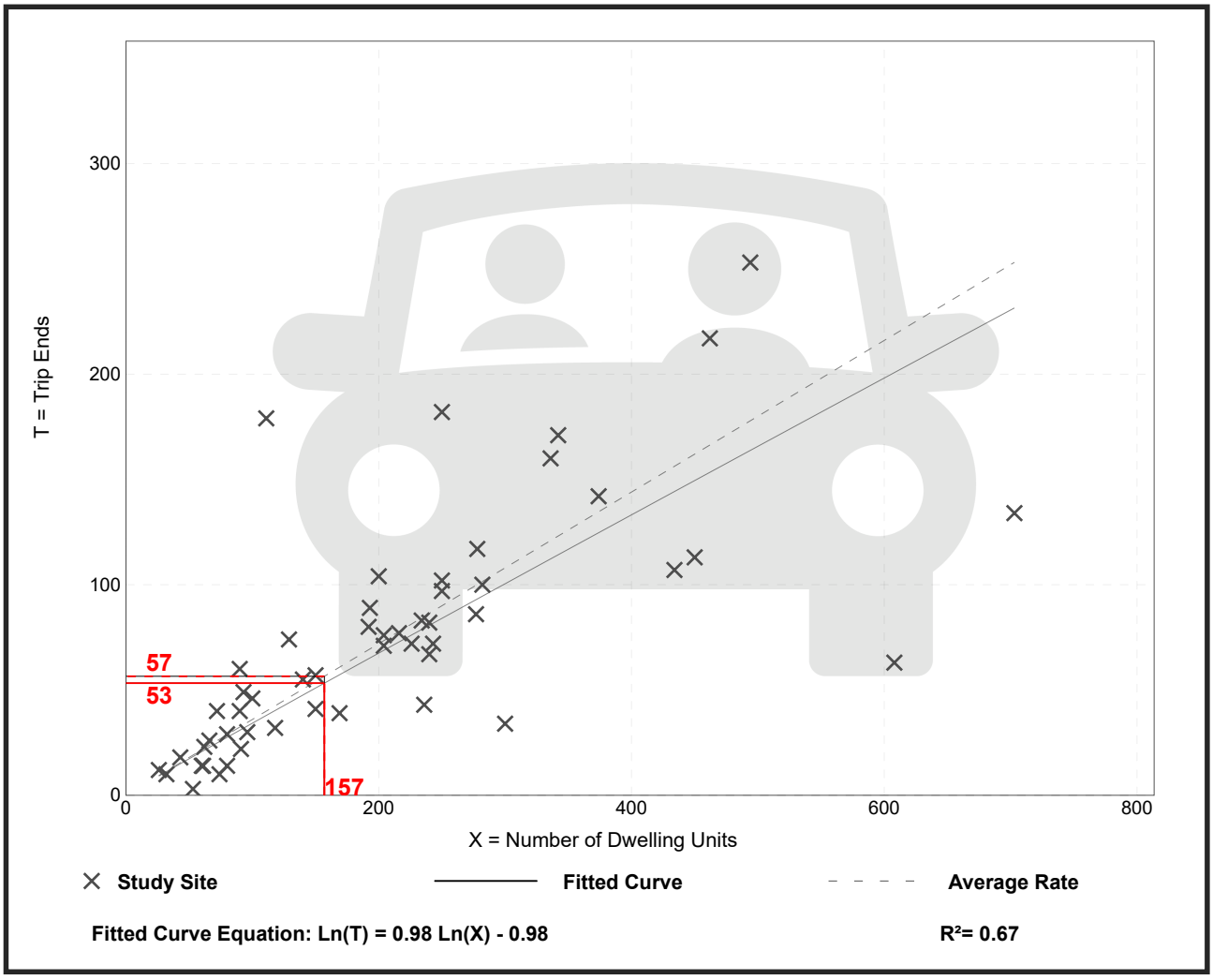
Multifamily Housing (Mid-Rise)
(221)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 53
Avg. Num. of Dwelling Units: 207
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.06 - 1.61	0.19

Data Plot and Equation



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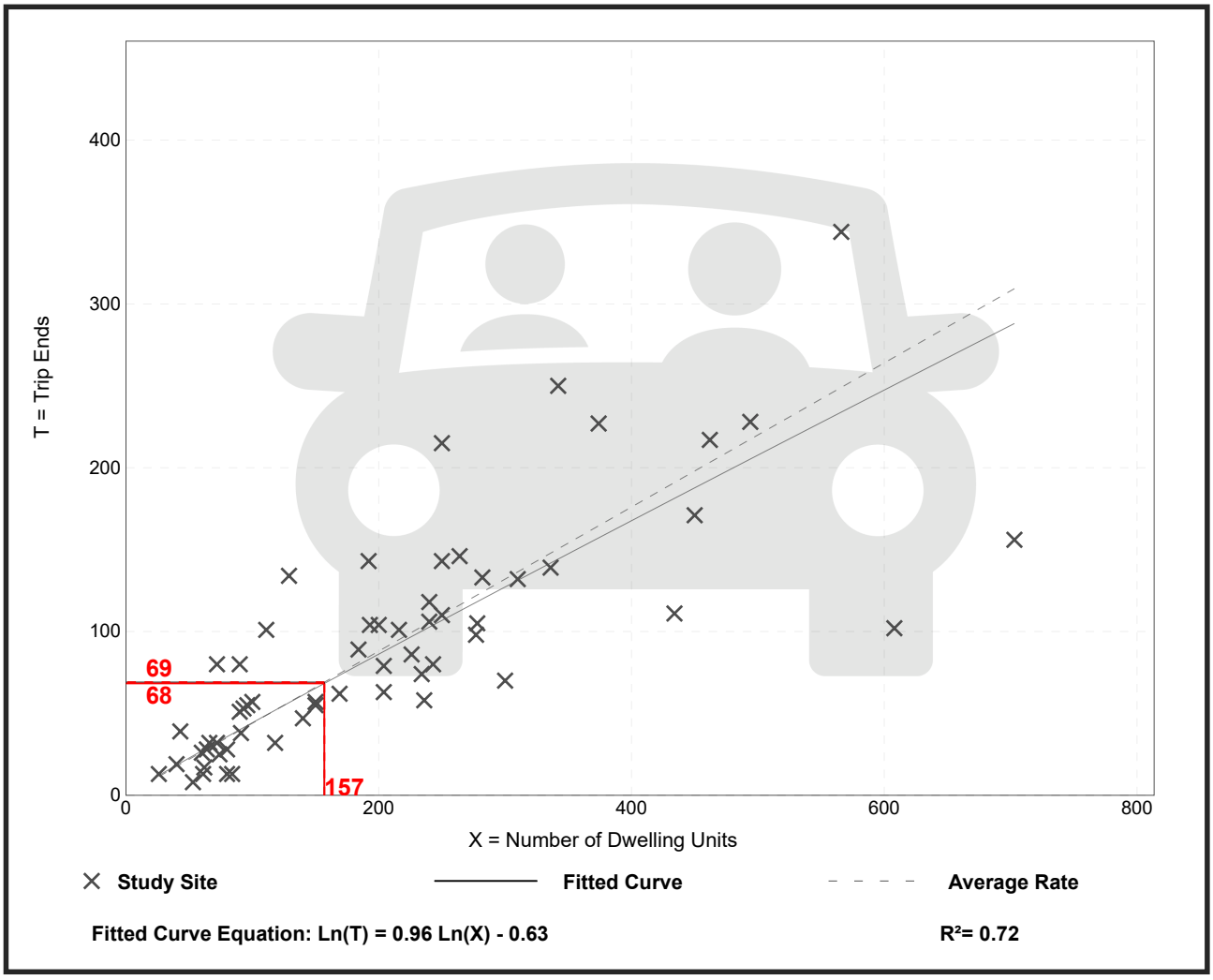
Multifamily Housing (Mid-Rise)
(221)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 60
Avg. Num. of Dwelling Units: 208
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.11	0.19

Data Plot and Equation



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Multifamily Housing (Mid-Rise)
(221)

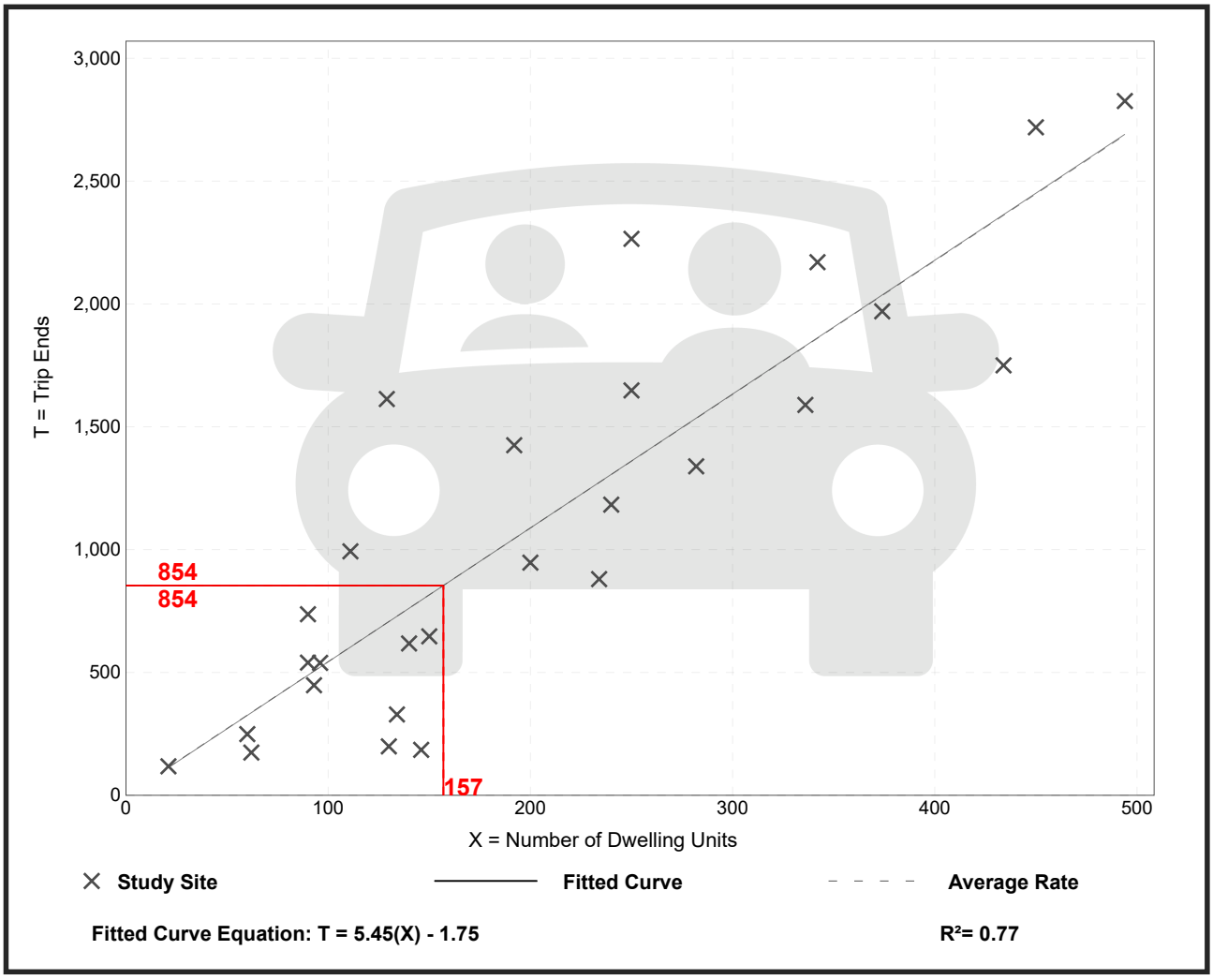
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 27
Avg. Num. of Dwelling Units: 205
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
5.44	1.27 - 12.50	2.03

Data Plot and Equation



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TRIP-DISTRIBUTION CALCULATIONS

Table 3. Residence MCD/County to Workplace MCD/County Commuting Flows

For more information on sampling and estimation methods, confidentiality protection, and

Universe: Workers 16 years and over.

Commuting flows are sorted by residence state, residence county, and residence minor civil division.

Residence		Place of Work				Commuting Flow	
State FIPS Code	Minor Civil Division Name	Minor Civil Division FIPS Code	State Name	County Name	Minor Civil Division Name	Workers in Commuting Flow	
25	Manchester-by-	37995	Massachu	Essex	Manchester-by-	727	31.0%
25	Manchester-by-	07000	Massachu	Suffolk	Boston city	382	16.3%
25	Manchester-by-	05595	Massachu	Essex	Beverly city	288	12.3%
25	Manchester-by-	11000	Massachu	Middlesex	Cambridge city	157	6.7%
25	Manchester-by-	16250	Massachu	Essex	Danvers town	89	3.8%
25	Manchester-by-	01465	Massachu	Essex	Andover town	68	2.9%
25	Manchester-by-	26150	Massachu	Essex	Gloucester city	61	2.6%
25	Manchester-by-	46365	Massachu	Essex	North Andover	50	2.1%
25	Manchester-by-	37490	Massachu	Essex	Lynn city	40	1.7%
25	Manchester-by-	04615	Massachu	Middlesex	Bedford town	40	1.7%
25	Manchester-by-	70150	Massachu	Essex	Topsfield town	38	1.6%
25	Manchester-by-	32310	Massachu	Essex	Ipswich town	32	1.4%
25	Manchester-by-	74595	Massachu	Essex	Wenham town	32	1.4%
25	Manchester-by-	27900	Massachu	Essex	Hamilton town	30	1.3%
25	Manchester-by-	09840	Massachu	Middlesex	Burlington town	30	1.3%
25	Manchester-by-	52490	Massachu	Essex	Peabody city	25	1.1%
25	Manchester-by-	81035	Massachu	Middlesex	Woburn city	24	1.0%
25	Manchester-by-	59105	Massachu	Essex	Salem city	23	1.0%
						2,348	
						2,136	

Exiting								Entering							
Matrix %								Matrix %							
Rte. 128 NB Ramp to School St.	School Street to Rte. 128 NB	Rte. 128 SB Ramp to School St.	School Street to Rte. 128 SB	School Street North	School Street South	Atwater Street East	%	Rte. 128 NB Ramp to School St.	School Street to Rte. 128 NB	Rte. 128 SB Ramp to School St.	School Street to Rte. 128 SB	School Street North	School Street South	Atwater Street East	%
					0.9	0.1	1						0.9	0.1	1
			1				1	1							1
			1				1	1							1
			1				1	1							1
			1				1	1							1
			1				1	1							1
			1				1	1							1
	1						1			1					1
			1				1	1							1
			1				1	1							1
			1				1	1							1
			1				1	1							1
				1			1					1			1
			1				1	1							1
				1			1					1			1
			1				1	1							1
			1				1	1							1
			1				1	1							1
			1				1	1							1

Table 3. Residence MCD/County to Workplace MCD/County Commuting Flow

For more information on sampling and estimation methods, confidentiality protection, and Universe: Workers 16 years and over.

Commuting flows are sorted by residence state, residence county, and residence minor civil division.

Residence		Place of Work				Commuting Flow			Exiting									Entering							
									Trip Distribution									Trip Disribution							
State FIPS Code	Minor Civil Division Name	Minor Civil Division FIPS Code	State Name	County Name	Minor Civil Division Name	Workers in Commuting Flow			Rte. 128 NB Ramp to School St.	School Street to Rte. 128 NB	Rte. 128 SB Ramp to School St.	School Street to Rte. 128 SB	School Street North	School Street South	Atwater Street East	%		Rte. 128 NB Ramp to School St.	School Street to Rte. 128 NB	Rte. 128 SB Ramp to School St.	School Street to Rte. 128 SB	School Street North	School Street South	Atwater Street East	%
25	Manchester-by-	37995	Massachu	Essex	Manchester-by-	727	31.0%		0	0	0	0	0	654.3	72.7	727		0	0	0	0	0	654.3	72.7	727
25	Manchester-by-	07000	Massachu	Suffolk	Boston city	382	16.3%		0	0	0	382	0	0	0	382		382	0	0	0	0	0	0	382
25	Manchester-by-	05595	Massachu	Essex	Beverly city	288	12.3%		0	0	0	288	0	0	0	288		288	0	0	0	0	0	0	288
25	Manchester-by-	11000	Massachu	Middlesex	Cambridge city	157	6.7%		0	0	0	157	0	0	0	157		157	0	0	0	0	0	0	157
25	Manchester-by-	16250	Massachu	Essex	Danvers town	89	3.8%		0	0	0	89	0	0	0	89		89	0	0	0	0	0	0	89
25	Manchester-by-	01465	Massachu	Essex	Andover town	68	2.9%		0	0	0	68	0	0	0	68		68	0	0	0	0	0	0	68
25	Manchester-by-	26150	Massachu	Essex	Gloucester city	61	2.6%		0	61	0	0	0	0	0	61		0	0	61	0	0	0	0	61
25	Manchester-by-	46365	Massachu	Essex	North Andover	50	2.1%		0	0	0	50	0	0	0	50		50	0	0	0	0	0	0	50
25	Manchester-by-	37490	Massachu	Essex	Lynn city	40	1.7%		0	0	0	40	0	0	0	40		40	0	0	0	0	0	0	40
25	Manchester-by-	04615	Massachu	Middlesex	Bedford town	40	1.7%		0	0	0	40	0	0	0	40		40	0	0	0	0	0	0	40
25	Manchester-by-	70150	Massachu	Essex	Topsfield town	38	1.6%		0	0	0	38	0	0	0	38		38	0	0	0	0	0	0	38
25	Manchester-by-	32310	Massachu	Essex	Ipswich town	32	1.4%		0	0	0	0	32	0	0	32		0	0	0	0	32	0	0	32
25	Manchester-by-	74595	Massachu	Essex	Wenham town	32	1.4%		0	0	0	32	0	0	0	32		32	0	0	0	0	0	0	32
25	Manchester-by-	27900	Massachu	Essex	Hamilton town	30	1.3%		0	0	0	0	30	0	0	30		0	0	0	0	30	0	0	30
25	Manchester-by-	09840	Massachu	Middlesex	Burlington town	30	1.3%		0	0	0	30	0	0	0	30		30	0	0	0	0	0	0	30
25	Manchester-by-	52490	Massachu	Essex	Peabody city	25	1.1%		0	0	0	25	0	0	0	25		25	0	0	0	0	0	0	25
25	Manchester-by-	81035	Massachu	Middlesex	Woburn city	24	1.0%		0	0	0	24	0	0	0	24		24	0	0	0	0	0	0	24
25	Manchester-by-	59105	Massachu	Essex	Salem city	23	1.0%		0	0	0	23	0	0	0	23		23	0	0	0	0	0	0	23
						2,348			0	61	0	1286	62	654.3	72.7	2136		1286	0	61	0	62	654.3	72.7	2136
									0.0%	2.9%	0.0%	60.2%	2.9%	30.6%	3.4%	100.0%		60.2%	0.0%	2.9%	0.0%	2.9%	30.6%	3.4%	100.0%
						2,136		USE		3%		60%	4%	30%	3%	100%		60%		3%		4%	30%	3%	100%

CAPACITY ANALYSIS

School Street/Atwater Street
School Street/Route 128 Southbound Ramps
School Street/Mill Street and Route 128 Northbound Ramps
School Street/Site Roadway

School Street/Atwater Street

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	62	7	161	87	8	212
Future Vol, veh/h	62	7	161	87	8	212
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	58	58	77	77	78	78
Heavy Vehicles, %	6	20	2	3	0	2
Mvmt Flow	107	12	209	113	10	272

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	558	266	0	0	322	0
Stage 1	266	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Critical Hdwy	6.46	6.4	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.48	-	-	2.2	-
Pot Cap-1 Maneuver	484	731	-	-	1249	-
Stage 1	769	-	-	-	-	-
Stage 2	749	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	480	731	-	-	1249	-
Mov Cap-2 Maneuver	480	-	-	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	742	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	497	1249	-
HCM Lane V/C Ratio	-	-	0.239	0.008	-
HCM Control Delay (s)	-	-	14.5	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	75	8	285	65	10	298
Future Vol, veh/h	75	8	285	65	10	298
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	52	52	86	86	77	77
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	144	15	331	76	13	387

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	782	369	0	0	407	0
Stage 1	369	-	-	-	-	-
Stage 2	413	-	-	-	-	-
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	366	681	-	-	1163	-
Stage 1	704	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	361	681	-	-	1163	-
Mov Cap-2 Maneuver	361	-	-	-	-	-
Stage 1	704	-	-	-	-	-
Stage 2	663	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.3	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	378	1163	-
HCM Lane V/C Ratio	-	-	0.422	0.011	-
HCM Control Delay (s)	-	-	21.3	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	66	8	173	93	9	227
Future Vol, veh/h	66	8	173	93	9	227
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	58	58	77	77	78	78
Heavy Vehicles, %	6	20	2	3	0	2
Mvmt Flow	114	14	225	121	12	291

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	601	286	0	0	346	0
Stage 1	286	-	-	-	-	-
Stage 2	315	-	-	-	-	-
Critical Hdwy	6.46	6.4	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.48	-	-	2.2	-
Pot Cap-1 Maneuver	457	712	-	-	1224	-
Stage 1	753	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	452	712	-	-	1224	-
Mov Cap-2 Maneuver	452	-	-	-	-	-
Stage 1	753	-	-	-	-	-
Stage 2	722	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.5	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	471	1224	-
HCM Lane V/C Ratio	-	-	0.271	0.009	-
HCM Control Delay (s)	-	-	15.5	8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0	-

Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	80	9	306	70	11	319
Future Vol, veh/h	80	9	306	70	11	319
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	52	52	86	86	77	77
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	154	17	356	81	14	414

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	839	397	0	0	437	0
Stage 1	397	-	-	-	-	-
Stage 2	442	-	-	-	-	-
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	339	657	-	-	1134	-
Stage 1	683	-	-	-	-	-
Stage 2	652	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	334	657	-	-	1134	-
Mov Cap-2 Maneuver	334	-	-	-	-	-
Stage 1	683	-	-	-	-	-
Stage 2	642	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.6	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	351	1134	-
HCM Lane V/C Ratio	-	-	0.488	0.013	-
HCM Control Delay (s)	-	-	24.6	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.6	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	66	9	185	93	10	263
Future Vol, veh/h	66	9	185	93	10	263
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	58	58	77	77	78	78
Heavy Vehicles, %	6	20	2	3	0	2
Mvmt Flow	114	16	240	121	13	337

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	664	301	0	0	361	0
Stage 1	301	-	-	-	-	-
Stage 2	363	-	-	-	-	-
Critical Hdwy	6.46	6.4	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.48	-	-	2.2	-
Pot Cap-1 Maneuver	419	698	-	-	1209	-
Stage 1	742	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	414	698	-	-	1209	-
Mov Cap-2 Maneuver	414	-	-	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.7	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	435	1209	-
HCM Lane V/C Ratio	-	-	0.297	0.011	-
HCM Control Delay (s)	-	-	16.7	8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	80	10	344	70	12	344
Future Vol, veh/h	80	10	344	70	12	344
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	52	52	86	86	77	77
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	154	19	400	81	16	447

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	920	441	0	0	481	0
Stage 1	441	-	-	-	-	-
Stage 2	479	-	-	-	-	-
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	303	621	-	-	1092	-
Stage 1	653	-	-	-	-	-
Stage 2	627	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	297	621	-	-	1092	-
Mov Cap-2 Maneuver	297	-	-	-	-	-
Stage 1	653	-	-	-	-	-
Stage 2	615	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.5	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	315	1092	-
HCM Lane V/C Ratio	-	-	0.549	0.014	-
HCM Control Delay (s)	-	-	29.5	8.3	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	3.1	0	-

Route 27/Route 16 School Street/Route 128 Southbound Ramps

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	69	40	234	169	74	204
Future Vol, veh/h	69	40	234	169	74	204
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	0	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	76	76	86	86
Heavy Vehicles, %	0	0	3	1	0	2
Mvmt Flow	82	48	308	222	86	237

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	717	308	0	0	308	0
Stage 1	308	-	-	-	-	-
Stage 2	409	-	-	-	-	-
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	399	737	-	-	1264	-
Stage 1	750	-	-	-	-	-
Stage 2	675	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	368	737	-	-	1264	-
Mov Cap-2 Maneuver	368	-	-	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	622	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.9	0	2.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	368	737	1264	-
HCM Lane V/C Ratio	-	-	0.223	0.065	0.068	-
HCM Control Delay (s)	-	-	17.6	10.2	8.1	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.2	0.2	-

Intersection	
Int Delay, s/veh	4.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	93	34	369	225	150	221
Future Vol, veh/h	93	34	369	225	150	221
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	0	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	92	92	91	91
Heavy Vehicles, %	0	0	1	1	0	1
Mvmt Flow	108	40	401	245	165	243

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	974	401	0	0	401	0
Stage 1	401	-	-	-	-	-
Stage 2	573	-	-	-	-	-
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	282	653	-	-	1169	-
Stage 1	681	-	-	-	-	-
Stage 2	568	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	236	653	-	-	1169	-
Mov Cap-2 Maneuver	236	-	-	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	475	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.7	0	3.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	236	653	1169	-
HCM Lane V/C Ratio	-	-	0.458	0.061	0.141	-
HCM Control Delay (s)	-	-	32.5	10.9	8.6	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	2.2	0.2	0.5	-

Intersection	
Int Delay, s/veh	2.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	74	43	251	181	79	219
Future Vol, veh/h	74	43	251	181	79	219
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	0	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	76	76	86	86
Heavy Vehicles, %	0	0	3	1	0	2
Mvmt Flow	88	51	330	238	92	255

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	769	330	0	0	330	0
Stage 1	330	-	-	-	-	-
Stage 2	439	-	-	-	-	-
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	372	716	-	-	1241	-
Stage 1	733	-	-	-	-	-
Stage 2	654	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	340	716	-	-	1241	-
Mov Cap-2 Maneuver	340	-	-	-	-	-
Stage 1	733	-	-	-	-	-
Stage 2	598	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	2.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	340	716	1241	-
HCM Lane V/C Ratio	-	-	0.259	0.071	0.074	-
HCM Control Delay (s)	-	-	19.3	10.4	8.1	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	1	0.2	0.2	-

Intersection	
Int Delay, s/veh	5.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	100	36	396	241	161	237
Future Vol, veh/h	100	36	396	241	161	237
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	0	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	92	92	91	91
Heavy Vehicles, %	0	0	1	1	0	1
Mvmt Flow	116	42	430	262	177	260

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1044	430	0	0	430	0
Stage 1	430	-	-	-	-	-
Stage 2	614	-	-	-	-	-
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	256	629	-	-	1140	-
Stage 1	660	-	-	-	-	-
Stage 2	544	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	209	629	-	-	1140	-
Mov Cap-2 Maneuver	209	-	-	-	-	-
Stage 1	660	-	-	-	-	-
Stage 2	445	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	33.7	0	3.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	209	629	1140	-
HCM Lane V/C Ratio	-	-	0.556	0.067	0.155	-
HCM Control Delay (s)	-	-	41.9	11.1	8.7	0
HCM Lane LOS	-	-	E	B	A	A
HCM 95th %tile Q(veh)	-	-	3	0.2	0.5	-

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	74	44	262	181	102	232
Future Vol, veh/h	74	44	262	181	102	232
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	0	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	76	76	86	86
Heavy Vehicles, %	0	0	3	1	0	2
Mvmt Flow	88	52	345	238	119	270

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	853	345	0	0	345	0
Stage 1	345	-	-	-	-	-
Stage 2	508	-	-	-	-	-
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	332	702	-	-	1225	-
Stage 1	722	-	-	-	-	-
Stage 2	608	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	294	702	-	-	1225	-
Mov Cap-2 Maneuver	294	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	539	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18	0	2.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	294	702	1225	-
HCM Lane V/C Ratio	-	-	0.3	0.075	0.097	-
HCM Control Delay (s)	-	-	22.4	10.5	8.3	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0.2	0.3	-

Intersection	
Int Delay, s/veh	6.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	100	37	433	241	177	246
Future Vol, veh/h	100	37	433	241	177	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	0	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	92	92	91	91
Heavy Vehicles, %	0	0	1	1	0	1
Mvmt Flow	116	43	471	262	195	270

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1131	471	0	0	471	0
Stage 1	471	-	-	-	-	-
Stage 2	660	-	-	-	-	-
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	227	597	-	-	1101	-
Stage 1	632	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	180	597	-	-	1101	-
Mov Cap-2 Maneuver	180	-	-	-	-	-
Stage 1	632	-	-	-	-	-
Stage 2	410	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	43.7	0	3.8
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	180	597	1101	-
HCM Lane V/C Ratio	-	-	0.646	0.072	0.177	-
HCM Control Delay (s)	-	-	55.6	11.5	9	0
HCM Lane LOS	-	-	F	B	A	A
HCM 95th %tile Q(veh)	-	-	3.7	0.2	0.6	-

School Street/Mill Street and Route 128 Northbound Ramps

Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↕			↕			↰	↱
Traffic Vol, veh/h	82	18	173	13	5	45	47	276	7	18	237	18
Future Vol, veh/h	82	18	173	13	5	45	47	276	7	18	237	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	250	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	72	72	72	71	71	71	88	88	88	80	80	80
Heavy Vehicles, %	2	0	0	0	0	0	6	4	0	0	5	8
Mvmt Flow	114	25	240	18	7	63	53	314	8	23	296	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	801	770	296	779	766	318	296	0	0	322	0	0
Stage 1	342	342	-	424	424	-	-	-	-	-	-	-
Stage 2	459	428	-	355	342	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.5	6.2	7.1	6.5	6.2	4.16	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4	3.3	3.5	4	3.3	2.254	-	-	2.2	-	-
Pot Cap-1 Maneuver	303	333	748	316	335	727	1243	-	-	1249	-	-
Stage 1	673	642	-	612	590	-	-	-	-	-	-	-
Stage 2	582	588	-	666	642	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	257	309	748	190	311	727	1243	-	-	1249	-	-
Mov Cap-2 Maneuver	257	309	-	190	311	-	-	-	-	-	-	-
Stage 1	638	628	-	580	559	-	-	-	-	-	-	-
Stage 2	497	557	-	425	628	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	19.6	15.5	1.1	0.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1243	-	-	265	748	430	1249	-	-
HCM Lane V/C Ratio	0.043	-	-	0.524	0.321	0.206	0.018	-	-
HCM Control Delay (s)	8	0	-	32.6	12.1	15.5	7.9	0	-
HCM Lane LOS	A	A	-	D	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.8	1.4	0.8	0.1	-	-

Intersection	
Int Delay, s/veh	36.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↕			↕			↰	↱
Traffic Vol, veh/h	143	36	226	9	10	51	98	400	16	29	254	31
Future Vol, veh/h	143	36	226	9	10	51	98	400	16	29	254	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	250	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	61	61	61	90	90	90	87	87	87
Heavy Vehicles, %	0	0	1	0	0	0	0	1	0	0	1	0
Mvmt Flow	159	40	251	15	16	84	109	444	18	33	292	36

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1079	1038	292	1049	1029	453	292	0	0	462	0	0
Stage 1	358	358	-	671	671	-	-	-	-	-	-	-
Stage 2	721	680	-	378	358	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.21	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.309	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	198	233	750	207	236	611	1281	-	-	1110	-	-
Stage 1	664	631	-	449	458	-	-	-	-	-	-	-
Stage 2	422	454	-	648	631	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 142	199	750	104	201	611	1281	-	-	1110	-	-
Mov Cap-2 Maneuver	~ 142	199	-	104	201	-	-	-	-	-	-	-
Stage 1	588	608	-	397	405	-	-	-	-	-	-	-
Stage 2	309	402	-	388	608	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	112.4	22.5	1.5	0.8
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1281	-	-	151	750	319	1110	-	-
HCM Lane V/C Ratio	0.085	-	-	1.317	0.335	0.36	0.03	-	-
HCM Control Delay (s)	8.1	0	-	238.8	12.2	22.5	8.3	0	-
HCM Lane LOS	A	A	-	F	B	C	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	12.1	1.5	1.6	0.1	-	-

Notes

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

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↔			↔			↰	↱
Traffic Vol, veh/h	88	19	185	14	5	48	50	296	8	19	255	19
Future Vol, veh/h	88	19	185	14	5	48	50	296	8	19	255	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	250	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	72	72	72	71	71	71	88	88	88	80	80	80
Heavy Vehicles, %	2	0	0	0	0	0	6	4	0	0	5	8
Mvmt Flow	122	26	257	20	7	68	57	336	9	24	319	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	859	826	319	835	822	341	319	0	0	345	0	0
Stage 1	367	367	-	455	455	-	-	-	-	-	-	-
Stage 2	492	459	-	380	367	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.5	6.2	7.1	6.5	6.2	4.16	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4	3.3	3.5	4	3.3	2.254	-	-	2.2	-	-
Pot Cap-1 Maneuver	277	310	726	289	311	706	1219	-	-	1225	-	-
Stage 1	653	626	-	589	572	-	-	-	-	-	-	-
Stage 2	558	570	-	646	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	231	285	726	163	286	706	1219	-	-	1225	-	-
Mov Cap-2 Maneuver	231	285	-	163	286	-	-	-	-	-	-	-
Stage 1	615	611	-	555	539	-	-	-	-	-	-	-
Stage 2	469	537	-	390	611	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23.4	17.1	1.1	0.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1219	-	-	239	726	391	1225	-	-
HCM Lane V/C Ratio	0.047	-	-	0.622	0.354	0.241	0.019	-	-
HCM Control Delay (s)	8.1	0	-	42	12.7	17.1	8	0	-
HCM Lane LOS	A	A	-	E	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3.7	1.6	0.9	0.1	-	-

Intersection	
Int Delay, s/veh	58

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↕			↕			↰	↱
Traffic Vol, veh/h	153	39	242	10	11	55	105	429	17	31	273	33
Future Vol, veh/h	153	39	242	10	11	55	105	429	17	31	273	33
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	250	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	61	61	61	90	90	90	87	87	87
Heavy Vehicles, %	0	0	1	0	0	0	0	1	0	0	1	0
Mvmt Flow	170	43	269	16	18	90	117	477	19	36	314	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1161	1116	314	1129	1107	487	314	0	0	496	0	0
Stage 1	386	386	-	721	721	-	-	-	-	-	-	-
Stage 2	775	730	-	408	386	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.21	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.309	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	174	209	729	183	212	585	1258	-	-	1078	-	-
Stage 1	641	614	-	422	435	-	-	-	-	-	-	-
Stage 2	394	431	-	624	614	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 119	174	729	82	177	585	1258	-	-	1078	-	-
Mov Cap-2 Maneuver	~ 119	174	-	82	177	-	-	-	-	-	-	-
Stage 1	558	588	-	368	379	-	-	-	-	-	-	-
Stage 2	276	375	-	349	588	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	183.2	28.8	1.6	0.8
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1258	-	-	127	729	273	1078	-	-
HCM Lane V/C Ratio	0.093	-	-	1.68	0.369	0.456	0.033	-	-
HCM Control Delay (s)	8.2	0	-	$ 398	12.8	28.8	8.5	0	-
HCM Lane LOS	A	A	-	F	B	D	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	15.8	1.7	2.2	0.1	-	-

Notes

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

Intersection	
Int Delay, s/veh	10.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↔			↔			↰	↱
Traffic Vol, veh/h	96	19	185	14	5	48	50	299	8	19	267	20
Future Vol, veh/h	96	19	185	14	5	48	50	299	8	19	267	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	250	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	72	72	72	71	71	71	88	88	88	80	80	80
Heavy Vehicles, %	2	0	0	0	0	0	6	4	0	0	5	8
Mvmt Flow	133	26	257	20	7	68	57	340	9	24	334	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	878	845	334	854	841	345	334	0	0	349	0	0
Stage 1	382	382	-	459	459	-	-	-	-	-	-	-
Stage 2	496	463	-	395	382	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.5	6.2	7.1	6.5	6.2	4.16	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4	3.3	3.5	4	3.3	2.254	-	-	2.2	-	-
Pot Cap-1 Maneuver	268	302	712	281	303	702	1203	-	-	1221	-	-
Stage 1	640	616	-	586	570	-	-	-	-	-	-	-
Stage 2	556	568	-	634	616	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	223	277	712	156	278	702	1203	-	-	1221	-	-
Mov Cap-2 Maneuver	223	277	-	156	278	-	-	-	-	-	-	-
Stage 1	602	601	-	551	536	-	-	-	-	-	-	-
Stage 2	467	534	-	378	601	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	27.1	17.6	1.1	0.5
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1203	-	-	230	712	380	1221	-	-
HCM Lane V/C Ratio	0.047	-	-	0.694	0.361	0.248	0.019	-	-
HCM Control Delay (s)	8.1	0	-	50	12.9	17.6	8	0	-
HCM Lane LOS	A	A	-	F	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	4.5	1.6	1	0.1	-	-

Intersection	
Int Delay, s/veh	82.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↕			↕			↰	↱
Traffic Vol, veh/h	178	39	242	10	11	55	105	441	17	31	281	34
Future Vol, veh/h	178	39	242	10	11	55	105	441	17	31	281	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	250	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	61	61	61	90	90	90	87	87	87
Heavy Vehicles, %	0	0	1	0	0	0	0	1	0	0	1	0
Mvmt Flow	198	43	269	16	18	90	117	490	19	36	323	39

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1183	1138	323	1151	1129	500	323	0	0	509	0	0
Stage 1	395	395	-	734	734	-	-	-	-	-	-	-
Stage 2	788	743	-	417	395	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.21	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.309	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	~ 168	203	720	177	206	575	1248	-	-	1066	-	-
Stage 1	634	608	-	415	429	-	-	-	-	-	-	-
Stage 2	387	425	-	617	608	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 114	169	720	78	171	575	1248	-	-	1066	-	-
Mov Cap-2 Maneuver	~ 114	169	-	78	171	-	-	-	-	-	-	-
Stage 1	551	582	-	361	373	-	-	-	-	-	-	-
Stage 2	270	369	-	342	582	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	259.6	30.3	1.5	0.8
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1248	-	-	121	720	264	1066	-	-
HCM Lane V/C Ratio	0.093	-	-	1.993	0.373	0.472	0.033	-	-
HCM Control Delay (s)	8.2	0	-	$ 534.8	12.9	30.3	8.5	0	-
HCM Lane LOS	A	A	-	F	B	D	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	19.6	1.7	2.4	0.1	-	-

Notes

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

School Street/Site Roadway

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	37	13	181	236	1
Future Vol, veh/h	2	37	13	181	236	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, %	2	2	2	2	2	2
Mvmt Flow	2	40	14	197	257	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	483	258	258	0	-	0
Stage 1	258	-	-	-	-	-
Stage 2	225	-	-	-	-	-
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	542	781	1307	-	-	-
Stage 1	785	-	-	-	-	-
Stage 2	812	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	535	781	1307	-	-	-
Mov Cap-2 Maneuver	535	-	-	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	812	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1307	-	763	-	-
HCM Lane V/C Ratio	0.011	-	0.056	-	-
HCM Control Delay (s)	7.8	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	26	39	315	330	2
Future Vol, veh/h	1	26	39	315	330	2
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	1	28	42	342	359	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	786	360	361	0	-	0
Stage 1	360	-	-	-	-	-
Stage 2	426	-	-	-	-	-
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	361	684	1198	-	-	-
Stage 1	706	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	345	684	1198	-	-	-
Mov Cap-2 Maneuver	345	-	-	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	659	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.7	0.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1198	-	660	-	-
HCM Lane V/C Ratio	0.035	-	0.044	-	-
HCM Control Delay (s)	8.1	0	10.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-