

# **Updated Transportation Impact Assessment**

Proposed Andover Town Yard Redevelopment  
Andover, Massachusetts

*Prepared for:*

Andover Town Yard LLC  
North Andover, Massachusetts

November 2023  
Updated March 2024

*Prepared by:*



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

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# **EXECUTIVE SUMMARY**

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## **DESCRIPTION OF PROJECT**

Vanasse & Associates, Inc. (VAI) has prepared this Updated Transportation Impact Assessment (UTIA) to identify traffic impacts associated with a proposed Andover Town Yard Redevelopment to be located at the former Andover Town Yard off of Pearson Street in Andover, Massachusetts (the “Project”). The purpose of this UTIA is to review existing and future traffic conditions in the vicinity of the site, determine the traffic impact of the proposed Project at key intersections expected to experience increased traffic levels from the Project, and review the need for improvements to mitigate the Project’s traffic impact. This is provided as an update to the initial TIA submitted in November 2023 and was prepared to address comments from the Town’s peer review consultant.

## **PROPOSED PROJECT**

The site is bounded by residential properties and the Haverhill Line railroad to the north, commercial properties to the south, residential properties to the east, and Haverhill Line railroad to the west. Currently, the site contains a commercial building and several residential buildings. The site has one curb cut onto Pearson Street and becomes Buxton Court. The Project entails razing the existing buildings and constructing two new buildings, one of which will consist of 164+1 multifamily units and a 2,500 square foot (sf) gym, and the other building will be composed of a 1,700 sf office, a 2,160 sf community center, and an 800 sf coffee shop. The site will provide 255 parking spaces. The +1 multifamily unit represents a single-family house that is included in the site area. This house will remain so it will not generate any new traffic volumes due to the Project.

## **EXISTING CONDITIONS**

A comprehensive field inventory was conducted to collect existing roadway geometrics, traffic volumes, operating characteristics, speed limits, and sight distances, as well as land use information. Traffic volumes were collected in September 2023 at the intersections expected to receive the traffic impact from the Project. These are listed below:

- North Main Street (Route 28) at Railroad Street
- Route 28 at Lewis Street
- Route 28 at Pearson Street

- Pearson Street at the site driveway/Depot Pizza parking lot
- Pearson Street at Essex Street and Railroad Street/Dundee Park Drive
- Essex Street at School Street
- Essex Street at Ridge Street and Brook Street
- School Street at Lupine Road and Ridge Street

## **FUTURE CONDITIONS**

Traffic volumes within the study area were projected to 2030, which reflects a seven-year planning horizon consistent with State traffic study guidelines. These conditions incorporate traffic growth due to general background traffic increases as well as development projects currently being proposed/permitted or under construction and expected to generate traffic in the future. This condition is referred to as the No-Build condition.

## **PROJECT-GENERATED TRAFFIC**

The Project is expected to generate 526 vehicle trips on an average weekday (two-way, 24-hour volume), with 54 vehicle trips (23 entering and 31 exiting) expected during the weekday morning peak hour and 46 vehicle trips (26 entering and 20 exiting) expected during the weekday evening peak hour.

Project-related traffic-volume increases external to the study area relative to 2030 No-Build conditions are anticipated to range from 0 to 15 vehicles or 0.0 to 2.0 percent during the peak periods.

## **TRAFFIC OPERATIONS ANALYSIS**

In future conditions, operations are generally preserved with minor increases in delays and vehicle queue lengths on the various approaches.

## **RECOMMENDATIONS**

Access to the Project site will be provided via one driveway onto Pearson Street and from the Buxton Court roadway. As a curb cut on Pearson Street exists and the Buxton Court entrance exists, the Project will not increase the number of access points. The following recommendations are offered with respect to the design and operation of the Project site access:

- Access should be placed under STOP-sign (*Manual on Uniform Traffic Control Devices* (MUTCD)<sup>1</sup> R1-1) control, with a painted STOP-bar included.
- All signs and other pavement markings to be installed within the Project site shall conform to the applicable standards of the current MUTCD.

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<sup>1</sup>*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

- Signs and landscaping adjacent to 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 sightlines.

### **MassWorks Project**

The Town has received a MassWorks grant to construct improvements on the Essex Street Corridor, which includes improvements to the intersections of Red Spring Road, School Street, Ridge Street, and Brook Street. In addition, the MassWorks grant includes the closure of Pearson Street on the east side of the railroad tracks near the entrance to the Project. These improvements are shown on graphics provided in the Appendix. These improvements will add bicycle accommodations, improve sidewalks, and include intersection reconfiguration to provide one-way couplets in some locations. Based on input provided by the Town Planning Department, the MassWorks design effort is proceeding with construction projected to start as soon as Fall 2024. As such, the MassWorks improvements are likely to be in place before the Project is fully built and occupied. Therefore, no additional mitigation is required beyond that proposed in the MassWorks design.

### **Pearson Street Closure**

A review of the analysis assuming the redistribution of traffic from Pearson Street as a result of its closure at the commuter rail crossing indicated little to no difference in traffic operations at the study area intersections. The Route 28 intersection with Pearson Street is expected to improve in operations due to the elimination of through movements and fewer vehicles using the intersection with Route 28.

### **CONCLUSIONS**

As documented in this study, Project-related traffic increases result in minor delay increases at signalized intersections; however, there is minimal change in vehicle queuing so it is unlikely that Project-related traffic increases will be noticeable. Further, Project-related traffic increases will not result in significant increases in overall traffic volumes or traffic delays within the study area. The site driveways will provide safe access to and from the development. In general, Project-related traffic can be adequately accommodated within the existing infrastructure with minimal impact on the traffic operations within the study area.

## **INTRODUCTION**

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Vanasse & Associates, Inc. (VAI) has prepared this Updated Transportation Impact Assessment (UTIA) in order to identify the traffic impacts associated with the proposed Andover Town Yard Redevelopment to be located at the former Andover Town Yard off of Pearson Street in Andover, Massachusetts. This report identifies and analyzes existing and future traffic conditions both with and without the Project and reviews access requirements, potential off-site improvements, and safety considerations. This update is provided as an update to the initial TIA submitted in November 2023 and was prepared to address comments from the Town's peer review consultant.

### **STUDY METHODOLOGY**

This study was prepared in accordance with the State guidelines for TIAs 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 geometry, observations of traffic flow, and collection of 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 these analyses consistent with State guidelines for the preparation of TIAs. The traffic analysis conducted in stage two identifies 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 are necessary, based on the results from stage two of the study.

## **EXISTING CONDITIONS**

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A comprehensive field inventory of existing conditions within the study area was conducted in August and September 2023. The field investigation consisted of an inventory of existing roadway geometrics; traffic volumes; and operating characteristics; as well as posted speed limits, sight distance, and land use information within the study area. The study area for the Project contains the major roadway which provides access to the Project, as well as the intersections which are expected to accommodate the majority of Project-related traffic. The study area is listed below and graphically depicted on Figure 1.

- North Main Street (Route 28) at Railroad Street
- Route 28 at Lewis Street
- Route 28 at Pearson Street
- Pearson Street at the site driveway/Depot Pizza parking lot
- Pearson Street at Essex Street and Railroad Street/Dundee Park Drive
- Essex Street at School Street
- Essex Street at Ridge Street and Brook Street
- School Street at Lupine Road and Ridge Street

The following describes the study area roadway which provides access/egress to the Project.

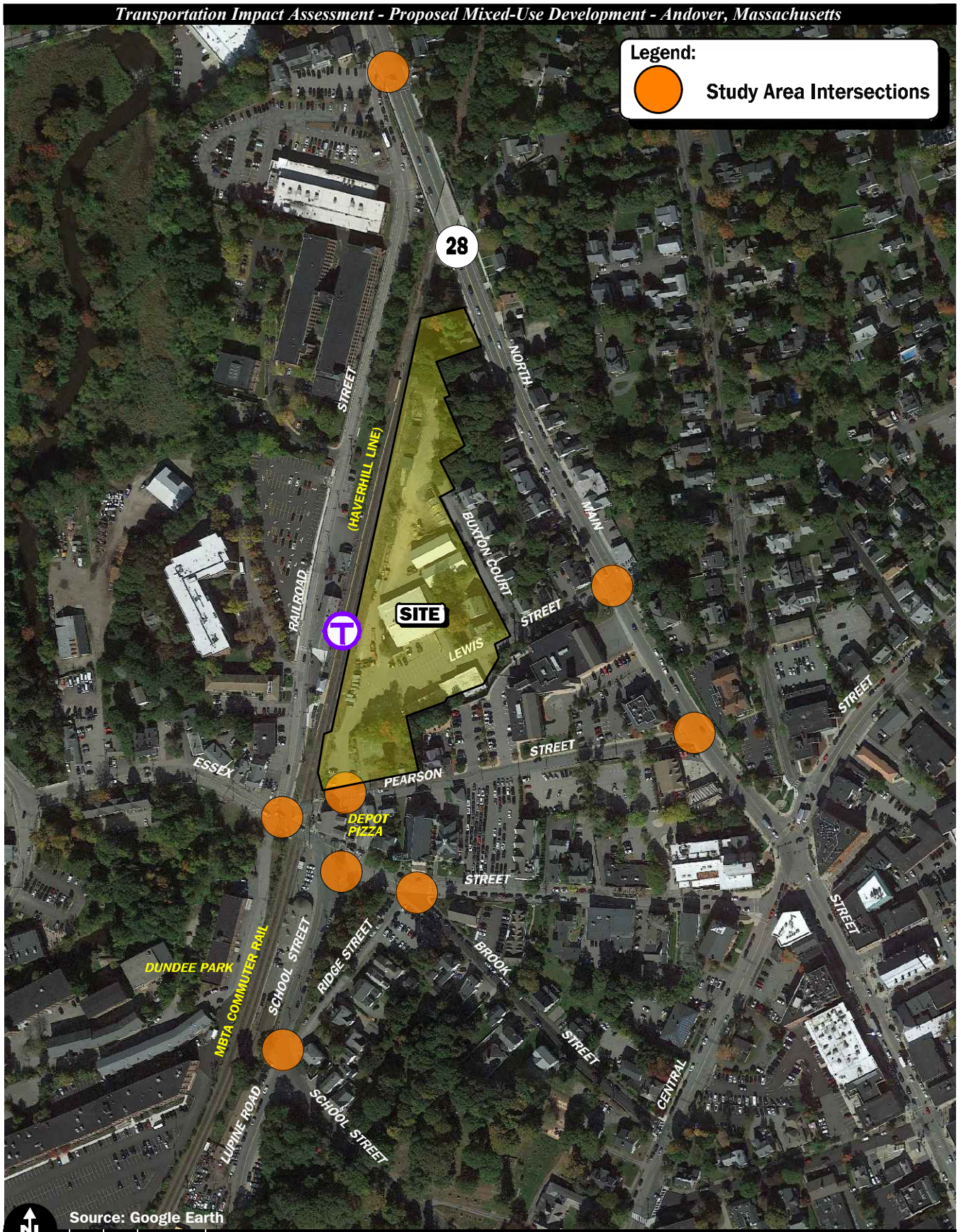
### **GEOMETRY**

#### **Roadway**

##### **Pearson Street**

Pearson Street is classified as a local roadway under Town jurisdiction. Pearson Street runs in a general east-to-west alignment throughout the study area. Pearson Street provides one general-purpose travel lane in each direction separated by a double-yellow centerline in the past, the roadway had just been repaved at the time of field inventory, with exclusive turn lanes provided at some intersections. The land uses along Pearson Street throughout the study area generally consist of commercial and residential uses.

**Legend:**  
 Study Area Intersections



**Figure 1**

**Site Location and Study Area Map**



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**Intersections**

Figure 2 summarizes existing lane use, travel lane widths, and sidewalk and crosswalk locations at the study area intersections.

**EXISTING TRAFFIC VOLUMES**

In order to establish base traffic-volume demands and flow patterns within the study area, manual turning movement counts (TMCs) were completed in September 2023. The TMCs were conducted during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods. Bicycles and pedestrians were also counted.

**Traffic-Volume Adjustments**

In order to develop 2023 Existing traffic-volume conditions, Massachusetts Department of Transportation (MassDOT) weekday seasonal factors for Urban Groups 4-7 (major and minor collectors and local roads and streets, the functional classifications of the majority of the study area roadways) were reviewed.<sup>2</sup> Based on a review of this data, it was determined that traffic volumes for the month of September are *above* average-month conditions. As such, the traffic volumes were not adjusted in order to be representative of average-month conditions.

MassDOT no longer requires pandemic-related adjustment of traffic counts performed after March 2022 except in locations where the predominant land use consists of offices or similar uses.<sup>3</sup> Given that the predominant land use within the study area is residential, no further adjustment (beyond the seasonal adjustment) is necessary.

As can be seen in Table 1, Pearson Street is estimated to carry approximately 1,211 vehicles per day (vpd) with 110 vehicles per hour (vph) during the weekday morning peak hour and 109 vph during the weekday evening peak hour. During the weekday morning peak hour, 66 percent of the traffic is traveling eastbound and during the weekday evening peak hour, 51 percent of the traffic is traveling eastbound. The existing weekday morning and evening peak-hour traffic volumes for the study area intersections are graphically depicted on Figures 3 and 4, respectively.

**Table 1  
2023 EXISTING ROADWAY TRAFFIC-VOLUME SUMMARY**

Location	Weekday	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Daily Volume (vpd) <sup>a</sup>	Volume (vph) <sup>b</sup>	Percent of Daily Traffic <sup>c</sup>	Predominant Flow	Volume (vph)	Percent of Daily Traffic	Predominant Flow
Pearson Street, east of Essex Street	1,211	110	9.1	65.5% EB	109	9.0	51.4% EB

Note: Includes seasonal correction factors applied to TMCs that were conducted in September 2023.

<sup>a</sup>Two-way daily traffic expressed in vehicles per day, estimated.

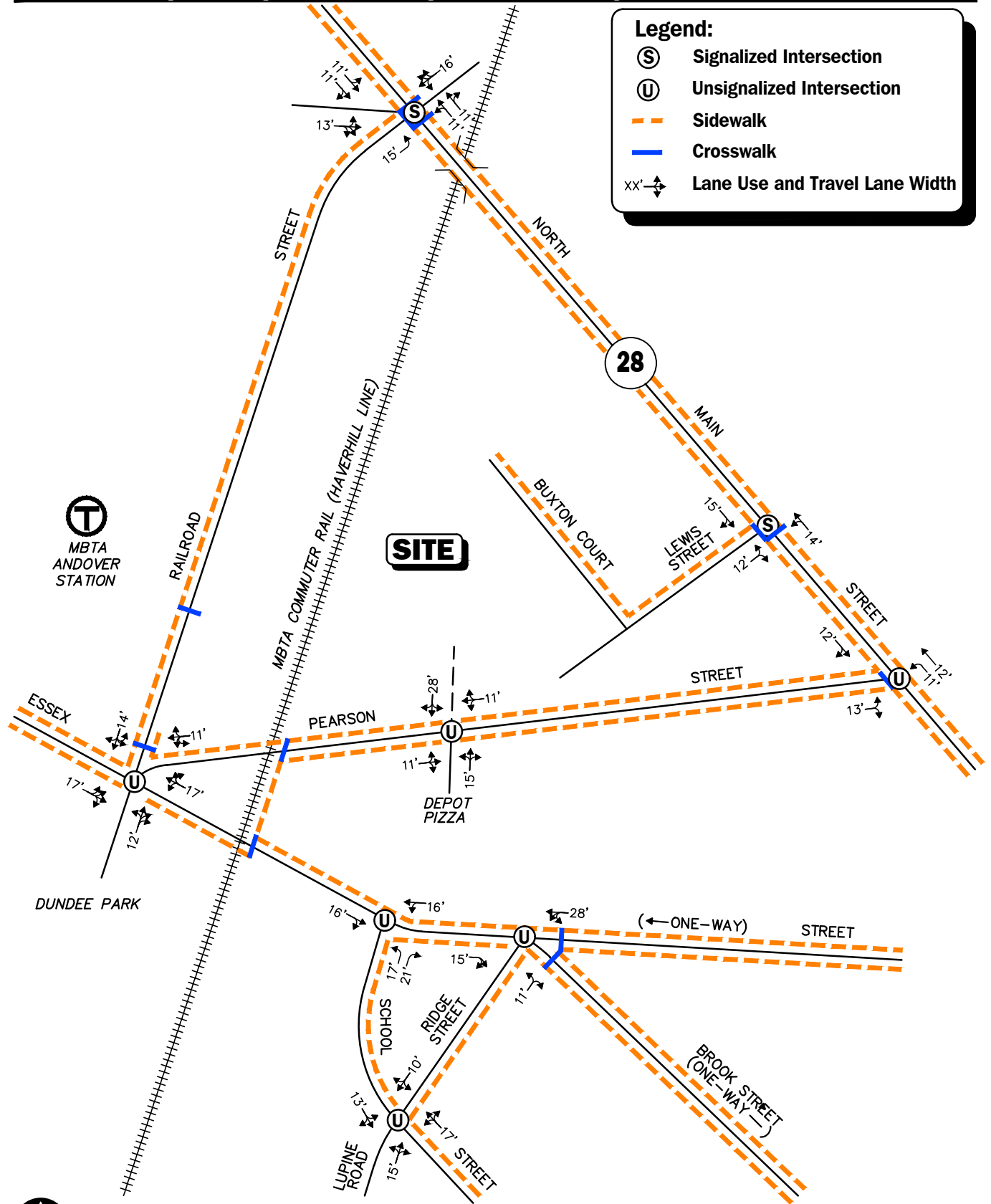
<sup>b</sup>Two-way peak-hour volume expressed in vehicles per hour.

<sup>c</sup>The percent of daily traffic that occurs during the peak hour.

EB = eastbound.

<sup>2</sup>MassDOT statewide Traffic Data Collection; 2019 Weekday Seasonal Factors, Groups U4-7.

<sup>3</sup>25% Design Submission Guidelines; MassDOT Highway Division, Traffic and Safety Engineering; Revised May 31, 2022.



**Legend:**

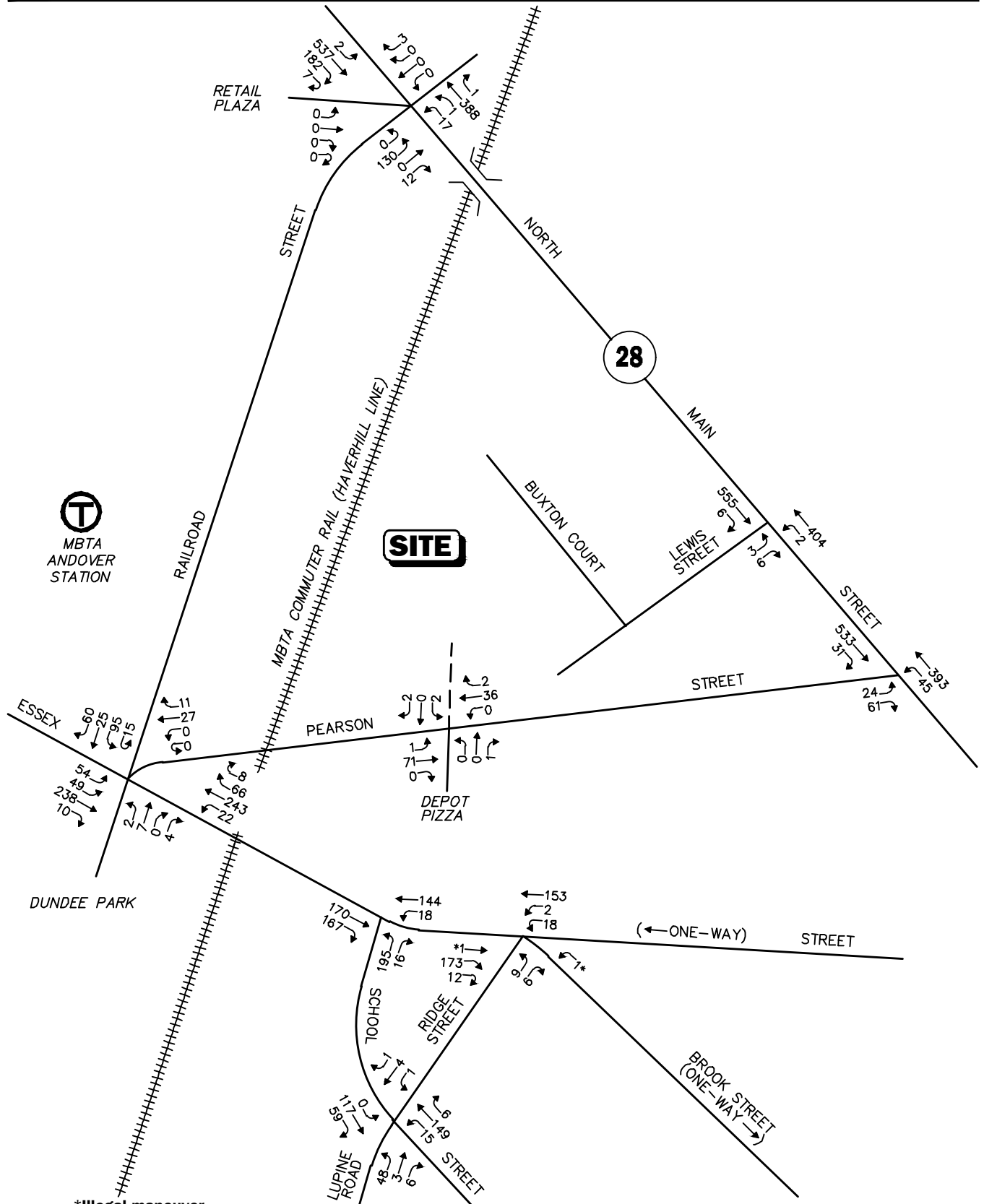
- Ⓢ Signalized Intersection
- Ⓤ Unsignalized Intersection
- - - Sidewalk
- Crosswalk
- XX' Lane Use and Travel Lane Width

Not To Scale



**Figure 2**  
Existing Intersection Lane Use, Travel Lane Width, and Pedestrian Facilities

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\*Illegal maneuver.

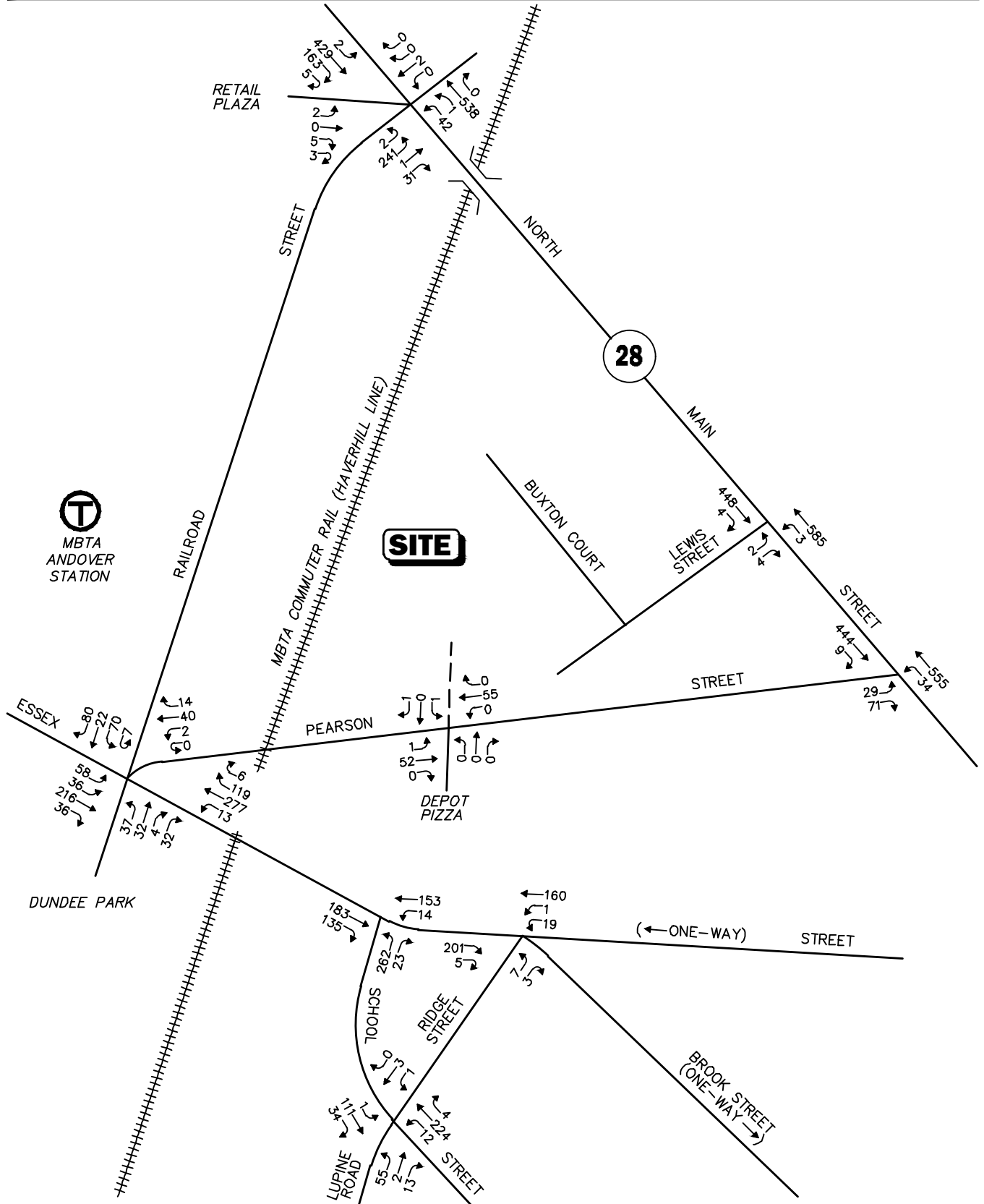
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 3

2023 Existing  
Weekday Morning  
Peak-Hour Traffic Volumes





Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.  
 Not To Scale **Figure 4**



**2023 Existing  
 Weekday Evening  
 Peak-Hour Traffic Volumes**

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**PEDESTRIAN AND BICYCLE FACILITIES**

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in August and September 2023. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study area roadways and at the study area intersections, as well as the location of bicycle facilities. Sidewalks are provided along both sides of Route 28, Pearson Street, Brook Street, Essex Street except between School Street and Pearson Street where it is along the north side from School Street to the railroad track and along the south side from the railroad tracks to Pearson Street, on the west side of Railroad Street, on the east side of School Street, on the east side of Ridge Street, on the east side of Buxton Court, and the north side of Lewis Street. Crosswalks are provided across the Route 28 and Railroad Street approaches of the intersection of Route 28 at Railroad Street, the Railroad Street leg of the intersection of Essex Street at Pearson Street and Railroad Street/Dundee Park Drive, the Brook Street leg and the Essex Street east leg of the intersection of Essex Street at Brook Street and Ridge Street, the Lewis Street leg and the Route 28 south leg of the intersection of Route 28 at Lewis Street, and the Pearson Street leg of the intersection of Route 28 at Pearson Street. In addition, there are crosswalks on Pearson Street and Essex Street just east of the MBTA railroad tracks and Railroad Street abutting the commuter rail station.

**PUBLIC TRANSPORTATION**

Public transportation services are provided within the study area by the Massachusetts Bay Transportation Authority (MBTA) and the Merrimack Valley Regional Transit Authority (MVRTA). The MBTA provides commuter rail service to North Station in Boston on the Haverhill Line by way of Andover Station, which is located at 26 Railroad Street, approximately 0.1 miles (a 2-minute walk) to the west of the Project site. In addition, the MVRTA provides fixed-route services with a bus stop at the MBTA Andover Station. Table 2 summarizes the characteristics of these services. Schedule and fare information for the fixed-route service is provided in the Appendix.

**Table 2  
PUBLIC TRANSPORTATION SERVICES**

Transit Agency	Service	Stop Closest to Site	Distance from Site	Weekday		Weekend	
				Hours of Operation	Headway (minutes)	Hours of Operation	Headway (minutes)
MBTA	Haverhill Line	Andover MBTA Station	~500 feet west	4:58 AM – 12:31 AM	45-138	5:51 AM – 12:21 AM	120-195
MVRTA	Bus Route 21: Andover Shuttle	Andover MBTA Station	~300 feet west	8:19 AM – 6:23 PM	70	--	--
MVRTA	Bus Route 2: Andover via South Broadway	Andover MBTA Station	~300 feet west	5:48 AM – 9:21 PM	30-60	7:18 AM – 6:21 PM	60

## **MOTOR VEHICLE CRASH DATA**

Motor vehicle crash information for the study area intersections was provided by the MassDOT Safety Management/Traffic Operations Unit for the most recent five-year period available (2016 through 2020) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized in Table 3 by intersection, type, weather condition, lighting condition, pavement condition, and severity.

As can be seen in Table 3, the study area intersections experience 13 crashes or less or 2.6 crashes or less per year. The majority of the crashes were angled collisions (36 out of 63), occurred on dry pavement (41 out of 63), during daylight (44 out of 63), in clear weather (35 out of 63), and caused property damage only (54 out of 63). No fatalities were reported over the five-year period reviewed. The crash rates for the intersections were observed to be lower than the MassDOT District 4 crash rates for a majority of the study area's unsignalized and signalized intersections. However, the intersections of Pearson Street at the site driveway and Depot Pizza parking lot, Essex Street at School Street, and Essex Street at Brook Street and Ridge Street were higher than the MassDOT District 4 crash rate for unsignalized intersections. These intersections were observed to have at most 10 accidents over the five years.

**Table 3**  
**MOTOR VEHICLE CRASH DATA SUMMARY**

Scenario	Rte 28 at Railroad St	Rte 28 at Lewis St	Rte 28 at Pearson St	Pearson St at Site Dwy and Depot Pizza Prkg Lot	Pearson St at Essex St and Railroad St/ Dundee Park Dr	Essex St at School St	Essex St at Brook St/ Ridge St	School St at Ridge St/ Lupine Rd
<i>Year:</i>								
2016	0	3	5	0	2	2	4	0
2017	2	4	3	1	2	3	5	0
2018	0	1	3	1	1	0	1	0
2019	1	3	2	0	6	5	0	0
<u>2020</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
Total	4	12	13	2	11	10	10	1
Average <sup>a</sup>	0.8	2.4	2.6	0.4	2.2	2.0	2.0	0.2
Crash Rate <sup>b</sup>	0.13	0.57	0.56	0.86	0.49	0.64	1.25	0.12
Significant <sup>c</sup>	No	No	No	Yes	No	Yes	Yes	No
<i>Type:</i>								
Angle	0	5	8	1	7	6	8	1
Rear-End	1	2	5	0	2	1	1	0
Head-On	0	0	0	0	0	0	0	0
Sideswipe	1	4	0	0	0	2	0	0
Fixed Object	2	1	0	1	2	1	1	0
Pedestrian	0	0	0	0	0	0	0	0
Bicyclist	0	0	0	0	0	0	0	0
<u>Unknown/Other</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	4	12	13	2	11	10	10	1
<i>Weather Conditions:</i>								
Clear	2	7	12	0	5	3	5	1
Cloudy/Rain	1	4	1	1	2	7	4	0
Snow/Ice	1	1	0	1	4	0	1	0
Fog	0	0	0	0	0	0	0	0
<u>Unknown/Other</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	4	12	13	2	11	10	10	1
<i>Lighting Conditions:</i>								
Daylight	2	12	12	2	4	3	8	1
Dawn/Dusk	0	0	0	0	0	1	0	0
Dark (lit)	2	0	0	0	5	5	2	0
Dark (unlit)	0	0	1	0	1	0	0	0
<u>Unknown/Other</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>
Total	4	12	13	2	11	10	10	1
<i>Pavement Conditions :</i>								
Dry	3	7	13	0	6	4	7	1
Wet	0	4	0	1	2	6	3	0
Snow/Ice	1	1	0	1	3	0	0	0
<u>Unknown/Other</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	4	12	13	2	11	10	10	1
<i>Severity:</i>								
Property Damage Only	4	10	9	2	10	9	9	1
Personal Injury	0	2	4	0	1	1	1	0
Fatality	0	0	0	0	0	0	0	0
<u>Unknown/Other</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	4	12	13	2	11	10	10	1

<sup>a</sup>Average number of crashes over a five-year period.

<sup>b</sup>Crash rate per million entering vehicles (mev).

<sup>c</sup>Significant if crash rate > 0.73 for signalized intersections or > 0.57 for unsignalized intersections (MassDOT District 4 rates).

Source: MassDOT Crash Data, 2016 through 2020.

## **FUTURE CONDITIONS**

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To determine the impact of site-generated traffic volumes on the roadway network under future conditions, existing traffic volumes in the study area were projected to the year 2030. Traffic volumes on the roadway network at that time, in the absence of the Project (that is, the No-Build condition), would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific development by others expected to be completed by 2030. Inclusion of these factors resulted in the development of 2030 No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop the 2030 Build traffic-volume conditions.

### **FUTURE TRAFFIC GROWTH**

Traffic growth on area roadways is a function of the expected land development impacting the study area. Several methods are used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all existing 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.

In addition, we identified the location and type of planned development affecting the study area, estimated the traffic to be generated by that development, and assigned it to the area roadway network. This produces a more realistic estimate of growth for local traffic. However, the drawback of this procedure is that the potential growth in population and development external to the study area would not be accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were used in this UTIA.

### **General Background Growth**

Traffic-volume data compiled by MassDOT from permanent count stations and historic traffic counts in the area were reviewed in order to determine general background traffic growth trends. Based on a review of this data and other area traffic studies, it was determined that the traffic volumes are increasing in the area by approximately 0.92 percent per year on average. Therefore, a 1.0 percent per year compounded annual background traffic growth rate was used to account for future traffic growth including presently unforeseen development within the study area.

### **Specific Development by Others**

The Town of Andover was contacted in order to determine if there are any planned or approved development projects that are expected to influence future traffic volumes within the study area. Based on these discussions, the following projects were identified for possible inclusion in this assessment:

***305 North Main Redevelopment.*** This project entails redeveloping the interior of an existing commercial building into a multi-family residential development. This development is north of our Project site. The 1.0 percent general background growth rate was assumed to account for the new trips generated by this project.

***Draper Block – 27 Main Street.*** This project entails construction of a 47,518 sf development that is north of the Project site. Based on a special permit document for this project, trips were generated for this project. Accordingly, trips from the 27 Main Street development were included in the future condition analysis.

No other 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.

### **Planned Roadway Improvements**

The Town of Andover and MassDOT were contacted in order to determine if there are any planned roadway improvement projects expected to be completed within the study area in the seven-year planning horizon. Based on these discussions, the following roadway improvement project was identified:

- ***Essex Street Corridor – MassWorks Grant.*** This project is being undertaken by MassWorks and entails the removal of the Pearson Street approach from the Essex Street at Pearson Street/Railroad Street/Dundee Park Drive intersection and pedestrian and bicycle improvements along the length of Essex Street and Brook Street to include the following:
  - Essex Street and Brook Street will be reconstructed to provide one-way and two-way bike lanes. At certain locations, there will be on-street parking provided along one or both sides of the roadway.
  - A marked crosswalk will be provided for crossing the approach of School Street for the intersection of Essex Street at School Street.
  - At the Depot Pizza location along Pearson Street, Pearson Street will be turned into a small roundabout and cut back from the five-way intersection with Essex Street.

No other 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 2030 No-Build peak-hour traffic-volume networks were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2023 Existing peak-hour traffic volumes and incorporating traffic projections from the development projects listed above. The

resulting 2030 No-Build weekday morning and evening peak-hour traffic-volume networks are shown on Figures 5 and 6, respectively.

### **PROJECT-GENERATED TRAFFIC**

The Project entails constructing several buildings consisting of 164+1 multifamily residential units, a gym, office space, and a coffee shop with a drive-through window. In order to develop the traffic characteristics of the proposed Project, trip-generation statistics published by the Institute of Transportation Engineers (ITE)<sup>4</sup> for Land Use Code (LUC) 221, *Multifamily Housing (Mid-Rise)*, LUC 492, *Health/Fitness Club*, LUC 712, *Small Office Building*, LUC 495, *Recreation Community Center*, and LUC 937, *Coffee/Donut Shop with Drive-Through Window* were used.

These many land uses within the same site can cause some trips generated to be with the site. The impact to study area intersections would be based only on the external trips that leave and enter outside the site. The base trip-generation calculations obtained using the ITE data were converted to external trips assuming an internal trip capture of 10 percent.

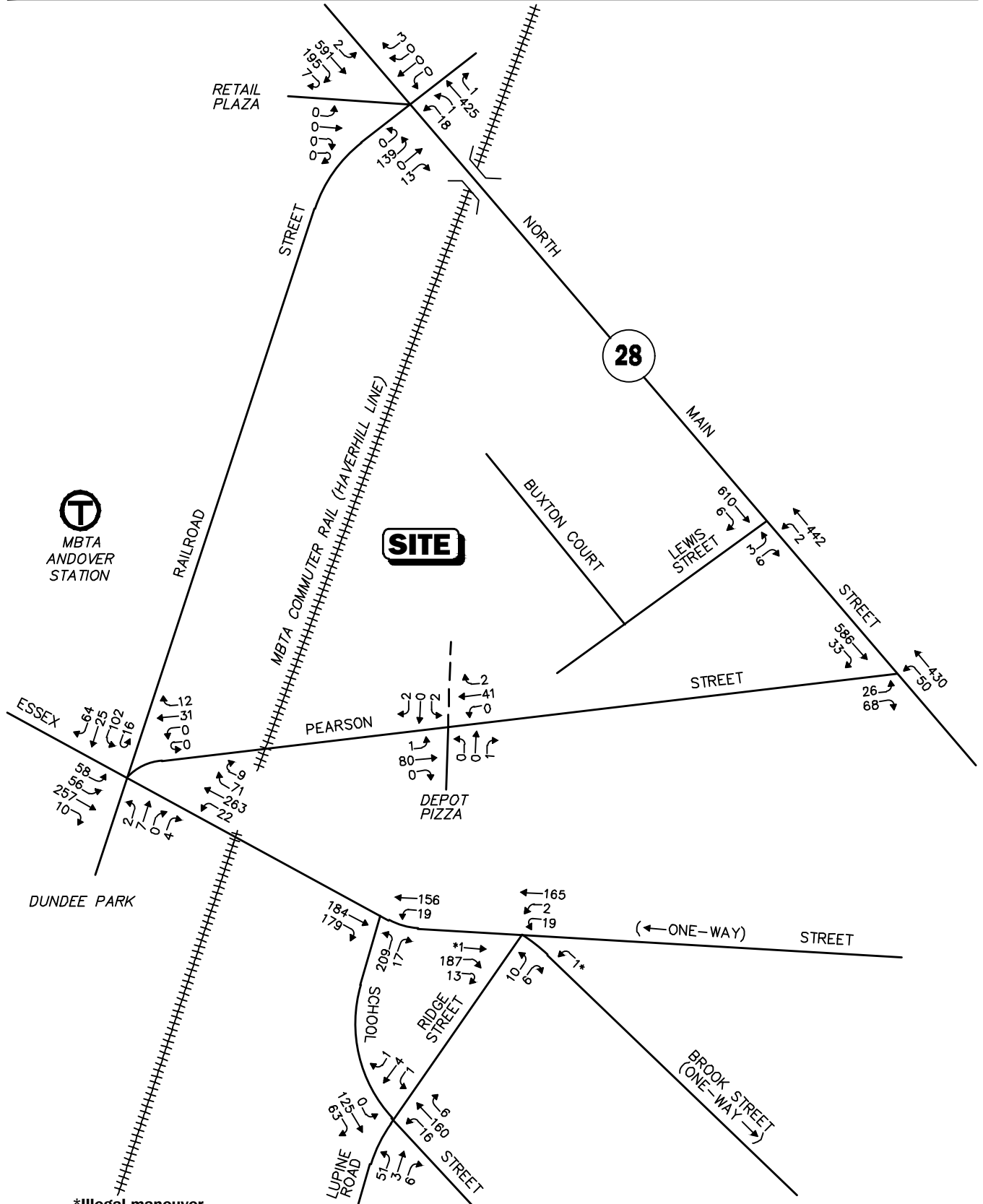
The external trips generated by the Project site were converted to person trips using the vehicle occupancy ratio (VOR) for Census Tract 2542 and were then disseminated to the available modes of transportation. The automobile person trips were then converted back to vehicle trips by dividing by the VOR. Table 4 shows the percentage of available transportation modes for each of the noted land uses. Table 5 shows the resulting calculations for the Project using the above methodology.

**Table 4  
MODE SPLIT BY LAND USE**

Land Use	SOV+HOV Trips	Transit Trips	Walk Trips	Other Trips
Multifamily Residential	41%	25%	13%	21%
Gym	40%	0%	30%	30%
Office Space	33%	33%	34%	0%
Community Center	100%	0%	0%	0%
Coffee Shop	40%	0%	30%	30%

Full calculations and tables of the trip-generation internal capture and the trip-generation by mode split can be found in the Appendix.

<sup>4</sup>*Trip Generation*, 11<sup>th</sup> Edition; Institute of Transportation Engineers; Washington, DC; 2021.



\*Illegal maneuver.

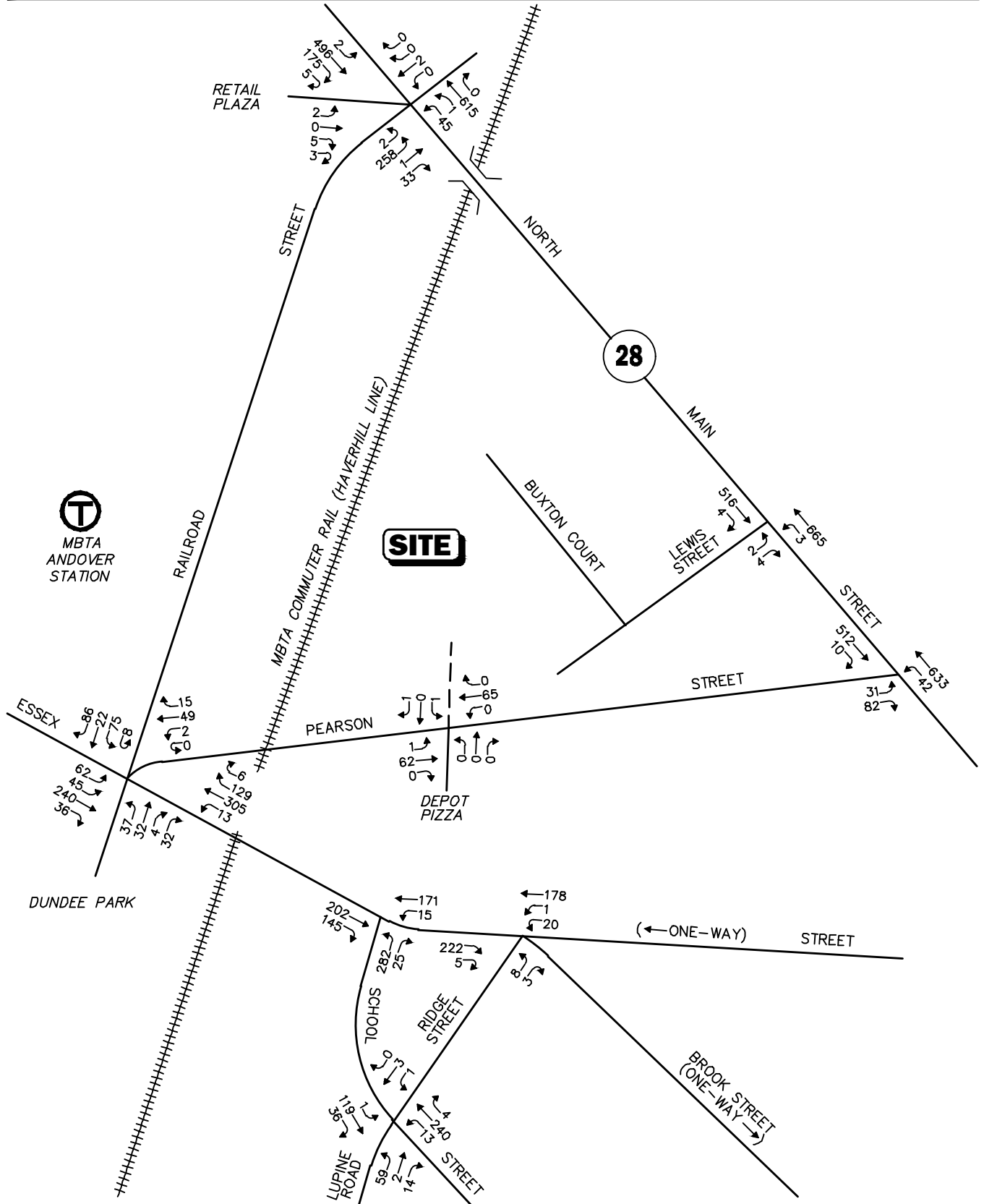
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

**Figure 5**

**2030 No-Build  
Weekday Morning  
Peak-Hour Traffic Volumes**





Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.  
 Not To Scale **Figure 6**



**2030 No-Build  
 Weekday Evening  
 Peak-Hour Traffic Volumes**

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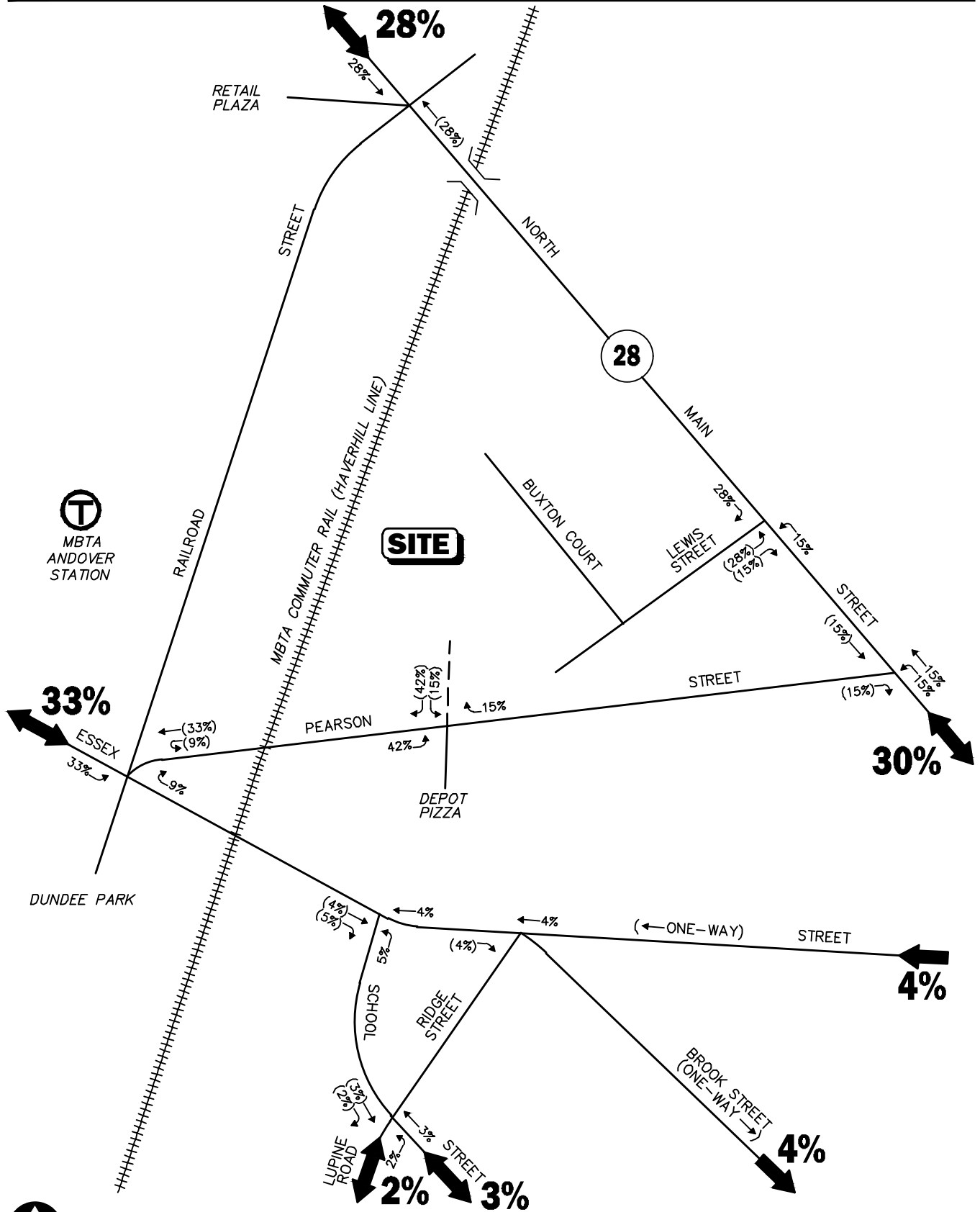
**Table 5  
PROPOSED SITE TRIP-GENERATION SUMMARY**

Time Period/ Directional Distribution	Multi-Family Residential	Gym	Office Space	Recreational Community Center	Coffee Shop with Drive-Thru	Total (F=A+B+C+D+E)
	Units (A)	(B)	(C)	(D)	(E)	(F=A+B+C+D+E)
	Vehicle Trips	Vehicle Trips	Vehicle Trips	Vehicle Trips	Vehicle Trips	Vehicle Trips
Weekday Daily	276	24	8	64	154	526
<i>Weekday Morning Peak Hour:</i>						
Entering	5	1	1	3	13	23
Exiting	<u>17</u>	<u>1</u>	<u>0</u>	<u>1</u>	<u>12</u>	<u>31</u>
Total	22	2	1	4	25	54
<i>Weekday Evening Peak Hour:</i>						
Entering	15	2	0	3	6	26
Exiting	<u>9</u>	<u>1</u>	<u>1</u>	<u>3</u>	<u>6</u>	<u>20</u>
Total	24	3	1	6	12	46

As can be seen in Table 5, the Project is expected to generate 526 vehicle trips on an average weekday (two-way, 24-hour volume), with 54 vehicle trips (23 entering and 31 exiting) expected during the weekday morning peak hour and 46 vehicle trips (26 entering and 20 exiting) expected during the weekday evening peak hour.

**TRIP DISTRIBUTION AND ASSIGNMENT**

The directional distribution of the site-generated trips to and from the Project was determined based on a combination of a review of existing travel patterns at the study area intersections and census data. Existing travel patterns for residents in census tract 2542 that work in Boston or Cambridge were removed because of the probability that these trips would be completed using the nearby commuter rail. The final trip distribution for the Project is summarized in Table 6 and graphically depicted on Figure 7. The weekday morning and evening peak-hour traffic volumes expected to be generated by the Project were assigned on the study area roadway network as shown on Figures 8 and 9, respectively.

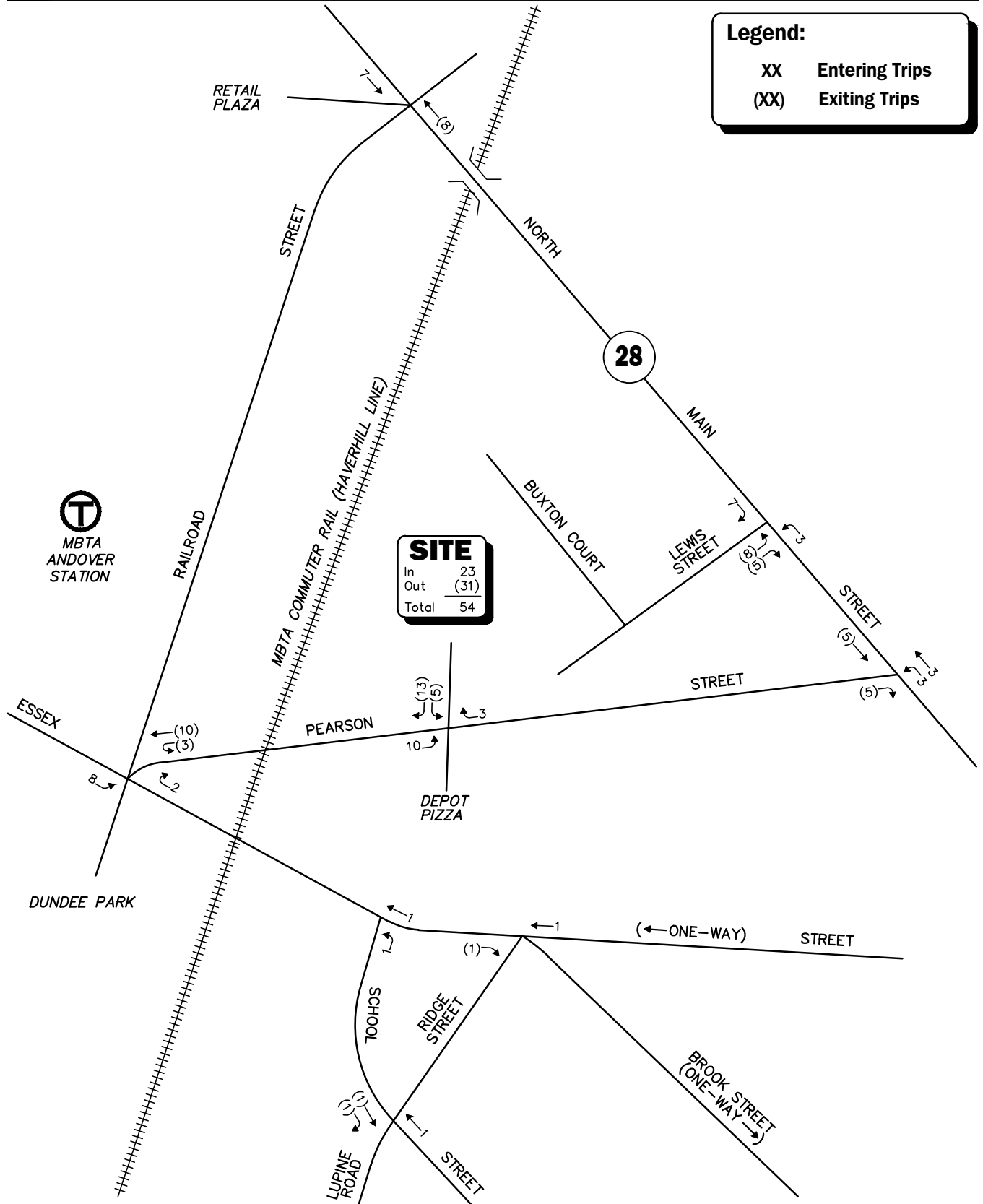


Not To Scale **Figure 7**



Trip Distribution Map

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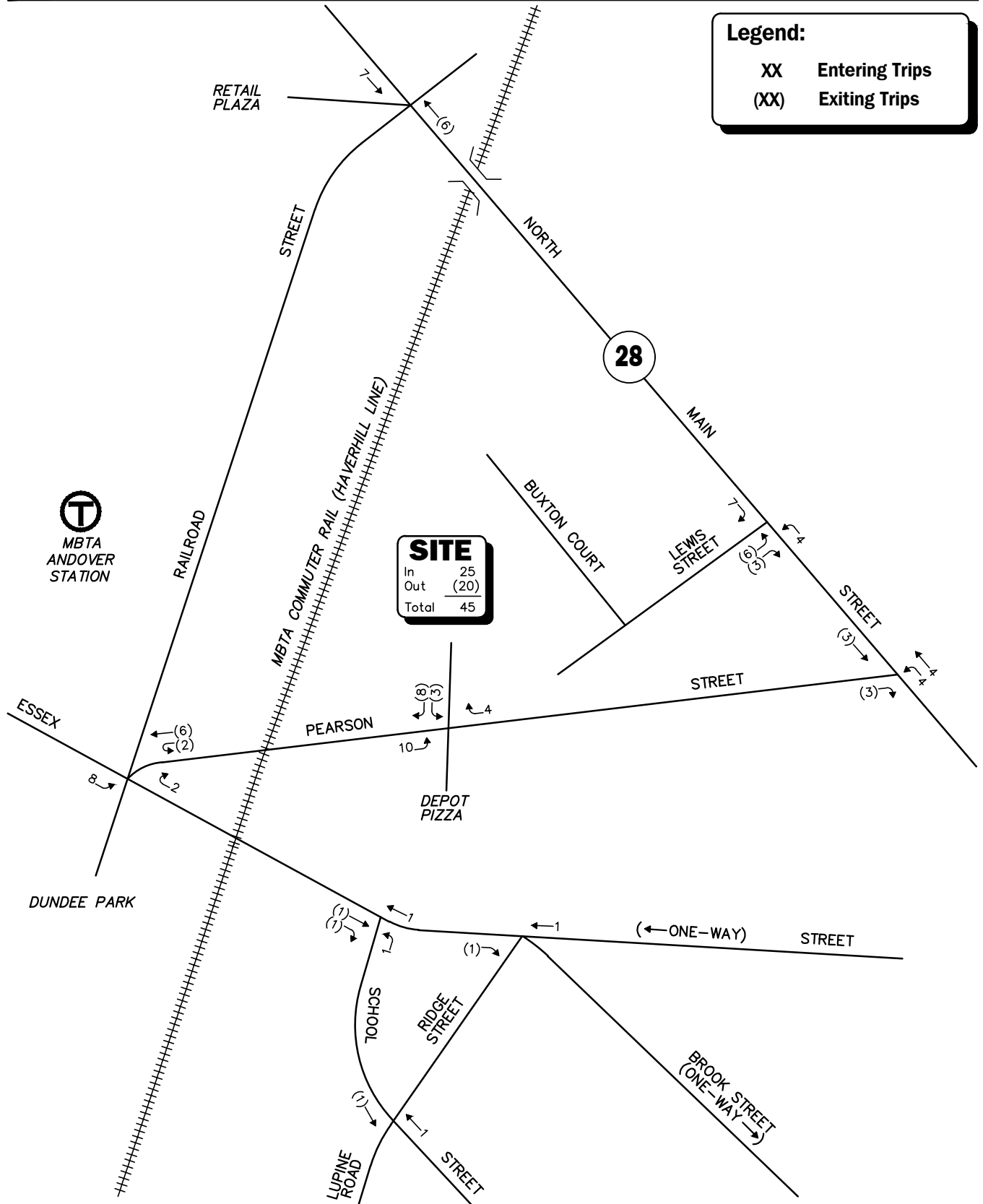


Not To Scale Figure 8



**Site-Generated  
 Weekday Morning  
 Peak-Hour Traffic Volumes**

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Not To Scale Figure 9



**Site-Generated  
 Weekday Evening  
 Peak-Hour Traffic Volumes**

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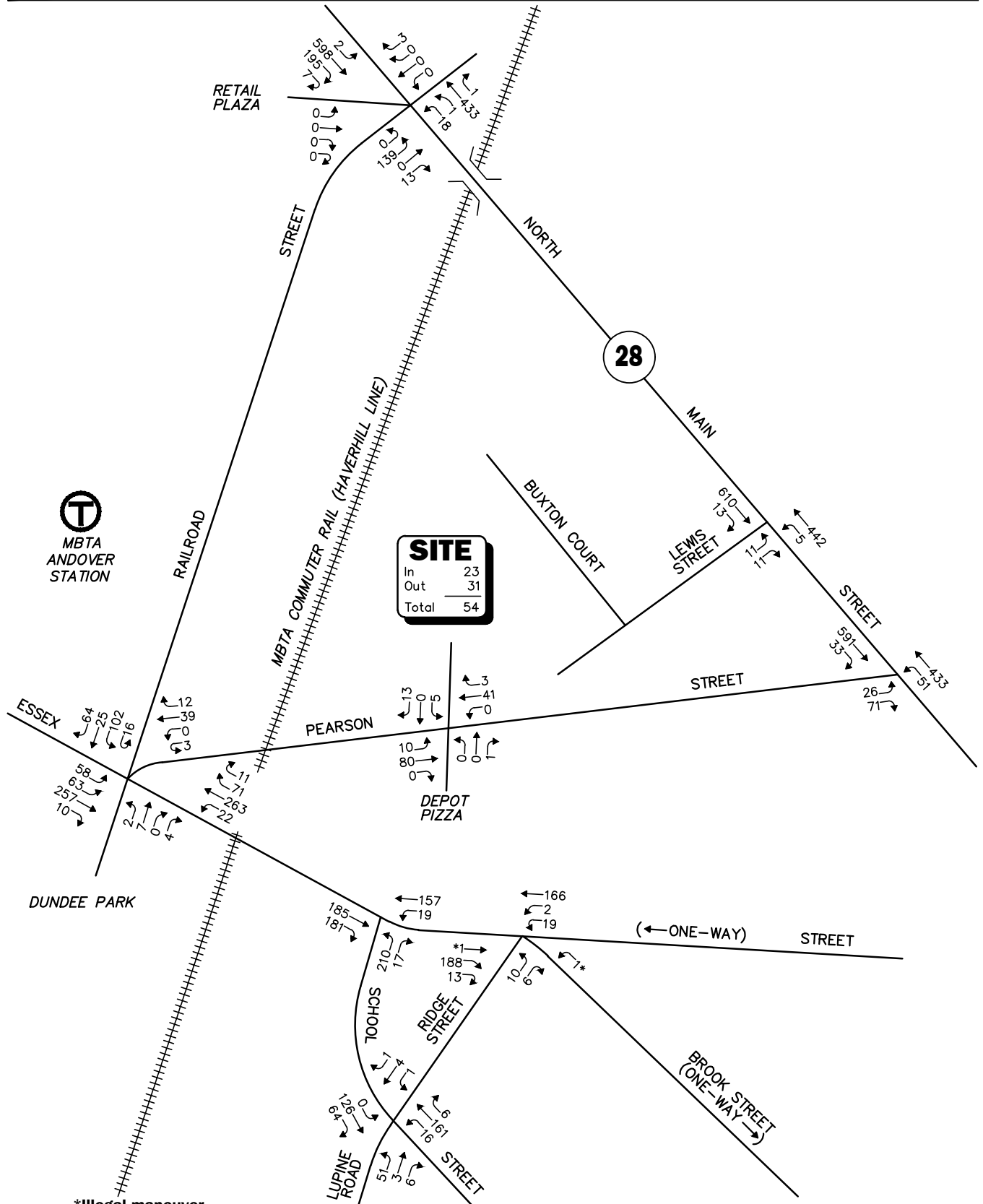
**Table 6**  
**TRIP-DISTRIBUTION SUMMARY**

Roadway	Direction (To/From)	Percent (To/From)
Route 28	North	28/28
Route 28	South	30/30
Lupine Road	South	2/2
Essex Street	East	0/4
Brook Street	East	4/0
School Street	East	3/3
Essex Street	West	<u>33/33</u>
TOTAL		100/100

**FUTURE TRAFFIC VOLUMES – BUILD CONDITION**

The 2030 Build condition networks consist of the 2030 No-Build traffic volumes with the anticipated Project-generated traffic added to them. The 2030 Build weekday morning and evening peak-hour traffic-volume networks are graphically depicted on Figures 10 and 11, respectively.

A summary of peak-hour projected traffic-volume increases external to the study area that is the subject of this assessment is shown in Table 7. These volumes are based on the expected increases from the Project.



\*Illegal maneuver.

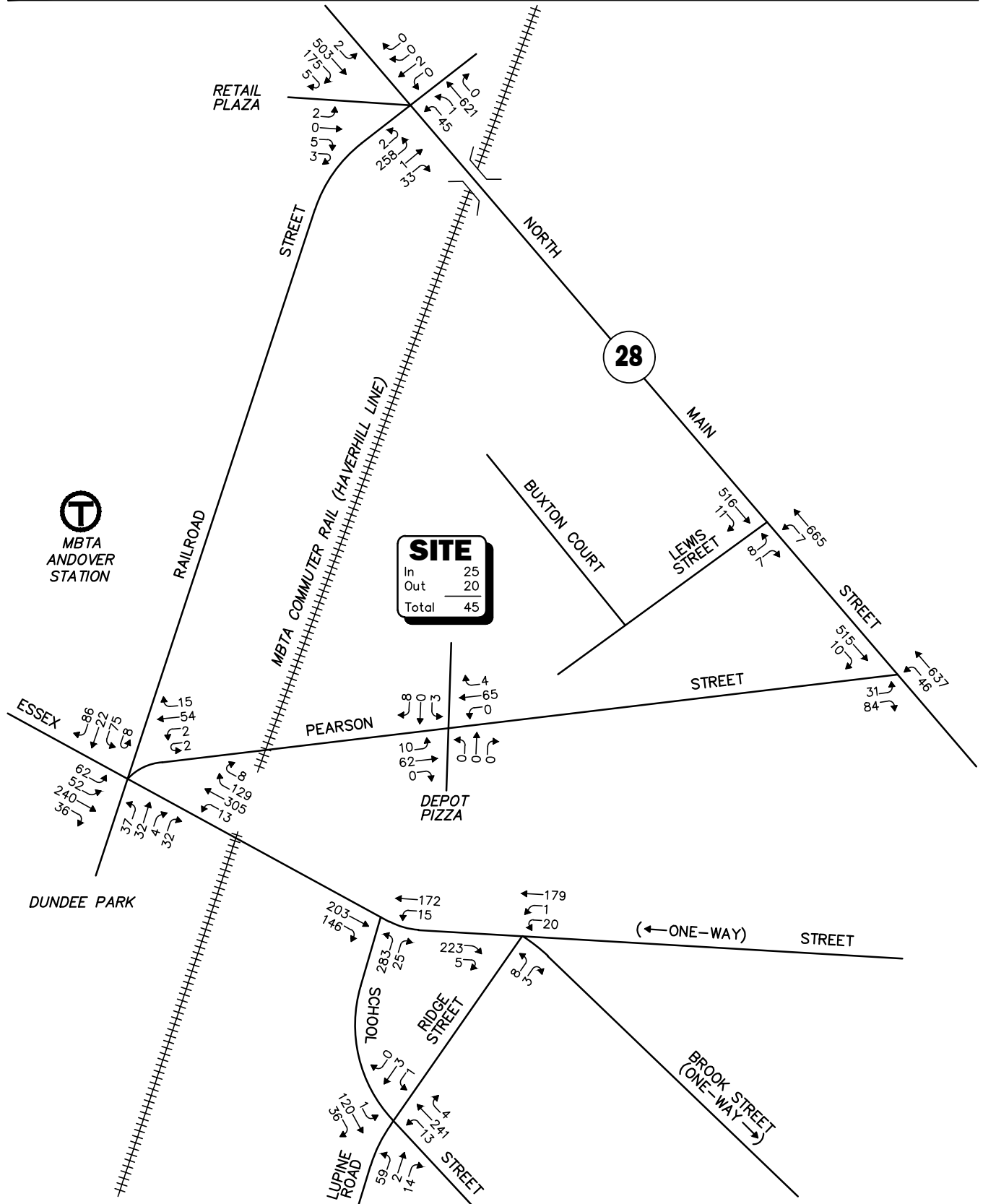
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 10

2030 Build  
Weekday Morning  
Peak-Hour Traffic Volumes





Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 11

2030 Build  
Weekday Evening  
Peak-Hour Traffic Volumes



**Table 7**  
**PEAK-HOUR TRAFFIC-VOLUME INCREASES**

Location/Peak Hour	2030 No-Build	2030 Build	Traffic-Volume Increase Over No-Build	Percent Increase Over No-Build
<i>Route 28, north of Railroad Street:</i>				
Weekday Morning	1,362	1,377	15	1.1
Weekday Evening	1,553	1,566	13	0.8
<i>Route 28, south of Pearson Street:</i>				
Weekday Morning	1,134	1,146	12	1.1
Weekday Evening	1,269	1,282	13	1.0
<i>Lupine Road, south of School Street:</i>				
Weekday Morning	143	144	1	0.7
Weekday Evening	127	127	0	0.0
<i>Brook Street, east of Ridge Street:</i>				
Weekday Morning	212	213	1	0.5
Weekday Evening	245	246	1	0.4
<i>School Street, east of Ridge Street:</i>				
Weekday Morning	314	316	2	0.6
Weekday Evening	391	393	2	0.5
<i>Essex Street, east of Ridge Street:</i>				
Weekday Morning	186	187	1	0.5
Weekday Evening	199	200	1	0.5
<i>Essex Street, west of Railroad Street:</i>				
Weekday Morning	741	756	15	2.0
Weekday Evening	860	872	12	1.4

As shown in Table 6, Project-related traffic-volume increases external to the study area relative to 2030 No-Build conditions are anticipated to range from 0 to 15 vehicles or 0.0 to 2.0 percent during the peak periods.

## SIGHT DISTANCE EVALUATION

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Sight distance measurements were performed at the proposed site driveway intersection with Pearson Street in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)<sup>5</sup> recommendations. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance recommended to be provided 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 is the sight distance recommended to be provided 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 for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions.* Table 8 presents the measured SSD and ISD at the Pearson Street intersection with the existing site driveway.

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<sup>5</sup>*A Policy on Geometric Design of Highway and Streets*, 7<sup>th</sup> Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2018.

**Table 8**  
**SIGHT DISTANCE MEASUREMENTS<sup>a</sup>**

Intersection/Sight Distance Measurement	Recommended Distances (Feet)	Field Measured Distances (Feet)
	Townwide Speed Limit 25 mph on Pearson Street	
<b><i>Pearson Street at Site Driveway</i></b>		
<i>Stopping Sight Distance:</i>		
Pearson Street approaching from the east	155	436 <sup>c</sup>
Pearson Street approaching from the west	155	241
<i>Intersection Sight Distance:<sup>b</sup></i>		
Left turn from Site Driveway (looking east)	280	300 <sup>c</sup>
Left turn from Site Driveway (looking west)	280	226 <sup>d</sup>

<sup>a</sup>Recommended values obtained from *A Policy on Geometric Design of Highways and Streets*, 7<sup>th</sup> Edition; American Association of State Highway and Transportation Officials (AASHTO); 2018.

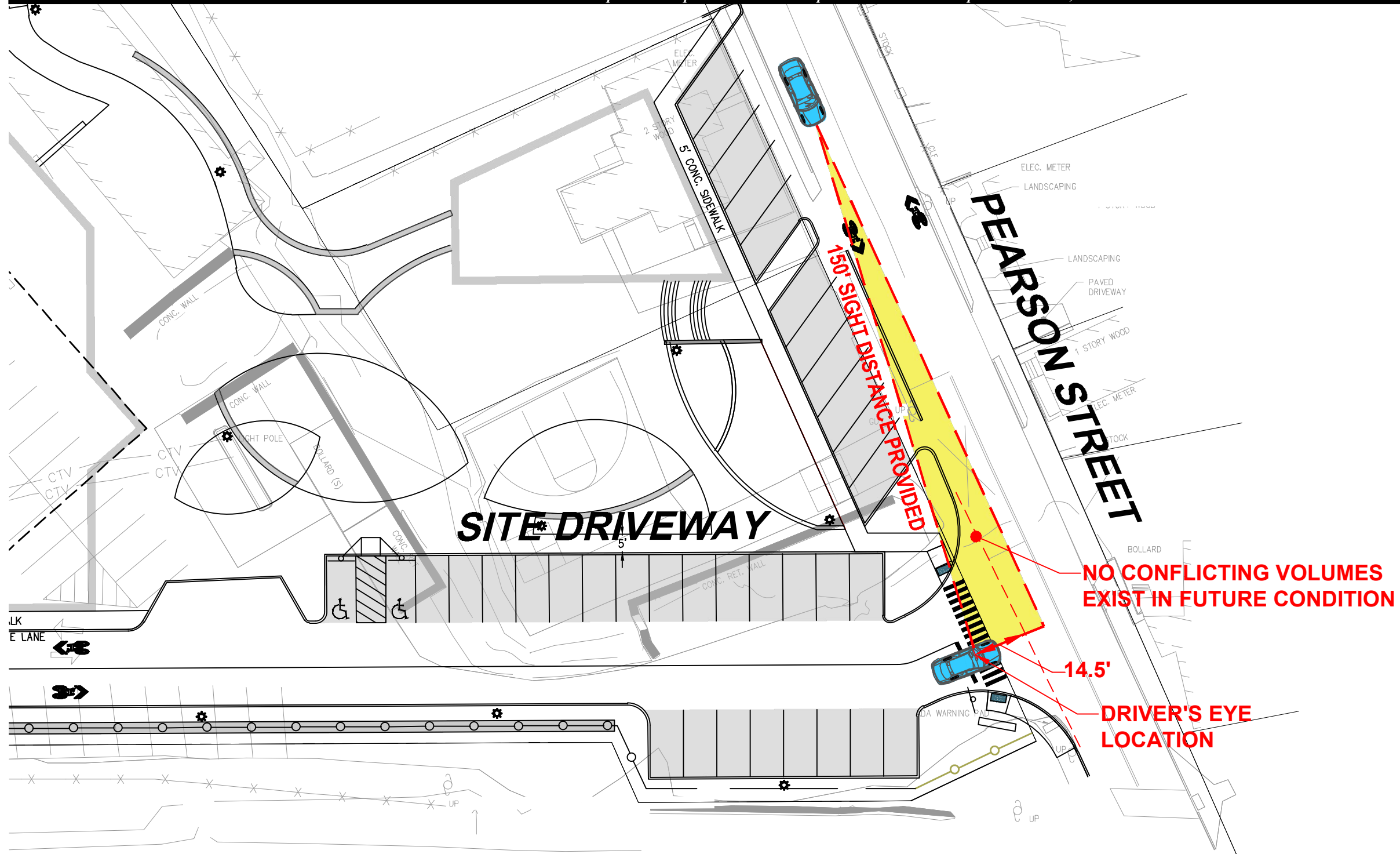
<sup>b</sup>Values shown are the intersection sight distance for a vehicle turning right or left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

<sup>c</sup>Distance if parked cars near the site driveway were removed.

<sup>d</sup>Distance if hedge west of the site driveway were cut.

As can be seen in Table 8, the sight distance at the existing intersection of the site driveway with Pearson Street was found to exceed the recommended values for SSD based on a speed of 25 mph. The site driveway did not meet the recommended value for ISD (looking west) for the 85<sup>th</sup> percentile vehicle travel speed of 25 mph due to a wall west of Railroad Street. However, the Essex Street Corridor Improvement Project is proposed to terminate Pearson Street prior to Railroad Street which will eliminate vehicles traveling to or from the west of the site driveway. In addition, vehicles traveling westbound on Pearson Street towards the site driveway will be decreasing in speed due to the turn required to enter the site; therefore, the sight distance provided is likely to exceed the distances that would otherwise be suggested.

A review of sight distance under proposed conditions at the Pearson Street/Site Driveway intersection and the Lewis Street/Buxton Court junction was also conducted. This indicates that at least 150 feet of sight distance is available looking east from the site driveway, with no encroachment due to parked vehicles or parking spaces in the vicinity of the community building. At the Lewis Street/Buxton Court junction approximately 90 feet of sight distance is available; however, this is not an intersection with conflicting movements. Therefore, recommendations related to sight distance are less relevant since if vehicles obey the rules of the road and stay on the correct side of the road there is no conflict. Depictions of these sight distance triangles are shown on Figures SD-1 and SD-2 for the respective locations.



Source: Morin-Cameron Group, Inc.

Note: This plan is for review purposes only and is not intended for construction.

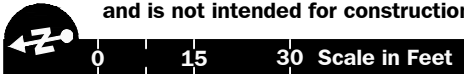


Figure SD-1  
Sight Distance Plan  
Pearson Street at Site Driveway



SOURCE: GOOGLE EARTH.

NOTE: THIS PLAN IS FOR REVIEW PURPOSES ONLY AND IS NOT INTENDED FOR CONSTRUCTION.

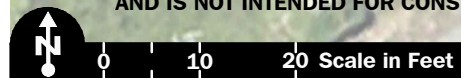


Figure SD-2

Sight Distance Plan  
Lewis Street at Buxton Court

# **TRAFFIC OPERATIONS ANALYSIS**

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Measuring existing and future traffic volumes quantify 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.<sup>6</sup> 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.

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<sup>6</sup>The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual 6<sup>th</sup> Edition*; Transportation Research Board; Washington, DC; 2016.

## Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

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

Levels of service for signalized intersections were calculated using the Percentile Delay Method implemented as a part of the Synchro™ 11 software as required by MassDOT. The Percentile Delay Method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on “percentile” delay. Level-of-service designations are based on the criterion of percentile delay per vehicle and are a measure of: i) driver discomfort; ii) motorist frustration; and iii) fuel consumption; and include a uniform delay based on percentile volumes using a Poisson arrival pattern, an initial queue move-up time, and a queue interaction delay that accounts for delays resulting from queues extending from adjacent intersections. Table 9 summarizes the relationship between level-of-service and percentile delay and uses the same numerical delay thresholds as the 2010 *Highway Capacity Manual (HCM)*<sup>7</sup> method. The tabulated percentile delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

**Table 9**  
**LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS<sup>a</sup>**

Level-of-Service by Volume-to-Capacity Ratio		Percentile Delay Per Vehicle (Seconds)
v/c ≤ 1.0	v/c > 1.0	
A	F	≤10.0
B	F	10.1 to 20.0
C	F	20.1 to 35.0
D	F	35.1 to 55.0
E	F	55.1 to 80.0
F	F	>80.0

<sup>a</sup>Source: Highway Capacity Manual 2010; Transportation Research Board; Washington, DC; 2010; page 18-6.

<sup>7</sup>*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 control delays resulting.

The levels of service of unsignalized intersections are determined by the application of a procedure described in the 2000 *Highway Capacity Manual (2000 HCM)*. Use of the 2000 HCM is appropriate since some intersections within the study area are under YIELD-control and later versions of the HCM do not accommodate this type of intersection control.

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 2000 *Highway Capacity Manual*. Table 10 summarizes the relationship between level of service and average control delay.

**Table 10**  
**LEVEL-OF-SERVICE CRITERIA FOR**  
**UNSIGNALIZED INTERSECTIONS<sup>a</sup>**

Level of Service	Average Control Delay (Seconds Per Vehicle)
A	≤ 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

<sup>a</sup>Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 17-2.

## SIDRA

The unsignalized capacity analysis for the approaches at the intersection of Essex Street at Pearson Street and Railroad Street and Dundee Park Drive is based on the procedures described in the Traffic Signalized and Unsignalized Intersection Design and Research Aid (SIDRA) Intersection.<sup>8</sup> The main features of the SIDRA Intersection method for unsignalized capacity estimation are the dependence of gap acceptance parameters on roadway geometry, entry lane flows, and the designation of traffic control on approach lanes.

The SIDRA analytical model calculates several components of delay. One of these, the average total delay component, produces level-of-service results based on the concepts described in the HCM. The delay ranges that define levels of service for unsignalized intersections are shown in Table 11.

**Table 11**  
**LEVEL-OF-SERVICE CRITERIA FOR SIDRA:**  
**UNSIGNALIZED INTERSECTIONS<sup>a</sup>**

Level-Of-Service by Volume-to-Capacity Ratio		Control Delay Per Vehicle (Seconds)
$v/c \leq 1.0$	$v/c > 1.0$	
A	F	$\leq 10.0$
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	$> 50.0$

<sup>a</sup>Source: *SIDRA Intersection 9.0 User Guide*; Akcelik & Associates Pty Ltd; Greythorn, Victoria 3104, Australia; October 2020.

<sup>8</sup>Traffic Signalized and Unsignalized Intersection Design and Research Aid, SIDRA Intersection 9.0 User Guide; Akcelik & Associates Pty Ltd; Greythorn, Victoria 3104, Australia; October 2020.

## **ANALYSIS RESULTS**

Level-of-service analyses were conducted for 2023 Existing, 2030 No-Build, and 2030 Build conditions for the study area intersections. The results of the intersection capacity analysis within the study area are described below, with a tabular summary provided in Tables 12 and 13.

### **Signalized Intersections**

#### **Route 28 at Railroad Street, Private Driveway, and Retail Plaza**

Under 2023 Existing and 2030 No-Build conditions, this intersection operates at an overall LOS A during the weekday morning peak hour and at an overall LOS C during the weekday evening peak hour. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. The vehicle queue lengths increase by less than 1 vehicle with the addition of Project traffic.

#### **Route 28 at Lewis Street**

Under 2023 Existing and 2030 No-Build conditions, this intersection operates at an overall LOS A during the weekday morning and evening peak hours. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. The vehicle queue lengths increase by less than 1 vehicle with the addition of Project traffic.

**Table 12**  
**SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Signalized Intersection/Peak Hour/Movement	2023 Existing				2030 No-Build				2030 Build			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup> Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>
<b>Route 28 at Railroad Street/Private Driveway/Retail Plaza</b>												
<i>Weekday Morning:</i>												
Railroad Street EB LT/TH/RT/HRT	0.49	16.2	B	1/3	0.52	17.6	B	1/3	0.52	17.6	B	1/3
Private Driveway WB HLT/LT/TH/RT	0.01	0.0	A	0/0	0.01	0.0	A	0/0	0.01	0.0	A	0/0
Route 28 NB HLT/LT/TH/RT	0.25	7.6	A	1/5	0.27	7.9	A	1/6	0.28	7.9	A	1/6
Route 28 SB LT/TH/RT/HRT	0.38	8.6	A	2/10	0.42	9.1	A	2/12	0.43	9.2	A	2/12
Retail Plaza SEB HLT/LT/RT/HRT	0.00	0.0	A	0/0	0.00	0.0	A	0/0	0.00	0.0	A	0/0
<b>Overall</b>	--	<b>8.9</b>	<b>A</b>	--	--	<b>9.5</b>	<b>A</b>	--	--	<b>9.5</b>	<b>A</b>	--
<i>Weekday Evening:</i>												
Railroad Street EB LT/TH/RT/HRT	0.76	54.4	D	8/17	0.82	58.3	E	8/19	0.82	58.3	E	8/19
Private Driveway WB HLT/LT/TH/RT	0.06	54.5	D	1/1	0.06	54.5	D	1/1	0.06	54.5	D	1/1
Route 28 NB HLT/LT/TH/RT	0.50	20.6	C	5/10	0.48	21.7	C	6/12	0.49	21.8	C	7/12
Route 28 SB LT/TH/RT/HRT	0.50	20.6	C	6/11	0.48	21.4	C	7/13	0.48	21.5	C	7/13
Retail Plaza SEB HLT/LT/RT/HRT	0.09	0.8	A	0/0	0.09	0.8	A	0/0	0.09	0.8	A	0/0
<b>Overall</b>	--	<b>26.9</b>	<b>C</b>	--	--	<b>28.2</b>	<b>C</b>	--	--	<b>28.2</b>	<b>C</b>	--
<b>Route 28 at Lewis Street</b>												
<i>Weekday Morning:</i>												
Lewis Street EB LT/RT	0.06	18.2	B	1/1	0.06	18.2	B	1/1	0.14	18.5	B	1/1
Route 28 NB LT/TH	0.29	3.8	A	0/7	0.32	4.0	A	0/7	0.35	5.5	A	0/8
Route 28 SB TH/RT	0.34	4.1	A	0/10	0.38	4.4	A	0/11	0.41	6.1	A	0/12
<b>Overall</b>	--	<b>4.1</b>	<b>A</b>	--	--	<b>4.4</b>	<b>A</b>	--	--	<b>6.1</b>	<b>A</b>	--
<i>Weekday Evening:</i>												
Lewis Street EB LT/RT	0.06	18.3	B	1/1	0.06	18.3	B	1/1	0.14	18.9	B	1/1
Route 28 NB LT/TH	0.35	4.2	A	0/10	0.40	4.6	A	0/13	0.43	6.6	A	0/14
Route 28 SB TH/RT	0.27	3.6	A	0/8	0.31	3.9	A	0/9	0.34	5.3	A	0/10
<b>Overall</b>	--	<b>4.1</b>	<b>A</b>	--	--	<b>4.4</b>	<b>A</b>	--	--	<b>6.3</b>	<b>A</b>	--

<sup>a</sup>Volume-to-capacity ratio.

<sup>b</sup>Control (signal) delay per vehicle in seconds.

<sup>c</sup>Level of service.

<sup>d</sup>Queue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; SEB = southeastbound; HLT = hard left-turning movements; LT = left-turning movements; TH = through movements; RT = right-turning movements; HRT = hard right-turning movements.

## **Unsignalized Intersection**

### **Route 28 at Pearson Street**

Under 2023 Existing conditions, the critical movement at this intersection operates at LOS C during the weekday morning and weekday evening peak hours. Under 2030 No-Build conditions, the critical movement at this intersection operates at LOS D during the weekday morning and weekday evening peak hours. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. Critical movement delay increases by less than 2 seconds and the queue length remains unchanged under 2030 Build conditions compared to 2030 No-Build conditions.

### **Pearson Street at Project Site Driveway and Depot Pizza**

Under 2023 Existing and 2030 No-Build conditions, the critical movements at this intersection operate at LOS A during the weekday morning and evening peak hours. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. Critical movement delay increases by less than 1 second and the queue length remains unchanged under 2030 Build conditions compared to 2030 No-Build conditions.

### **Essex Street at Pearson Street and Railroad Street and Dundee Park Drive**

Under 2023 Existing conditions, the critical movements at this intersection operate at LOS D or better during the weekday morning peak hour and operate at LOS E or better during the weekday evening peak hour. Under 2030 No-Build conditions, the critical movements at this intersection operate at LOS E or better during the weekday morning peak hour and operate at LOS F or better during the weekday evening peak hour. No changes to level of service occur under 2030 Build conditions during the weekday evening peak hour; however, during the weekday morning peak hour the level of service degraded from LOS E or better to LOS F or better due to the addition of Project traffic. Critical movement delay increases by less than 5 seconds and the queue length increases by less than 1 vehicle under 2030 Build conditions compared to 2030 No-Build conditions.

### **Essex Street at School Street**

Under 2023 Existing and 2030 No-Build conditions, the critical movements at this intersection operate at LOS C during the weekday morning and evening peak hours. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. Critical movement delay increases by less than 1 second and the queue length remains unchanged under 2030 Build conditions compared to 2030 No-Build conditions.

### **Essex Street at Ridge Street and Brook Street**

Under 2023 Existing and 2030 No-Build conditions, the critical movements at this intersection operate at LOS B during the weekday morning and evening peak hours. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. Critical movement delay increases by less than 1 second and the queue length remains unchanged under 2030 Build conditions compared to 2030 No-Build conditions.

### **School Street at Ridge Street and Lupine Road**

Under 2023 Existing and 2030 No-Build conditions, the critical movements at this intersection operate at LOS B during the weekday morning and evening peak hours. No changes to level of service occur under 2030 Build conditions due to the addition of Project traffic. Critical movement delay increases by less than 1 second and the queue length remains unchanged under 2030 Build conditions compared to 2030 No-Build conditions.

**Table 13**  
**UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Unsignalized Intersection/ Critical Movement/Peak Hour	2023 Existing				2030 No-Build				2030 Build			
	Demand <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	Demand	Delay	LOS	Queue	Demand	Delay	LOS	Queue
<b>Route 28 at Pearson Street</b>												
<i>Weekday Morning:</i>												
Pearson Street EB LT/RT	85	23.5	C	2	94	31.5	D	3	97	33.0	D	3
<i>Weekday Evening:</i>												
Pearson Street EB LT/RT	100	20.3	C	2	113	28.7	D	3	115	30.0	D	3
<b>Pearson Street at the Project Site Dwy/Depot Pizza</b>												
<i>Weekday Morning:</i>												
Depot Pizza NB LT/TH/RT	1	8.7	A	0	1	8.8	A	0	1	8.8	A	0
Project Site Dwy SB LT/TH/RT	4	9.0	A	1	4	9.0	A	1	18	9.0	A	1
<i>Weekday Evening:</i>												
Depot Pizza NB LT/TH/RT	0	0.0	A	0	0	0.0	A	0	0	0.0	A	0
Project Site Dwy SB LT/TH/RT	2	9.1	A	1	2	9.2	A	1	11	9.3	A	1
<b>Essex Street at Pearson Street/Railroad Street/ Dundee Park Drive</b>												
<i>Weekday Morning:</i>												
Dundee Park Drive NB LT/TH/RT/HRT	13	18.2	C	1	13	19.9	C	1	13	20.3	C	1
Essex Street WB LT/TH/RT/HRT	339	5.0	A	2	365	5.3	A	2	366	5.4	A	2
Pearson Street SWB HLT/LT/RT/HRT	38	6.3	A	1	43	6.7	A	1	55	6.9	A	1
Railroad Street SB HLT/LT/TH/RT	195	34.3	D	5	207	48.0	E	7	207	>50.0	F	8
Essex Street EB HLT/LT/TH/RT	351	4.8	A	2	381	5.2	A	2	388	5.4	A	2
<i>Weekday Evening:</i>												
Dundee Park Drive NB LT/TH/RT/HRT	105	48.6	E	6	105	>50.0	F	8	105	>50.0	F	9
Essex Street WB LT/TH/RT/HRT	415	6.7	A	4	453	7.3	A	4	454	7.4	A	4
Pearson Street SWB HLT/LT/RT/HRT	56	7.1	A	1	66	7.9	A	1	75	8.1	A	1
Railroad Street SB HLT/LT/TH/RT	179	36.3	E	5	191	>50.0	F	7	191	>50.0	F	7
Essex Street EB HLT/LT/TH/RT	246	5.2	A	2	383	5.9	A	3	391	6.2	A	3
<b>Essex Street at School Street</b>												
<i>Weekday Morning:</i>												
School Street NB LT/RT	211	19.5	C	3	226	23.1	C	4	227	23.4	C	4
<i>Weekday Evening:</i>												
School Street NB LT/RT	285	18.1	C	3	307	21.8	C	4	308	22.0	C	4

See notes at end of table.

**Table 13 (Continued)**  
**UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Unsignalized Intersection/ Critical Movement/Peak Hour	2023 Existing				2030 No-Build				2030 Build			
	Demand <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	Demand	Delay	LOS	Queue	Demand	Delay	LOS	Queue
<b><i>Essex Street at Ridge Street/Brook Street</i></b>												
<i>Weekday Morning:</i>												
Ridge Street NB LT/RT	15	10.5	B	1	16	10.8	B	1	16	10.8	B	1
<i>Weekday Evening:</i>												
Ridge Street NB LT/RT	10	10.5	B	1	11	10.8	B	1	11	10.9	B	1
<b><i>School Street at Ridge Street/Lupine Road</i></b>												
<i>Weekday Morning:</i>												
Lupine Road NB LT/TH/RT	57	12.8	B	1	60	13.4	B	1	60	13.4	B	1
Ridge Street SB LT/TH/RT	6	12.1	B	1	6	12.4	B	1	6	12.4	B	1
<i>Weekday Evening:</i>												
Lupine Road NB LT/TH/RT	70	13.2	B	1	75	13.8	B	1	75	13.8	B	1
Ridge Street SB LT/TH/RT	4	12.9	B	1	4	13.3	B	1	4	13.3	B	1

<sup>a</sup>Demand in vehicles per hour.

<sup>b</sup>Delay in seconds per vehicle.

<sup>c</sup>Level of service.

<sup>d</sup>95th percentile queue length (veh).

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; SWB = southwestbound; HLT = hard left-turning movements; LT = left-turning movements; TH = through movements; HRT = hard right-turning movements; RT = right-turning movements.

## **MassWorks Alternative Build Analysis**

As previously stated in the roadway improvements section of this report, the Essex Street Corridor MassWorks Grant Improvement Project will remove the Pearson Street approach to this intersection. As such, an Alternative Analysis was conducted assuming Pearson Street ends and does not connect through to the Essex Street intersection. In order to do this, traffic volumes were redistributed throughout the study area. This redistribution is shown in Figures 5A-W and 6A-W in the Appendix. The redistributed 2030 No-Build weekday morning and evening peak hour networks are shown on Figures 5A and 6A, respectively. The site-generated trips are redistributed to account for the removal of Pearson Street which is shown on Figures 8A and 9A. The site-generated trips are added to the redistributed 2030 No-Build traffic to become the redistributed 2030 Build weekday morning and evening peak hours. The MassWorks Alternative 2030 Build networks are shown on Figures 10A and 11A. All MassWorks Alternative network figures are in the Appendix. The 2030 No-Build MassWorks Alternative Analysis and 2030 Build MassWorks Alternative Analysis results are summarized in Tables 14 and 15. All the traffic-volume network diagrams are provided in the Appendix demonstrating the traffic redistribution.

## **Signalized Intersections**

### **Route 28 at Railroad Street, Private Driveway, and Retail Plaza**

Under 2030 No-Build and Build conditions, no changes to level of service occur due to the redistributed traffic. The vehicle queue lengths increase by less than 1 vehicle due to the redistributed traffic.

### **Route 28 at Lewis Street**

Under 2030 No-Build and Build conditions, no changes to level of service occur due to the redistributed traffic. The vehicle queue lengths increase by less than 2 vehicles due to the redistributed traffic.

**Table 14**  
**MASSWORKS ALTERNATIVE SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Signalized Intersection/ Peak Hour/Movement	2030 No-Build				2030 No-Build Alternative				2030 Build				2030 Build Alternative			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue Avg/95 <sup>th</sup> <sup>d</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>
<b>Route 28 at Railroad Street/ Private Driveway/Retail Plaza</b>																
<i>Weekday Morning:</i>																
Railroad Street EB LT/TH/RT/HRT	0.52	17.6	B	1/3	0.51	17.4	B	1/3	0.52	17.6	B	1/3	0.53	18.3	B	1/4
Private Dwy WB HLT/LT/TH/RT	0.01	0.0	A	0/0	0.01	0.0	A	0/0	0.01	0.0	A	0/0	0.01	0.0	A	0/0
Route 28 NB HLT/LT/TH/RT	0.27	7.9	A	1/6	0.27	7.9	A	1/6	0.28	7.9	A	1/6	0.30	8.2	A	1/6
Route 28 SB LT/TH/RT/HRT	0.42	9.1	A	2/12	0.42	9.1	A	2/12	0.43	9.2	A	2/12	0.42	9.3	A	2/12
Retail Plaza SEB HLT/LT/RT/HRT	0.00	0.0	A	0/0	0.00	0.0	A	0/0	0.00	0.0	A	0/0	0.00	0.0	A	0/0
<b>Overall</b>	--	<b>9.5</b>	<b>A</b>	--	--	<b>9.4</b>	<b>A</b>	--	--	<b>9.5</b>	<b>A</b>	--	--	<b>9.8</b>	<b>A</b>	--
<i>Weekday Evening:</i>																
Railroad Street EB LT/TH/RT/HRT	0.82	58.3	E	8/19	0.80	56.9	E	8/19	0.82	58.3	E	8/19	0.82	58.7	E	8/19
Private Dwy WB HLT/LT/TH/RT	0.06	54.5	D	1/1	0.06	54.5	D	1/1	0.06	54.5	D	1/1	0.06	54.5	D	1/1
Route 28 NB HLT/LT/TH/RT	0.48	21.7	C	6/12	0.48	21.8	C	6/12	0.49	21.8	C	7/12	0.51	22.4	C	7/13
Route 28 SB LT/TH/RT/HRT	0.48	21.4	C	7/13	0.48	21.5	C	7/13	0.48	21.5	C	7/13	0.48	21.5	C	7/13
Retail Plaza SEB HLT/LT/RT/HRT	0.09	0.8	A	0/0	0.09	0.8	A	0/0	0.09	0.8	A	0/0	0.09	0.8	A	0/0
<b>Overall</b>	--	<b>28.2</b>	<b>C</b>	--	--	<b>27.8</b>	<b>C</b>	--	--	<b>28.2</b>	<b>C</b>	--	--	<b>28.5</b>	<b>C</b>	--
<b>Route 28 at Lewis Street</b>																
<i>Weekday Morning:</i>																
Lewis Street EB LT/RT	0.06	18.2	B	1/1	0.06	18.2	B	1/1	0.14	18.5	B	1/1	0.19	18.1	B	1/1
Route 28 NB LT/TH	0.32	4.0	A	0/7	0.32	4.0	A	0/7	0.35	5.5	A	0/8	0.35	5.9	A	0/8
Route 28 SB TH/RT	0.38	4.4	A	0/11	0.39	4.5	A	0/12	0.41	6.1	A	0/12	0.43	6.9	A	0/14
<b>Overall</b>	--	<b>4.4</b>	<b>A</b>	--	--	<b>4.4</b>	<b>A</b>	--	--	<b>6.1</b>	<b>A</b>	--	--	<b>6.9</b>	<b>A</b>	--
<i>Weekday Evening:</i>																
Lewis Street EB LT/RT	0.06	18.3	B	1/1	0.06	18.3	B	1/1	0.14	18.9	B	1/1	0.19	18.1	B	1/1
Route 28 NB LT/TH	0.40	4.6	A	0/13	0.40	4.7	A	0/13	0.43	6.6	A	0/14	0.45	7.3	A	0/15
Route 28 SB TH/RT	0.31	3.9	A	0/9	0.31	3.9	A	0/9	0.34	5.3	A	0/10	0.35	5.8	A	0/10
<b>Overall</b>	--	<b>4.4</b>	<b>A</b>	--	--	<b>4.4</b>	<b>A</b>	--	--	<b>6.3</b>	<b>A</b>	--	--	<b>7.0</b>	<b>A</b>	--

<sup>a</sup>Volume-to-capacity ratio.

<sup>b</sup>Control (signal) delay per vehicle in seconds.

<sup>c</sup>Level of service.

<sup>d</sup>Queue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; SEB = southeastbound; HLT = hard left-turning movements; LT = left-turning movements; TH = through movements; RT = right-turning movements; HRT = hard right-turning movements.

## **Unsignalized Intersection**

### **Route 28 at Pearson Street**

Under 2030 No-Build and Build conditions, the level of service of the critical movement improves from LOS D to LOS C due to the redistributed traffic. Critical movement delay decreases by at most 12 seconds and the queue length decreases by 2 vehicles under alternative conditions compared to previous conditions.

### **Pearson Street at Project Site Driveway and Depot Pizza**

Under 2030 No-Build and Build conditions, there is no change to level of service due to the redistributed traffic. Critical movement delay decreases by at most 1 second and the queue length remains unchanged under alternative conditions compared to previous conditions.

### **Essex Street at Pearson Street and Railroad Street and Dundee Park Drive**

Under 2030 No-Build conditions, the level of service of the critical movements degrades from LOS E or better to LOS F or better due to the redistributed traffic. Under 2030 Build conditions, there is no change to level of service of the critical movements that occur due to the redistributed traffic.

### **Essex Street at School Street**

Under 2030 No-Build and Build conditions, the level of service of the critical movement degrades from LOS C to LOS D due to the redistributed traffic. Critical movement delay increases by less than 6 seconds and the queue length increases by 1 vehicle under alternative conditions compared to previous conditions.

### **Essex Street at Ridge Street and Brook Street**

Under 2030 No-Build and Build conditions, there is no change to level of service due to the redistributed traffic. Critical movement delay increases by at most 1 second and the queue length remains unchanged under alternative conditions compared to previous conditions.

### **School Street at Ridge Street and Lupine Road**

Under 2030 No-Build and Build conditions, there is no change to level of service due to the redistributed traffic. Critical movement delay decreases by at most 1 second and the queue length remains unchanged under alternative conditions compared to previous conditions.

**Table 15**  
**MASSWORKS ALTERNATIVE UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Unsignalized Intersection/ Critical Movement/Peak Hour	2030 No-Build				2030 No-Build Alternative				2030 Build				2030 Build Alternative			
	Demand <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	Demand	Delay	LOS	Queue	Demand	Delay	LOS	Queue	Demand	Delay	LOS	Queue
<b>Route 28 at Pearson Street</b>																
<i>Weekday Morning:</i>																
Pearson Street EB LT/RT	94	31.5	D	3	16	22.9	C	1	97	33.0	D	3	19	21.2	C	1
<i>Weekday Evening:</i>																
Pearson Street EB LT/RT	113	28.7	D	3	65	20.6	C	1	115	30.0	D	3	67	21.2	C	1
<b>Pearson Street at the Project Site Dwy/ Depot Pizza</b>																
<i>Weekday Morning:</i>																
Depot Pizza NB LT/TH/RT	1	8.8	A	0	1	8.3	A	0	1	8.8	A	0	1	8.3	A	0
Project Site Dwy SB LT/TH/RT	4	9.0	A	1	4	8.6	A	1	18	9.0	A	1	7	8.6	A	1
<i>Weekday Evening:</i>																
Depot Pizza NB LT/TH/RT	0	0.0	A	0	0	0.0	A	0	0	0.0	A	0	0	0.0	A	0
Project Site Dwy SB LT/TH/RT	2	9.2	A	1	2	8.5	A	1	11	9.3	A	1	4	8.6	A	1
<b>Essex Street at Pearson Street/Railroad Street/ Dundee Park Drive</b>																
<i>Weekday Morning:</i>																
Dundee Park Drive NB LT/TH/RT/HRT	13	19.9	C	1	13	19.7	C	1	13	20.3	C	1	13	19.8	C	1
Essex Street WB LT/TH/RT/HRT	365	5.3	A	2	387	3.1	A	1	366	5.4	A	2	385	3.1	A	1
Pearson Street SWB HLT/LT/RT/HRT	43	6.7	A	1	--	--	--	--	55	6.9	A	1	--	--	--	--
Railroad Street SB HLT/LT/TH/RT	207	48.0	E	7	193	>50.0	F	7	207	>50.0	F	8	203	>50.0	F	7
Essex Street EB HLT/LT/TH/RT	381	5.2	A	2	381	4.1	A	1	388	5.4	A	2	388	4.3	A	2
<i>Weekday Evening:</i>																
Dundee Park Drive NB LT/TH/RT/HRT	105	>50.0	F	8	105	>50.0	F	7	105	>50.0	F	9	105	>50.0	F	7
Essex Street WB LT/TH/RT/HRT	453	7.3	A	4	490	3.6	A	1	454	7.4	A	4	489	3.6	A	1
Pearson Street SWB HLT/LT/RT/HRT	66	7.9	A	1	--	--	A	--	75	8.1	A	1	--	--	--	--
Railroad Street SB HLT/LT/TH/RT	191	>50.0	F	7	194	>50.0	F	9	191	>50.0	F	7	200	>50.0	F	9
Essex Street EB HLT/LT/TH/RT	383	5.9	A	3	383	4.9	A	2	391	6.2	A	3	390	5.1	A	2
<b>Essex Street at School Street</b>																
<i>Weekday Morning:</i>																
School Street NB LT/RT	226	23.1	C	4	221	28.7	D	5	227	23.4	C	4	221	28.5	D	5
<i>Weekday Evening:</i>																
School Street NB LT/RT	307	21.8	C	4	303	27.6	D	5	308	22.0	C	4	303	27.4	D	5

See notes at end of table.

**Table 15 (Continued)**

**MASSWORKS ALTERNATIVE UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Unsignalized Intersection/ Critical Movement/Peak Hour	2030 No-Build				2030 No-Build Alternative				2030 Build				2030 Build Alternative			
	Demand <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup>	Demand	Delay	LOS	Queue	Demand	Delay	LOS	Queue	Demand	Delay	LOS	Queue
<b><i>Essex Street at Ridge Street/Brook Street</i></b>																
<i>Weekday Morning:</i>																
Ridge Street NB LT/RT	16	10.8	B	1	17	11.3	B	1	16	10.8	B	1	17	11.3	B	1
<i>Weekday Evening:</i>																
Ridge Street NB LT/RT	11	10.8	B	1	12	11.4	B	1	11	10.9	B	1	12	11.4	B	1
<b><i>School Street at Ridge Street/Lupine Road</i></b>																
<i>Weekday Morning:</i>																
Lupine Road NB LT/TH/RT	60	13.4	B	1	60	13.3	B	1	60	13.4	B	1	60	13.3	B	1
Ridge Street SB LT/TH/RT	6	12.4	B	1	6	12.3	B	1	6	12.4	B	1	6	12.3	B	1
<i>Weekday Evening:</i>																
Lupine Road NB LT/TH/RT	75	13.8	B	1	75	13.7	B	1	75	13.8	B	1	75	13.7	B	1
Ridge Street SB LT/TH/RT	4	13.3	B	1	4	13.3	B	1	4	13.3	B	1	4	13.3	B	1

<sup>a</sup>Demand in vehicles per hour.

<sup>b</sup>Delay in seconds per vehicle.

<sup>c</sup>Level of service.

<sup>d</sup>95th percentile queue length (veh).

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; SWB = southwestbound; HLT = hard left-turning movements; LT = left-turning movements; TH = through movements; HRT = hard right-turning movements; RT = right-turning movements.

## Traffic Signal Warrants

The *Manual on Uniform Traffic Control Devices* (MUTCD)<sup>9</sup> establishes nine warrants or criteria to evaluate a location for the installation or retention of a traffic signal. At least one of the nine warrants should be satisfied in order to justify the installation or retention of a traffic signal; however, satisfaction of a warrant in and of itself does not justify traffic signal control. An engineering evaluation of the location in question should indicate that the establishment of traffic signal control will improve the overall safety and/or operation of the intersection. Table 16 identifies the nine traffic signal warrants that were reviewed for this analysis.

**Table 16**  
**TRAFFIC SIGNAL WARRANTS**

Warrant No.	Description
1	Eight-Hour Vehicular Volume
2	Four-Hour Vehicular Volume
3	Peak Hour
4	Pedestrian Volume
5	School Crossing
6	Coordinated Signal System
7	Crash Experience
8	Roadway Network
9	Intersection near a Grade Crossing

Accordingly, a Traffic Signal Warrants Analysis (TSWA) was conducted, which reviewed each of the traffic signal warrants listed in Table 16 for the intersection of Essex Street at Railroad Street and Dundee Park Drive under the following conditions:

- Design Speed: 25 mph
- Traffic Volumes: 2023 Existing and 2030 Build average-month conditions<sup>10</sup>

Table 16 summarizes the results of the TSWA for the subject intersections, with the detailed TSWA worksheets and supporting materials attached.

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<sup>9</sup>Ibid 1.

<sup>10</sup>Traffic volumes at the intersections were adjusted downward to average-month conditions.

**Table 17**  
**TRAFFIC SIGNAL WARRANTS ANALYSIS –**  
**ESSEX STREET AT RAILROAD STREET AND DUNDEE PARK DRIVE**

Warrant No.	Description	2023 Existing Satisfied?	2030 Build Satisfied?
1	Eight-Hour Vehicular Volume	No	No
2	Four-Hour Vehicular Volume	No	No
3	Peak Hour	No	No
4	Pedestrian Volume	No	No
5	School Crossing	No	No
6	Coordinated Signal System	No	No
7	Crash Experience	No	No
8	Roadway Network	No	No
9	Intersection Near a Grade Crossing	No	No

As can be seen in Table 17, the intersection of Essex Street at Railroad Street and Dundee Park Drive was not found to satisfy any of the traffic signal warrants under 2023 Existing or 2030 Build conditions.

## RECOMMENDATIONS AND CONCLUSIONS

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VAI has prepared this UTIA in order to evaluate potential traffic impacts associated with the proposed Andover Town Yard Redevelopment in Andover, Massachusetts. This study was prepared in accordance with MassDOT Guidelines for *Transportation Impact Assessment (TIA)*; and was conducted pursuant to the standards of the traffic engineering and transportation planning professions for the preparation of such reports. Based on the results of this study, the following can be concluded:

- Several of the study area intersection crash rates were observed to be higher than the MassDOT District 4 crash rates for unsignalized intersections.
- The Project is expected to generate 500 vehicle trips on an average weekday (two-way, 24-hour volume), with 54 vehicle trips (23 entering and 31 exiting) expected during the weekday morning peak hour and 45 vehicle trips (25 entering and 20 exiting) expected during the weekday morning peak hour.
- The sight distance at the intersection of the site driveway with Pearson Street was found to exceed the recommended values for SSD and ISD looking east of the site driveway based on a speed of 25 mph. However, due to the Essex Corridor Improvement Project, there are not expected to be any vehicle movements looking west.
- The analysis has indicated that the Project will generally result in minimal impact on motorist delays and vehicle queue lengths at the study intersection.

## **RECOMMENDATIONS**

A transportation improvement program has been developed that is designed to provide safe and efficient access to the Project and address any deficiencies identified at the study area locations. The following improvements have been recommended as a part of this evaluation:

### **Project Access**

Access to the Project site will be provided via one driveway onto Pearson Street and from the Buxton Court roadway. As a curb cut on Pearson Street exists and the Buxton Court entrance exists, the Project will not increase the number of access points. The following recommendations are offered with respect to the design and operation of the Project site access:

- Access should be placed under STOP-sign (MUTCD R1-1) control, with a painted STOP-bar included.
- All signs and other pavement markings to be installed within the Project site shall conform to the applicable standards of the current MUTCD.
- Signs and landscaping adjacent to 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 sightlines.

### **MassWorks Project**

The Town has received a MassWorks grant to construct improvements on the Essex Street Corridor, which includes improvements to the intersections of Red Spring Road, School Street, Ridge Street, and Brook Street. In addition, the MassWorks grant includes the closure of Pearson Street on the east side of the railroad tracks near the entrance to the Project. These improvements are shown in graphics provided in the Appendix. These improvements will add bicycle accommodations, improve sidewalks, and include intersection reconfiguration to provide one-way couplets in some locations. Based on input provided by the Town Planning Department, the MassWorks design effort is proceeding with construction projected to start as soon as Fall 2024. As such, the MassWorks improvements are likely to be in place before the Project is fully built and occupied. Therefore, no additional mitigation is required beyond that proposed in the MassWorks design.

### **Pearson Street Closure**

A review of the analysis assuming the redistribution of traffic from Pearson Street as a result of its closure at the commuter rail crossing indicated little to no difference in traffic operations at the study area intersections. The Route 28 intersection with Pearson Street is expected to improve in operations due to the elimination of through movements and fewer vehicles using the intersection with Route 28.

## **CONCLUSIONS**

As documented in this study, Project-related traffic increases result in minor delay increases at signalized intersections; however, there is minimal change in vehicle queuing so it is unlikely that Project-related traffic increases will be noticeable. Further, Project-related traffic increases will not result in significant increases in overall traffic volumes or traffic delays within the study area. The site driveways will provide safe access to and from the development. In general, Project-related traffic can be adequately accommodated within the existing infrastructure with minimal impact on the traffic operations within the study area.

## APPENDIX

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TRAFFIC COUNT DATA  
SEASONAL ADJUSTMENT DATA  
PUBLIC TRANSPORTATION SCHEDULES  
MASSDOT CRASH RATE WORKSHEETS  
GROWTH RATE DATA  
MODE SPLIT DATA  
TRIP GENERATION DATA  
JOURNEY TO WORK  
CAPACITY ANALYSIS  
TRAFFIC SIGNAL WARRANT ANALYSIS REPORTS  
SEASONAL ADJUSTMENT OF TSWA VOLUMES  
MASSWORKS ALTERNATIVE REDISTRIBUTION WORKSHEETS  
MASSWORKS ALTERNATIVE FIGURES  
MASSWORKS ALTERNATIVE CAPACITY ANALYSIS  
ELM SQUARE MEMORANDUM  
ELM SQUARE CAPCITY ANALYSIS  
ELM SQUARE MASSWORKS ALTERNATIVE CAPCITY ANALYSIS

TRAFFIC COUNT DATA

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# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	North Main St From North				Driveway From East				North Main St From South				Railroad St From West				Plaza From Northwest				Int. Total
	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	
07:00 AM	0	151	20	0	0	0	0	0	0	0	56	0	0	18	0	1	0	0	0	0	246
07:15 AM	0	145	27	0	1	0	0	0	0	0	54	0	0	14	0	0	0	0	0	0	241
07:30 AM	0	132	46	0	0	0	0	0	3	0	77	0	0	23	1	4	0	0	0	0	286
07:45 AM	0	159	39	0	0	0	0	1	4	0	75	0	0	19	0	0	0	0	0	1	298
<b>Total</b>	<b>0</b>	<b>587</b>	<b>132</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>262</b>	<b>0</b>	<b>0</b>	<b>74</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1071</b>
08:00 AM	1	151	55	0	0	0	0	2	2	0	84	1	0	36	0	1	0	0	0	0	333
08:15 AM	0	141	51	1	0	0	0	0	4	0	82	0	0	27	0	4	0	0	0	0	310
08:30 AM	1	131	43	6	0	0	0	1	4	1	99	0	0	33	0	4	0	0	0	0	323
08:45 AM	0	114	33	0	0	0	0	0	7	0	123	0	0	34	0	3	0	0	0	0	314
<b>Total</b>	<b>2</b>	<b>537</b>	<b>182</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>17</b>	<b>1</b>	<b>388</b>	<b>1</b>	<b>0</b>	<b>130</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1280</b>
<b>Grand Total</b>	<b>2</b>	<b>1124</b>	<b>314</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>24</b>	<b>1</b>	<b>650</b>	<b>1</b>	<b>0</b>	<b>204</b>	<b>1</b>	<b>17</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2351</b>
Apprch %	0.1	77.7	21.7	0.5	20	0	0	80	3.6	0.1	96.2	0.1	0	91.9	0.5	7.7	0	0	0	100	
Total %	0.1	47.8	13.4	0.3	0	0	0	0.2	1	0	27.6	0	0	8.7	0	0.7	0	0	0	0	
Cars	2	1108	311	7	1	0	0	4	24	1	635	1	0	194	1	17	0	0	0	1	2307
% Cars	100	98.6	99	100	100	0	0	100	100	100	97.7	100	0	95.1	100	100	0	0	0	100	98.1
Trucks	0	16	3	0	0	0	0	0	0	0	15	0	0	10	0	0	0	0	0	0	44
% Trucks	0	1.4	1	0	0	0	0	0	0	0	2.3	0	0	4.9	0	0	0	0	0	0	1.9

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. 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	1	151	55	0	207	0	0	0	2	2	2	0	84	1	87	0	36	0	1	37	0	0	0	0	0	333
08:15 AM	0	141	51	1	193	0	0	0	0	0	4	0	82	0	86	0	27	0	4	31	0	0	0	0	0	310
08:30 AM	1	131	43	6	181	0	0	0	1	1	4	1	99	0	104	0	33	0	4	37	0	0	0	0	0	323
08:45 AM	0	114	33	0	147	0	0	0	0	0	7	0	123	0	130	0	34	0	3	37	0	0	0	0	0	314
Total Volume	2	537	182	7	728	0	0	0	3	3	17	1	388	1	407	0	130	0	12	142	0	0	0	0	0	1280
% App. Total	0.3	73.8	25	1		0	0	0	100		4.2	0.2	95.3	0.2		0	91.5	0	8.5		0	0	0	0	0	
PHF	.500	.889	.827	.292	.879	.000	.000	.000	.375	.375	.607	.250	.789	.250	.783	.000	.903	.000	.750	.959	.000	.000	.000	.000	.000	.961
Cars	2	528	180	7	717	0	0	0	3	3	17	1	380	1	399	0	125	0	12	137	0	0	0	0	0	1256
% Cars	100	98.3	98.9	100	98.5	0	0	0	100	100	100	100	97.9	100	98.0	0	96.2	0	100	96.5	0	0	0	0	0	98.1
Trucks	0	9	2	0	11	0	0	0	0	0	0	0	8	0	8	0	5	0	0	5	0	0	0	0	0	24
% Trucks	0	1.7	1.1	0	1.5	0	0	0	0	0	0	0	2.1	0	2.0	0	3.8	0	0	3.5	0	0	0	0	0	1.9

# Accurate Counts

978-664-2565

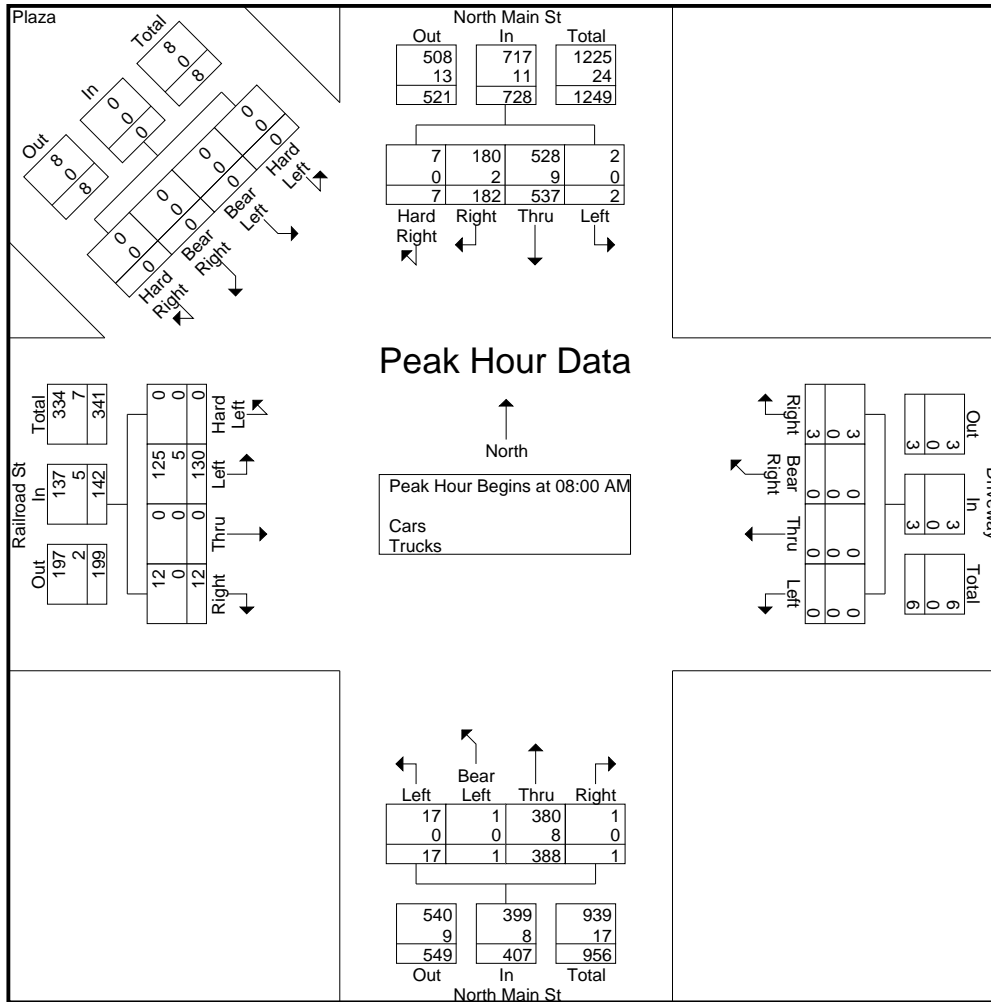
File Name : 89750001

Site Code : 89750001

Start Date : 9/20/2023

Page No : 2

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1  
 Peak Hour for Each Approach Begins at:

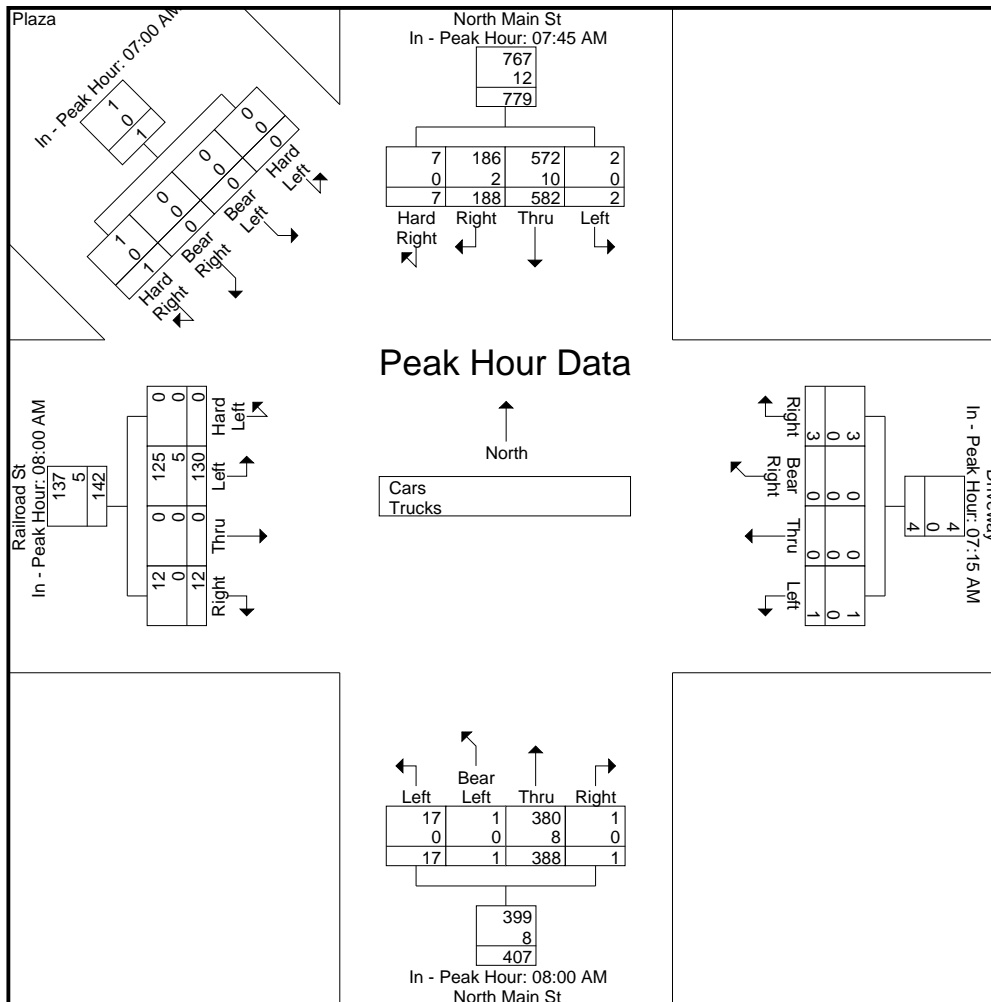
	07:45 AM				07:15 AM				08:00 AM				08:00 AM				07:00 AM								
+0 mins.	0	159	39	0	198	1	0	0	0	1	2	0	84	1	87	0	36	0	1	37	0	0	0	0	0
+15 mins.	1	151	55	0	207	0	0	0	0	0	4	0	82	0	86	0	27	0	4	31	0	0	0	0	0
+30 mins.	0	141	51	1	193	0	0	0	1	1	4	1	99	0	104	0	33	0	4	37	0	0	0	0	0
+45 mins.	1	131	43	6	181	0	0	0	2	2	7	0	123	0	130	0	34	0	3	37	0	0	0	1	1
Total Volume	2	582	188	7	779	1	0	0	3	4	17	1	388	1	407	0	130	0	12	142	0	0	0	1	1
% App. Total	0.3	74.7	24.1	0.9		25	0	0	75		4.2	0.2	95.3	0.2		0	91.5	0	8.5		0	0	0	100	
PHF	.500	.915	.855	.292	.941	.250	.000	.000	.375	.500	.607	.250	.789	.250	.783	.000	.903	.000	.750	.959	.000	.000	.000	.250	.250
Cars	2	57	18	7	767	1	0	0	3	4	17	1	38	1	399	0	12	0	12	137	0	0	0	1	1
% Cars	10	98.	98.	10	98.5	10	0	0	10	100	10	10	97.	10	98	0	96.	0	10	96.5	0	0	0	10	100
Trucks	0	3	9	0		0	0	0	0		0	0	9	0		0	2	0	0		0	0	0	0	
% Trucks	0	10	2	0	12	0	0	0	0	0	0	0	8	0	8	0	5	0	0	5	0	0	0	0	0
	0	1.7	1.1	0	1.5	0	0	0	0	0	0	0	2.1	0	2	0	3.8	0	0	3.5	0	0	0	0	0

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 3



# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	North Main St From North				Driveway From East				North Main St From South				Railroad St From West				Plaza From Northwest				Int. Total
	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	
07:00 AM	0	149	19	0	0	0	0	0	0	0	54	0	0	16	0	1	0	0	0	0	239
07:15 AM	0	142	27	0	1	0	0	0	0	0	52	0	0	13	0	0	0	0	0	0	235
07:30 AM	0	132	46	0	0	0	0	0	3	0	74	0	0	21	1	4	0	0	0	0	281
07:45 AM	0	157	39	0	0	0	0	1	4	0	75	0	0	19	0	0	0	0	0	1	296
<b>Total</b>	0	580	131	0	1	0	0	1	7	0	255	0	0	69	1	5	0	0	0	1	1051
08:00 AM	1	148	55	0	0	0	0	2	2	0	82	1	0	35	0	1	0	0	0	0	327
08:15 AM	0	137	50	1	0	0	0	0	4	0	81	0	0	25	0	4	0	0	0	0	302
08:30 AM	1	130	42	6	0	0	0	1	4	1	97	0	0	32	0	4	0	0	0	0	318
08:45 AM	0	113	33	0	0	0	0	0	7	0	120	0	0	33	0	3	0	0	0	0	309
<b>Total</b>	2	528	180	7	0	0	0	3	17	1	380	1	0	125	0	12	0	0	0	0	1256
<b>Grand Total</b>	2	1108	311	7	1	0	0	4	24	1	635	1	0	194	1	17	0	0	0	1	2307
Apprch %	0.1	77.6	21.8	0.5	20	0	0	80	3.6	0.2	96.1	0.2	0	91.5	0.5	8	0	0	0	100	
Total %	0.1	48	13.5	0.3	0	0	0	0.2	1	0	27.5	0	0	8.4	0	0.7	0	0	0	0	

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total	
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. 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	1	148	55	0	204	0	0	0	2	2	2	0	82	1	85	0	35	0	1	36	0	0	0	0	0	0	327
08:15 AM	0	137	50	1	188	0	0	0	0	0	4	0	81	0	85	0	25	0	4	29	0	0	0	0	0	0	302
08:30 AM	1	130	42	6	179	0	0	0	1	1	4	1	97	0	102	0	32	0	4	36	0	0	0	0	0	0	318
08:45 AM	0	113	33	0	146	0	0	0	0	0	7	0	120	0	127	0	33	0	3	36	0	0	0	0	0	0	309
Total Volume	2	528	180	7	717	0	0	0	3	3	17	1	380	1	399	0	125	0	12	137	0	0	0	0	0	0	1256
% App. Total	0.3	73.6	25.1	1		0	0	0	100		4.3	0.3	95.2	0.3		0	91.2	0	8.8		0	0	0	0	0	0	
PHF	.500	.892	.818	.292	.879	.000	.000	.000	.375	.375	.607	.250	.792	.250	.785	.000	.893	.000	.750	.951	.000	.000	.000	.000	.000	.960	

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	North Main St From North				Driveway From East				North Main St From South				Railroad St From West				Plaza From Northwest				Int. Total
	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	
07:00 AM	0	2	1	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	7
07:15 AM	0	3	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	6
07:30 AM	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	0	5
07:45 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
<b>Total</b>	0	7	1	0	0	0	0	0	0	0	7	0	0	5	0	0	0	0	0	0	20
08:00 AM	0	3	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	6
08:15 AM	0	4	1	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	8
08:30 AM	0	1	1	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	5
08:45 AM	0	1	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	5
<b>Total</b>	0	9	2	0	0	0	0	0	0	0	8	0	0	5	0	0	0	0	0	0	24
<b>Grand Total</b>	0	16	3	0	0	0	0	0	0	0	15	0	0	10	0	0	0	0	0	0	44
Apprch %	0	84.2	15.8	0	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	
Total %	0	36.4	6.8	0	0	0	0	0	0	0	34.1	0	0	22.7	0	0	0	0	0	0	

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total	
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. 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	0	3	0	0	3	0	0	0	0	0	0	0	2	0	2	0	1	0	0	1	0	0	0	0	0	0	6
08:15 AM	0	4	1	0	5	0	0	0	0	0	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	0	8
08:30 AM	0	1	1	0	2	0	0	0	0	0	0	0	2	0	2	0	1	0	0	1	0	0	0	0	0	0	5
08:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	3	0	3	0	1	0	0	1	0	0	0	0	0	0	5
Total Volume	0	9	2	0	11	0	0	0	0	0	0	0	8	0	8	0	5	0	0	5	0	0	0	0	0	0	24
% App. Total	0	81.8	18.2	0		0	0	0	0		0	0	100	0		0	100	0	0		0	0	0	0	0		
PHF	.000	.563	.500	.000	.550	.000	.000	.000	.000	.000	.000	.000	.667	.000	.667	.000	.625	.000	.000	.625	.000	.000	.000	.000	.000	.750	

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 10

## Groups Printed- Bikes Peds

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Exclu. Total	Inclu. Total	Int. Total		
	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	3	0	3
07:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	4
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
07:45 AM	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4	4	0	4
<b>Total</b>	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	5	11	1	12
08:00 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	5	0	5	
08:15 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	4	
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	2	
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	3	0	3	
<b>Total</b>	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3	3	0	0	0	0	6	14	0	14	
Grand Total	0	0	1	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0	0	7	7	0	0	0	0	11	25	1	26	
Apprch %	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	0			0	0	0	0					
Total %	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	0			0	0	0	0		96.2	3.8		

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total				
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total					
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																														
Peak Hour for Entire Intersection Begins at 07:00 AM																														
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% App. Total	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	0			0	0	0	0					
PHF	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	North Main St From North				Driveway From East				North Main St From South				Railroad St From West				Plaza From Northwest				Int. Total
	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	
04:00 PM	0	106	48	0	0	0	0	0	8	0	130	0	1	62	0	3	0	0	1	1	360
04:15 PM	0	113	41	0	0	0	0	0	13	0	145	0	2	76	0	6	1	0	1	0	398
04:30 PM	0	85	34	0	0	0	0	0	7	0	129	0	0	58	0	8	2	0	0	2	325
04:45 PM	0	95	36	3	0	0	0	0	12	0	129	0	0	49	0	11	0	0	2	2	339
<b>Total</b>	<b>0</b>	<b>399</b>	<b>159</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>0</b>	<b>533</b>	<b>0</b>	<b>3</b>	<b>245</b>	<b>0</b>	<b>28</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>5</b>	<b>1422</b>
05:00 PM	0	122	46	0	0	0	0	0	3	0	132	0	2	68	1	6	2	0	2	1	385
05:15 PM	2	100	44	0	0	2	0	0	12	1	139	0	0	57	0	7	0	0	0	0	364
05:30 PM	0	112	37	2	0	0	0	0	15	0	138	0	0	67	0	7	0	0	1	0	379
05:45 PM	0	95	33	0	1	0	0	0	8	0	129	0	0	48	1	2	1	0	0	0	318
<b>Total</b>	<b>2</b>	<b>429</b>	<b>160</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>38</b>	<b>1</b>	<b>538</b>	<b>0</b>	<b>2</b>	<b>240</b>	<b>2</b>	<b>22</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>1446</b>
<b>Grand Total</b>	<b>2</b>	<b>828</b>	<b>319</b>	<b>5</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>78</b>	<b>1</b>	<b>1071</b>	<b>0</b>	<b>5</b>	<b>485</b>	<b>2</b>	<b>50</b>	<b>6</b>	<b>0</b>	<b>7</b>	<b>6</b>	<b>2868</b>
Apprch %	0.2	71.8	27.6	0.4	33.3	66.7	0	0	6.8	0.1	93.1	0	0.9	89.5	0.4	9.2	31.6	0	36.8	31.6	
Total %	0.1	28.9	11.1	0.2	0	0.1	0	0	2.7	0	37.3	0	0.2	16.9	0.1	1.7	0.2	0	0.2	0.2	
Cars	2	818	315	5	1	2	0	0	78	1	1059	0	5	479	2	50	6	0	7	6	2836
% Cars	100	98.8	98.7	100	100	100	0	0	100	100	98.9	0	100	98.8	100	100	100	0	100	100	98.9
Trucks	0	10	4	0	0	0	0	0	0	0	12	0	0	6	0	0	0	0	0	0	32
% Trucks	0	1.2	1.3	0	0	0	0	0	0	0	1.1	0	0	1.2	0	0	0	0	0	0	1.1

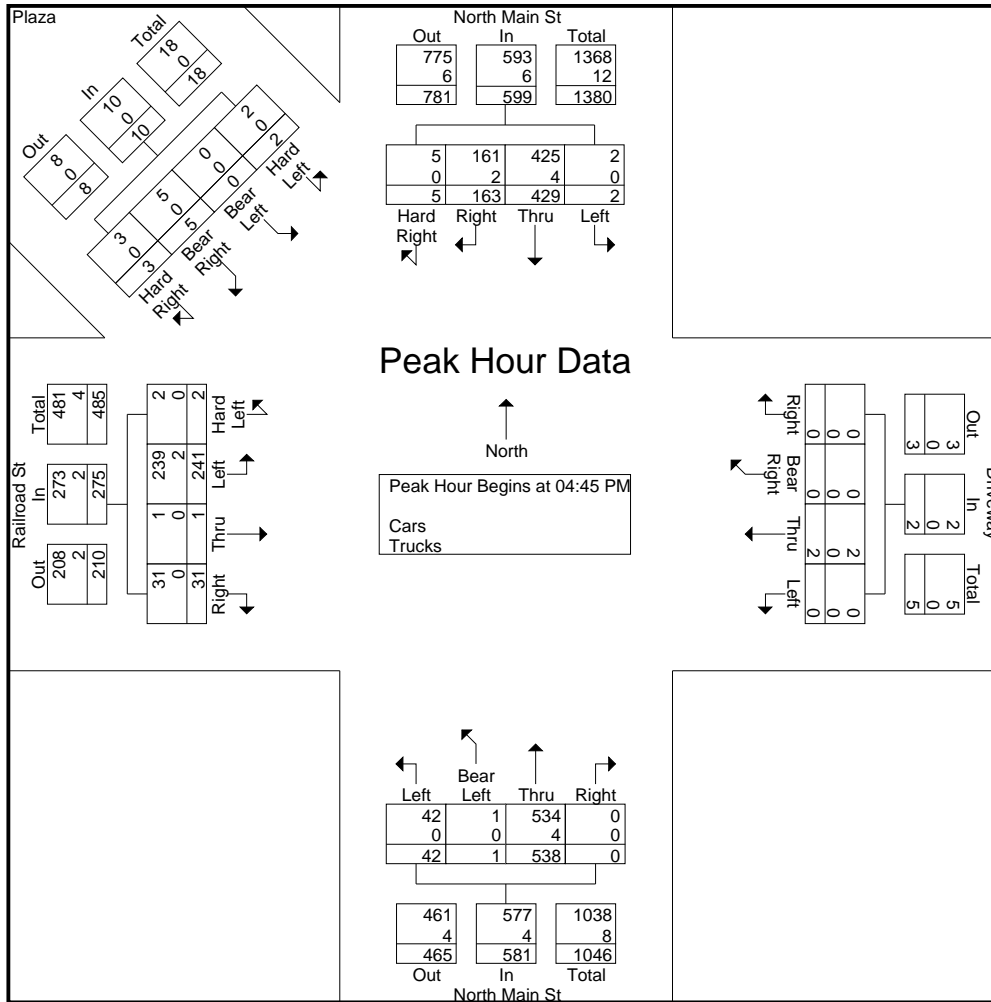
Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:45 PM																										
04:45 PM	0	95	36	3	134	0	0	0	0	0	12	0	129	0	141	0	49	0	11	60	0	0	2	2	4	339
05:00 PM	0	122	46	0	168	0	0	0	0	0	3	0	132	0	135	2	68	1	6	77	2	0	2	1	5	385
05:15 PM	2	100	44	0	146	0	2	0	0	2	12	1	139	0	152	0	57	0	7	64	0	0	0	0	0	364
05:30 PM	0	112	37	2	151	0	0	0	0	0	15	0	138	0	153	0	67	0	7	74	0	0	1	0	1	379
Total Volume	2	429	163	5	599	0	2	0	0	2	42	1	538	0	581	2	241	1	31	275	2	0	5	3	10	1467
% App. Total	0.3	71.6	27.2	0.8		0	100	0	0		7.2	0.2	92.6	0		0.7	87.6	0.4	11.3		20	0	50	30		
PHF	.250	.879	.886	.417	.891	.000	.250	.000	.000	.250	.700	.250	.968	.000	.949	.250	.886	.250	.705	.893	.250	.000	.625	.375	.500	.953
Cars	2	425	161	5	593	0	2	0	0	2	42	1	534	0	577	2	239	1	31	273	2	0	5	3	10	1455
% Cars	100	99.1	98.8	100	99.0	0	100	0	0	100	100	100	99.3	0	99.3	100	99.2	100	100	99.3	100	0	100	100	100	99.2
Trucks	0	4	2	0	6	0	0	0	0	0	0	0	4	0	4	0	2	0	0	2	0	0	0	0	0	12
% Trucks	0	0.9	1.2	0	1.0	0	0	0	0	0	0	0	0.7	0	0.7	0	0.8	0	0	0.7	0	0	0	0	0	0.8

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 2



**Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1**

**Peak Hour for Each Approach Begins at:**

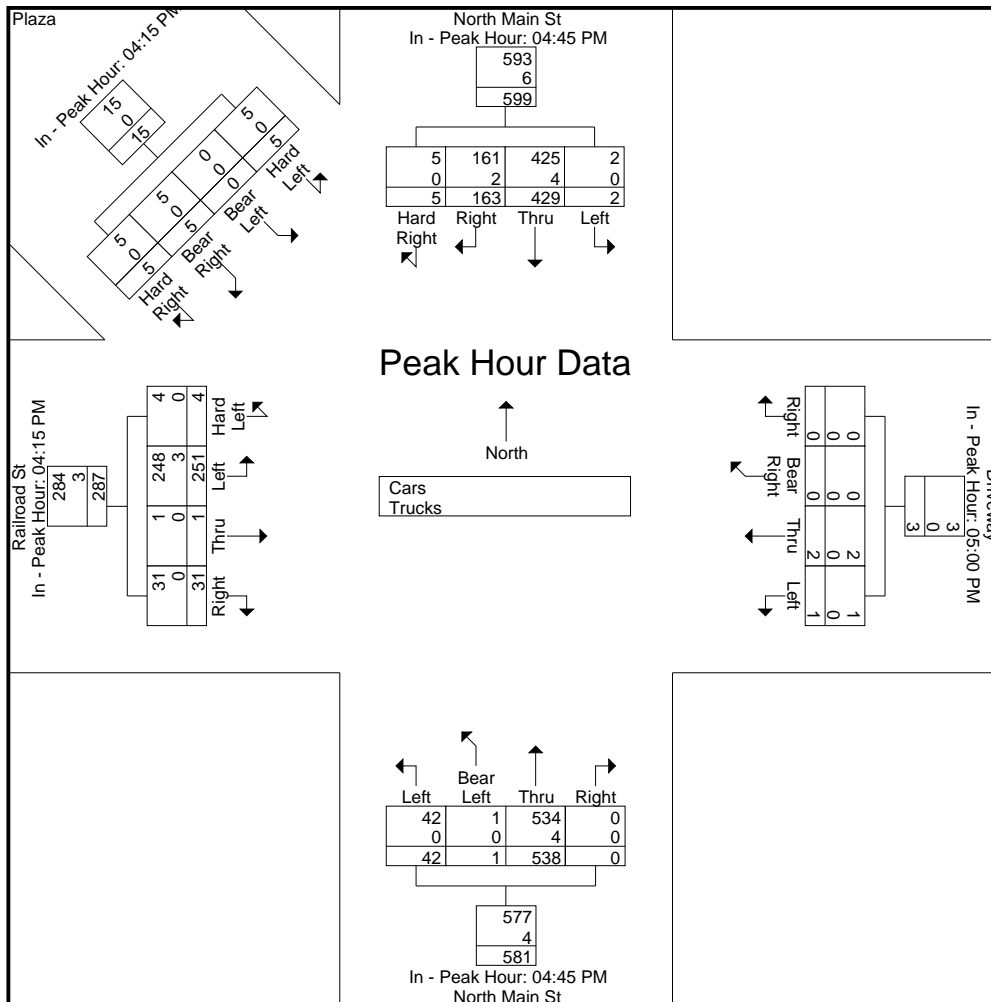
	04:45 PM					05:00 PM					04:45 PM					04:15 PM					04:15 PM				
+0 mins.	0	95	36	3	134	0	0	0	0	0	12	0	129	0	141	2	76	0	6	84	1	0	1	0	2
+15 mins.	0	122	46	0	168	0	2	0	0	2	3	0	132	0	135	0	58	0	8	66	2	0	0	2	4
+30 mins.	2	100	44	0	146	0	0	0	0	0	12	1	139	0	152	0	49	0	11	60	0	0	2	2	4
+45 mins.	0	112	37	2	151	1	0	0	0	1	15	0	138	0	153	2	68	1	6	77	2	0	2	1	5
Total Volume	2	429	163	5	599	1	2	0	0	3	42	1	538	0	581	4	251	1	31	287	5	0	5	5	15
% App. Total	0.3	71.6	27.2	0.8		33.3	66.7	0	0		7.2	0.2	92.6	0		1.4	87.5	0.3	10.8		33.3	0	33.3	33.3	
PHF	.250	.879	.886	.417	.891	.250	.250	.000	.000	.375	.700	.250	.968	.000	.949	.500	.826	.250	.705	.854	.625	.000	.625	.625	.750
Cars	2	42	16	5	593	1	2	0	0	3	42	1	53	0	577	4	24	1	31	284	5	0	5	5	15
% Cars	10	99.	98.	10	99	10	10	0	0	100	10	10	99.	0	99.3	10	98.	10	10	99	10	0	10	10	100
Trucks	0	1	8	0	6	0	0	0	0	0	0	0	3	0	4	0	8	0	0	3	0	0	0	0	0
% Trucks	0	0.9	1.2	0	1	0	0	0	0	0	0	0	0.7	0	0.7	0	1.2	0	0	1	0	0	0	0	0

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 3



# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	North Main St From North				Driveway From East				North Main St From South				Railroad St From West				Plaza From Northwest				Int. Total
	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	
04:00 PM	0	106	46	0	0	0	0	0	8	0	128	0	1	61	0	3	0	0	1	1	355
04:15 PM	0	111	41	0	0	0	0	0	13	0	141	0	2	76	0	6	1	0	1	0	392
04:30 PM	0	82	34	0	0	0	0	0	7	0	128	0	0	56	0	8	2	0	0	2	319
04:45 PM	0	93	36	3	0	0	0	0	12	0	128	0	0	49	0	11	0	0	2	2	336
<b>Total</b>	0	392	157	3	0	0	0	0	40	0	525	0	3	242	0	28	3	0	4	5	1402
05:00 PM	0	122	45	0	0	0	0	0	3	0	131	0	2	67	1	6	2	0	2	1	382
05:15 PM	2	99	43	0	0	2	0	0	12	1	138	0	0	57	0	7	0	0	0	0	361
05:30 PM	0	111	37	2	0	0	0	0	15	0	137	0	0	66	0	7	0	0	1	0	376
05:45 PM	0	94	33	0	1	0	0	0	8	0	128	0	0	47	1	2	1	0	0	0	315
<b>Total</b>	2	426	158	2	1	2	0	0	38	1	534	0	2	237	2	22	3	0	3	1	1434
<b>Grand Total</b>	2	818	315	5	1	2	0	0	78	1	1059	0	5	479	2	50	6	0	7	6	2836
Apprch %	0.2	71.8	27.6	0.4	33.3	66.7	0	0	6.9	0.1	93.1	0	0.9	89.4	0.4	9.3	31.6	0	36.8	31.6	
Total %	0.1	28.8	11.1	0.2	0	0.1	0	0	2.8	0	37.3	0	0.2	16.9	0.1	1.8	0.2	0	0.2	0.2	

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:45 PM																										
04:45 PM	0	93	36	3	132	0	0	0	0	0	12	0	128	0	140	0	49	0	11	60	0	0	2	2	4	336
05:00 PM	0	122	45	0	167	0	0	0	0	0	3	0	131	0	134	2	67	1	6	76	2	0	2	1	5	382
05:15 PM	2	99	43	0	144	0	2	0	0	2	12	1	138	0	151	0	57	0	7	64	0	0	0	0	0	361
05:30 PM	0	111	37	2	150	0	0	0	0	0	15	0	137	0	152	0	66	0	7	73	0	0	1	0	1	376
Total Volume	2	425	161	5	593	0	2	0	0	2	42	1	534	0	577	2	239	1	31	273	2	0	5	3	10	1455
% App. Total	0.3	71.7	27.2	0.8	0	100	0	0	7.3	0.2	92.5	0	0.7	87.5	0.4	11.4	20	0	50	30						
PHF	.250	.871	.894	.417	.888	.000	.250	.000	.000	.250	.700	.250	.967	.000	.949	.250	.892	.250	.705	.898	.250	.000	.625	.375	.500	.952

# Accurate Counts

978-664-2565

N/S Street : North Main Street  
 E/W Street : Driveway / Railroad Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750001  
 Site Code : 89750001  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	North Main St From North				Driveway From East				North Main St From South				Railroad St From West				Plaza From Northwest				Int. Total
	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	
04:00 PM	0	0	2	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	5
04:15 PM	0	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	6
04:30 PM	0	3	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	6
04:45 PM	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
<b>Total</b>	0	7	2	0	0	0	0	0	0	0	8	0	0	3	0	0	0	0	0	0	20
05:00 PM	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3
05:15 PM	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
05:30 PM	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3
05:45 PM	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3
<b>Total</b>	0	3	2	0	0	0	0	0	0	0	4	0	0	3	0	0	0	0	0	0	12
<b>Grand Total</b>	0	10	4	0	0	0	0	0	0	0	12	0	0	6	0	0	0	0	0	0	32
Apprch %	0	71.4	28.6	0	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	
Total %	0	31.2	12.5	0	0	0	0	0	0	0	37.5	0	0	18.8	0	0	0	0	0	0	

Start Time	North Main St From North					Driveway From East					North Main St From South					Railroad St From West					Plaza From Northwest					Int. Total					
	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. 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	2	0	2	0	0	0	0	0	0	0	2	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	5
04:15 PM	0	2	0	0	2	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
04:30 PM	0	3	0	0	3	0	0	0	0	0	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	6
04:45 PM	0	2	0	0	2	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total Volume	0	7	2	0	9	0	0	0	0	0	0	0	8	0	8	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	20
% App. Total	0	77.8	22.2	0		0	0	0	0		0	0	100	0		0	100	0	0		0	0	0	0	0	0	0	0	0	0	
PHF	.000	.583	.250	.000	.750	.000	.000	.000	.000	.000	.000	.000	.500	.000	.500	.000	.375	.000	.000	.375	.000	.000	.000	.000	.000	.000	.000	.000	.833		



# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Route 28 From North		Route 28 From South		Lewis St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00 AM	155	0	0	56	0	1	212
07:15 AM	145	0	1	58	1	2	207
07:30 AM	129	0	1	76	1	2	209
07:45 AM	150	2	1	73	1	2	229
<b>Total</b>	<b>579</b>	<b>2</b>	<b>3</b>	<b>263</b>	<b>3</b>	<b>7</b>	<b>857</b>
08:00 AM	159	1	0	89	0	2	251
08:15 AM	139	0	0	80	1	0	220
08:30 AM	141	2	2	104	2	1	252
08:45 AM	116	3	0	131	0	3	253
<b>Total</b>	<b>555</b>	<b>6</b>	<b>2</b>	<b>404</b>	<b>3</b>	<b>6</b>	<b>976</b>
<b>Grand Total</b>	<b>1134</b>	<b>8</b>	<b>5</b>	<b>667</b>	<b>6</b>	<b>13</b>	<b>1833</b>
Apprch %	99.3	0.7	0.7	99.3	31.6	68.4	
Total %	61.9	0.4	0.3	36.4	0.3	0.7	
Cars	1118	8	5	653	6	13	1803
% Cars	98.6	100	100	97.9	100	100	98.4
Trucks	16	0	0	14	0	0	30
% Trucks	1.4	0	0	2.1	0	0	1.6

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	<b>159</b>	1	<b>160</b>	0	89	89	0	2	2	251
08:15 AM	139	0	139	0	80	80	1	0	1	220
08:30 AM	141	2	143	2	104	106	2	1	3	252
08:45 AM	116	3	119	0	131	131	0	3	3	253
<b>Total Volume</b>	<b>555</b>	<b>6</b>	<b>561</b>	<b>2</b>	<b>404</b>	<b>406</b>	<b>3</b>	<b>6</b>	<b>9</b>	<b>976</b>
% App. Total	98.9	1.1		0.5	99.5		33.3	66.7		
PHF	.873	.500	.877	.250	.771	.775	.375	.500	.750	.964
Cars	546	6	552	2	396	398	3	6	9	959
% Cars	98.4	100	98.4	100	98.0	98.0	100	100	100	98.3
Trucks	9	0	9	0	8	8	0	0	0	17
% Trucks	1.6	0	1.6	0	2.0	2.0	0	0	0	1.7

# Accurate Counts

978-664-2565

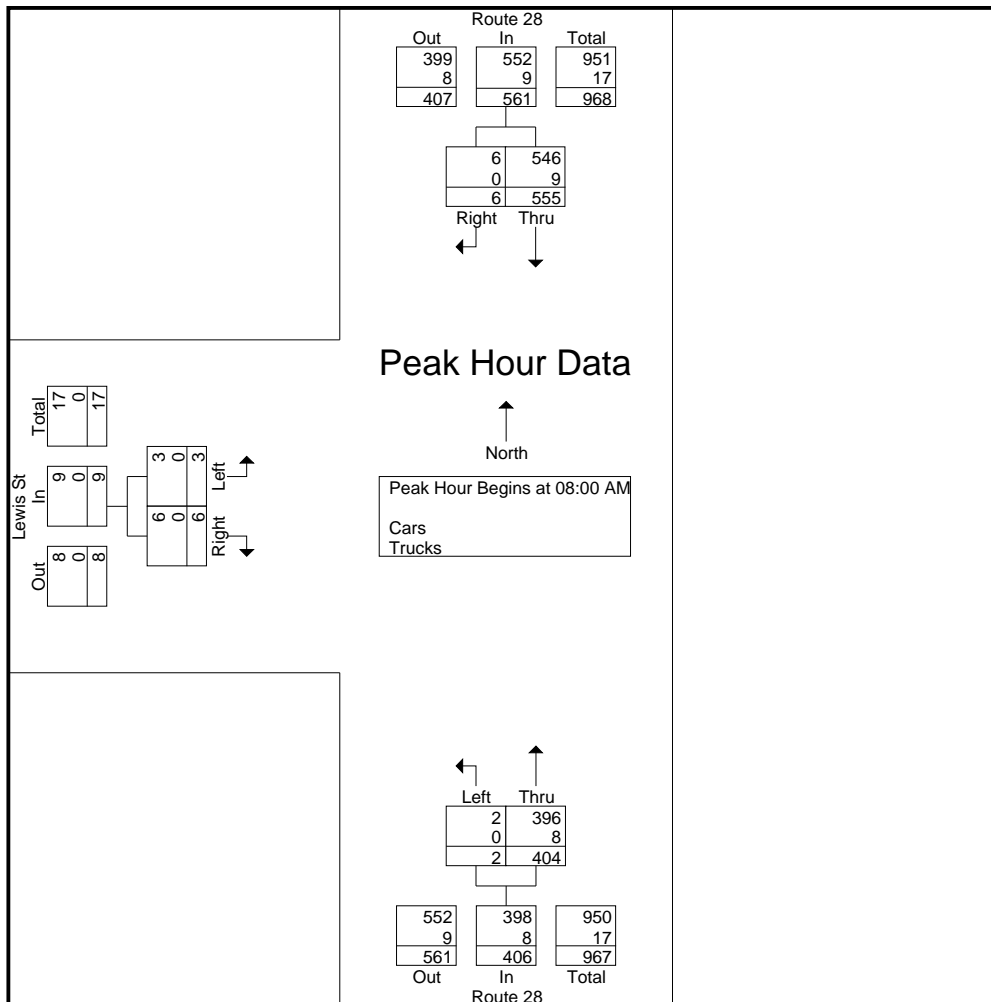
File Name : 89750002

Site Code : 89750002

Start Date : 9/20/2023

Page No : 2

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear



**Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1**

Peak Hour for Each Approach Begins at:

	07:45 AM			08:00 AM			07:15 AM		
+0 mins.	150	2	152	0	89	89	1	2	3
+15 mins.	<b>159</b>	1	<b>160</b>	0	80	80	1	2	3
+30 mins.	139	0	139	2	104	106	1	2	3
+45 mins.	141	2	143	0	<b>131</b>	<b>131</b>	0	2	2
Total Volume	589	5	594	2	404	406	3	8	11
% App. Total	99.2	0.8		0.5	99.5		27.3	72.7	
PHF	.926	.625	.928	.250	.771	.775	.750	1.000	.917
Cars	579	5	584	2	396	398	3	8	11
% Cars	98.3	100	98.3	100	98	98	100	100	100
Trucks	10	0	10	0	8	8	0	0	0
% Trucks	1.7	0	1.7	0	2	2	0	0	0

# Accurate Counts

978-664-2565

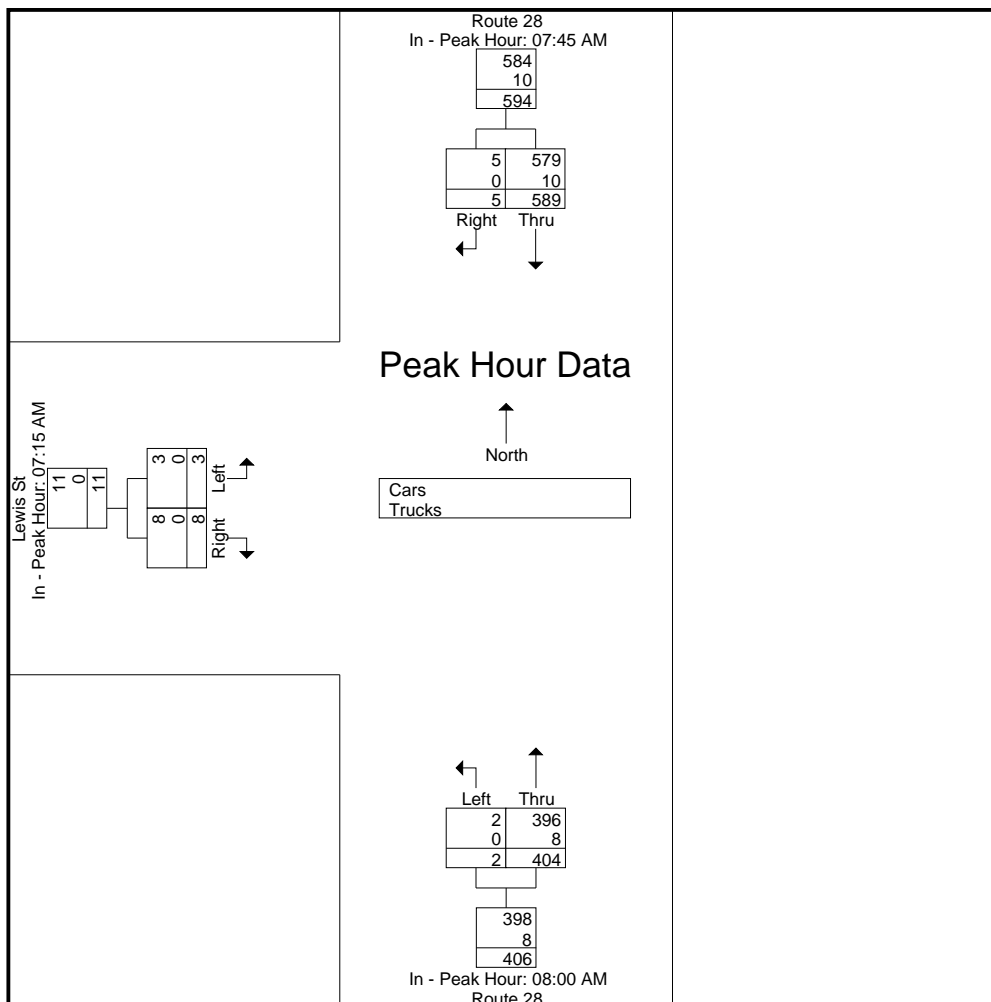
File Name : 89750002

Site Code : 89750002

Start Date : 9/20/2023

Page No : 3

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Route 28 From North		Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	Left	Thru	Left	Right			
07:00 AM	153	0	0	55	0	1	209		
07:15 AM	142	0	1	56	1	2	202		
07:30 AM	129	0	1	73	1	2	206		
07:45 AM	148	2	1	73	1	2	227		
<b>Total</b>	<b>572</b>	<b>2</b>	<b>3</b>	<b>257</b>	<b>3</b>	<b>7</b>	<b>844</b>		
08:00 AM	156	1	0	87	0	2	246		
08:15 AM	136	0	0	78	1	0	215		
08:30 AM	139	2	2	103	2	1	249		
08:45 AM	115	3	0	128	0	3	249		
<b>Total</b>	<b>546</b>	<b>6</b>	<b>2</b>	<b>396</b>	<b>3</b>	<b>6</b>	<b>959</b>		
<b>Grand Total</b>	<b>1118</b>	<b>8</b>	<b>5</b>	<b>653</b>	<b>6</b>	<b>13</b>	<b>1803</b>		
Apprch %	99.3	0.7	0.8	99.2	31.6	68.4			
Total %	62	0.4	0.3	36.2	0.3	0.7			

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	<b>156</b>	1	<b>157</b>	0	87	87	0	2	2	246
08:15 AM	136	0	136	0	78	78	1	0	1	215
08:30 AM	139	2	141	2	103	105	2	1	3	249
08:45 AM	115	3	118	0	128	128	0	3	3	249
<b>Total Volume</b>	<b>546</b>	<b>6</b>	<b>552</b>	<b>2</b>	<b>396</b>	<b>398</b>	<b>3</b>	<b>6</b>	<b>9</b>	<b>959</b>
% App. Total	98.9	1.1		0.5	99.5		33.3	66.7		
PHF	.875	.500	.879	.250	.773	.777	.375	.500	.750	.963

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Route 28 From North		Route 28 From South		Lewis St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00 AM	2	0	0	1	0	0	3
07:15 AM	3	0	0	2	0	0	5
07:30 AM	0	0	0	3	0	0	3
07:45 AM	2	0	0	0	0	0	2
<b>Total</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>13</b>
08:00 AM	3	0	0	2	0	0	5
08:15 AM	3	0	0	2	0	0	5
08:30 AM	2	0	0	1	0	0	3
08:45 AM	1	0	0	3	0	0	4
<b>Total</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>17</b>
<b>Grand Total</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>30</b>
Apprch %	100	0	0	100	0	0	
Total %	53.3	0	0	46.7	0	0	

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	3	0	3	0	2	2	0	0	0	5
08:15 AM	3	0	3	0	2	2	0	0	0	5
08:30 AM	2	0	2	0	1	1	0	0	0	3
08:45 AM	1	0	1	0	3	3	0	0	0	4
<b>Total Volume</b>	<b>9</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>8</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>
% App. Total	100	0		0	100		0	0		
PHF	.750	.000	.750	.000	.667	.667	.000	.000	.000	.850



# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Route 28 From North		Route 28 From South		Lewis St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
04:00 PM	113	2	1	143	0	3	262
04:15 PM	114	2	2	141	0	2	261
04:30 PM	91	1	0	142	0	1	235
04:45 PM	100	0	2	143	1	2	248
<b>Total</b>	<b>418</b>	<b>5</b>	<b>5</b>	<b>569</b>	<b>1</b>	<b>8</b>	<b>1006</b>
05:00 PM	125	1	0	136	1	0	263
05:15 PM	109	0	0	159	0	0	268
05:30 PM	114	3	1	147	0	2	267
05:45 PM	97	0	0	139	0	0	236
<b>Total</b>	<b>445</b>	<b>4</b>	<b>1</b>	<b>581</b>	<b>1</b>	<b>2</b>	<b>1034</b>
<b>Grand Total</b>	<b>863</b>	<b>9</b>	<b>6</b>	<b>1150</b>	<b>2</b>	<b>10</b>	<b>2040</b>
Apprch %	99	1	0.5	99.5	16.7	83.3	
Total %	42.3	0.4	0.3	56.4	0.1	0.5	
Cars	854	9	6	1139	2	10	2020
% Cars	99	100	100	99	100	100	99
Trucks	9	0	0	11	0	0	20
% Trucks	1	0	0	1	0	0	1

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	100	0	100	2	143	145	1	2	3	248
05:00 PM	125	1	126	0	136	136	1	0	1	263
05:15 PM	109	0	109	0	159	159	0	0	0	268
05:30 PM	114	3	117	1	147	148	0	2	2	267
<b>Total Volume</b>	<b>448</b>	<b>4</b>	<b>452</b>	<b>3</b>	<b>585</b>	<b>588</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>1046</b>
% App. Total	99.1	0.9		0.5	99.5		33.3	66.7		
PHF	.896	.333	.897	.375	.920	.925	.500	.500	.500	.976
Cars	444	4	448	3	582	585	2	4	6	1039
% Cars	99.1	100	99.1	100	99.5	99.5	100	100	100	99.3
Trucks	4	0	4	0	3	3	0	0	0	7
% Trucks	0.9	0	0.9	0	0.5	0.5	0	0	0	0.7

# Accurate Counts

978-664-2565

File Name : 89750002

Site Code : 89750002

Start Date : 9/20/2023

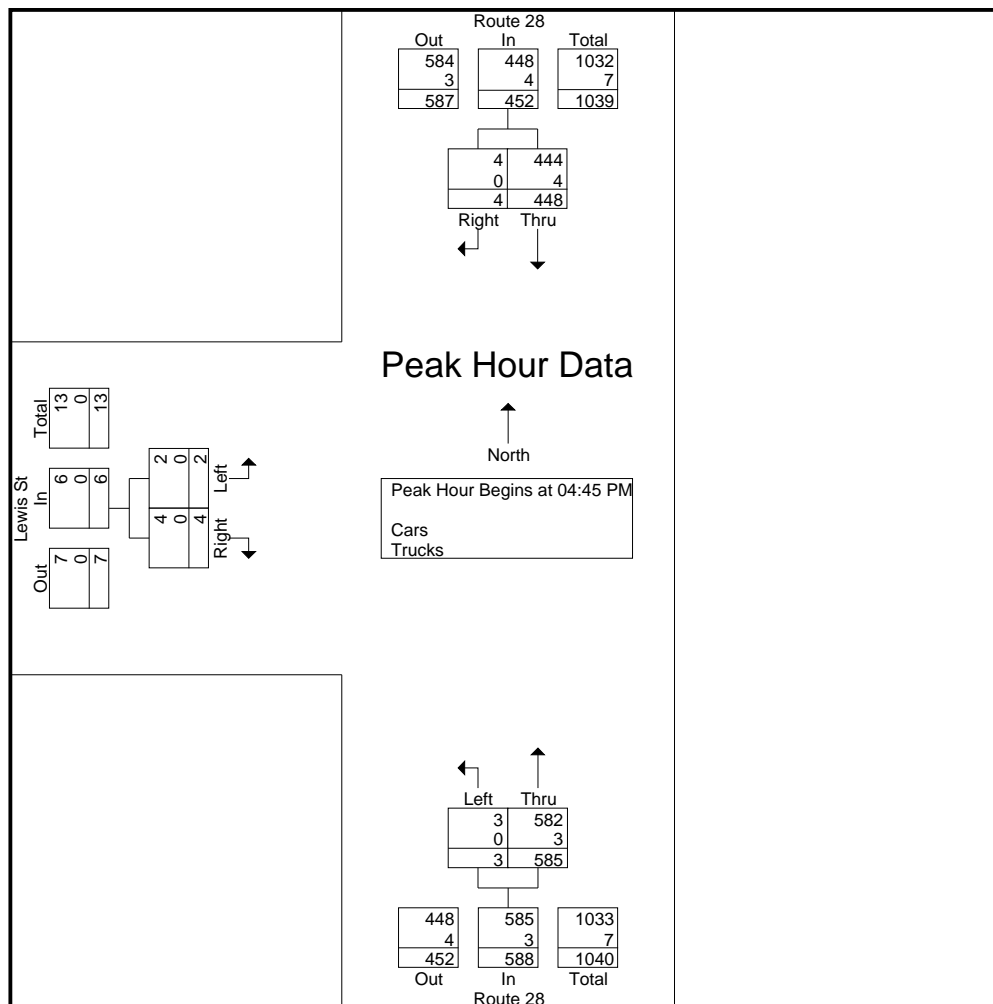
Page No : 2

N/S Street : Route 28

E/W Street : Lewis Street

City/State : Andover, MA

Weather : Clear



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	04:45 PM			04:45 PM			04:00 PM		
+0 mins.	100	0	100	2	143	145	0	3	3
+15 mins.	125	1	126	0	136	136	0	2	2
+30 mins.	109	0	109	0	159	159	0	1	1
+45 mins.	114	3	117	1	147	148	1	2	3
Total Volume	448	4	452	3	585	588	1	8	9
% App. Total	99.1	0.9		0.5	99.5		11.1	88.9	
PHF	.896	.333	.897	.375	.920	.925	.250	.667	.750
Cars	444	4	448	3	582	585	1	8	9
% Cars	99.1	100	99.1	100	99.5	99.5	100	100	100
Trucks	4	0	4	0	3	3	0	0	0
% Trucks	0.9	0	0.9	0	0.5	0.5	0	0	0

# Accurate Counts

978-664-2565

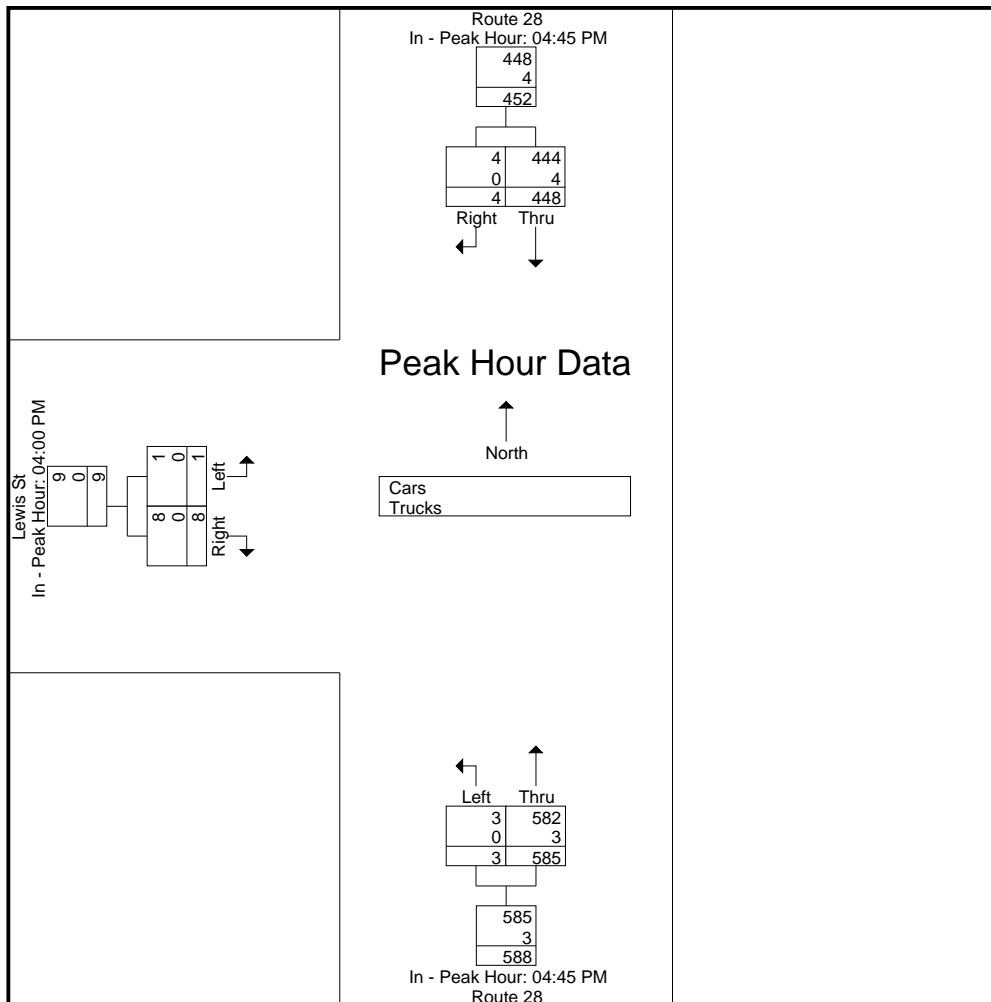
File Name : 89750002

Site Code : 89750002

Start Date : 9/20/2023

Page No : 3

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Route 28 From North		Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	Left	Thru	Left	Right	Right		
04:00 PM	113	2	1	140	0	3		259	
04:15 PM	112	2	2	138	0	2		256	
04:30 PM	89	1	0	141	0	1		232	
04:45 PM	98	0	2	143	1	2		246	
<b>Total</b>	<b>412</b>	<b>5</b>	<b>5</b>	<b>562</b>	<b>1</b>	<b>8</b>		<b>993</b>	
05:00 PM	125	1	0	135	1	0		262	
05:15 PM	108	0	0	158	0	0		266	
05:30 PM	113	3	1	146	0	2		265	
05:45 PM	96	0	0	138	0	0		234	
<b>Total</b>	<b>442</b>	<b>4</b>	<b>1</b>	<b>577</b>	<b>1</b>	<b>2</b>		<b>1027</b>	
<b>Grand Total</b>	<b>854</b>	<b>9</b>	<b>6</b>	<b>1139</b>	<b>2</b>	<b>10</b>		<b>2020</b>	
Apprch %	99	1	0.5	99.5	16.7	83.3			
Total %	42.3	0.4	0.3	56.4	0.1	0.5			

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	98	0	98	2	143	145	1	2	3	246
05:00 PM	<b>125</b>	1	<b>126</b>	0	135	135	1	0	1	262
05:15 PM	108	0	108	0	<b>158</b>	<b>158</b>	0	0	0	<b>266</b>
05:30 PM	113	<b>3</b>	116	1	146	147	0	2	2	265
<b>Total Volume</b>	<b>444</b>	<b>4</b>	<b>448</b>	<b>3</b>	<b>582</b>	<b>585</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>1039</b>
% App. Total	99.1	0.9		0.5	99.5		33.3	66.7		
PHF	.888	.333	.889	.375	.921	.926	.500	.500	.500	.977

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Route 28 From North		Route 28 From South		Lewis St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
04:00 PM	0	0	0	3	0	0	3
04:15 PM	2	0	0	3	0	0	5
04:30 PM	2	0	0	1	0	0	3
04:45 PM	2	0	0	0	0	0	2
<b>Total</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>13</b>
05:00 PM	0	0	0	1	0	0	1
05:15 PM	1	0	0	1	0	0	2
05:30 PM	1	0	0	1	0	0	2
05:45 PM	1	0	0	1	0	0	2
<b>Total</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>7</b>
<b>Grand Total</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>20</b>
Apprch %	100	0	0	100	0	0	
Total %	45	0	0	55	0	0	

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	<b>3</b>	<b>3</b>	0	0	0	3
04:15 PM	<b>2</b>	0	<b>2</b>	0	<b>3</b>	<b>3</b>	0	0	0	<b>5</b>
04:30 PM	2	0	2	0	1	1	0	0	0	3
04:45 PM	2	0	2	0	0	0	0	0	0	2
<b>Total Volume</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>13</b>
% App. Total	100	0		0	100		0	0		
PHF	.750	.000	.750	.000	.583	.583	.000	.000	.000	.650

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Lewis Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750002  
 Site Code : 89750002  
 Start Date : 9/20/2023  
 Page No : 10

## Groups Printed- Bikes Peds

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Exclu. Total	Inclu. Total	Int. Total
	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds			
04:00 PM	0	0	0	0	0	0	0	0	1	1	0	1
04:15 PM	0	0	0	0	0	3	0	0	5	8	0	8
04:30 PM	0	0	0	0	0	1	0	0	2	3	0	3
04:45 PM	0	0	0	0	0	0	0	0	1	1	0	1
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>13</b>	<b>0</b>	<b>13</b>
05:00 PM	0	0	0	0	1	0	0	0	2	2	1	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	0	0	0	1	0	0	0	1	1	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>5</b>
<b>Grand Total</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>16</b>	<b>2</b>	<b>18</b>
Apprch %	100	0		0	100		0	0				
Total %	50	0		0	50		0	0		88.9	11.1	

Start Time	Route 28 From North			Route 28 From South			Lewis St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	1	1	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	1	0	0	0	0	0	0	1
<b>Total Volume</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>% App. Total</b>	<b>100</b>	<b>0</b>		<b>0</b>	<b>100</b>		<b>0</b>	<b>0</b>		
PHF	.250	.000	.250	.000	.250	.250	.000	.000	.000	.500

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Route 28 From North		Route 28 From South		Pearson St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00 AM	160	5	3	51	2	6	227
07:15 AM	142	3	6	55	4	13	223
07:30 AM	121	6	15	76	4	11	233
07:45 AM	137	6	16	74	2	11	246
<b>Total</b>	<b>560</b>	<b>20</b>	<b>40</b>	<b>256</b>	<b>12</b>	<b>41</b>	<b>929</b>
08:00 AM	159	4	11	88	6	13	281
08:15 AM	133	7	11	79	0	11	241
08:30 AM	126	13	12	98	12	19	280
08:45 AM	115	7	11	128	6	18	285
<b>Total</b>	<b>533</b>	<b>31</b>	<b>45</b>	<b>393</b>	<b>24</b>	<b>61</b>	<b>1087</b>
<b>Grand Total</b>	<b>1093</b>	<b>51</b>	<b>85</b>	<b>649</b>	<b>36</b>	<b>102</b>	<b>2016</b>
Apprch %	95.5	4.5	11.6	88.4	26.1	73.9	
Total %	54.2	2.5	4.2	32.2	1.8	5.1	
Cars	1078	51	85	636	35	102	1987
% Cars	98.6	100	100	98	97.2	100	98.6
Trucks	15	0	0	13	1	0	29
% Trucks	1.4	0	0	2	2.8	0	1.4

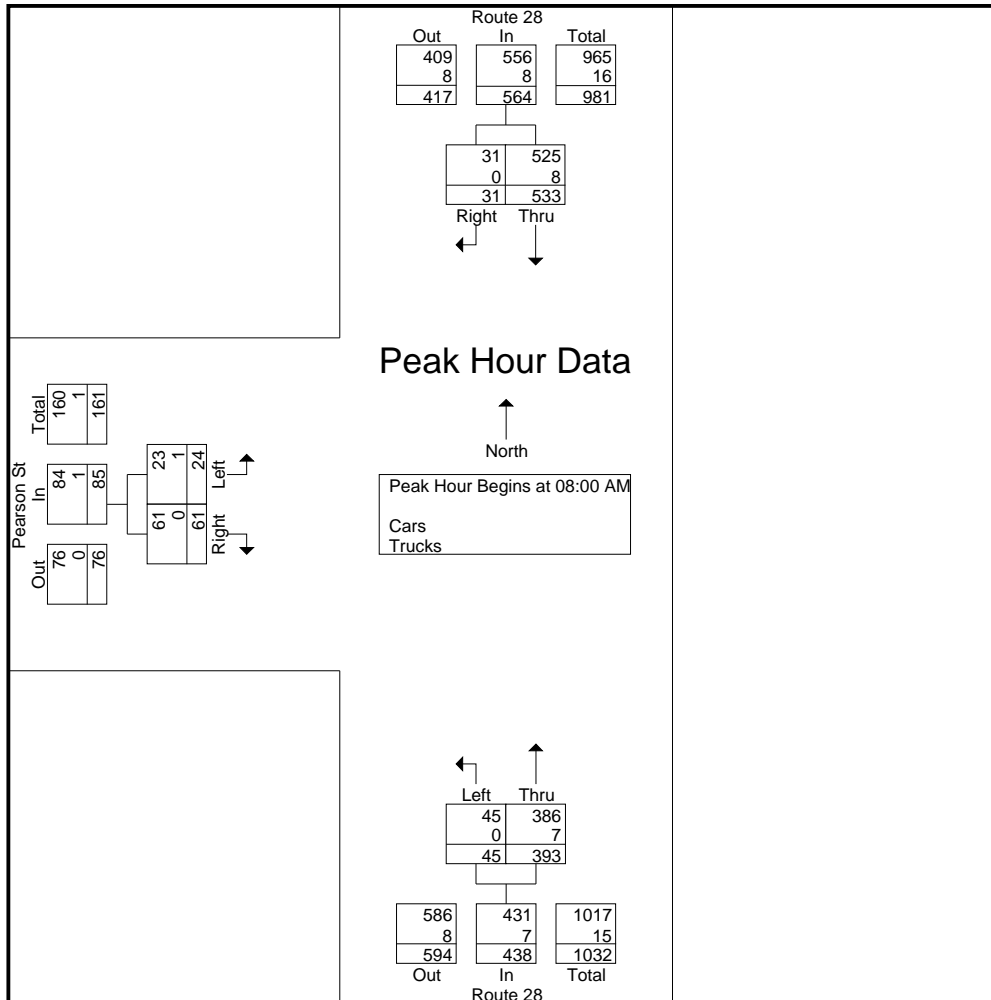
Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	<b>159</b>	4	<b>163</b>	11	88	99	6	13	19	281
08:15 AM	133	7	140	11	79	90	0	11	11	241
08:30 AM	126	<b>13</b>	139	<b>12</b>	98	110	<b>12</b>	<b>19</b>	<b>31</b>	280
08:45 AM	115	7	122	11	<b>128</b>	<b>139</b>	6	18	24	<b>285</b>
<b>Total Volume</b>	<b>533</b>	<b>31</b>	<b>564</b>	<b>45</b>	<b>393</b>	<b>438</b>	<b>24</b>	<b>61</b>	<b>85</b>	<b>1087</b>
% App. Total	94.5	5.5		10.3	89.7		28.2	71.8		
PHF	.838	.596	.865	.938	.768	.788	.500	.803	.685	.954
Cars	525	31	556	45	386	431	23	61	84	1071
% Cars	98.5	100	98.6	100	98.2	98.4	95.8	100	98.8	98.5
Trucks	8	0	8	0	7	7	1	0	1	16
% Trucks	1.5	0	1.4	0	1.8	1.6	4.2	0	1.2	1.5

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 2



**Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1**

Peak Hour for Each Approach Begins at:

	07:45 AM			08:00 AM			08:00 AM		
+0 mins.	137	6	143	11	88	99	6	13	19
+15 mins.	<b>159</b>	4	<b>163</b>	11	79	90	0	11	11
+30 mins.	133	7	140	<b>12</b>	<b>98</b>	110	<b>12</b>	<b>19</b>	<b>31</b>
+45 mins.	126	<b>13</b>	139	11	<b>128</b>	<b>139</b>	6	18	24
Total Volume	555	30	585	45	393	438	24	61	85
% App. Total	94.9	5.1		10.3	89.7		28.2	71.8	
PHF	.873	.577	.897	.938	.768	.788	.500	.803	.685
Cars	546	30	576	45	386	431	23	61	84
% Cars	98.4	100	98.5	100	98.2	98.4	95.8	100	98.8
Trucks	9	0	9	0	7	7	1	0	1
% Trucks	1.6	0	1.5	0	1.8	1.6	4.2	0	1.2

# Accurate Counts

978-664-2565

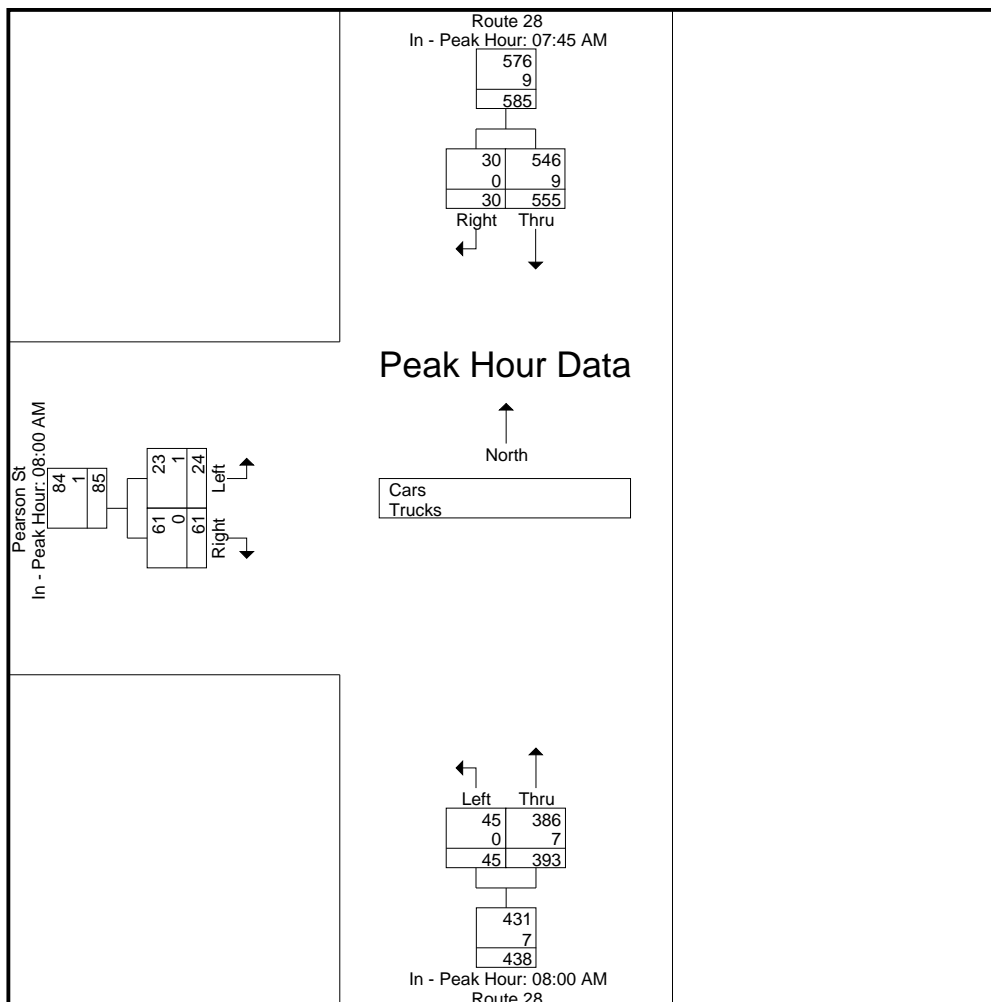
File Name : 89750003

Site Code : 89750003

Start Date : 9/20/2023

Page No : 3

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Route 28 From North		Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	Left	Thru	Left	Right			
07:00 AM	158	5	3	50	2	6	224		
07:15 AM	139	3	6	53	4	13	218		
07:30 AM	121	6	15	73	4	11	230		
07:45 AM	135	6	16	74	2	11	244		
<b>Total</b>	<b>553</b>	<b>20</b>	<b>40</b>	<b>250</b>	<b>12</b>	<b>41</b>	<b>916</b>		
08:00 AM	156	4	11	87	5	13	276		
08:15 AM	130	7	11	77	0	11	236		
08:30 AM	125	13	12	97	12	19	278		
08:45 AM	114	7	11	125	6	18	281		
<b>Total</b>	<b>525</b>	<b>31</b>	<b>45</b>	<b>386</b>	<b>23</b>	<b>61</b>	<b>1071</b>		
<b>Grand Total</b>	<b>1078</b>	<b>51</b>	<b>85</b>	<b>636</b>	<b>35</b>	<b>102</b>	<b>1987</b>		
Apprch %	95.5	4.5	11.8	88.2	25.5	74.5			
Total %	54.3	2.6	4.3	32	1.8	5.1			

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	<b>156</b>	4	<b>160</b>	11	87	98	5	13	18	276
08:15 AM	130	7	137	11	77	88	0	11	11	236
08:30 AM	125	<b>13</b>	138	<b>12</b>	97	109	<b>12</b>	<b>19</b>	<b>31</b>	278
08:45 AM	114	7	121	11	<b>125</b>	<b>136</b>	6	18	24	<b>281</b>
Total Volume	525	31	556	45	386	431	23	61	84	1071
% App. Total	94.4	5.6		10.4	89.6		27.4	72.6		
PHF	.841	.596	.869	.938	.772	.792	.479	.803	.677	.953

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Route 28 From North		Route 28 From South		Pearson St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00 AM	2	0	0	1	0	0	3
07:15 AM	3	0	0	2	0	0	5
07:30 AM	0	0	0	3	0	0	3
07:45 AM	2	0	0	0	0	0	2
<b>Total</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>13</b>
08:00 AM	3	0	0	1	1	0	5
08:15 AM	3	0	0	2	0	0	5
08:30 AM	1	0	0	1	0	0	2
08:45 AM	1	0	0	3	0	0	4
<b>Total</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>16</b>
<b>Grand Total</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>1</b>	<b>0</b>	<b>29</b>
Apprch %	100	0	0	100	100	0	
Total %	51.7	0	0	44.8	3.4	0	

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	3	0	3	0	1	1	1	0	1	5
08:15 AM	3	0	3	0	2	2	0	0	0	5
08:30 AM	1	0	1	0	1	1	0	0	0	2
08:45 AM	1	0	1	0	3	3	0	0	0	4
<b>Total Volume</b>	<b>8</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>7</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>16</b>
% App. Total	100	0		0	100		100	0		
PHF	.667	.000	.667	.000	.583	.583	.250	.000	.250	.800

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Exclu. Total	Inclu. Total	Int. Total
	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	2	2	0	2
07:30 AM	0	0	0	1	0	0	0	0	2	2	1	3
07:45 AM	0	0	0	0	0	0	0	0	4	4	0	4
<b>Total</b>	0	0	0	1	0	0	0	0	8	8	1	9
08:00 AM	0	0	0	0	0	0	0	0	1	1	0	1
08:15 AM	0	0	1	0	0	1	0	0	2	4	0	4
08:30 AM	0	0	0	0	0	1	0	0	4	5	0	5
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	1	0	0	2	0	0	7	10	0	10
<b>Grand Total</b>	0	0	1	1	0	2	0	0	15	18	1	19
Apprch %	0	0		100	0		0	0				
Total %	0	0		100	0		0	0		94.7	5.3	

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	1	0	1	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0
<b>Total Volume</b>	0	0	0	1	0	1	0	0	0	1
<b>% App. Total</b>	0	0		100	0		0	0		
<b>PHF</b>	.000	.000	.000	.250	.000	.250	.000	.000	.000	.250

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Route 28 From North		Route 28 From South		Pearson St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
04:00 PM	117	1	12	135	14	11	290
04:15 PM	113	2	9	141	3	18	286
04:30 PM	91	3	10	134	5	20	263
04:45 PM	96	3	9	134	9	17	268
<b>Total</b>	<b>417</b>	<b>9</b>	<b>40</b>	<b>544</b>	<b>31</b>	<b>66</b>	<b>1107</b>
05:00 PM	126	3	13	127	12	24	305
05:15 PM	109	3	3	150	6	18	289
05:30 PM	113	0	9	144	2	12	280
05:45 PM	92	2	11	134	7	10	256
<b>Total</b>	<b>440</b>	<b>8</b>	<b>36</b>	<b>555</b>	<b>27</b>	<b>64</b>	<b>1130</b>
<b>Grand Total</b>	<b>857</b>	<b>17</b>	<b>76</b>	<b>1099</b>	<b>58</b>	<b>130</b>	<b>2237</b>
Apprch %	98.1	1.9	6.5	93.5	30.9	69.1	
Total %	38.3	0.8	3.4	49.1	2.6	5.8	
Cars	848	17	76	1089	57	129	2216
% Cars	98.9	100	100	99.1	98.3	99.2	99.1
Trucks	9	0	0	10	1	1	21
% Trucks	1.1	0	0	0.9	1.7	0.8	0.9

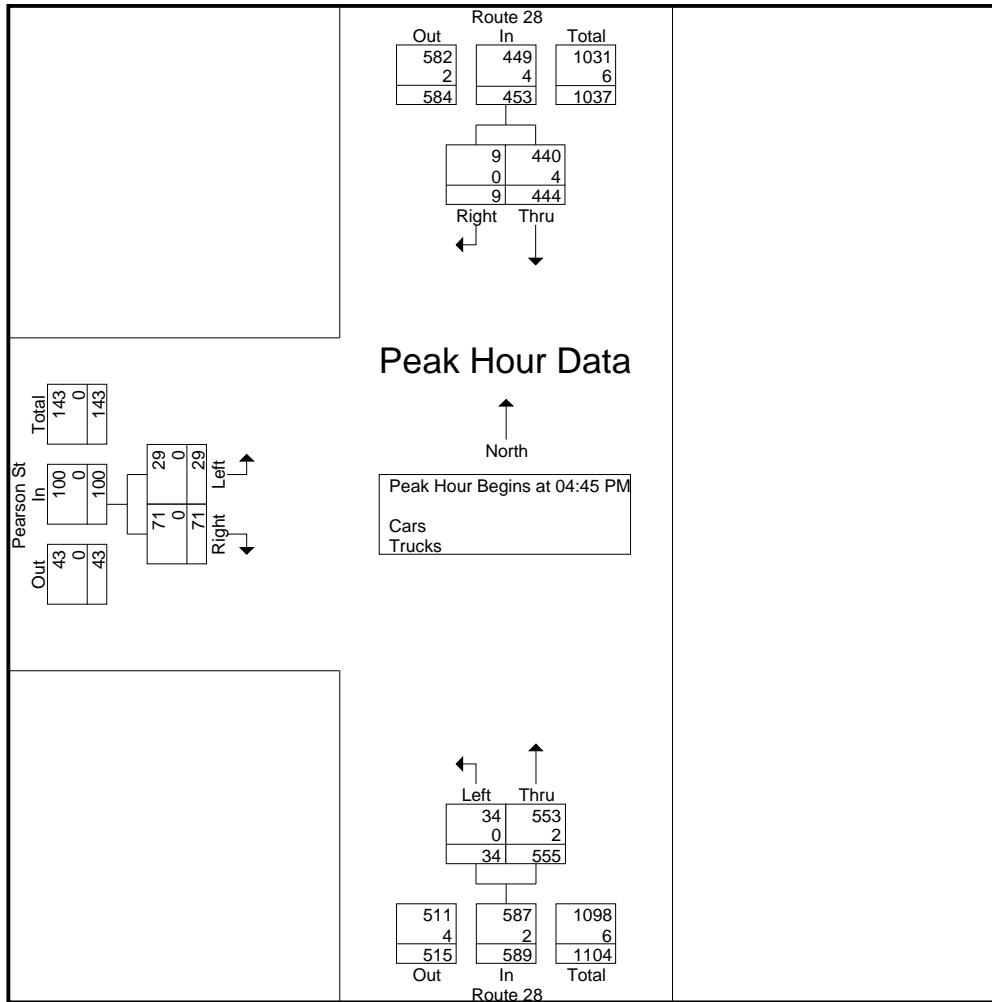
Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	96	<b>3</b>	99	9	134	143	9	17	26	268
05:00 PM	<b>126</b>	3	<b>129</b>	<b>13</b>	127	140	<b>12</b>	<b>24</b>	<b>36</b>	<b>305</b>
05:15 PM	109	3	112	3	<b>150</b>	<b>153</b>	6	18	24	289
05:30 PM	113	0	113	9	144	153	2	12	14	280
<b>Total Volume</b>	<b>444</b>	<b>9</b>	<b>453</b>	<b>34</b>	<b>555</b>	<b>589</b>	<b>29</b>	<b>71</b>	<b>100</b>	<b>1142</b>
% App. Total	98	2		5.8	94.2		29	71		
PHF	.881	.750	.878	.654	.925	.962	.604	.740	.694	.936
Cars	440	9	449	34	553	587	29	71	100	1136
% Cars	99.1	100	99.1	100	99.6	99.7	100	100	100	99.5
Trucks	4	0	4	0	2	2	0	0	0	6
% Trucks	0.9	0	0.9	0	0.4	0.3	0	0	0	0.5

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 2



**Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1**

Peak Hour for Each Approach Begins at:

	04:45 PM			05:00 PM			04:30 PM		
+0 mins.	96	3	99	13	127	140	5	20	25
+15 mins.	<b>126</b>	3	<b>129</b>	3	<b>150</b>	<b>153</b>	9	17	26
+30 mins.	109	3	112	9	144	153	<b>12</b>	<b>24</b>	<b>36</b>
+45 mins.	113	0	113	11	134	145	6	18	24
Total Volume	444	9	453	36	555	591	32	79	111
% App. Total	98	2		6.1	93.9		28.8	71.2	
PHF	.881	.750	.878	.692	.925	.966	.667	.823	.771
Cars	440	9	449	36	552	588	32	79	111
% Cars	99.1	100	99.1	100	99.5	99.5	100	100	100
Trucks	4	0	4	0	3	3	0	0	0
% Trucks	0.9	0	0.9	0	0.5	0.5	0	0	0

# Accurate Counts

978-664-2565

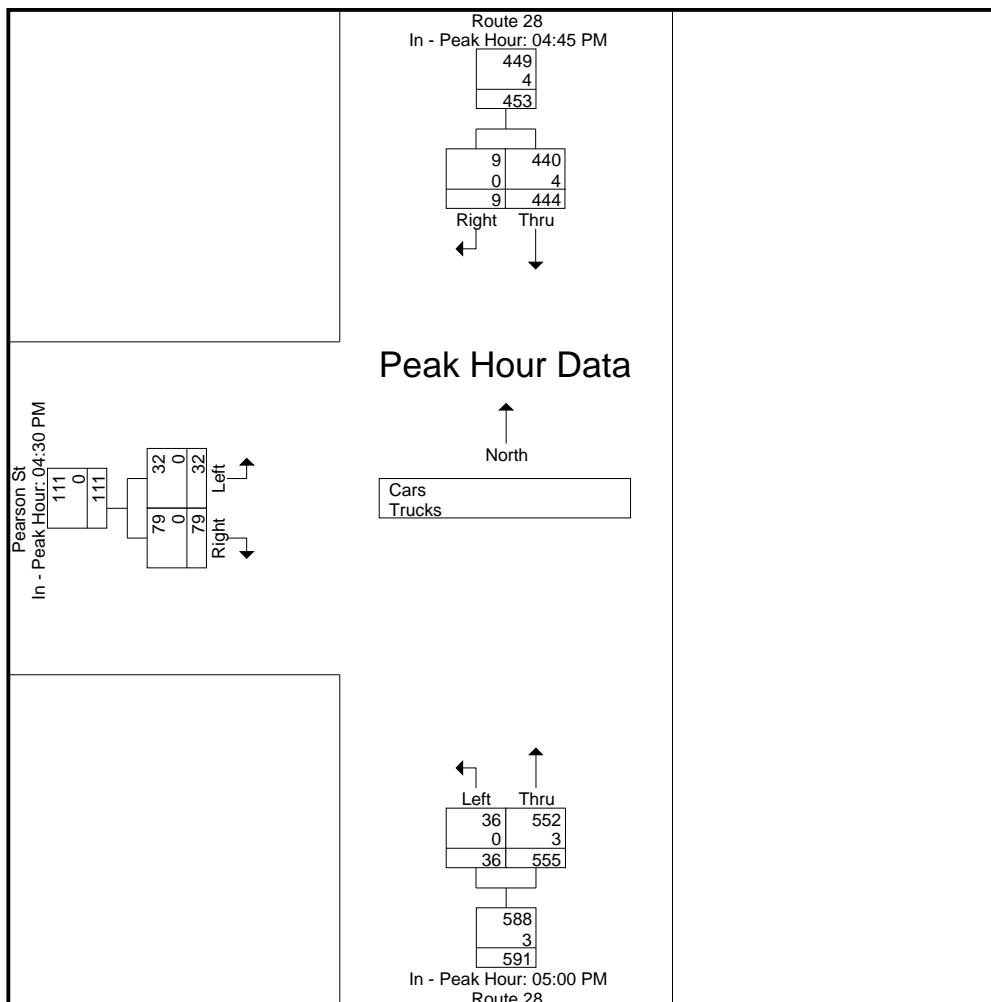
File Name : 89750003

Site Code : 89750003

Start Date : 9/20/2023

Page No : 3

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear



# Accurate Counts

978-664-2565

File Name : 89750003

Site Code : 89750003

Start Date : 9/20/2023

Page No : 4

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

### Groups Printed- Cars

Start Time	Route 28 From North		Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	Left	Thru	Left	Right	Right		
04:00 PM	117	1	12	132	14	11		287	
04:15 PM	111	2	9	138	3	17		280	
04:30 PM	89	3	10	133	5	20		260	
04:45 PM	94	3	9	134	9	17		266	
<b>Total</b>	<b>411</b>	<b>9</b>	<b>40</b>	<b>537</b>	<b>31</b>	<b>65</b>		<b>1093</b>	
05:00 PM	125	3	13	126	12	24		303	
05:15 PM	108	3	3	150	6	18		288	
05:30 PM	113	0	9	143	2	12		279	
05:45 PM	91	2	11	133	6	10		253	
<b>Total</b>	<b>437</b>	<b>8</b>	<b>36</b>	<b>552</b>	<b>26</b>	<b>64</b>		<b>1123</b>	
<b>Grand Total</b>	<b>848</b>	<b>17</b>	<b>76</b>	<b>1089</b>	<b>57</b>	<b>129</b>		<b>2216</b>	
Apprch %	98	2	6.5	93.5	30.6	69.4			
Total %	38.3	0.8	3.4	49.1	2.6	5.8			

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	94	<b>3</b>	97	9	134	143	9	17	26	266
05:00 PM	<b>125</b>	3	<b>128</b>	<b>13</b>	126	139	<b>12</b>	<b>24</b>	<b>36</b>	<b>303</b>
05:15 PM	108	3	111	3	<b>150</b>	<b>153</b>	6	18	24	288
05:30 PM	113	0	113	9	143	152	2	12	14	279
Total Volume	440	9	449	34	553	587	29	71	100	1136
% App. Total	98	2		5.8	94.2		29	71		
PHF	.880	.750	.877	.654	.922	.959	.604	.740	.694	.937

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Route 28 From North		Route 28 From South		Pearson St From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
04:00 PM	0	0	0	3	0	0	3
04:15 PM	2	0	0	3	0	1	6
04:30 PM	2	0	0	1	0	0	3
04:45 PM	2	0	0	0	0	0	2
<b>Total</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>1</b>	<b>14</b>
05:00 PM	1	0	0	1	0	0	2
05:15 PM	1	0	0	0	0	0	1
05:30 PM	0	0	0	1	0	0	1
05:45 PM	1	0	0	1	1	0	3
<b>Total</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>7</b>
<b>Grand Total</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>1</b>	<b>1</b>	<b>21</b>
Apprch %	100	0	0	100	50	50	
Total %	42.9	0	0	47.6	4.8	4.8	

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. 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	<b>3</b>	<b>3</b>	0	0	0	3
04:15 PM	<b>2</b>	0	<b>2</b>	0	<b>3</b>	<b>3</b>	0	<b>1</b>	<b>1</b>	<b>6</b>
04:30 PM	2	0	2	0	1	1	0	0	0	3
04:45 PM	2	0	2	0	0	0	0	0	0	2
<b>Total Volume</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>14</b>
% App. Total	100	0		0	100		0	100		
PHF	.750	.000	.750	.000	.583	.583	.000	.250	.250	.583

# Accurate Counts

978-664-2565

N/S Street : Route 28  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750003  
 Site Code : 89750003  
 Start Date : 9/20/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Exclu. Total	Inclu. Total	Int. Total
	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds			
04:00 PM	0	0	0	0	0	0	0	0	1	1	0	1
04:15 PM	0	0	0	0	0	1	0	0	4	5	0	5
04:30 PM	0	0	0	0	0	0	0	0	3	3	0	3
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>9</b>	<b>0</b>	<b>9</b>
05:00 PM	0	0	0	0	1	1	0	0	3	4	1	5
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	0	0	0	1	0	0	0	1	1	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>7</b>
<b>Grand Total</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>14</b>	<b>2</b>	<b>16</b>
Apprch %	100	0		0	100		0	0				
Total %	50	0		0	50		0	0		87.5	12.5	

Start Time	Route 28 From North			Route 28 From South			Pearson St From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	1	1	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	1	0	0	0	0	0	0	1
<b>Total Volume</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>% App. Total</b>	<b>100</b>	<b>0</b>		<b>0</b>	<b>100</b>		<b>0</b>	<b>0</b>		
<b>PHF</b>	<b>.250</b>	<b>.000</b>	<b>.250</b>	<b>.000</b>	<b>.250</b>	<b>.250</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.500</b>

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750004  
 Site Code : 89750004  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Site Driveway From North			Pearson St From East			Depot Pizza Parking Lot From South			Pearson St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	0	1	0	0	0	0	0	0	0	8	0	9
07:15 AM	0	0	0	0	9	0	0	0	0	0	17	0	26
07:30 AM	0	0	0	0	13	0	0	0	0	0	13	0	26
07:45 AM	0	0	0	0	12	0	0	0	0	0	15	0	27
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>34</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>53</b>	<b>0</b>	<b>88</b>
08:00 AM	0	0	1	0	6	1	0	0	0	0	15	0	23
08:15 AM	0	0	0	0	10	1	0	0	0	0	13	0	24
08:30 AM	1	0	1	0	8	0	0	0	1	0	22	0	33
08:45 AM	1	0	0	0	12	0	0	0	0	1	21	0	35
<b>Total</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>36</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>71</b>	<b>0</b>	<b>115</b>
<b>Grand Total</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>70</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>124</b>	<b>0</b>	<b>203</b>
Apprch %	40	0	60	0	97.2	2.8	0	0	100	0.8	99.2	0	
Total %	1	0	1.5	0	34.5	1	0	0	0.5	0.5	61.1	0	
Cars	2	0	3	0	69	2	0	0	1	1	120	0	198
% Cars	100	0	100	0	98.6	100	0	0	100	100	96.8	0	97.5
Trucks	0	0	0	0	1	0	0	0	0	0	4	0	5
% Trucks	0	0	0	0	1.4	0	0	0	0	0	3.2	0	2.5

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. 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	0	0	1	1	0	6	1	7	0	0	0	0	0	15	0	15	23
08:15 AM	0	0	0	0	0	10	1	11	0	0	0	0	0	13	0	13	24
08:30 AM	1	0	1	2	0	8	0	8	0	0	1	1	0	22	0	22	33
08:45 AM	1	0	0	1	0	12	0	12	0	0	0	0	1	21	0	22	35
<b>Total Volume</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>36</b>	<b>2</b>	<b>38</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>71</b>	<b>0</b>	<b>72</b>	<b>115</b>
% App. Total	50	0	50		0	94.7	5.3		0	0	100		1.4	98.6	0		
PHF	.500	.000	.500	.500	.000	.750	.500	.792	.000	.000	.250	.250	.250	.807	.000	.818	.821
Cars	2	0	2	4	0	36	2	38	0	0	1	1	1	69	0	70	113
% Cars	100	0	100	100	0	100	100	100	0	0	100	100	100	97.2	0	97.2	98.3
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	2.8	1.7

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

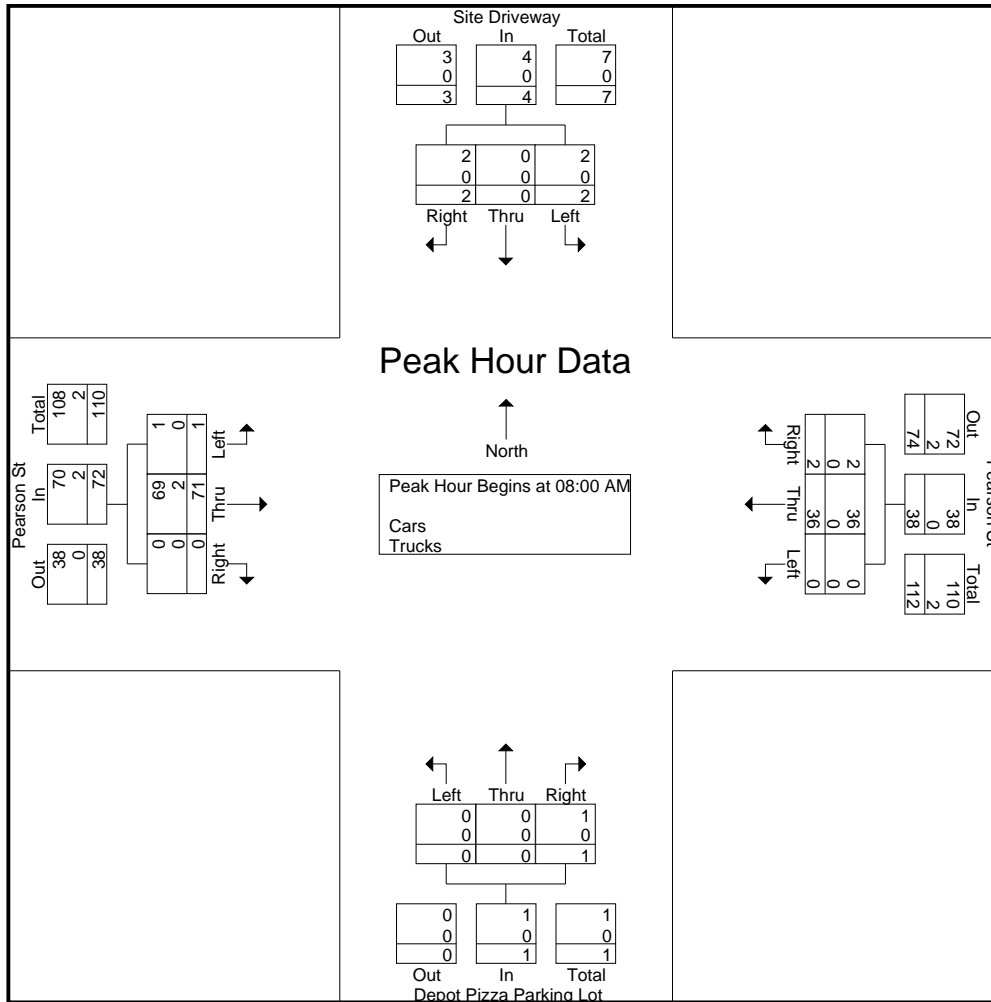
Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 2



**Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1**

**Peak Hour for Each Approach Begins at:**

	08:00 AM				07:30 AM				07:45 AM				08:00 AM			
+0 mins.	0	0	1	1	0	13	0	13	0	0	0	0	0	15	0	15
+15 mins.	0	0	0	0	0	12	0	12	0	0	0	0	0	13	0	13
+30 mins.	1	0	1	2	0	6	1	7	0	0	0	0	0	22	0	22
+45 mins.	1	0	0	1	0	10	1	11	0	0	1	1	1	21	0	22
Total Volume	2	0	2	4	0	41	2	43	0	0	1	1	1	71	0	72
% App. Total	50	0	50		0	95.3	4.7		0	0	100		1.4	98.6	0	
PHF	.500	.000	.500	.500	.000	.788	.500	.827	.000	.000	.250	.250	.250	.807	.000	.818
Cars	2	0	2	4	0	41	2	43	0	0	1	1	1	69	0	70
% Cars	100	0	100	100	0	100	100	100	0	0	100	100	100	97.2	0	97.2
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	2.8

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

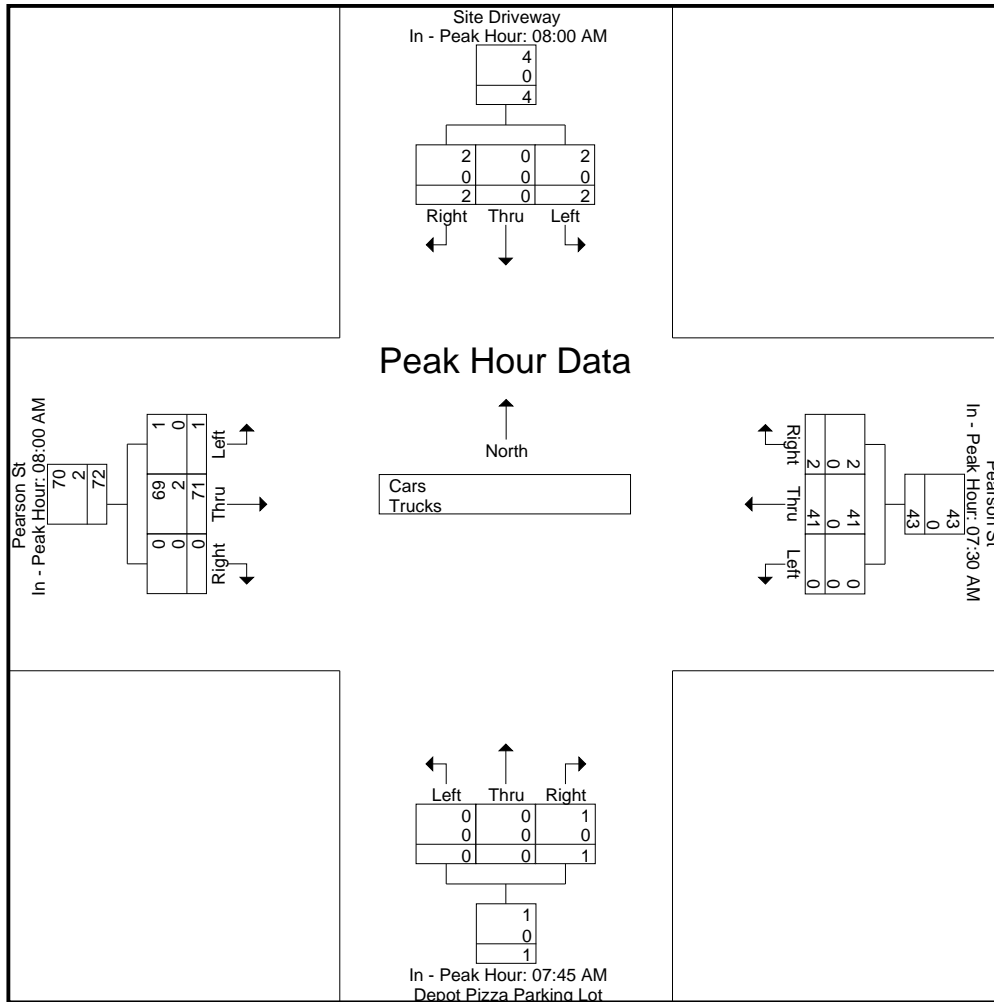
Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 3



# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 4

## Groups Printed- Cars

Start Time	Site Driveway From North			Pearson St From East			Depot Pizza Parking Lot From South			Pearson St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	0	1	0	0	0	0	0	0	0	7	0	8
07:15 AM	0	0	0	0	8	0	0	0	0	0	16	0	24
07:30 AM	0	0	0	0	13	0	0	0	0	0	13	0	26
07:45 AM	0	0	0	0	12	0	0	0	0	0	15	0	27
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>33</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>51</b>	<b>0</b>	<b>85</b>
08:00 AM	0	0	1	0	6	1	0	0	0	0	13	0	21
08:15 AM	0	0	0	0	10	1	0	0	0	0	13	0	24
08:30 AM	1	0	1	0	8	0	0	0	1	0	22	0	33
08:45 AM	1	0	0	0	12	0	0	0	0	1	21	0	35
<b>Total</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>36</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>69</b>	<b>0</b>	<b>113</b>
Grand Total	2	0	3	0	69	2	0	0	1	1	120	0	198
Apprch %	40	0	60	0	97.2	2.8	0	0	100	0.8	99.2	0	
Total %	1	0	1.5	0	34.8	1	0	0	0.5	0.5	60.6	0	

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. 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	0	0	1	1	0	6	1	7	0	0	0	0	0	13	0	13	21
08:15 AM	0	0	0	0	0	10	1	11	0	0	0	0	0	13	0	13	24
08:30 AM	1	0	1	2	0	8	0	8	0	0	1	1	0	22	0	22	33
08:45 AM	1	0	0	1	0	12	0	12	0	0	0	0	1	21	0	22	35
Total Volume	2	0	2	4	0	36	2	38	0	0	1	1	1	69	0	70	113
% App. Total	50	0	50		0	94.7	5.3		0	0	100		1.4	98.6	0		
PHF	.500	.000	.500	.500	.000	.750	.500	.792	.000	.000	.250	.250	.250	.784	.000	.795	.807

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 7

### Groups Printed- Trucks

Start Time	Site Driveway From North			Pearson St From East			Depot Pizza Parking Lot From South			Pearson St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
07:15 AM	0	0	0	0	1	0	0	0	0	0	1	0	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	1	0	0	0	0	0	2	0	3
08:00 AM	0	0	0	0	0	0	0	0	0	0	2	0	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	2	0	2
<b>Grand Total</b>	0	0	0	0	1	0	0	0	0	0	4	0	5
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	20	0	0	0	0	0	80	0	

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total	
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total		
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																		
Peak Hour for Entire Intersection Begins at 07:15 AM																		
07:15 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2
<b>Total Volume</b>	0	0	0	0	0	1	0	1	0	0	0	0	0	0	3	0	3	4
<b>% App. Total</b>	0	0	0	0	0	100	0	0	0	0	0	0	0	0	100	0	0	0
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.375	.000	.375	.500

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 10

## Groups Printed- Bikes Peds

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
07:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	4	0	4
07:15 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2
07:30 AM	0	0	0	5	0	1	0	1	0	0	0	0	0	0	0	2	8	1	9
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
<b>Total</b>	0	0	0	7	0	1	0	1	0	0	0	0	0	0	0	7	15	1	16
08:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
08:15 AM	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	1	8	0	8
08:30 AM	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	6	0	6
<b>Total</b>	0	0	0	14	0	0	0	0	0	0	0	1	0	0	0	6	21	0	21
<b>Grand Total</b>	0	0	0	21	0	1	0	1	0	0	0	1	0	0	0	13	36	1	37
Apprch %	0	0	0		0	100	0		0	0	0		0	0	0				
Total %	0	0	0		0	100	0		0	0	0		0	0	0		97.3	2.7	

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Volume</b>	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
<b>% App. Total</b>	0	0	0		0	100	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.250

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot  
 E/W Street : Pearson Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750004  
 Site Code : 89750004  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Site Driveway From North			Pearson St From East			Depot Pizza Parking Lot From South			Pearson St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	0	0	0	18	0	0	0	0	0	13	0	31
04:15 PM	0	0	0	0	10	0	0	0	0	0	12	0	22
04:30 PM	0	0	0	1	9	0	0	0	0	0	9	0	19
04:45 PM	0	0	1	0	14	0	0	0	1	1	8	0	25
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>51</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>42</b>	<b>0</b>	<b>97</b>
05:00 PM	1	0	1	0	23	0	0	0	0	0	16	0	41
05:15 PM	0	0	0	0	7	0	0	0	0	1	13	0	21
05:30 PM	0	0	0	0	11	0	0	0	0	0	8	0	19
05:45 PM	0	0	0	0	14	0	0	0	0	0	15	0	29
<b>Total</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>52</b>	<b>0</b>	<b>110</b>
<b>Grand Total</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>106</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>94</b>	<b>0</b>	<b>207</b>
Apprch %	33.3	0	66.7	0.9	99.1	0	0	0	100	2.1	97.9	0	
Total %	0.5	0	1	0.5	51.2	0	0	0	0.5	1	45.4	0	
Cars	1	0	2	1	105	0	0	0	1	2	92	0	204
% Cars	100	0	100	100	99.1	0	0	0	100	100	97.9	0	98.6
Trucks	0	0	0	0	1	0	0	0	0	0	2	0	3
% Trucks	0	0	0	0	0.9	0	0	0	0	0	2.1	0	1.4

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	1	0	1	2	0	23	0	23	0	0	0	0	0	16	0	16	41
05:15 PM	0	0	0	0	0	7	0	7	0	0	0	0	0	1	13	14	21
05:30 PM	0	0	0	0	0	11	0	11	0	0	0	0	0	0	8	8	19
05:45 PM	0	0	0	0	0	14	0	14	0	0	0	0	0	0	15	15	29
<b>Total Volume</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>55</b>	<b>0</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>52</b>	<b>0</b>	<b>53</b>	<b>110</b>
% App. Total	50	0	50		0	100	0		0	0	0		1.9	98.1	0		
PHF	.250	.000	.250	.250	.000	.598	.000	.598	.000	.000	.000	.000	.250	.813	.000	.828	.671
Cars	1	0	1	2	0	55	0	55	0	0	0	0	1	51	0	52	109
% Cars	100	0	100	100	0	100	0	100	0	0	0	0	100	98.1	0	98.1	99.1
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1.9	0	1.9	0.9

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

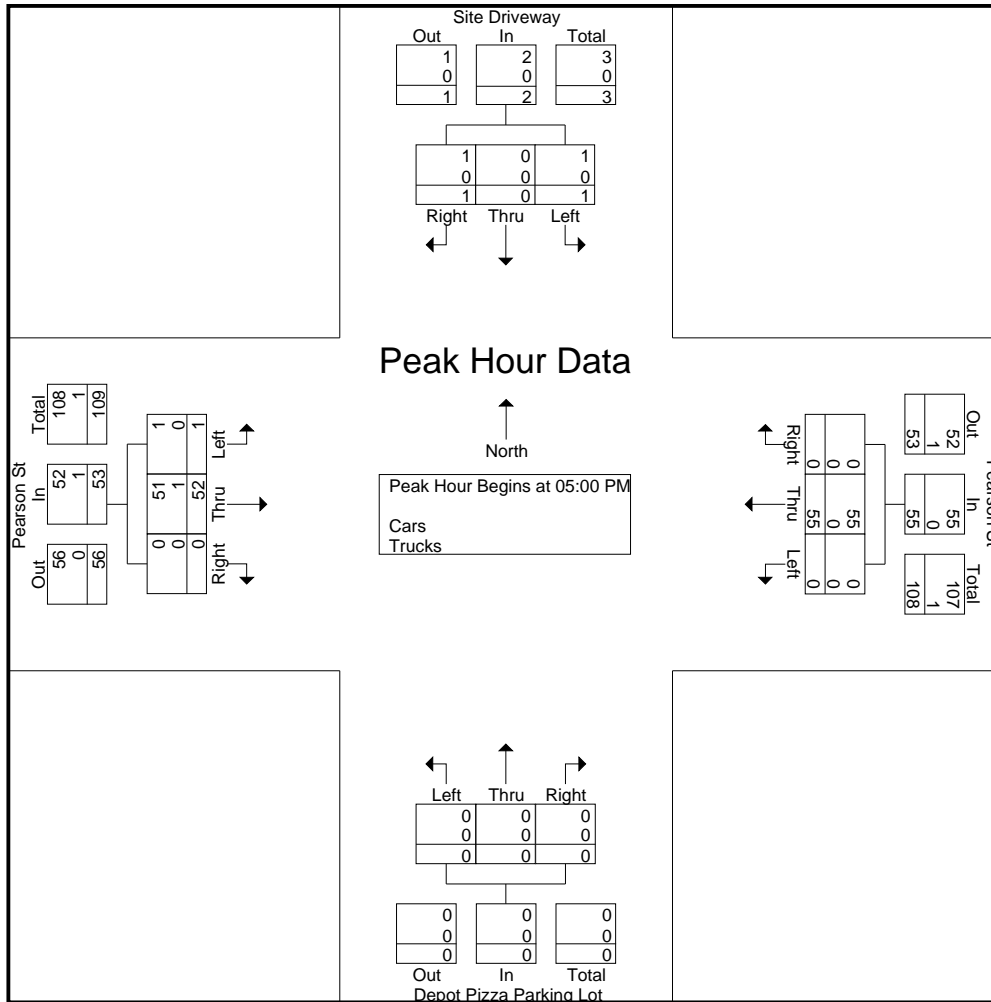
Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 2



**Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1**

**Peak Hour for Each Approach Begins at:**

	04:15 PM				04:00 PM				05:00 PM							
+0 mins.	0	0	0	0	0	10	0	10	0	0	0	0	0	<b>16</b>	0	<b>16</b>
+15 mins.	0	0	0	0	1	9	0	10	0	0	0	0	1	13	0	14
+30 mins.	0	0	1	1	0	14	0	14	0	0	0	0	0	8	0	8
+45 mins.	1	0	1	2	0	<b>23</b>	0	<b>23</b>	0	0	1	1	0	15	0	15
Total Volume	1	0	2	3	1	56	0	57	0	0	1	1	1	52	0	53
% App. Total	33.3	0	66.7		1.8	98.2	0		0	0	100		1.9	98.1	0	
PHF	.250	.000	.500	.375	.250	.609	.000	.620	.000	.000	.250	.250	.250	.813	.000	.828
Cars	1	0	2	3	1	55	0	56	0	0	1	1	1	51	0	52
% Cars	100	0	100	100	100	98.2	0	98.2	0	0	100	100	100	98.1	0	98.1
Trucks	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1
% Trucks	0	0	0	0	0	1.8	0	1.8	0	0	0	0	0	1.9	0	1.9

# Accurate Counts

978-664-2565

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

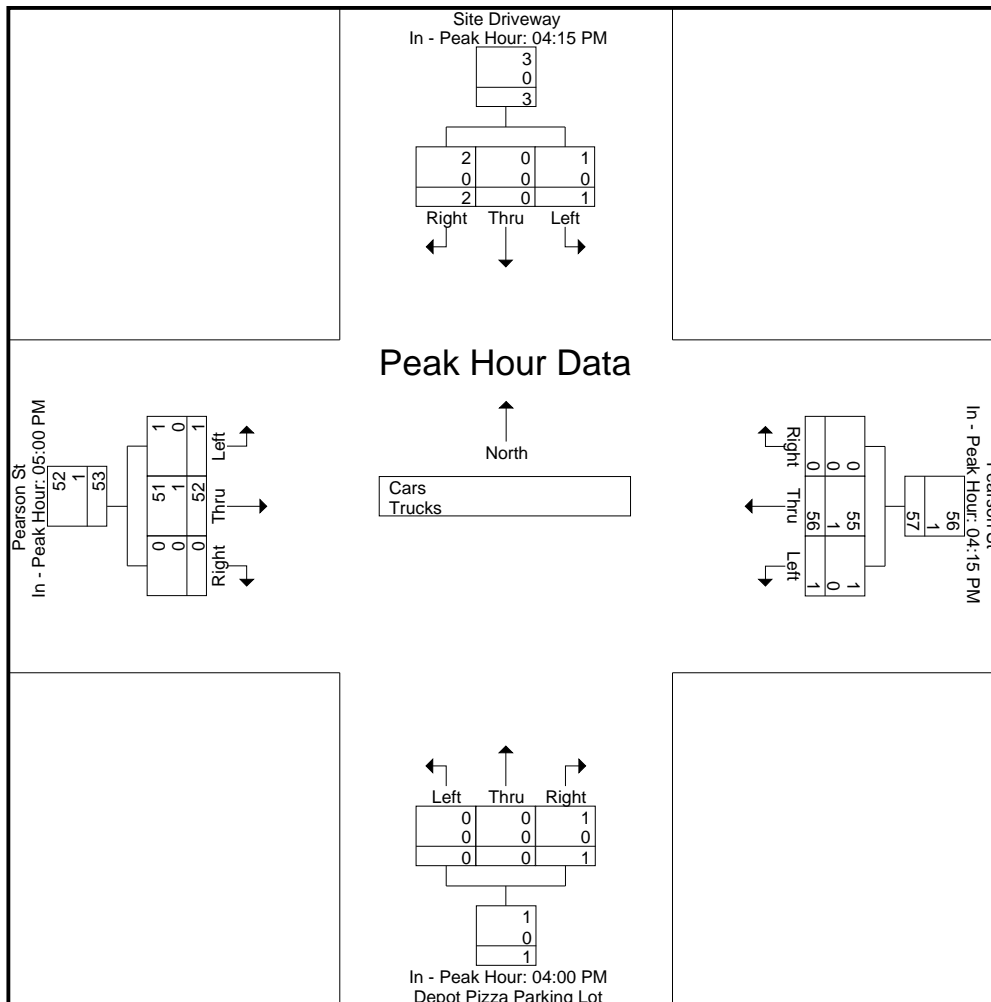
Page No : 3

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 4

## Groups Printed- Cars

Start Time	Site Driveway From North			Pearson St From East			Depot Pizza Parking Lot From South			Pearson St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	0	0	0	18	0	0	0	0	0	13	0	31
04:15 PM	0	0	0	0	10	0	0	0	0	0	11	0	21
04:30 PM	0	0	0	1	9	0	0	0	0	0	9	0	19
04:45 PM	0	0	1	0	13	0	0	0	1	1	8	0	24
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>41</b>	<b>0</b>	<b>95</b>
05:00 PM	1	0	1	0	23	0	0	0	0	0	16	0	41
05:15 PM	0	0	0	0	7	0	0	0	0	1	13	0	21
05:30 PM	0	0	0	0	11	0	0	0	0	0	8	0	19
05:45 PM	0	0	0	0	14	0	0	0	0	0	14	0	28
<b>Total</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>51</b>	<b>0</b>	<b>109</b>
<b>Grand Total</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>105</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>92</b>	<b>0</b>	<b>204</b>
Apprch %	33.3	0	66.7	0.9	99.1	0	0	0	100	2.1	97.9	0	
Total %	0.5	0	1	0.5	51.5	0	0	0	0.5	1	45.1	0	

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	1	0	1	2	0	23	0	23	0	0	0	0	0	16	0	16	41
05:15 PM	0	0	0	0	0	7	0	7	0	0	0	0	0	1	13	14	21
05:30 PM	0	0	0	0	0	11	0	11	0	0	0	0	0	0	8	8	19
05:45 PM	0	0	0	0	0	14	0	14	0	0	0	0	0	0	14	14	28
<b>Total Volume</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>55</b>	<b>0</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>51</b>	<b>0</b>	<b>52</b>	<b>109</b>
% App. Total	50	0	50		0	100	0		0	0	0		1.9	98.1	0		
PHF	.250	.000	.250	.250	.000	.598	.000	.598	.000	.000	.000	.000	.250	.797	.000	.813	.665

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 7

## Groups Printed- Trucks

Start Time	Site Driveway From North			Pearson St From East			Depot Pizza Parking Lot From South			Pearson St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>2</b>
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	1	0	1
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Grand Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>3</b>
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	33.3	0	0	0	0	0	66.7	0	

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. 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	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
04:30 PM	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	1	0	1	0	0	0	0	0	0	0	0	1
<b>Total Volume</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>% App. Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.250	.000	.250	.500

# Accurate Counts

978-664-2565

N/S Street : Site Driveway / Depot Pizza Parking Lot

E/W Street : Pearson Street

City/State : Andover, MA

Weather : Clear

File Name : 89750004

Site Code : 89750004

Start Date : 9/20/2023

Page No : 10

## Groups Printed- Bikes Peds

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	6	0	6
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	2
04:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	4	0	4
04:45 PM	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	2	7	0	7
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>19</b>	<b>0</b>	<b>19</b>
05:00 PM	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	1	6	0	6
05:15 PM	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	1	0	1	0	0	0	0	0	2	0	0	0	0	3	1	4
05:45 PM	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	4	0	4
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>13</b>	<b>1</b>	<b>14</b>
<b>Grand Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>32</b>	<b>1</b>	<b>33</b>
Apprch %	0	0	0		0	100	0		0	0	0		0	0	0				
Total %	0	0	0		0	100	0		0	0	0		0	0	0		97	3	

Start Time	Site Driveway From North				Pearson St From East				Depot Pizza Parking Lot From South				Pearson St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	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	0	0	0	0
05:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
<b>Total Volume</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>% App. Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.250

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 1

## Groups Printed- Cars - Trucks

Start Time	Railroad St From North				Pearson St From Northeast				Essex St From East				Dundee Park Dr From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	
07:00 AM	1	12	1	7	1	0	0	0	0	17	8	0	1	1	1	0	5	6	45	3	109
07:15 AM	1	12	1	5	0	1	4	2	1	16	13	0	0	1	0	1	9	14	48	2	131
07:30 AM	4	14	1	19	0	0	6	7	2	43	11	1	1	1	0	2	14	8	36	4	174
07:45 AM	3	17	9	11	0	0	12	0	2	110	13	1	0	0	0	0	14	8	40	0	240
<b>Total</b>	<b>9</b>	<b>55</b>	<b>12</b>	<b>42</b>	<b>1</b>	<b>1</b>	<b>22</b>	<b>9</b>	<b>5</b>	<b>186</b>	<b>45</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>42</b>	<b>36</b>	<b>169</b>	<b>9</b>	<b>654</b>
08:00 AM	3	23	5	17	0	0	3	4	7	42	15	1	1	0	0	2	20	11	76	3	233
08:15 AM	5	26	6	13	0	0	5	4	4	37	14	0	0	3	0	1	13	7	64	2	204
08:30 AM	1	23	5	19	0	0	5	2	9	54	24	5	1	4	0	1	7	15	43	5	223
08:45 AM	5	12	5	7	0	0	7	5	11	40	31	1	0	1	0	2	12	15	53	7	214
<b>Total</b>	<b>14</b>	<b>84</b>	<b>21</b>	<b>56</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>15</b>	<b>31</b>	<b>173</b>	<b>84</b>	<b>7</b>	<b>2</b>	<b>8</b>	<b>0</b>	<b>6</b>	<b>52</b>	<b>48</b>	<b>236</b>	<b>17</b>	<b>874</b>
<b>Grand Total</b>	<b>23</b>	<b>139</b>	<b>33</b>	<b>98</b>	<b>1</b>	<b>1</b>	<b>42</b>	<b>24</b>	<b>36</b>	<b>359</b>	<b>129</b>	<b>9</b>	<b>4</b>	<b>11</b>	<b>1</b>	<b>9</b>	<b>94</b>	<b>84</b>	<b>405</b>	<b>26</b>	<b>1528</b>
Apprch %	7.8	47.4	11.3	33.4	1.5	1.5	61.8	35.3	6.8	67.4	24.2	1.7	16	44	4	36	15.4	13.8	66.5	4.3	
Total %	1.5	9.1	2.2	6.4	0.1	0.1	2.7	1.6	2.4	23.5	8.4	0.6	0.3	0.7	0.1	0.6	6.2	5.5	26.5	1.7	
Cars	23	138	33	97	1	1	42	24	36	350	122	9	4	11	1	9	94	83	398	26	1502
% Cars	100	99.3	100	99	100	100	100	100	100	97.5	94.6	100	100	100	100	100	100	98.8	98.3	100	98.3
Trucks	0	1	0	1	0	0	0	0	0	9	7	0	0	0	0	0	0	1	7	0	26
% Trucks	0	0.7	0	1	0	0	0	0	0	2.5	5.4	0	0	0	0	0	0	1.2	1.7	0	1.7

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. 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	3	17	9	11	40	0	0	12	0	12	2	110	13	1	126	0	0	0	0	0	14	8	40	0	62	240
08:00 AM	3	23	5	17	48	0	0	3	4	7	7	42	15	1	65	1	0	0	2	3	20	11	76	3	110	233
08:15 AM	5	26	6	13	50	0	0	5	4	9	4	37	14	0	55	0	3	0	1	4	13	7	64	2	86	204
08:30 AM	1	23	5	19	48	0	0	5	2	7	9	54	24	5	92	1	4	0	1	6	7	15	43	5	70	223
Total Volume	12	89	25	60	186	0	0	25	10	35	22	243	66	7	338	2	7	0	4	13	54	41	223	10	328	900
% App. Total	6.5	47.8	13.4	32.3	0	0	71.4	28.6		.611	.552	.688	.350	.671	.500	.438	.000	.500	.542	.675	.683	.734	.500	.745	.938	
PHF	.600	.856	.694	.789	.930	.000	.000	.521	.625	.729	.611	.552	.688	.350	.671	.500	.438	.000	.500	.542	.675	.683	.734	.500	.745	.938
Cars	12	89	25	59	185	0	0	25	10	35	22	239	62	7	330	2	7	0	4	13	54	40	221	10	325	888
% Cars	100	100	100	98.3	99.5	0	0	100	100	100	100	98.4	93.9	100	97.6	100	100	0	100	100	100	97.6	99.1	100	99.1	98.7
Trucks	0	0	0	1	1	0	0	0	0	0	0	4	4	0	8	0	0	0	0	0	0	1	2	0	3	12
% Trucks	0	0	0	1.7	0.5	0	0	0	0	0	0	1.6	6.1	0	2.4	0	0	0	0	0	0	2.4	0.9	0	0.9	1.3

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

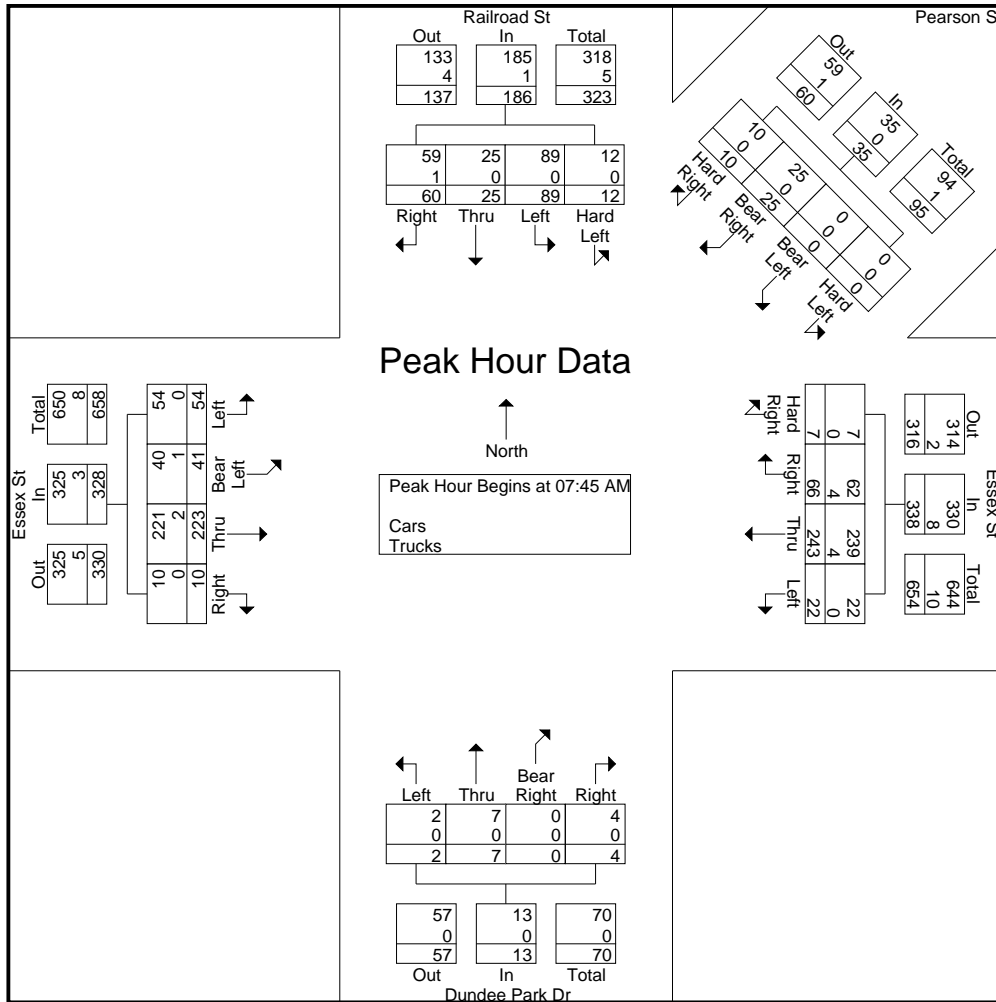
Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 2



**Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1**

**Peak Hour for Each Approach Begins at:**

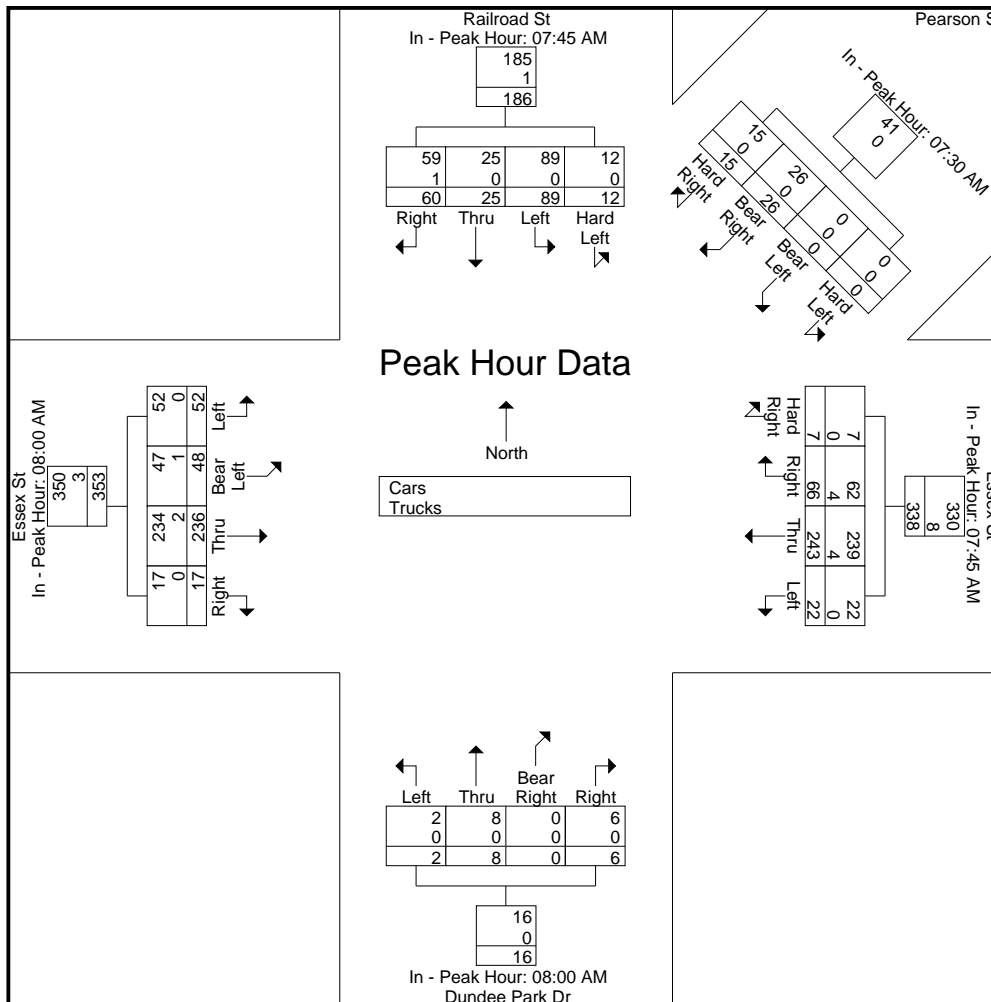
	07:45 AM					07:30 AM					07:45 AM					08:00 AM					08:00 AM				
+0 mins.	3	17	9	11	40	0	0	6	7	13	2	110	13	1	126	1	0	0	2	3	20	11	76	3	110
+15 mins.	3	23	5	17	48	0	0	12	0	12	7	42	15	1	65	0	3	0	1	4	13	7	64	2	86
+30 mins.	5	26	6	13	50	0	0	3	4	7	4	37	14	0	55	1	4	0	1	6	7	15	43	5	70
+45 mins.	1	23	5	19	48	0	0	5	4	9	9	54	24	5	92	0	1	0	2	3	12	15	53	7	87
Total Volume	12	89	25	60	186	0	0	26	15	41	22	243	66	7	338	2	8	0	6	16	52	48	236	17	353
% App. Total	6.5	47.8	13.4	32.3		0	0	63.4	36.6		6.5	71.9	19.5	2.1		12.5	50	0	37.5		14.7	13.6	66.9	4.8	
PHF	.600	.856	.694	.789	.930	.000	.000	.542	.536	.788	.611	.552	.688	.350	.671	.500	.500	.000	.750	.667	.650	.800	.776	.607	.802
Cars	12	89	25	59	185	0	0	26	15	41	22	239	62	7	330	2	8	0	6	16	52	47	234	17	350
% Cars	10	10	10	98.	99.5	0	0	10	10	100	10	98.	93.	10	97.6	10	10	0	10	100	10	97.	99.	10	99.2
Trucks	0	0	0	1	1	0	0	0	0	0	0	4	4	0	8	0	0	0	0	0	0	1	2	0	3
% Trucks	0	0	0	1.7	0.5	0	0	0	0	0	0	1.6	6.1	0	2.4	0	0	0	0	0	0	2.1	0.8	0	0.8

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750005  
 Site Code : 89750005  
 Start Date : 9/20/2023  
 Page No : 3



# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750005  
 Site Code : 89750005  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Railroad St From North				Pearson St From Northeast				Essex St From East				Dundee Park Dr From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	
07:00 AM	1	11	1	7	1	0	0	0	0	16	7	0	1	1	1	0	5	6	44	3	105
07:15 AM	1	12	1	5	0	1	4	2	1	14	12	0	0	1	0	1	9	14	45	2	125
07:30 AM	4	14	1	19	0	0	6	7	2	41	11	1	1	1	0	2	14	8	35	4	171
07:45 AM	3	17	9	11	0	0	12	0	2	107	13	1	0	0	0	0	14	8	40	0	237
<b>Total</b>	9	54	12	42	1	1	22	9	5	178	43	2	2	3	1	3	42	36	164	9	638
08:00 AM	3	23	5	17	0	0	3	4	7	41	14	1	1	0	0	2	20	10	75	3	229
08:15 AM	5	26	6	13	0	0	5	4	4	37	12	0	0	3	0	1	13	7	64	2	202
08:30 AM	1	23	5	18	0	0	5	2	9	54	23	5	1	4	0	1	7	15	42	5	220
08:45 AM	5	12	5	7	0	0	7	5	11	40	30	1	0	1	0	2	12	15	53	7	213
<b>Total</b>	14	84	21	55	0	0	20	15	31	172	79	7	2	8	0	6	52	47	234	17	864
<b>Grand Total</b>	23	138	33	97	1	1	42	24	36	350	122	9	4	11	1	9	94	83	398	26	1502
Apprch %	7.9	47.4	11.3	33.3	1.5	1.5	61.8	35.3	7	67.7	23.6	1.7	16	44	4	36	15.6	13.8	66.2	4.3	
Total %	1.5	9.2	2.2	6.5	0.1	0.1	2.8	1.6	2.4	23.3	8.1	0.6	0.3	0.7	0.1	0.6	6.3	5.5	26.5	1.7	

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. 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	3	17	9	11	40	0	0	12	0	12	2	107	13	1	123	0	0	0	0	0	14	8	40	0	62	237
08:00 AM	3	23	5	17	48	0	0	3	4	7	7	41	14	1	63	1	0	0	2	3	20	10	75	3	108	229
08:15 AM	5	26	6	13	50	0	0	5	4	9	4	37	12	0	53	0	3	0	1	4	13	7	64	2	86	202
08:30 AM	1	23	5	18	47	0	0	5	2	7	9	54	23	5	91	1	4	0	1	6	7	15	42	5	69	220
Total Volume	12	89	25	59	185	0	0	25	10	35	22	239	62	7	330	2	7	0	4	13	54	40	221	10	325	888
% App. Total	6.5	48.1	13.5	31.9	0	0	71.4	28.6	6.7	72.4	18.8	2.1	15.4	53.8	0	30.8	16.6	12.3	68	3.1						
PHF	.600	.856	.694	.819	.925	.000	.000	.521	.625	.729	.611	.558	.674	.350	.671	.500	.438	.000	.500	.542	.675	.667	.737	.500	.752	.937

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 7

## Groups Printed- Trucks

Start Time	Railroad St From North				Pearson St From Northeast				Essex St From East				Dundee Park Dr From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	
07:00 AM	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	4
07:15 AM	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3	0	6
07:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	3
07:45 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
<b>Total</b>	0	1	0	0	0	0	0	0	0	8	2	0	0	0	0	0	0	0	5	0	16
08:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	4
08:15 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
08:30 AM	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	3
08:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
<b>Total</b>	0	0	0	1	0	0	0	0	0	1	5	0	0	0	0	0	0	1	2	0	10
<b>Grand Total</b>	0	1	0	1	0	0	0	0	0	9	7	0	0	0	0	0	0	1	7	0	26
Apprch %	0	50	0	50	0	0	0	0	0	56.2	43.8	0	0	0	0	0	0	12.5	87.5	0	
Total %	0	3.8	0	3.8	0	0	0	0	0	34.6	26.9	0	0	0	0	0	0	3.8	26.9	0	

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 07:00 AM																										
07:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	1	0	1	4
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0	0	3	0	3	6
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	1	0	1	3
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Total Volume	0	1	0	0	1	0	0	0	0	0	0	8	2	0	10	0	0	0	0	0	0	0	5	0	5	16
% App. Total	0	100	0	0		0	0	0	0		0	80	20	0		0	0	0	0		0	0	100	0		
PHF	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.667	.500	.000	.833	.000	.000	.000	.000	.000	.000	.000	.417	.000	.417	.667

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 10

## Groups Printed- Bikes Peds

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Exclu. Total	Inclu. Total	Int. Total
	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
07:15 AM	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
07:30 AM	0	0	0	0	5	0	0	0	1	8	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	14	3	17
07:45 AM	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
<b>Total</b>	0	0	0	0	8	0	0	0	1	10	0	1	3	0	1	0	0	0	0	0	0	0	0	0	0	19	5	24
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
08:15 AM	0	0	1	0	6	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	9	1	10
08:30 AM	0	0	0	0	3	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6	0	6
08:45 AM	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	4
<b>Total</b>	0	0	1	0	10	0	0	0	0	6	0	0	0	0	2	0	0	0	0	0	0	0	1	0	1	19	2	21
Grand Total	0	0	1	0	18	0	0	0	1	16	0	1	3	0	3	0	0	0	0	0	0	0	1	0	1	38	7	45
Apprch %	0	0	100	0		0	0	0	100		0	25	75	0		0	0	0	0		0	0	100	0				
Total %	0	0	14.3	0		0	0	0	14.3		0	14.3	42.9	0		0	0	0	0		0	0	14.3	0		84.4	15.6	

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total					
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total						
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 07:15 AM																															
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	1	1	0	1	3	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6
% App. Total	0	0	0	0		0	0	0	100			0	25	75	0		0	0	0	0		0	0	100	0						
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.250	.375	.000	.500	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.000	.250	.500			

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 1

## Groups Printed- Cars - Trucks

Start Time	Railroad St From North				Pearson St From Northeast				Essex St From East				Dundee Park Dr From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	
04:00 PM	2	13	4	17	1	2	8	3	4	59	44	1	7	8	0	5	14	8	34	4	238
04:15 PM	4	15	2	16	0	0	8	2	3	66	28	1	6	8	0	2	15	6	42	8	232
04:30 PM	2	13	3	18	0	1	4	2	2	69	22	0	8	6	0	7	9	6	59	4	235
04:45 PM	0	16	7	15	0	0	11	3	7	58	29	3	9	10	0	6	13	5	66	20	278
<b>Total</b>	<b>8</b>	<b>57</b>	<b>16</b>	<b>66</b>	<b>1</b>	<b>3</b>	<b>31</b>	<b>10</b>	<b>16</b>	<b>252</b>	<b>123</b>	<b>5</b>	<b>30</b>	<b>32</b>	<b>0</b>	<b>20</b>	<b>51</b>	<b>25</b>	<b>201</b>	<b>36</b>	<b>983</b>
05:00 PM	3	14	4	23	0	0	16	6	0	72	32	0	13	10	3	15	20	8	34	6	279
05:15 PM	1	25	8	24	0	1	5	1	4	64	30	2	7	6	1	4	16	10	49	6	264
05:30 PM	3	13	3	18	1	1	6	1	2	64	31	1	9	7	1	10	12	2	45	4	234
05:45 PM	6	20	3	14	0	1	10	3	8	67	26	1	10	1	2	13	16	6	56	14	277
<b>Total</b>	<b>13</b>	<b>72</b>	<b>18</b>	<b>79</b>	<b>1</b>	<b>3</b>	<b>37</b>	<b>11</b>	<b>14</b>	<b>267</b>	<b>119</b>	<b>4</b>	<b>39</b>	<b>24</b>	<b>7</b>	<b>42</b>	<b>64</b>	<b>26</b>	<b>184</b>	<b>30</b>	<b>1054</b>
<b>Grand Total</b>	<b>21</b>	<b>129</b>	<b>34</b>	<b>145</b>	<b>2</b>	<b>6</b>	<b>68</b>	<b>21</b>	<b>30</b>	<b>519</b>	<b>242</b>	<b>9</b>	<b>69</b>	<b>56</b>	<b>7</b>	<b>62</b>	<b>115</b>	<b>51</b>	<b>385</b>	<b>66</b>	<b>2037</b>
Apprch %	6.4	39.2	10.3	44.1	2.1	6.2	70.1	21.6	3.8	64.9	30.2	1.1	35.6	28.9	3.6	32	18.6	8.3	62.4	10.7	
Total %	1	6.3	1.7	7.1	0.1	0.3	3.3	1	1.5	25.5	11.9	0.4	3.4	2.7	0.3	3	5.6	2.5	18.9	3.2	
Cars	20	126	34	144	2	6	68	21	30	515	236	9	69	56	7	62	114	50	380	66	2015
% Cars	95.2	97.7	100	99.3	100	100	100	100	100	99.2	97.5	100	100	100	100	100	99.1	98	98.7	100	98.9
Trucks	1	3	0	1	0	0	0	0	0	4	6	0	0	0	0	0	1	1	5	0	22
% Trucks	4.8	2.3	0	0.7	0	0	0	0	0	0.8	2.5	0	0	0	0	0	0.9	2	1.3	0	1.1

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. 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	2	13	3	18	36	0	1	4	2	7	2	69	22	0	93	8	6	0	7	21	9	6	59	4	78	235
04:45 PM	0	16	7	15	38	0	0	11	3	14	7	58	29	3	97	9	10	0	6	25	13	5	66	20	104	278
05:00 PM	3	14	4	23	44	0	0	16	6	22	0	72	32	0	104	13	10	3	15	41	20	8	34	6	68	279
05:15 PM	1	25	8	24	58	0	1	5	1	7	4	64	30	2	100	7	6	1	4	18	16	10	49	6	81	264
Total Volume	6	68	22	80	176	0	2	36	12	50	13	263	113	5	394	37	32	4	32	105	58	29	208	36	331	1056
% App. Total	3.4	38.6	12.5	45.5	0	4	72	24	3.3	66.8	28.7	1.3	35.2	30.5	3.8	30.5	17.5	8.8	62.8	10.9						
PHF	.500	.680	.688	.833	.759	.000	.500	.563	.500	.568	.464	.913	.883	.417	.947	.712	.800	.333	.533	.640	.725	.725	.788	.450	.796	.946
Cars	6	66	22	80	174	0	2	36	12	50	13	263	110	5	391	37	32	4	32	105	58	29	206	36	329	1049
% Cars	100	97.1	100	100	98.9	0	100	100	100	100	100	100	97.3	100	99.2	100	100	100	100	100	100	100	99.0	100	99.4	99.3
Trucks	0	2	0	0	2	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	2	0	2	7
% Trucks	0	2.9	0	0	1.1	0	0	0	0	0	0	0	2.7	0	0.8	0	0	0	0	0	0	0	1.0	0	0.6	0.7

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

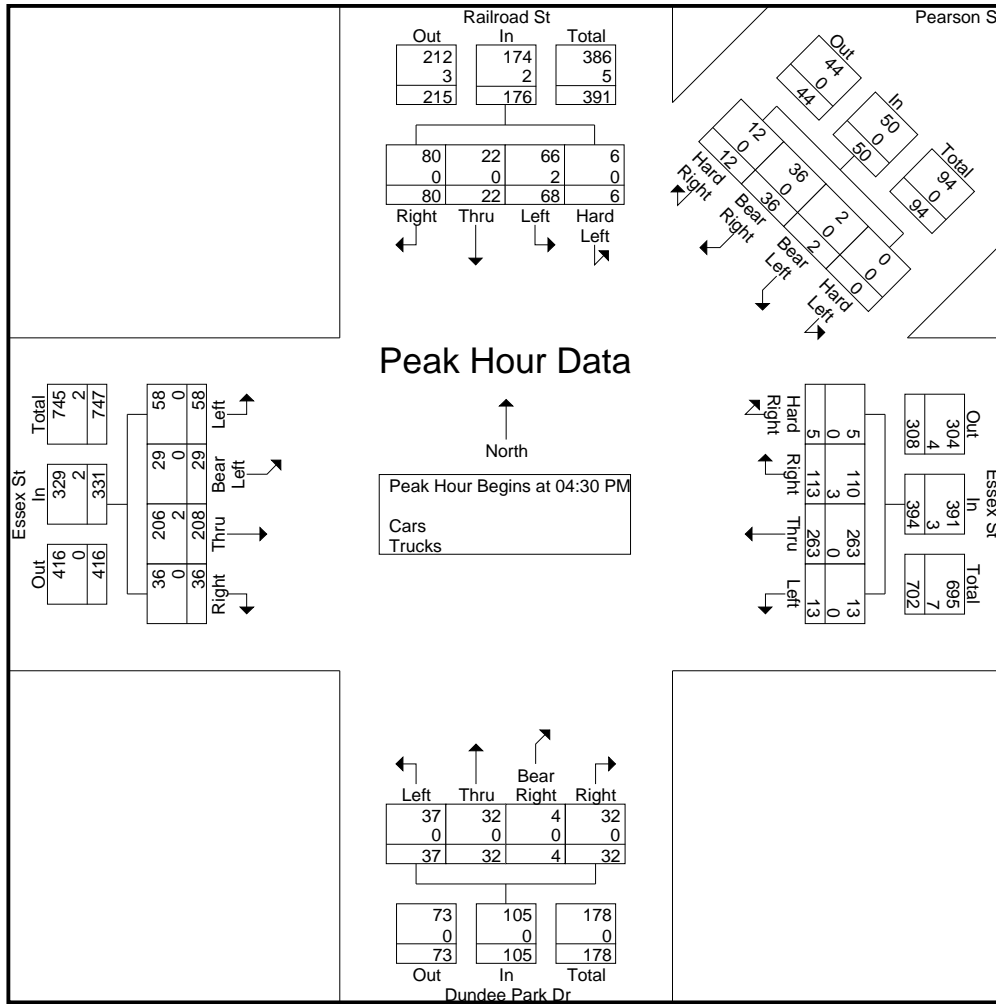
Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 2



**Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1**

Peak Hour for Each Approach Begins at:

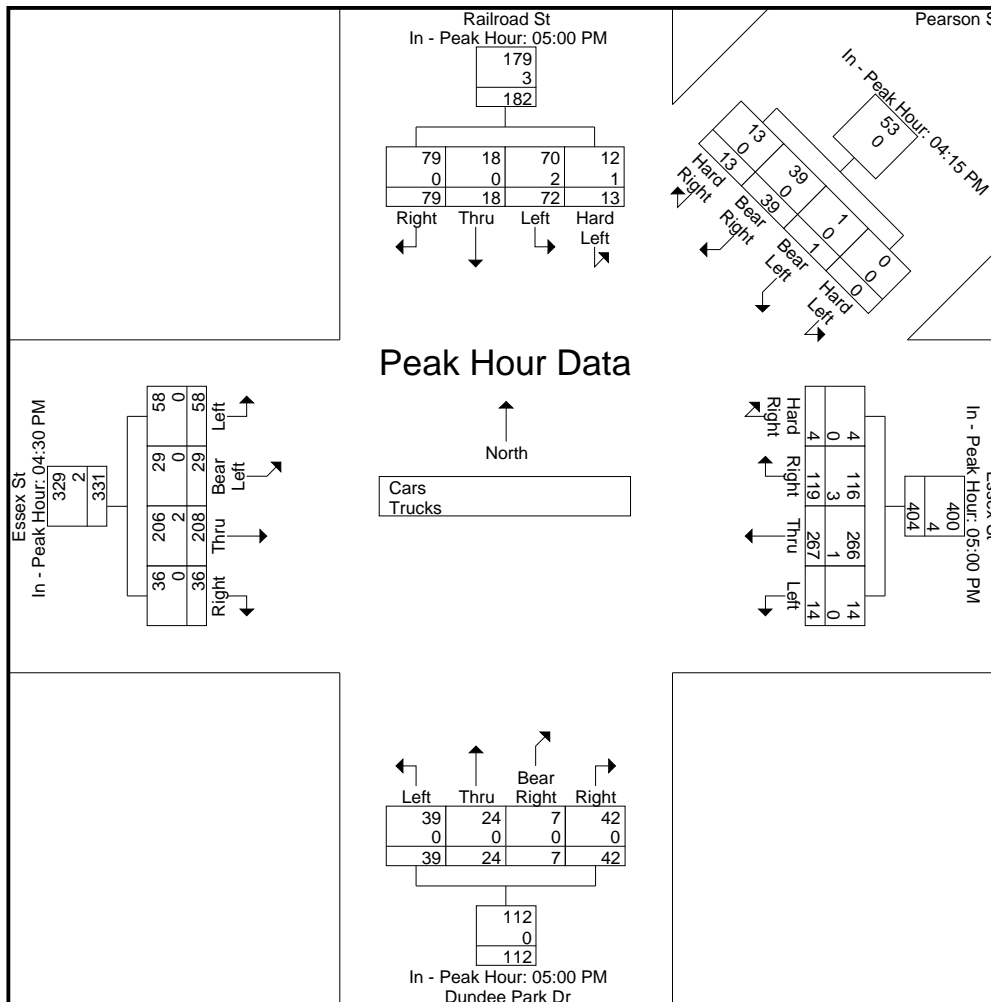
	05:00 PM					04:15 PM					05:00 PM					04:30 PM									
+0 mins.	3	14	4	23	44	0	0	8	2	10	0	<b>72</b>	<b>32</b>	0	<b>104</b>	<b>13</b>	<b>10</b>	<b>3</b>	<b>15</b>	<b>41</b>	9	6	59	4	78
+15 mins.	1	<b>25</b>	<b>8</b>	<b>24</b>	<b>58</b>	0	<b>1</b>	4	2	7	4	64	30	<b>2</b>	100	7	6	1	4	18	13	5	<b>66</b>	<b>20</b>	<b>104</b>
+30 mins.	3	13	3	18	37	0	0	11	3	14	2	64	31	1	98	9	7	1	10	27	<b>20</b>	8	34	6	68
+45 mins.	<b>6</b>	20	3	14	43	0	0	<b>16</b>	<b>6</b>	<b>22</b>	<b>8</b>	67	26	1	102	10	1	2	13	26	16	<b>10</b>	49	6	81
Total Volume	13	72	18	79	182	0	1	39	13	53	14	267	119	4	404	39	24	7	42	112	58	29	208	36	331
% App. Total	7.1	39.6	9.9	43.4	0	1.9	73.6	24.5	3.5	66.1	29.5	1	34.8	21.4	6.2	37.5	17.5	8.8	62.8	10.9					
PHF	.542	.720	.563	.823	.784	.000	.250	.609	.542	.602	.438	.927	.930	.500	.971	.750	.600	.583	.700	.683	.725	.725	.788	.450	.796
Cars	12	70	18	79	179	0	1	39	13	53	14	266	116	4	400	39	24	7	42	112	58	29	206	36	329
% Cars	92.	97.	10	10	98.4	0	10	10	10	100	10	99.	97.	10	99	10	10	10	10	100	10	10	99	10	99.4
Trucks	1	2	0	0	3	0	0	0	0	0	0	1	3	0	4	0	0	0	0	0	0	0	2	0	2
% Trucks	7.7	2.8	0	0	1.6	0	0	0	0	0	0	0.4	2.5	0	1	0	0	0	0	0	0	0	1	0	0.6

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750005  
 Site Code : 89750005  
 Start Date : 9/20/2023  
 Page No : 3



# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 4

## Groups Printed- Cars

Start Time	Railroad St From North				Pearson St From Northeast				Essex St From East				Dundee Park Dr From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	
04:00 PM	2	12	4	16	1	2	8	3	4	57	43	1	7	8	0	5	14	8	32	4	231
04:15 PM	4	15	2	16	0	0	8	2	3	65	28	1	6	8	0	2	15	5	41	8	229
04:30 PM	2	13	3	18	0	1	4	2	2	69	20	0	8	6	0	7	9	6	59	4	233
04:45 PM	0	16	7	15	0	0	11	3	7	58	29	3	9	10	0	6	13	5	65	20	277
<b>Total</b>	<b>8</b>	<b>56</b>	<b>16</b>	<b>65</b>	<b>1</b>	<b>3</b>	<b>31</b>	<b>10</b>	<b>16</b>	<b>249</b>	<b>120</b>	<b>5</b>	<b>30</b>	<b>32</b>	<b>0</b>	<b>20</b>	<b>51</b>	<b>24</b>	<b>197</b>	<b>36</b>	<b>970</b>
05:00 PM	3	13	4	23	0	0	16	6	0	72	31	0	13	10	3	15	20	8	33	6	276
05:15 PM	1	24	8	24	0	1	5	1	4	64	30	2	7	6	1	4	16	10	49	6	263
05:30 PM	3	13	3	18	1	1	6	1	2	63	30	1	9	7	1	10	12	2	45	4	232
05:45 PM	5	20	3	14	0	1	10	3	8	67	25	1	10	1	2	13	15	6	56	14	274
<b>Total</b>	<b>12</b>	<b>70</b>	<b>18</b>	<b>79</b>	<b>1</b>	<b>3</b>	<b>37</b>	<b>11</b>	<b>14</b>	<b>266</b>	<b>116</b>	<b>4</b>	<b>39</b>	<b>24</b>	<b>7</b>	<b>42</b>	<b>63</b>	<b>26</b>	<b>183</b>	<b>30</b>	<b>1045</b>
<b>Grand Total</b>	<b>20</b>	<b>126</b>	<b>34</b>	<b>144</b>	<b>2</b>	<b>6</b>	<b>68</b>	<b>21</b>	<b>30</b>	<b>515</b>	<b>236</b>	<b>9</b>	<b>69</b>	<b>56</b>	<b>7</b>	<b>62</b>	<b>114</b>	<b>50</b>	<b>380</b>	<b>66</b>	<b>2015</b>
<b>Apprch %</b>	<b>6.2</b>	<b>38.9</b>	<b>10.5</b>	<b>44.4</b>	<b>2.1</b>	<b>6.2</b>	<b>70.1</b>	<b>21.6</b>	<b>3.8</b>	<b>65.2</b>	<b>29.9</b>	<b>1.1</b>	<b>35.6</b>	<b>28.9</b>	<b>3.6</b>	<b>32</b>	<b>18.7</b>	<b>8.2</b>	<b>62.3</b>	<b>10.8</b>	
<b>Total %</b>	<b>1</b>	<b>6.3</b>	<b>1.7</b>	<b>7.1</b>	<b>0.1</b>	<b>0.3</b>	<b>3.4</b>	<b>1</b>	<b>1.5</b>	<b>25.6</b>	<b>11.7</b>	<b>0.4</b>	<b>3.4</b>	<b>2.8</b>	<b>0.3</b>	<b>3.1</b>	<b>5.7</b>	<b>2.5</b>	<b>18.9</b>	<b>3.3</b>	

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. 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	2	13	3	18	36	0	1	4	2	7	2	69	20	0	91	8	6	0	7	21	9	6	59	4	78	233
04:45 PM	0	16	7	15	38	0	0	11	3	14	7	58	29	3	97	9	10	0	6	25	13	5	65	20	103	277
05:00 PM	3	13	4	23	43	0	0	16	6	22	0	72	31	0	103	13	10	3	15	41	20	8	33	6	67	276
05:15 PM	1	24	8	24	57	0	1	5	1	7	4	64	30	2	100	7	6	1	4	18	16	10	49	6	81	263
<b>Total Volume</b>	<b>6</b>	<b>66</b>	<b>22</b>	<b>80</b>	<b>174</b>	<b>0</b>	<b>2</b>	<b>36</b>	<b>12</b>	<b>50</b>	<b>13</b>	<b>263</b>	<b>110</b>	<b>5</b>	<b>391</b>	<b>37</b>	<b>32</b>	<b>4</b>	<b>32</b>	<b>105</b>	<b>58</b>	<b>29</b>	<b>206</b>	<b>36</b>	<b>329</b>	<b>1049</b>
<b>% App. Total</b>	<b>3.4</b>	<b>37.9</b>	<b>12.6</b>	<b>46</b>	<b>0</b>	<b>4</b>	<b>72</b>	<b>24</b>	<b>3.3</b>	<b>67.3</b>	<b>28.1</b>	<b>1.3</b>	<b>35.2</b>	<b>30.5</b>	<b>3.8</b>	<b>30.5</b>	<b>17.6</b>	<b>8.8</b>	<b>62.6</b>	<b>10.9</b>						
<b>PHF</b>	<b>.500</b>	<b>.688</b>	<b>.688</b>	<b>.833</b>	<b>.763</b>	<b>.000</b>	<b>.500</b>	<b>.563</b>	<b>.500</b>	<b>.568</b>	<b>.464</b>	<b>.913</b>	<b>.887</b>	<b>.417</b>	<b>.949</b>	<b>.712</b>	<b>.800</b>	<b>.333</b>	<b>.533</b>	<b>.640</b>	<b>.725</b>	<b>.725</b>	<b>.792</b>	<b>.450</b>	<b>.799</b>	<b>.947</b>

Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 7

Groups Printed- Trucks

Start Time	Railroad St From North				Pearson St From Northeast				Essex St From East				Dundee Park Dr From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	
04:00 PM	0	1	0	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	2	0	7
04:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	1	0	1	0	0	0	0	0	3	3	0	0	0	0	0	0	1	4	0	13
05:00 PM	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	3
05:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
05:45 PM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	3
Total	1	2	0	0	0	0	0	0	0	1	3	0	0	0	0	0	1	0	1	0	9
Grand Total	1	3	0	1	0	0	0	0	0	4	6	0	0	0	0	0	1	1	5	0	22
Apprch %	20	60	0	20	0	0	0	0	0	40	60	0	0	0	0	0	14.3	14.3	71.4	0	
Total %	4.5	13.6	0	4.5	0	0	0	0	0	18.2	27.3	0	0	0	0	0	4.5	4.5	22.7	0	

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. 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	1	0	1	2	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0	0	2	0	2	7
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	0	1	0	1	2	0	0	0	0	0	0	3	3	0	6	0	0	0	0	0	0	1	4	0	5	13
% App. Total	0	50	0	50		0	0	0	0		0	50	50	0		0	0	0	0		0	20	80	0		
PHF	.000	.250	.000	.250	.250	.000	.000	.000	.000	.000	.000	.375	.375	.000	.500	.000	.000	.000	.000	.000	.000	.250	.500	.000	.625	.464

# Accurate Counts

978-664-2565

N/S Street : Railroad St / Dundee Park Dr

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear

File Name : 89750005

Site Code : 89750005

Start Date : 9/20/2023

Page No : 10

## Groups Printed- Bikes Peds

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Exclu. Total	Inclu. Total	Int. Total
	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds			
04:00 PM	0	0	0	0	5	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	9	0	9
04:15 PM	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
04:30 PM	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	0	7
04:45 PM	0	0	0	0	5	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0	10
<b>Total</b>	0	0	0	0	15	0	0	0	0	10	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	29	0	29
05:00 PM	0	2	0	0	6	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	11	2	13
05:15 PM	0	0	0	0	6	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	11
05:30 PM	0	0	0	0	5	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	0	9
05:45 PM	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
<b>Total</b>	0	2	0	0	19	0	0	0	0	12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	33	2	35
Grand Total	0	2	0	0	34	0	0	0	0	22	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	62	2	64
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0				
Total %	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		96.9	3.1	

Start Time	Railroad St From North					Pearson St From Northeast					Essex St From East					Dundee Park Dr From South					Essex St From West					Int. Total			
	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total				
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																													
Peak Hour for Entire Intersection Begins at 04:15 PM																													
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0
PHF	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Essex St From East		School St From South		Essex St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00 AM	1	15	15	1	28	41	101
07:15 AM	0	9	20	0	29	35	93
07:30 AM	0	26	46	3	28	29	132
07:45 AM	0	60	62	7	42	34	205
<b>Total</b>	<b>1</b>	<b>110</b>	<b>143</b>	<b>11</b>	<b>127</b>	<b>139</b>	<b>531</b>
08:00 AM	3	36	53	2	43	45	182
08:15 AM	2	14	38	2	43	49	148
08:30 AM	13	34	42	5	42	39	175
08:45 AM	7	17	41	10	34	35	144
<b>Total</b>	<b>25</b>	<b>101</b>	<b>174</b>	<b>19</b>	<b>162</b>	<b>168</b>	<b>649</b>
<b>Grand Total</b>	<b>26</b>	<b>211</b>	<b>317</b>	<b>30</b>	<b>289</b>	<b>307</b>	<b>1180</b>
Apprch %	11	89	91.4	8.6	48.5	51.5	
Total %	2.2	17.9	26.9	2.5	24.5	26	
Cars	26	205	304	27	285	296	1143
% Cars	100	97.2	95.9	90	98.6	96.4	96.9
Trucks	0	6	13	3	4	11	37
% Trucks	0	2.8	4.1	10	1.4	3.6	3.1

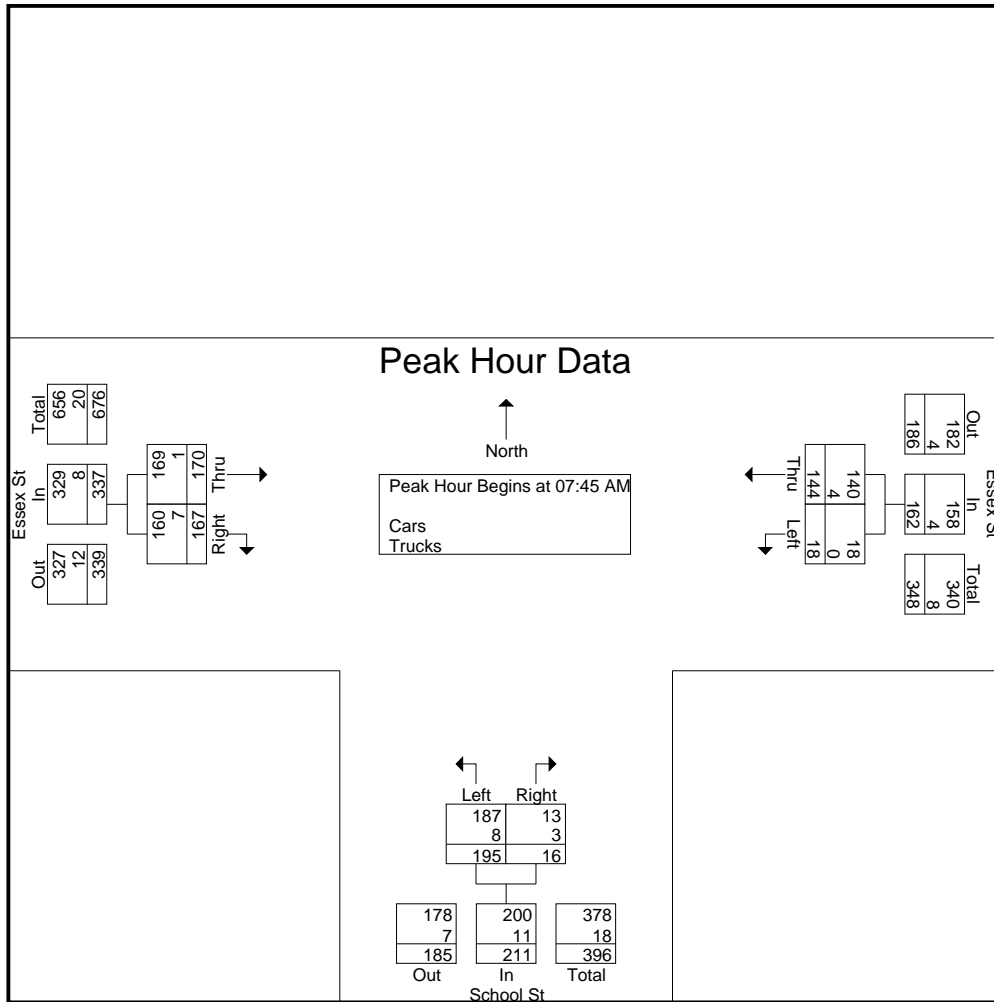
Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	0	<b>60</b>	<b>60</b>	<b>62</b>	<b>7</b>	<b>69</b>	42	34	76	<b>205</b>
08:00 AM	3	36	39	53	2	55	<b>43</b>	45	88	182
08:15 AM	2	14	16	38	2	40	43	<b>49</b>	<b>92</b>	148
08:30 AM	<b>13</b>	34	47	42	5	47	42	39	81	175
<b>Total Volume</b>	18	144	162	195	16	211	170	167	337	710
% App. Total	11.1	88.9		92.4	7.6		50.4	49.6		
PHF	.346	.600	.675	.786	.571	.764	.988	.852	.916	.866
Cars	18	140	158	187	13	200	169	160	329	687
% Cars	100	97.2	97.5	95.9	81.3	94.8	99.4	95.8	97.6	96.8
Trucks	0	4	4	8	3	11	1	7	8	23
% Trucks	0	2.8	2.5	4.1	18.8	5.2	0.6	4.2	2.4	3.2

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 2



## Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

### Peak Hour for Each Approach Begins at:

	07:45 AM			07:30 AM			07:45 AM		
+0 mins.	0	<b>60</b>	<b>60</b>	46	3	49	42	34	76
+15 mins.	3	36	39	<b>62</b>	<b>7</b>	<b>69</b>	<b>43</b>	45	88
+30 mins.	2	14	16	53	2	55	43	<b>49</b>	<b>92</b>
+45 mins.	<b>13</b>	34	47	38	2	40	42	39	81
Total Volume	18	144	162	199	14	213	170	167	337
% App. Total	11.1	88.9		93.4	6.6		50.4	49.6	
PHF	.346	.600	.675	.802	.500	.772	.988	.852	.916
Cars	18	140	158	194	12	206	169	160	329
% Cars	100	97.2	97.5	97.5	85.7	96.7	99.4	95.8	97.6
Trucks	0	4	4	5	2	7	1	7	8
% Trucks	0	2.8	2.5	2.5	14.3	3.3	0.6	4.2	2.4

# Accurate Counts

978-664-2565

File Name : 89750006

Site Code : 89750006

Start Date : 9/26/2023

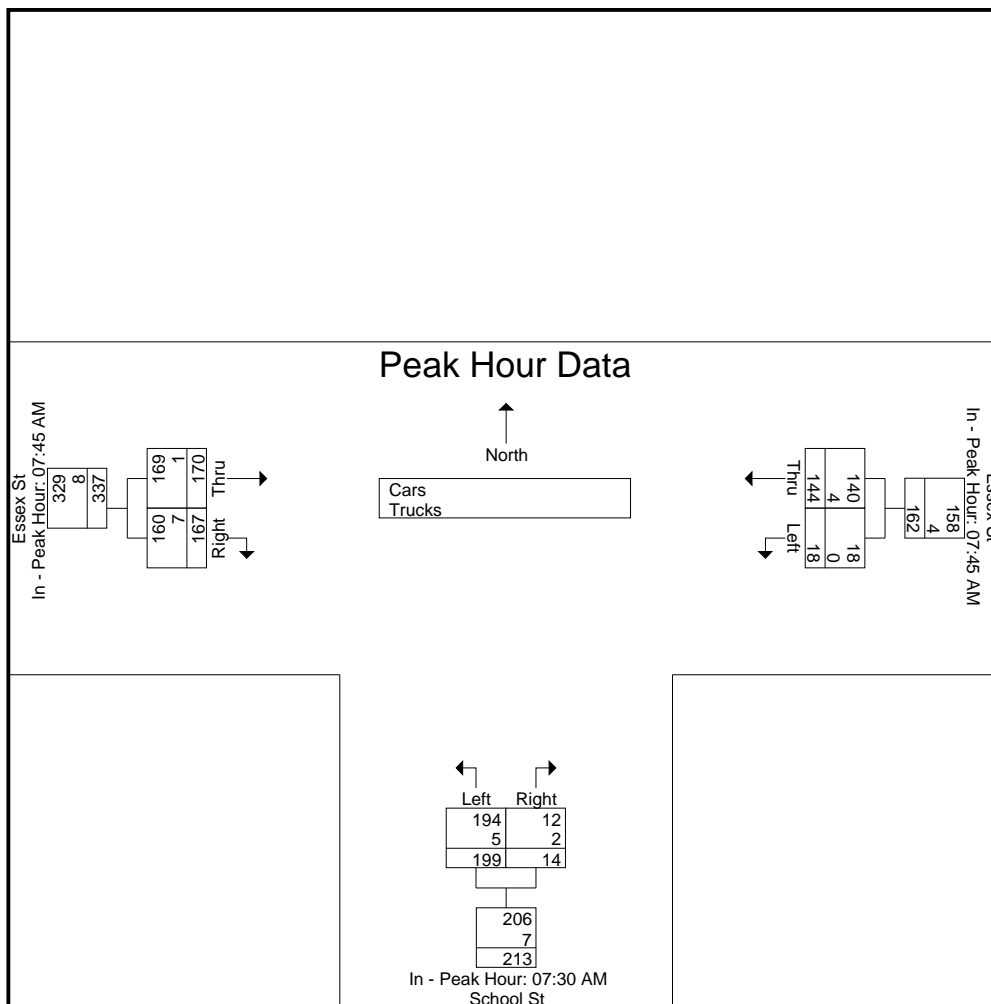
Page No : 3

N/S Street : School Street

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Essex St From East		School St From South		Essex St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00 AM	1	14	15	1	26	39	96
07:15 AM	0	9	16	0	28	33	86
07:30 AM	0	25	45	3	28	29	130
07:45 AM	0	60	62	7	42	33	204
<b>Total</b>	<b>1</b>	<b>108</b>	<b>138</b>	<b>11</b>	<b>124</b>	<b>134</b>	<b>516</b>
08:00 AM	3	33	50	1	43	44	174
08:15 AM	2	14	37	1	43	46	143
08:30 AM	13	33	38	4	41	37	166
08:45 AM	7	17	41	10	34	35	144
<b>Total</b>	<b>25</b>	<b>97</b>	<b>166</b>	<b>16</b>	<b>161</b>	<b>162</b>	<b>627</b>
<b>Grand Total</b>	<b>26</b>	<b>205</b>	<b>304</b>	<b>27</b>	<b>285</b>	<b>296</b>	<b>1143</b>
Apprch %	11.3	88.7	91.8	8.2	49.1	50.9	
Total %	2.3	17.9	26.6	2.4	24.9	25.9	

Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. 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	0	<b>60</b>	<b>60</b>	<b>62</b>	<b>7</b>	<b>69</b>	42	33	75	<b>204</b>
08:00 AM	3	33	36	50	1	51	<b>43</b>	44	87	174
08:15 AM	2	14	16	37	1	38	43	<b>46</b>	<b>89</b>	143
08:30 AM	<b>13</b>	33	46	38	4	42	41	37	78	166
Total Volume	18	140	158	187	13	200	169	160	329	687
% App. Total	11.4	88.6		93.5	6.5		51.4	48.6		
PHF	.346	.583	.658	.754	.464	.725	.983	.870	.924	.842

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Essex St From East		School St From South		Essex St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00 AM	0	1	0	0	2	2	5
07:15 AM	0	0	4	0	1	2	7
07:30 AM	0	1	1	0	0	0	2
07:45 AM	0	0	0	0	0	1	1
<b>Total</b>	0	2	5	0	3	5	15
08:00 AM	0	3	3	1	0	1	8
08:15 AM	0	0	1	1	0	3	5
08:30 AM	0	1	4	1	1	2	9
08:45 AM	0	0	0	0	0	0	0
<b>Total</b>	0	4	8	3	1	6	22
<b>Grand Total</b>	0	6	13	3	4	11	37
Apprch %	0	100	81.2	18.8	26.7	73.3	
Total %	0	16.2	35.1	8.1	10.8	29.7	

Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. 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	0	0	0	0	0	0	0	1	1	1
08:00 AM	0	3	3	3	1	4	0	1	1	8
08:15 AM	0	0	0	1	1	2	0	3	3	5
08:30 AM	0	1	1	4	1	5	1	2	3	9
<b>Total Volume</b>	0	4	4	8	3	11	1	7	8	23
<b>% App. Total</b>	0	100		72.7	27.3		12.5	87.5		
<b>PHF</b>	.000	.333	.333	.500	.750	.550	.250	.583	.667	.639

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	Essex St From East			School St From South			Essex St From West			Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	1	0	1	0	0	0	0	5	5	2	7
07:45 AM	0	1	0	0	0	0	0	0	1	1	1	2
<b>Total</b>	0	2	0	1	0	0	0	0	6	6	3	9
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	1	0	0	1	1
08:30 AM	0	0	0	0	0	0	0	0	2	2	0	2
08:45 AM	0	0	0	0	0	1	0	0	0	1	0	1
<b>Total</b>	0	0	0	0	0	1	0	1	2	3	1	4
<b>Grand Total</b>	0	2	0	1	0	1	0	1	8	9	4	13
Apprch %	0	100		100	0		0	100				
Total %	0	50		25	0		0	25		69.2	30.8	

Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	0	1	1	1	0	1	0	0	0	2
07:45 AM	0	1	1	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	1	1	1
<b>Total Volume</b>	0	2	2	1	0	1	0	1	1	4
<b>% App. Total</b>	0	100		100	0		0	100		
<b>PHF</b>	.000	.500	.500	.250	.000	.250	.000	.250	.250	.500

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Essex St From East		School St From South		Essex St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
04:00 PM	2	30	76	8	30	26	172
04:15 PM	4	28	61	4	43	34	174
04:30 PM	4	28	56	6	36	24	154
04:45 PM	0	29	63	3	36	39	170
<b>Total</b>	<b>10</b>	<b>115</b>	<b>256</b>	<b>21</b>	<b>145</b>	<b>123</b>	<b>670</b>
05:00 PM	3	42	68	8	48	38	207
05:15 PM	3	36	69	4	44	30	186
05:30 PM	3	31	64	6	41	40	185
05:45 PM	5	44	61	5	50	27	192
<b>Total</b>	<b>14</b>	<b>153</b>	<b>262</b>	<b>23</b>	<b>183</b>	<b>135</b>	<b>770</b>
<b>Grand Total</b>	<b>24</b>	<b>268</b>	<b>518</b>	<b>44</b>	<b>328</b>	<b>258</b>	<b>1440</b>
Apprch %	8.2	91.8	92.2	7.8	56	44	
Total %	1.7	18.6	36	3.1	22.8	17.9	
Cars	24	268	509	44	325	252	1422
% Cars	100	100	98.3	100	99.1	97.7	98.8
Trucks	0	0	9	0	3	6	18
% Trucks	0	0	1.7	0	0.9	2.3	1.2

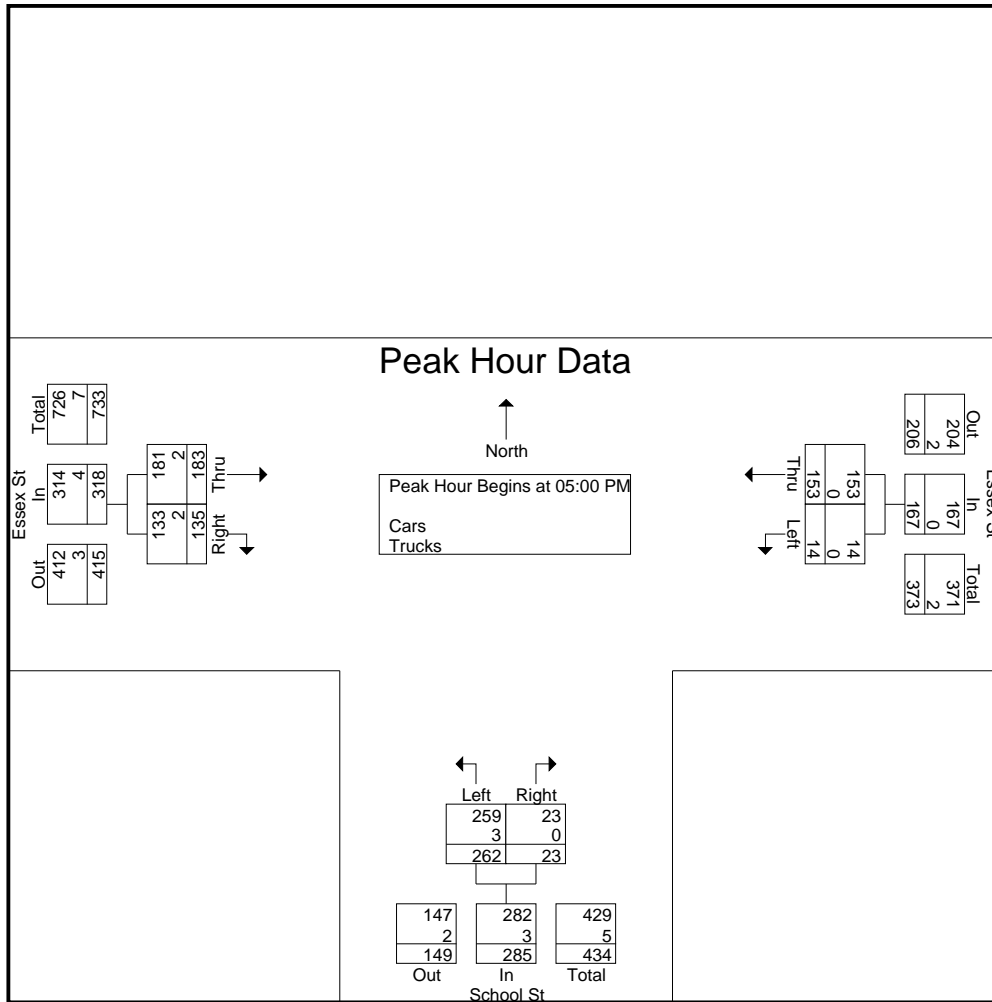
Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	3	42	45	68	<b>8</b>	<b>76</b>	48	38	<b>86</b>	<b>207</b>
05:15 PM	3	36	39	<b>69</b>	4	73	44	30	74	186
05:30 PM	3	31	34	64	6	70	41	<b>40</b>	81	185
05:45 PM	<b>5</b>	<b>44</b>	<b>49</b>	61	5	66	<b>50</b>	27	77	192
<b>Total Volume</b>	<b>14</b>	<b>153</b>	<b>167</b>	<b>262</b>	<b>23</b>	<b>285</b>	<b>183</b>	<b>135</b>	<b>318</b>	<b>770</b>
% App. Total	8.4	91.6		91.9	8.1		57.5	42.5		
PHF	.700	.869	.852	.949	.719	.938	.915	.844	.924	.930
Cars	14	153	167	259	23	282	181	133	314	763
% Cars	100	100	100	98.9	100	98.9	98.9	98.5	98.7	99.1
Trucks	0	0	0	3	0	3	2	2	4	7
% Trucks	0	0	0	1.1	0	1.1	1.1	1.5	1.3	0.9

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
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**Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1**

Peak Hour for Each Approach Begins at:

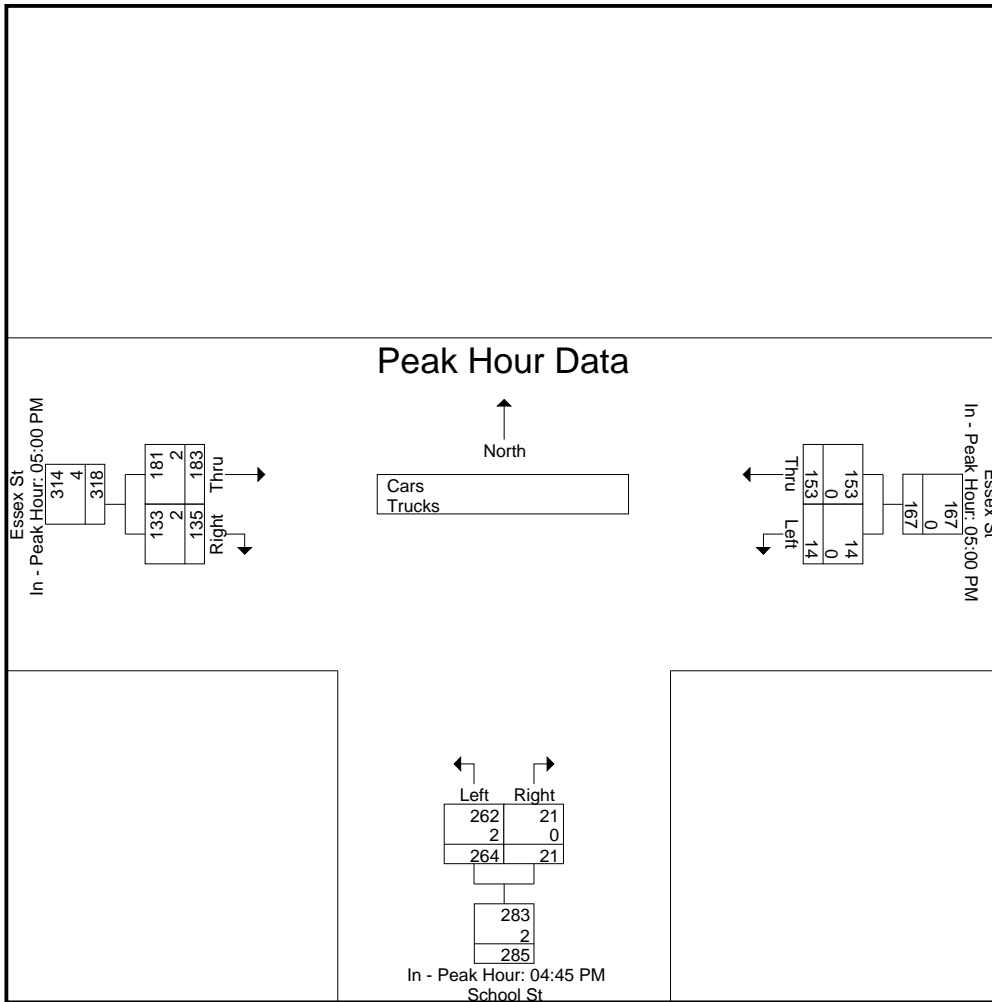
	05:00 PM			04:45 PM			05:00 PM		
+0 mins.	3	42	45	63	3	66	48	38	<b>86</b>
+15 mins.	3	36	39	68	<b>8</b>	<b>76</b>	44	30	74
+30 mins.	3	31	34	<b>69</b>	4	73	41	<b>40</b>	81
+45 mins.	<b>5</b>	<b>44</b>	<b>49</b>	64	6	70	<b>50</b>	27	77
Total Volume	14	153	167	264	21	285	183	135	318
% App. Total	8.4	91.6		92.6	7.4		57.5	42.5	
PHF	.700	.869	.852	.957	.656	.938	.915	.844	.924
Cars	14	153	167	262	21	283	181	133	314
% Cars	100	100	100	99.2	100	99.3	98.9	98.5	98.7
Trucks	0	0	0	2	0	2	2	2	4
% Trucks	0	0	0	0.8	0	0.7	1.1	1.5	1.3

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 3



# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 4

### Groups Printed- Cars

Start Time	Essex St From East		School St From South		Essex St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
04:00 PM	2	30	75	8	30	23	168
04:15 PM	4	28	58	4	42	33	169
04:30 PM	4	28	54	6	36	24	152
04:45 PM	0	29	63	3	36	39	170
<b>Total</b>	<b>10</b>	<b>115</b>	<b>250</b>	<b>21</b>	<b>144</b>	<b>119</b>	<b>659</b>
05:00 PM	3	42	67	8	48	37	205
05:15 PM	3	36	69	4	44	29	185
05:30 PM	3	31	63	6	39	40	182
05:45 PM	5	44	60	5	50	27	191
<b>Total</b>	<b>14</b>	<b>153</b>	<b>259</b>	<b>23</b>	<b>181</b>	<b>133</b>	<b>763</b>
<b>Grand Total</b>	<b>24</b>	<b>268</b>	<b>509</b>	<b>44</b>	<b>325</b>	<b>252</b>	<b>1422</b>
Apprch %	8.2	91.8	92	8	56.3	43.7	
Total %	1.7	18.8	35.8	3.1	22.9	17.7	

Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	3	42	45	67	<b>8</b>	<b>75</b>	48	37	<b>85</b>	<b>205</b>
05:15 PM	3	36	39	<b>69</b>	4	73	44	29	73	185
05:30 PM	3	31	34	63	6	69	39	<b>40</b>	79	182
05:45 PM	<b>5</b>	<b>44</b>	<b>49</b>	60	5	65	<b>50</b>	27	77	191
Total Volume	14	153	167	259	23	282	181	133	314	763
% App. Total	8.4	91.6		91.8	8.2		57.6	42.4		
PHF	.700	.869	.852	.938	.719	.940	.905	.831	.924	.930

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Essex St From East		School St From South		Essex St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
04:00 PM	0	0	1	0	0	3	4
04:15 PM	0	0	3	0	1	1	5
04:30 PM	0	0	2	0	0	0	2
04:45 PM	0	0	0	0	0	0	0
<b>Total</b>	0	0	6	0	1	4	11
05:00 PM	0	0	1	0	0	1	2
05:15 PM	0	0	0	0	0	1	1
05:30 PM	0	0	1	0	2	0	3
05:45 PM	0	0	1	0	0	0	1
<b>Total</b>	0	0	3	0	2	2	7
<b>Grand Total</b>	0	0	9	0	3	6	18
Apprch %	0	0	100	0	33.3	66.7	
Total %	0	0	50	0	16.7	33.3	

Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. 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	1	0	1	0	3	3	4
04:15 PM	0	0	0	3	0	3	1	1	2	5
04:30 PM	0	0	0	2	0	2	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0
<b>Total Volume</b>	0	0	0	6	0	6	1	4	5	11
<b>% App. Total</b>	0	0		100	0		20	80		
<b>PHF</b>	.000	.000	.000	.500	.000	.500	.250	.333	.417	.550

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750006  
 Site Code : 89750006  
 Start Date : 9/26/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	Essex St From East			School St From South			Essex St From West			Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds			
04:00 PM	0	0	2	0	0	0	0	0	0	2	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	3	1	0	2	0	0	0	5	1	6
04:45 PM	0	0	0	1	0	0	0	0	2	2	1	3
<b>Total</b>	0	0	5	2	0	2	0	0	2	9	2	11
05:00 PM	0	0	1	0	0	0	0	0	5	6	0	6
05:15 PM	0	0	2	0	0	1	0	0	0	3	0	3
05:30 PM	0	0	0	0	0	0	0	0	4	4	0	4
05:45 PM	0	0	0	0	0	0	0	0	1	1	0	1
<b>Total</b>	0	0	3	0	0	1	0	0	10	14	0	14
<b>Grand Total</b>	0	0	8	2	0	3	0	0	12	23	2	25
Apprch %	0	0		100	0		0	0				
Total %	0	0		100	0		0	0		92	8	

Start Time	Essex St From East			School St From South			Essex St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. 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
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	1	0	1	0	0	0	1
04:45 PM	0	0	0	1	0	1	0	0	0	1
<b>Total Volume</b>	0	0	0	2	0	2	0	0	0	2
<b>% App. Total</b>	0	0		100	0		0	0		
<b>PHF</b>	.000	.000	.000	.500	.000	.500	.000	.000	.000	.500

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	Essex St From East			Brook St From Southeast			Ridge St From South			Essex St From West			Int. Total
	Hard Left	Left	Thru	Hard Left	Bear Left	Hard Right	Left	Right	Hard Right	Thru	Bear Right	Right	
07:00 AM	3	0	13	0	0	0	0	0	0	0	26	0	42
07:15 AM	3	0	9	0	0	0	0	0	1	0	33	0	46
07:30 AM	2	1	28	0	0	0	2	0	0	0	22	2	57
07:45 AM	2	0	50	0	0	0	1	0	1	0	50	1	105
<b>Total</b>	<b>10</b>	<b>1</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>131</b>	<b>3</b>	<b>250</b>
08:00 AM	5	0	24	0	0	0	2	0	2	0	41	4	78
08:15 AM	4	2	23	0	0	0	1	0	2	1	45	4	82
08:30 AM	7	0	29	1	0	0	3	0	1	0	37	3	81
08:45 AM	5	2	32	0	0	0	2	0	0	0	32	0	73
<b>Total</b>	<b>21</b>	<b>4</b>	<b>108</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>155</b>	<b>11</b>	<b>314</b>
<b>Grand Total</b>	<b>31</b>	<b>5</b>	<b>208</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>286</b>	<b>14</b>	<b>564</b>
Apprch %	12.7	2	85.2	100	0	0	61.1	0	38.9	0.3	95	4.7	
Total %	5.5	0.9	36.9	0.2	0	0	2	0	1.2	0.2	50.7	2.5	
Cars	31	5	206	1	0	0	11	0	7	1	280	14	556
% Cars	100	100	99	100	0	0	100	0	100	100	97.9	100	98.6
Trucks	0	0	2	0	0	0	0	0	0	0	6	0	8
% Trucks	0	0	1	0	0	0	0	0	0	0	2.1	0	1.4

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total	
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 07:45 AM</b>																	
07:45 AM	2	0	<b>50</b>	<b>52</b>	0	0	0	0	1	0	1	2	0	<b>50</b>	1	<b>51</b>	<b>105</b>
08:00 AM	5	0	24	29	0	0	0	0	2	0	2	4	0	41	4	45	78
08:15 AM	4	2	23	29	0	0	0	0	1	0	2	3	1	45	4	50	82
08:30 AM	7	0	29	36	1	0	0	1	3	0	1	4	0	37	3	40	81
<b>Total Volume</b>	<b>18</b>	<b>2</b>	<b>126</b>	<b>146</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>6</b>	<b>13</b>	<b>1</b>	<b>173</b>	<b>12</b>	<b>186</b>	<b>346</b>
% App. Total	12.3	1.4	86.3		100	0	0		53.8	0	46.2		0.5	93	6.5		
PHF	.643	.250	.630	.702	.250	.000	.000	.250	.583	.000	.750	.813	.250	.865	.750	.912	.824
Cars	18	2	125	145	1	0	0	1	7	0	6	13	1	170	12	183	342
% Cars	100	100	99.2	99.3	100	0	0	100	100	0	100	100	100	98.3	100	98.4	98.8
Trucks	0	0	1	1	0	0	0	0	0	0	0	0	0	3	0	3	4
% Trucks	0	0	0.8	0.7	0	0	0	0	0	0	0	0	0	1.7	0	1.6	1.2

# Accurate Counts

978-664-2565

File Name : 89750007

Site Code : 89750007

Start Date : 9/26/2023

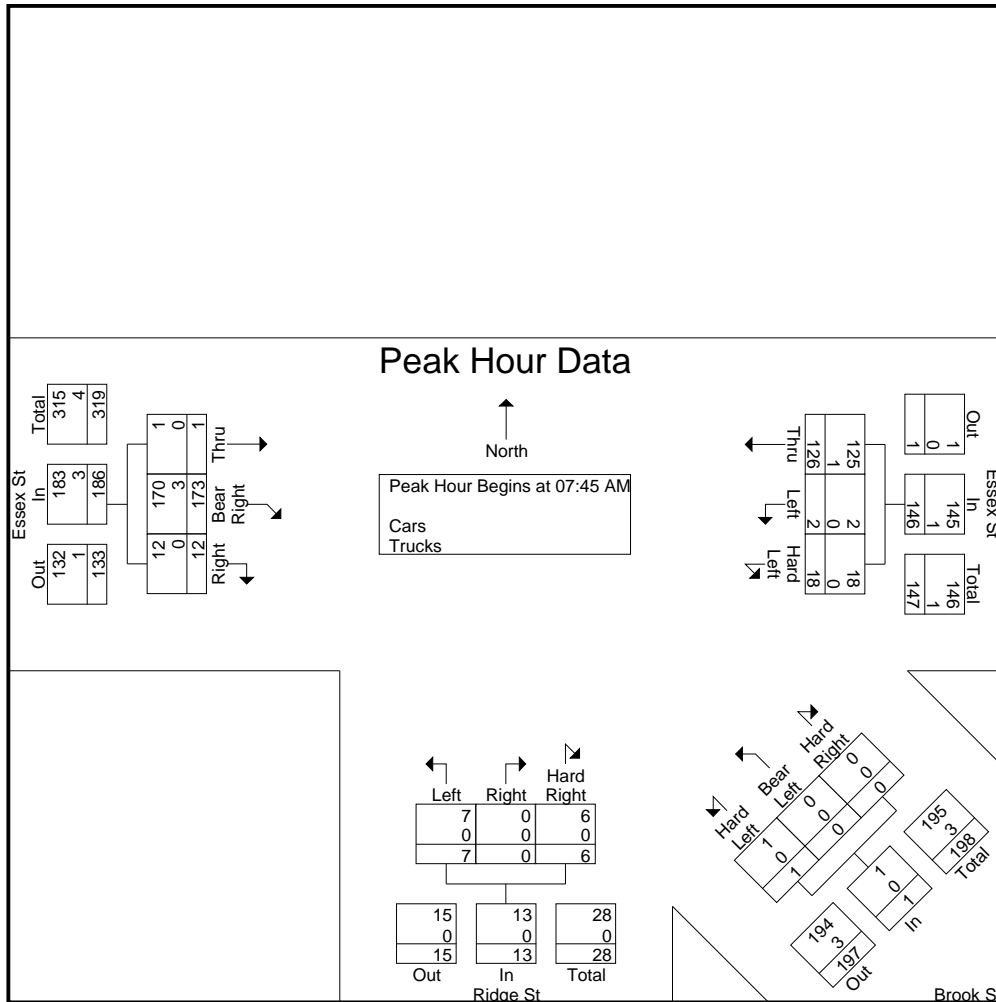
Page No : 2

N/S Street : Ridge Street

E/W Street : Essex Street

City/State : Andover, MA

Weather : Clear



**Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1**

**Peak Hour for Each Approach Begins at:**

	07:45 AM				07:45 AM				07:45 AM				07:45 AM			
+0 mins.	2	0	50	52	0	0	0	0	1	0	1	2	0	50	1	51
+15 mins.	5	0	24	29	0	0	0	0	2	0	2	4	0	41	4	45
+30 mins.	4	2	23	29	0	0	0	0	1	0	2	3	1	45	4	50
+45 mins.	7	0	29	36	1	0	0	1	3	0	1	4	0	37	3	40
Total Volume	18	2	126	146	1	0	0	1	7	0	6	13	1	173	12	186
% App. Total	12.3	1.4	86.3		100	0	0		53.8	0	46.2		0.5	93	6.5	
PHF	.643	.250	.630	.702	.250	.000	.000	.250	.583	.000	.750	.813	.250	.865	.750	.912
Cars	18	2	125	145	1	0	0	1	7	0	6	13	1	170	12	183
% Cars	100	100	99.2	99.3	100	0	0	100	100	0	100	100	100	98.3	100	98.4
Trucks	0	0	1	1	0	0	0	0	0	0	0	0	0	3	0	3
% Trucks	0	0	0.8	0.7	0	0	0	0	0	0	0	0	0	1.7	0	1.6

# Accurate Counts

978-664-2565

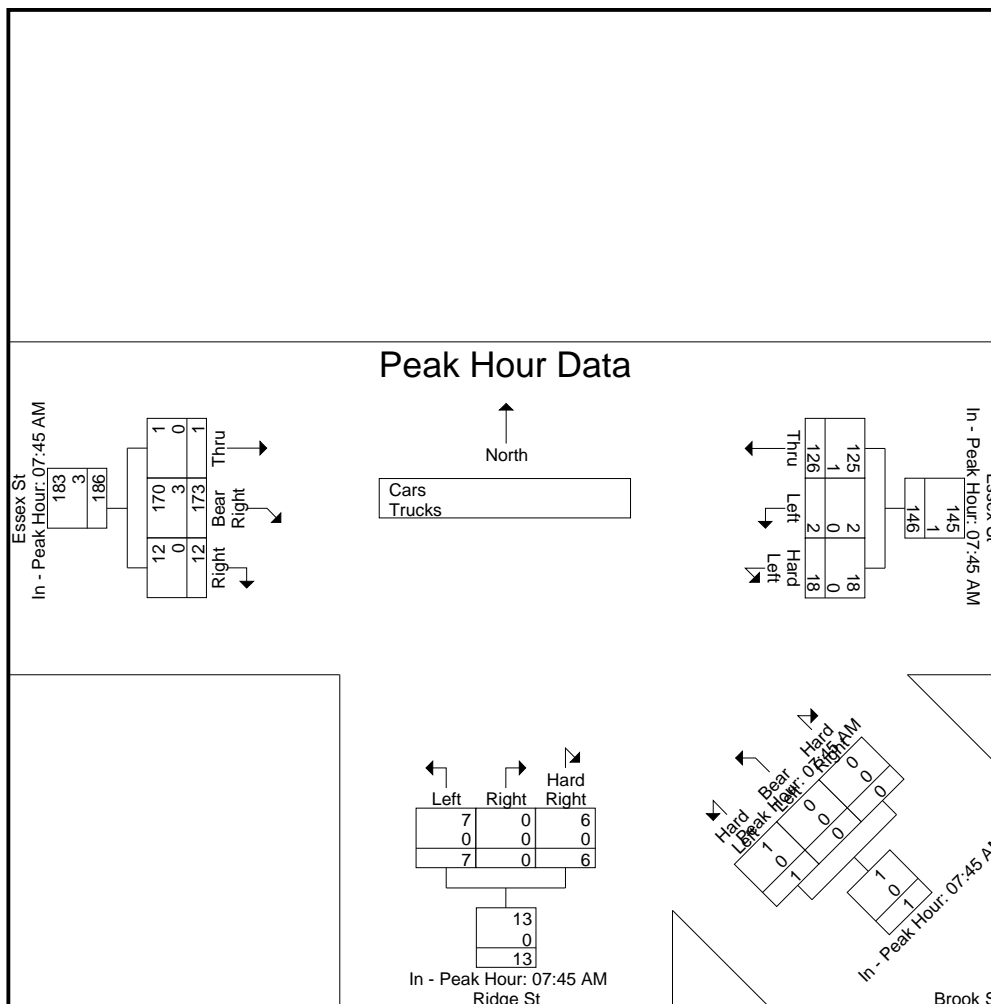
File Name : 89750007

Site Code : 89750007

Start Date : 9/26/2023

Page No : 3

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear



Cars  
Trucks

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Essex St From East			Brook St From Southeast			Ridge St From South			Essex St From West			Int. Total
	Hard Left	Left	Thru	Hard Left	Bear Left	Hard Right	Left	Right	Hard Right	Thru	Bear Right	Right	
07:00 AM	3	0	13	0	0	0	0	0	0	0	26	0	42
07:15 AM	3	0	9	0	0	0	0	0	1	0	33	0	46
07:30 AM	2	1	27	0	0	0	2	0	0	0	19	2	53
07:45 AM	2	0	50	0	0	0	1	0	1	0	49	1	104
<b>Total</b>	<b>10</b>	<b>1</b>	<b>99</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>127</b>	<b>3</b>	<b>245</b>
08:00 AM	5	0	23	0	0	0	2	0	2	0	40	4	76
08:15 AM	4	2	23	0	0	0	1	0	2	1	44	4	81
08:30 AM	7	0	29	1	0	0	3	0	1	0	37	3	81
08:45 AM	5	2	32	0	0	0	2	0	0	0	32	0	73
<b>Total</b>	<b>21</b>	<b>4</b>	<b>107</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>153</b>	<b>11</b>	<b>311</b>
<b>Grand Total</b>	<b>31</b>	<b>5</b>	<b>206</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>280</b>	<b>14</b>	<b>556</b>
Apprch %	12.8	2.1	85.1	100	0	0	61.1	0	38.9	0.3	94.9	4.7	
Total %	5.6	0.9	37.1	0.2	0	0	2	0	1.3	0.2	50.4	2.5	

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total	
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 07:45 AM</b>																	
07:45 AM	2	0	<b>50</b>	<b>52</b>	0	0	0	0	1	0	1	2	0	<b>49</b>	1	<b>50</b>	<b>104</b>
08:00 AM	5	0	23	28	0	0	0	0	2	0	<b>2</b>	<b>4</b>	0	40	4	44	76
08:15 AM	4	2	23	29	0	0	0	0	1	0	2	3	1	44	4	49	81
08:30 AM	7	0	29	36	1	0	0	1	3	0	1	4	0	37	3	40	81
Total Volume	18	2	125	145	1	0	0	1	7	0	6	13	1	170	12	183	342
% App. Total	12.4	1.4	86.2		100	0	0		53.8	0	46.2		0.5	92.9	6.6		
PHF	.643	.250	.625	.697	.250	.000	.000	.250	.583	.000	.750	.813	.250	.867	.750	.915	.822

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	Essex St From East			Brook St From Southeast			Ridge St From South			Essex St From West			Int. Total
	Hard Left	Left	Thru	Hard Left	Bear Left	Hard Right	Left	Right	Hard Right	Thru	Bear Right	Right	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	1	0	0	0	0	0	0	0	3	0	4
07:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
<b>Total</b>	0	0	1	0	0	0	0	0	0	0	4	0	5
08:00 AM	0	0	1	0	0	0	0	0	0	0	1	0	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	1	0	0	0	0	0	0	0	2	0	3
<b>Grand Total</b>	0	0	2	0	0	0	0	0	0	0	6	0	8
Apprch %	0	0	100	0	0	0	0	0	0	0	100	0	
Total %	0	0	25	0	0	0	0	0	0	0	75	0	

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total	
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total		
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																		
<b>Peak Hour for Entire Intersection Begins at 07:30 AM</b>																		
07:30 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3	0	3	4
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
08:00 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	2	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
<b>Total Volume</b>	0	0	2	2	0	0	0	0	0	0	0	0	0	6	0	6	8	8
<b>% App. Total</b>	0	0	100		0	0	0		0	0	0		0	100	0			
<b>PHF</b>	.000	.000	.500	.500	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.000	.500	.500	.500

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 10

## Groups Printed- Bikes Peds

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Exclu. Total	Inclu. Total	Int. Total
	Hard Left	Left	Thru	Peds	Hard Left	Bear Left	Hard Right	Peds	Left	Right	Hard Right	Peds	Thru	Bear Right	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	2	6	0	6
07:30 AM	0	0	1	3	0	0	0	1	2	0	0	0	0	0	0	0	4	3	7
07:45 AM	0	0	1	3	0	0	0	3	0	0	0	0	0	0	0	1	7	1	8
<b>Total</b>	0	0	2	8	0	0	0	4	2	0	0	2	0	0	0	3	17	4	21
08:00 AM	0	0	0	4	0	0	0	3	0	0	0	0	0	0	0	0	7	0	7
08:15 AM	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	3	0	3
08:30 AM	0	0	0	6	0	0	0	1	0	0	0	1	0	0	0	2	10	0	10
08:45 AM	0	0	0	3	0	0	0	4	0	0	0	1	0	0	0	0	8	0	8
<b>Total</b>	0	0	0	15	0	0	0	9	0	0	0	2	0	0	0	2	28	0	28
<b>Grand Total</b>	0	0	2	23	0	0	0	13	2	0	0	4	0	0	0	5	45	4	49
Apprch %	0	0	100		0	0	0		100	0	0		0	0	0				
Total %	0	0	50		0	0	0		50	0	0		0	0	0		91.8	8.2	

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total	
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 07:00 AM</b>																	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	1	1	0	0	0	0	2	0	0	2	0	0	0	0	3
07:45 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
<b>Total Volume</b>	0	0	2	2	0	0	0	0	2	0	0	2	0	0	0	0	4
<b>% App. Total</b>	0	0	100		0	0	0		100	0	0		0	0	0		
PHF	.000	.000	.500	.500	.000	.000	.000	.000	.250	.000	.000	.250	.000	.000	.000	.000	.333

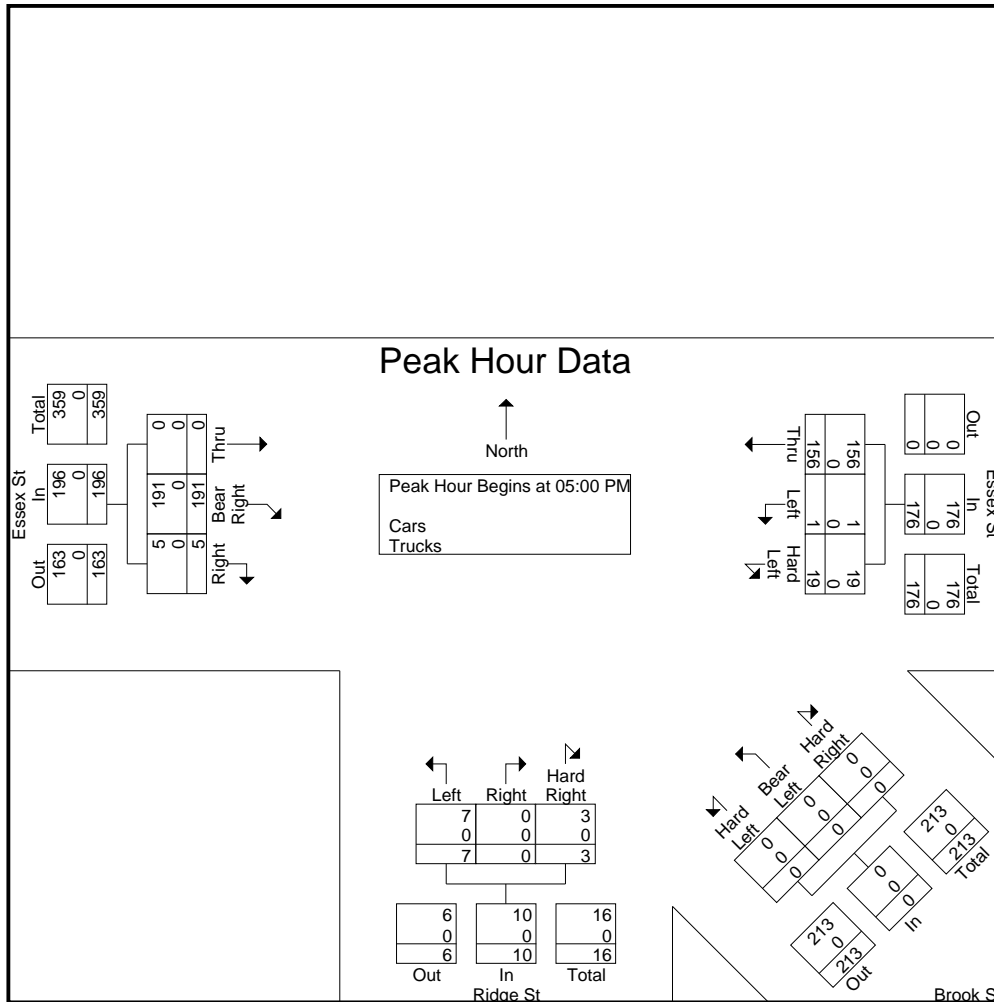


# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 2



## Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

### Peak Hour for Each Approach Begins at:

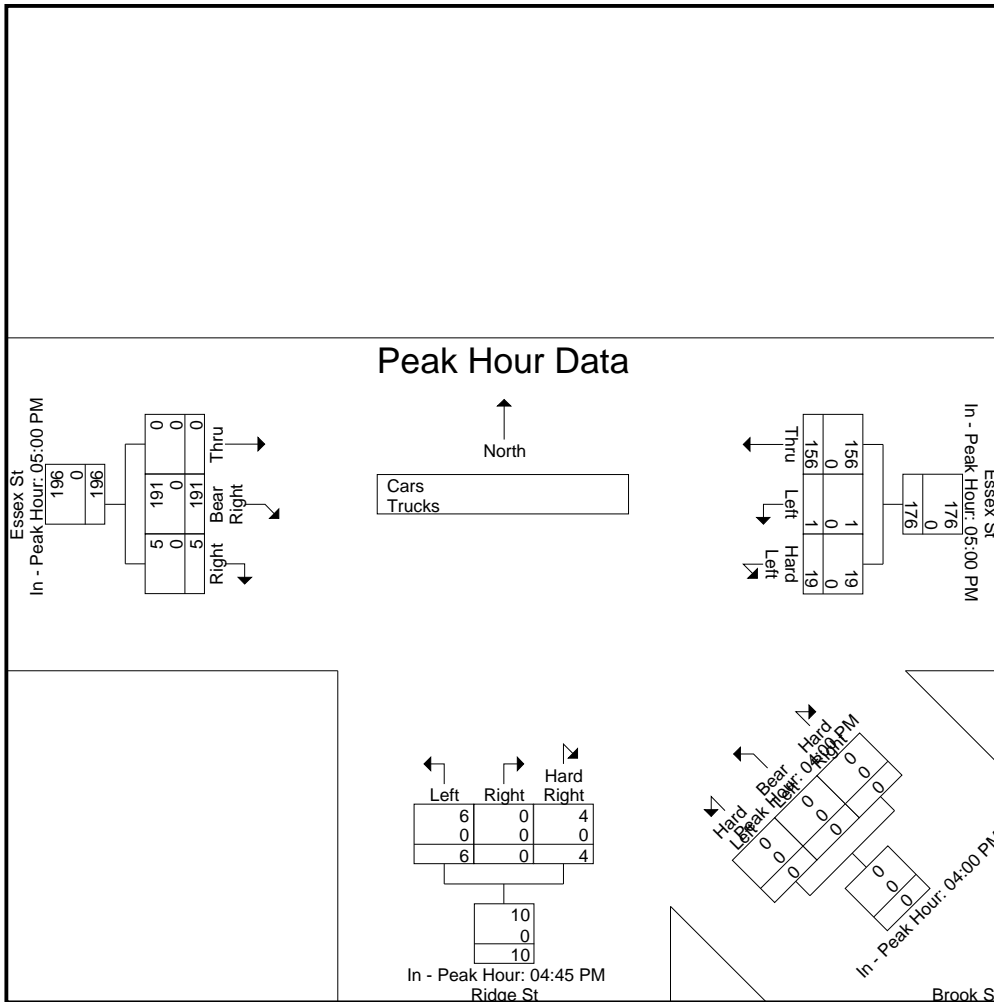
	05:00 PM				04:00 PM				04:45 PM				05:00 PM			
+0 mins.	4	0	42	46	0	0	0	0	1	0	2	3	0	50	3	53
+15 mins.	5	1	39	45	0	0	0	0	2	0	1	3	0	45	0	45
+30 mins.	6	0	31	37	0	0	0	0	2	0	0	2	0	44	1	45
+45 mins.	4	0	44	48	0	0	0	0	1	0	1	2	0	52	1	53
Total Volume	19	1	156	176	0	0	0	0	6	0	4	10	0	191	5	196
% App. Total	10.8	0.6	88.6		0	0	0		60	0	40		0	97.4	2.6	
PHF	.792	.250	.886	.917	.000	.000	.000	.000	.750	.000	.500	.833	.000	.918	.417	.925
Cars	19	1	156	176	0	0	0	0	6	0	4	10	0	191	5	196
% Cars	100	100	100	100	0	0	0	0	100	0	100	100	0	100	100	100
Trucks	0	0	0	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	0	0	0

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 3



Essex St  
In - Peak Hour: 05:00 PM

176	176
0	0
156	1
156	0
1	19
0	0
19	0

Thru Left Hard Left

Essex St  
In - Peak Hour: 05:00 PM

176	176
0	0
156	1
156	0
1	19
0	0
19	0

Thru Left Hard Left

Essex St  
In - Peak Hour: 05:00 PM

176	176
0	0
156	1
156	0
1	19
0	0
19	0

Thru Left Hard Left

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	Essex St From East			Brook St From Southeast			Ridge St From South			Essex St From West			Int. Total
	Hard Left	Left	Thru	Hard Left	Bear Left	Hard Right	Left	Right	Hard Right	Thru	Bear Right	Right	
04:00 PM	2	1	30	0	0	0	0	0	1	0	36	0	70
04:15 PM	4	1	31	0	0	0	1	0	1	0	42	2	82
04:30 PM	5	0	32	0	0	0	0	0	0	1	40	0	78
04:45 PM	2	0	26	0	0	0	1	0	2	0	35	2	68
<b>Total</b>	<b>13</b>	<b>2</b>	<b>119</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>153</b>	<b>4</b>	<b>298</b>
05:00 PM	4	0	42	0	0	0	2	0	1	0	50	3	102
05:15 PM	5	1	39	0	0	0	2	0	0	0	45	0	92
05:30 PM	6	0	31	0	0	0	1	0	1	0	44	1	84
05:45 PM	4	0	44	0	0	0	2	0	1	0	52	1	104
<b>Total</b>	<b>19</b>	<b>1</b>	<b>156</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>191</b>	<b>5</b>	<b>382</b>
<b>Grand Total</b>	<b>32</b>	<b>3</b>	<b>275</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>7</b>	<b>1</b>	<b>344</b>	<b>9</b>	<b>680</b>
Apprch %	10.3	1	88.7	0	0	0	56.2	0	43.8	0.3	97.2	2.5	
Total %	4.7	0.4	40.4	0	0	0	1.3	0	1	0.1	50.6	1.3	

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total	
<b>Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 05:00 PM</b>																	
05:00 PM	4	0	42	46	0	0	0	0	2	0	1	3	0	50	3	53	102
05:15 PM	5	1	39	45	0	0	0	0	2	0	0	2	0	45	0	45	92
05:30 PM	6	0	31	37	0	0	0	0	1	0	1	2	0	44	1	45	84
05:45 PM	4	0	44	48	0	0	0	0	2	0	1	3	0	52	1	53	104
<b>Total Volume</b>	<b>19</b>	<b>1</b>	<b>156</b>	<b>176</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>3</b>	<b>10</b>	<b>0</b>	<b>191</b>	<b>5</b>	<b>196</b>	<b>382</b>
% App. Total	10.8	0.6	88.6		0	0	0		70	0	30		0	97.4	2.6		
PHF	.792	.250	.886	.917	.000	.000	.000	.000	.875	.000	.750	.833	.000	.918	.417	.925	.918

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 7

## Groups Printed- Trucks

Start Time	Essex St From East			Brook St From Southeast			Ridge St From South			Essex St From West			Int. Total
	Hard Left	Left	Thru	Hard Left	Bear Left	Hard Right	Left	Right	Hard Right	Thru	Bear Right	Right	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
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
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0
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
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Grand Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %													

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total	
<b>Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 04:00 PM</b>																	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	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	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Volume</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>% App. Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>PHF</b>	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

# Accurate Counts

978-664-2565

N/S Street : Ridge Street  
 E/W Street : Essex Street  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750007  
 Site Code : 89750007  
 Start Date : 9/26/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Exclu. Total	Inclu. Total	Int. Total	
	Hard Left	Left	Thru	Peds	Hard Left	Bear Left	Hard Right	Peds	Left	Right	Hard Right	Peds	Thru	Bear Right	Right	Peds				
04:00 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	3	0	3
04:15 PM	0	0	0	4	0	0	0	0	5	0	0	0	0	0	0	0	3	12	0	12
04:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0	0	4	0	4
04:45 PM	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	4
<b>Total</b>	0	0	0	7	0	0	0	0	8	0	0	0	4	0	0	0	4	23	0	23
05:00 PM	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	4
05:15 PM	0	0	0	4	0	0	0	0	9	0	0	0	1	0	0	0	0	14	0	14
05:30 PM	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	4
05:45 PM	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	2
<b>Total</b>	0	0	0	10	0	0	0	0	13	0	0	0	1	0	0	0	0	24	0	24
<b>Grand Total</b>	0	0	0	17	0	0	0	0	21	0	0	0	5	0	0	0	4	47	0	47
Apprch %	0	0	0		0	0	0			0	0	0		0	0	0				
Total %																	100	0		

Start Time	Essex St From East				Brook St From Southeast				Ridge St From South				Essex St From West				Int. Total
	Hard Left	Left	Thru	App. Total	Hard Left	Bear Left	Hard Right	App. Total	Left	Right	Hard Right	App. Total	Thru	Bear Right	Right	App. Total	
<b>Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 04:00 PM</b>																	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	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	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Volume</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>% App. Total</b>	0	0	0		0	0	0			0	0	0		0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	School St From North			Ridge St From East			School St From South			Lupine Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	21	10	0	1	0	2	7	0	10	0	0	51
07:15 AM	0	26	6	0	1	1	2	13	2	5	0	8	64
07:30 AM	0	19	10	0	0	0	1	43	0	12	4	1	90
07:45 AM	0	17	8	0	1	0	5	50	0	11	0	0	92
<b>Total</b>	<b>0</b>	<b>83</b>	<b>34</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>10</b>	<b>113</b>	<b>2</b>	<b>38</b>	<b>4</b>	<b>9</b>	<b>297</b>
08:00 AM	0	43	15	0	0	0	4	25	2	14	2	2	107
08:15 AM	0	33	15	0	0	0	3	30	1	8	1	2	93
08:30 AM	0	24	21	1	3	1	3	44	3	15	0	2	117
08:45 AM	0	21	10	1	0	0	6	34	1	14	1	3	91
<b>Total</b>	<b>0</b>	<b>121</b>	<b>61</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>16</b>	<b>133</b>	<b>7</b>	<b>51</b>	<b>4</b>	<b>9</b>	<b>408</b>
<b>Grand Total</b>	<b>0</b>	<b>204</b>	<b>95</b>	<b>2</b>	<b>6</b>	<b>2</b>	<b>26</b>	<b>246</b>	<b>9</b>	<b>89</b>	<b>8</b>	<b>18</b>	<b>705</b>
Apprch %	0	68.2	31.8	20	60	20	9.3	87.5	3.2	77.4	7	15.7	
Total %	0	28.9	13.5	0.3	0.9	0.3	3.7	34.9	1.3	12.6	1.1	2.6	
Cars	0	199	93	2	6	2	23	237	9	85	8	12	676
% Cars	0	97.5	97.9	100	100	100	88.5	96.3	100	95.5	100	66.7	95.9
Trucks	0	5	2	0	0	0	3	9	0	4	0	6	29
% Trucks	0	2.5	2.1	0	0	0	11.5	3.7	0	4.5	0	33.3	4.1

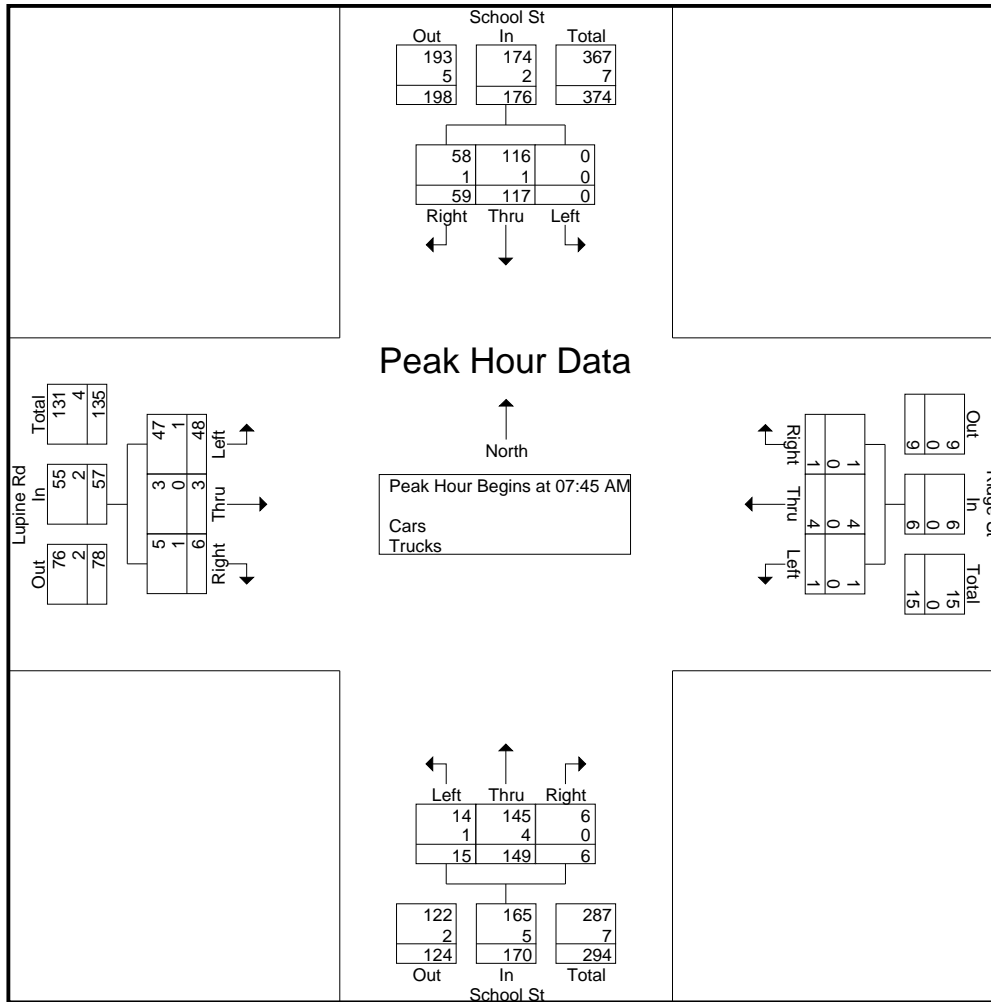
Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	17	8	25	0	1	0	1	<b>5</b>	<b>50</b>	0	<b>55</b>	11	0	0	11	92
08:00 AM	0	<b>43</b>	15	<b>58</b>	0	0	0	0	4	25	2	31	14	<b>2</b>	<b>2</b>	<b>18</b>	107
08:15 AM	0	33	15	48	0	0	0	0	3	30	1	34	8	1	2	11	93
08:30 AM	0	24	<b>21</b>	45	<b>1</b>	<b>3</b>	<b>1</b>	<b>5</b>	3	44	<b>3</b>	50	<b>15</b>	0	2	17	<b>117</b>
Total Volume	0	117	59	176	1	4	1	6	15	149	6	170	48	3	6	57	409
% App. Total	0	66.5	33.5		16.7	66.7	16.7		8.8	87.6	3.5		84.2	5.3	10.5		
PHF	.000	.680	.702	.759	.250	.333	.250	.300	.750	.745	.500	.773	.800	.375	.750	.792	.874
Cars	0	116	58	174	1	4	1	6	14	145	6	165	47	3	5	55	400
% Cars	0	99.1	98.3	98.9	100	100	100	100	93.3	97.3	100	97.1	97.9	100	83.3	96.5	97.8
Trucks	0	1	1	2	0	0	0	0	1	4	0	5	1	0	1	2	9
% Trucks	0	0.9	1.7	1.1	0	0	0	0	6.7	2.7	0	2.9	2.1	0	16.7	3.5	2.2

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 2



**Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1**

**Peak Hour for Each Approach Begins at:**

	08:00 AM				07:45 AM				07:45 AM				08:00 AM			
+0 mins.	0	<b>43</b>	15	<b>58</b>	0	1	0	1	<b>5</b>	<b>50</b>	0	<b>55</b>	14	<b>2</b>	2	<b>18</b>
+15 mins.	0	33	15	48	0	0	0	0	4	25	2	31	8	1	2	11
+30 mins.	0	24	<b>21</b>	45	0	0	0	0	3	30	1	34	<b>15</b>	0	2	17
+45 mins.	0	21	10	31	<b>1</b>	<b>3</b>	<b>1</b>	<b>5</b>	3	44	<b>3</b>	50	14	1	<b>3</b>	18
Total Volume	0	121	61	182	1	4	1	6	15	149	6	170	51	4	9	64
% App. Total	0	66.5	33.5		16.7	66.7	16.7		8.8	87.6	3.5		79.7	6.2	14.1	
PHF	.000	.703	.726	.784	.250	.333	.250	.300	.750	.745	.500	.773	.850	.500	.750	.889
Cars	0	120	60	180	1	4	1	6	14	145	6	165	50	4	8	62
% Cars	0	99.2	98.4	98.9	100	100	100	100	93.3	97.3	100	97.1	98	100	88.9	96.9
Trucks	0	1	1	2	0	0	0	0	1	4	0	5	1	0	1	2
% Trucks	0	0.8	1.6	1.1	0	0	0	0	6.7	2.7	0	2.9	2	0	11.1	3.1

# Accurate Counts

978-664-2565

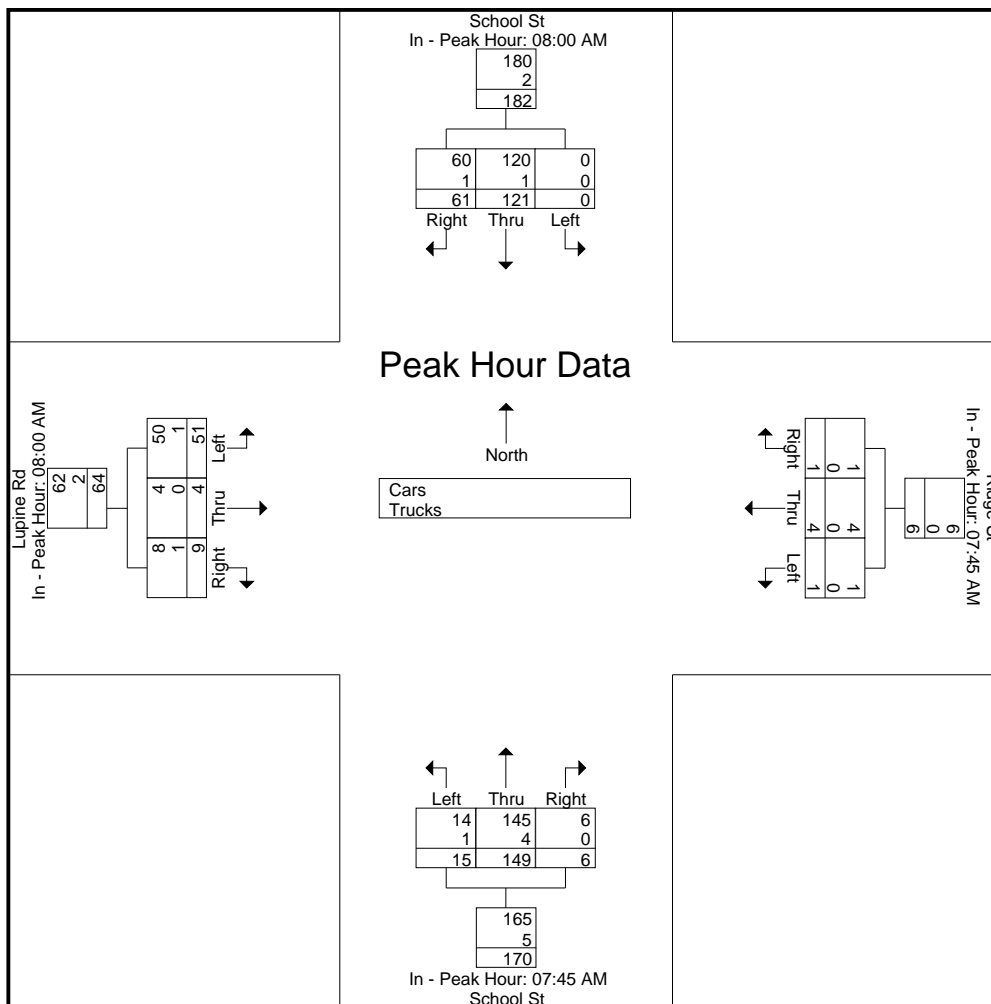
File Name : 89750008

Site Code : 89750008

Start Date : 9/20/2023

Page No : 3

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	School St From North			Ridge St From East			School St From South			Lupine Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	20	10	0	1	0	2	6	0	10	0	0	49
07:15 AM	0	24	5	0	1	1	2	12	2	3	0	3	53
07:30 AM	0	18	10	0	0	0	1	41	0	11	4	1	86
07:45 AM	0	17	8	0	1	0	5	50	0	11	0	0	92
<b>Total</b>	0	79	33	0	3	1	10	109	2	35	4	4	280
08:00 AM	0	43	15	0	0	0	4	23	2	14	2	1	104
08:15 AM	0	33	15	0	0	0	2	29	1	7	1	2	90
08:30 AM	0	23	20	1	3	1	3	43	3	15	0	2	114
08:45 AM	0	21	10	1	0	0	4	33	1	14	1	3	88
<b>Total</b>	0	120	60	2	3	1	13	128	7	50	4	8	396
<b>Grand Total</b>	0	199	93	2	6	2	23	237	9	85	8	12	676
Apprch %	0	68.2	31.8	20	60	20	8.6	88.1	3.3	81	7.6	11.4	
Total %	0	29.4	13.8	0.3	0.9	0.3	3.4	35.1	1.3	12.6	1.2	1.8	

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 07:45 AM</b>																	
07:45 AM	0	17	8	25	0	1	0	1	5	50	0	55	11	0	0	11	92
08:00 AM	0	43	15	58	0	0	0	0	4	23	2	29	14	2	1	17	104
08:15 AM	0	33	15	48	0	0	0	0	2	29	1	32	7	1	2	10	90
08:30 AM	0	23	20	43	1	3	1	5	3	43	3	49	15	0	2	17	114
<b>Total Volume</b>	0	116	58	174	1	4	1	6	14	145	6	165	47	3	5	55	400
<b>% App. Total</b>	0	66.7	33.3		16.7	66.7	16.7		8.5	87.9	3.6		85.5	5.5	9.1		
<b>PHF</b>	.000	.674	.725	.750	.250	.333	.250	.300	.700	.725	.500	.750	.783	.375	.625	.809	.877

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	School St From North			Ridge St From East			School St From South			Lupine Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	1	0	0	0	0	0	1	0	0	0	0	2
07:15 AM	0	2	1	0	0	0	0	1	0	2	0	5	11
07:30 AM	0	1	0	0	0	0	0	2	0	1	0	0	4
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>5</b>	<b>17</b>
08:00 AM	0	0	0	0	0	0	0	2	0	0	0	1	3
08:15 AM	0	0	0	0	0	0	1	1	0	1	0	0	3
08:30 AM	0	1	1	0	0	0	0	1	0	0	0	0	3
08:45 AM	0	0	0	0	0	0	2	1	0	0	0	0	3
<b>Total</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>12</b>
<b>Grand Total</b>	<b>0</b>	<b>5</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>9</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>6</b>	<b>29</b>
Apprch %	0	71.4	28.6	0	0	0	25	75	0	40	0	60	
Total %	0	17.2	6.9	0	0	0	10.3	31	0	13.8	0	20.7	

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 07:15 AM</b>																	
07:15 AM	0	2	1	3	0	0	0	0	0	1	0	1	2	0	5	7	11
07:30 AM	0	1	0	1	0	0	0	0	0	2	0	2	1	0	0	1	4
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	2	0	2	0	0	1	1	3
<b>Total Volume</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>5</b>	<b>3</b>	<b>0</b>	<b>6</b>	<b>9</b>	<b>18</b>
<b>% App. Total</b>	<b>0</b>	<b>75</b>	<b>25</b>		<b>0</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>100</b>	<b>0</b>		<b>33.3</b>	<b>0</b>	<b>66.7</b>		
PHF	.000	.375	.250	.333	.000	.000	.000	.000	.000	.625	.000	.625	.375	.000	.300	.321	.409

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2	0	2
07:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
07:45 AM	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	1	3
<b>Total</b>	0	1	0	0	0	0	0	4	0	1	0	1	0	0	0	0	5	2	7
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	2	1	3
08:30 AM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0	2
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	2	0	0	0	1	0	1	0	0	0	0	0	1	4	1	5
<b>Grand Total</b>	0	1	0	2	0	0	0	5	0	2	0	1	0	0	0	1	9	3	12
Apprch %	0	100	0		0	0	0		0	100	0		0	0	0				
Total %	0	33.3	0		0	0	0		0	66.7	0		0	0	0		75	25	

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
<b>Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 07:30 AM</b>																	
07:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
07:45 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
<b>Total Volume</b>	0	1	0	1	0	0	0	0	0	2	0	2	0	0	0	0	3
<b>% App. Total</b>	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.250	.000	.250	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.750

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 1

### Groups Printed- Cars - Trucks

Start Time	School St From North			Ridge St From East			School St From South			Lupine Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	15	17	1	0	0	12	70	0	17	2	2	136
04:15 PM	0	21	12	1	0	1	7	53	2	17	1	6	121
04:30 PM	0	28	8	0	1	0	3	45	2	8	0	3	98
04:45 PM	0	29	7	1	0	0	1	48	0	13	0	2	101
<b>Total</b>	<b>0</b>	<b>93</b>	<b>44</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>23</b>	<b>216</b>	<b>4</b>	<b>55</b>	<b>3</b>	<b>13</b>	<b>456</b>
05:00 PM	0	20	7	0	0	0	8	67	1	13	2	5	123
05:15 PM	0	34	12	1	0	0	2	51	0	16	0	6	122
05:30 PM	0	25	7	0	3	0	0	52	2	12	0	2	103
05:45 PM	1	32	8	0	0	0	2	54	1	14	0	0	112
<b>Total</b>	<b>1</b>	<b>111</b>	<b>34</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>12</b>	<b>224</b>	<b>4</b>	<b>55</b>	<b>2</b>	<b>13</b>	<b>460</b>
<b>Grand Total</b>	<b>1</b>	<b>204</b>	<b>78</b>	<b>4</b>	<b>4</b>	<b>1</b>	<b>35</b>	<b>440</b>	<b>8</b>	<b>110</b>	<b>5</b>	<b>26</b>	<b>916</b>
Apprch %	0.4	72.1	27.6	44.4	44.4	11.1	7.2	91.1	1.7	78	3.5	18.4	
Total %	0.1	22.3	8.5	0.4	0.4	0.1	3.8	48	0.9	12	0.5	2.8	
Cars	1	200	76	4	4	1	32	431	8	110	5	26	898
% Cars	100	98	97.4	100	100	100	91.4	98	100	100	100	100	98
Trucks	0	4	2	0	0	0	3	9	0	0	0	0	18
% Trucks	0	2	2.6	0	0	0	8.6	2	0	0	0	0	2

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	20	7	27	0	0	0	0	<b>8</b>	<b>67</b>	1	<b>76</b>	13	2	5	20	<b>123</b>
05:15 PM	0	<b>34</b>	<b>12</b>	<b>46</b>	<b>1</b>	0	0	1	2	51	0	53	<b>16</b>	0	<b>6</b>	<b>22</b>	122
05:30 PM	0	25	7	32	0	<b>3</b>	0	<b>3</b>	0	52	<b>2</b>	54	12	0	2	14	103
05:45 PM	<b>1</b>	32	8	41	0	0	0	0	2	54	1	57	14	0	0	14	112
<b>Total Volume</b>	<b>1</b>	<b>111</b>	<b>34</b>	<b>146</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>12</b>	<b>224</b>	<b>4</b>	<b>240</b>	<b>55</b>	<b>2</b>	<b>13</b>	<b>70</b>	<b>460</b>
% App. Total	0.7	76	23.3		25	75	0		5	93.3	1.7		78.6	2.9	18.6		
PHF	.250	.816	.708	.793	.250	.250	.000	.333	.375	.836	.500	.789	.859	.250	.542	.795	.935
Cars	1	110	34	145	1	3	0	4	12	221	4	237	55	2	13	70	456
% Cars	100	99.1	100	99.3	100	100	0	100	100	98.7	100	98.8	100	100	100	100	99.1
Trucks	0	1	0	1	0	0	0	0	0	3	0	3	0	0	0	0	4
% Trucks	0	0.9	0	0.7	0	0	0	0	0	1.3	0	1.3	0	0	0	0	0.9

# Accurate Counts

978-664-2565

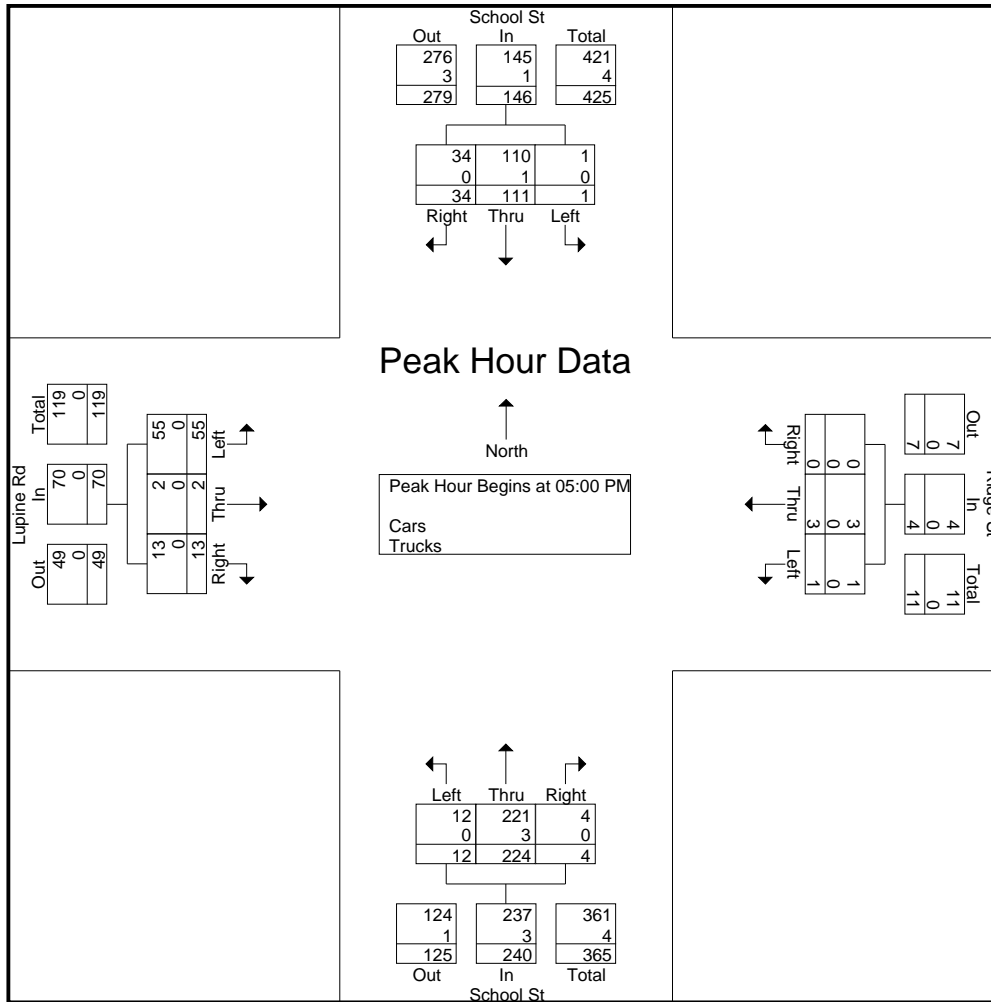
File Name : 89750008

Site Code : 89750008

Start Date : 9/20/2023

Page No : 2

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	05:00 PM				04:00 PM				04:00 PM				04:00 PM			
+0 mins.	0	20	7	27	1	0	0	1	12	70	0	82	17	2	2	21
+15 mins.	0	34	12	46	1	0	1	2	7	53	2	62	17	1	6	24
+30 mins.	0	25	7	32	0	1	0	1	3	45	2	50	8	0	3	11
+45 mins.	1	32	8	41	1	0	0	1	1	48	0	49	13	0	2	15
Total Volume	1	111	34	146	3	1	1	5	23	216	4	243	55	3	13	71
% App. Total	0.7	76	23.3		60	20	20		9.5	88.9	1.6		77.5	4.2	18.3	
PHF	.250	.816	.708	.793	.750	.250	.250	.625	.479	.771	.500	.741	.809	.375	.542	.740
Cars	1	110	34	145	3	1	1	5	20	210	4	234	55	3	13	71
% Cars	100	99.1	100	99.3	100	100	100	100	87	97.2	100	96.3	100	100	100	100
Trucks	0	1	0	1	0	0	0	0	3	6	0	9	0	0	0	0
% Trucks	0	0.9	0	0.7	0	0	0	0	13	2.8	0	3.7	0	0	0	0

# Accurate Counts

978-664-2565

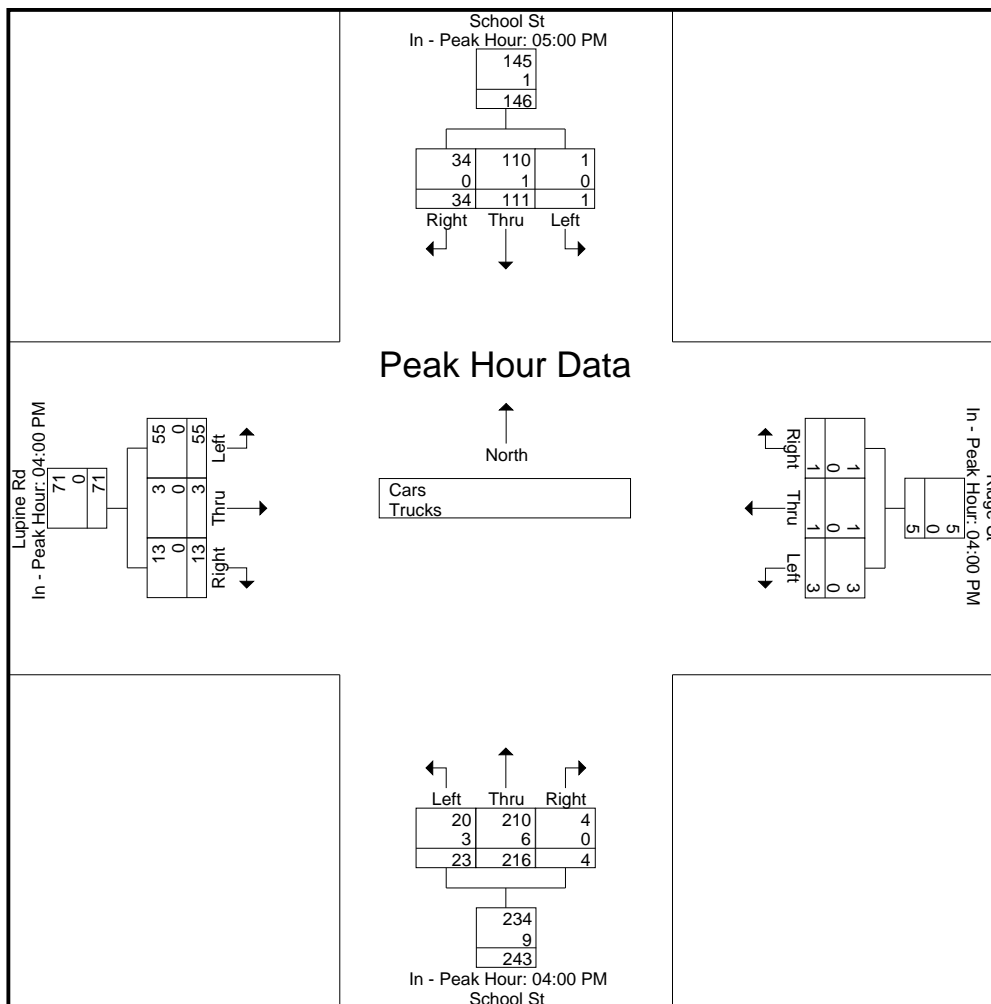
File Name : 89750008

Site Code : 89750008

Start Date : 9/20/2023

Page No : 3

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear



# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 4

## Groups Printed- Cars

Start Time	School St From North			Ridge St From East			School St From South			Lupine Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	14	15	1	0	0	10	67	0	17	2	2	128
04:15 PM	0	20	12	1	0	1	6	52	2	17	1	6	118
04:30 PM	0	28	8	0	1	0	3	43	2	8	0	3	96
04:45 PM	0	28	7	1	0	0	1	48	0	13	0	2	100
<b>Total</b>	<b>0</b>	<b>90</b>	<b>42</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>20</b>	<b>210</b>	<b>4</b>	<b>55</b>	<b>3</b>	<b>13</b>	<b>442</b>
05:00 PM	0	20	7	0	0	0	8	66	1	13	2	5	122
05:15 PM	0	33	12	1	0	0	2	51	0	16	0	6	121
05:30 PM	0	25	7	0	3	0	0	51	2	12	0	2	102
05:45 PM	1	32	8	0	0	0	2	53	1	14	0	0	111
<b>Total</b>	<b>1</b>	<b>110</b>	<b>34</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>12</b>	<b>221</b>	<b>4</b>	<b>55</b>	<b>2</b>	<b>13</b>	<b>456</b>
<b>Grand Total</b>	<b>1</b>	<b>200</b>	<b>76</b>	<b>4</b>	<b>4</b>	<b>1</b>	<b>32</b>	<b>431</b>	<b>8</b>	<b>110</b>	<b>5</b>	<b>26</b>	<b>898</b>
Apprch %	0.4	72.2	27.4	44.4	44.4	11.1	6.8	91.5	1.7	78	3.5	18.4	
Total %	0.1	22.3	8.5	0.4	0.4	0.1	3.6	48	0.9	12.2	0.6	2.9	

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
<b>Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 05:00 PM</b>																	
05:00 PM	0	20	7	27	0	0	0	0	<b>8</b>	<b>66</b>	1	<b>75</b>	13	2	5	20	<b>122</b>
05:15 PM	0	<b>33</b>	<b>12</b>	<b>45</b>	<b>1</b>	0	0	1	2	51	0	53	<b>16</b>	0	<b>6</b>	<b>22</b>	121
05:30 PM	0	25	7	32	0	<b>3</b>	0	<b>3</b>	0	51	<b>2</b>	53	12	0	2	14	102
05:45 PM	<b>1</b>	32	8	41	0	0	0	0	2	53	1	56	14	0	0	14	111
<b>Total Volume</b>	<b>1</b>	<b>110</b>	<b>34</b>	<b>145</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>12</b>	<b>221</b>	<b>4</b>	<b>237</b>	<b>55</b>	<b>2</b>	<b>13</b>	<b>70</b>	<b>456</b>
<b>% App. Total</b>	<b>0.7</b>	<b>75.9</b>	<b>23.4</b>		<b>25</b>	<b>75</b>	<b>0</b>		<b>5.1</b>	<b>93.2</b>	<b>1.7</b>		<b>78.6</b>	<b>2.9</b>	<b>18.6</b>		
PHF	.250	.833	.708	.806	.250	.250	.000	.333	.375	.837	.500	.790	.859	.250	.542	.795	.934

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 7

### Groups Printed- Trucks

Start Time	School St From North			Ridge St From East			School St From South			Lupine Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	1	2	0	0	0	2	3	0	0	0	0	8
04:15 PM	0	1	0	0	0	0	1	1	0	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	2	0	0	0	0	2
04:45 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
<b>Total</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14</b>
05:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
05:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Grand Total</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>18</b>
Apprch %	0	66.7	33.3	0	0	0	25	75	0	0	0	0	
Total %	0	22.2	11.1	0	0	0	16.7	50	0	0	0	0	

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
<b>Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 04:00 PM</b>																	
04:00 PM	0	1	2	3	0	0	0	0	2	3	0	5	0	0	0	0	8
04:15 PM	0	1	0	1	0	0	0	0	1	1	0	2	0	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2
04:45 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
<b>Total Volume</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>6</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14</b>
<b>% App. Total</b>	<b>0</b>	<b>60</b>	<b>40</b>		<b>0</b>	<b>0</b>	<b>0</b>		<b>33.3</b>	<b>66.7</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>		
PHF	.000	.750	.250	.417	.000	.000	.000	.000	.375	.500	.000	.450	.000	.000	.000	.000	.438

# Accurate Counts

978-664-2565

N/S Street : School Street  
 E/W Street : Ridge St / Lupine Rd  
 City/State : Andover, MA  
 Weather : Clear

File Name : 89750008  
 Site Code : 89750008  
 Start Date : 9/20/2023  
 Page No : 10

### Groups Printed- Bikes Peds

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
04:00 PM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0	2
04:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
04:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
04:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
<b>Total</b>	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	5	0	5
05:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
05:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
05:30 PM	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	4	0	4
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	0	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	6	0	6
<b>Grand Total</b>	0	0	0	4	0	0	0	5	0	0	0	1	0	0	0	1	11	0	11
Apprch %	0	0	0		0	0	0		0	0	0		0	0	0				
Total %																	100	0	

Start Time	School St From North				Ridge St From East				School St From South				Lupine Rd From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
<b>Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1</b>																	
<b>Peak Hour for Entire Intersection Begins at 04:00 PM</b>																	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	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	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Volume</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>% App. Total</b>	0	0	0		0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SEASONAL ADJUSTMENT DATA

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Massachusetts Highway Department  
Statewide Traffic Data Collection  
2019 Weekday Seasonal Factors

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

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

**Recreational - East Group** - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

**Recreational - West Group** - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113, 1114,1116,2196,2197 and 2198.

PUBLIC TRANSPORTATION SCHEDULES

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# ROUTE 21 OUTBOUND

## Andover Shuttle

### MONDAY - FRIDAY

1	2	3	4	5	6	7	8	9
Bus starts at The Robb Center	Bus Leaves from Chestnut Court	Bus Leaves from The Robb Center	Bus Leaves from Main St & Central St	Bus Leaves from Andover Commons	Bus Leaves from Shawsheen Plaza	Bus Leaves from Frye Circle	Bus Leaves from Doctor's Park	Bus ends at ANA YMCA
8:10	8:13	8:15	8:19	8:21	8:25	8:28	8:33	8:35
9:20	9:23	9:25	9:29	9:31	9:35	9:38	9:43	9:45
10:30	10:33	10:35	10:39	10:41	10:45	10:48	10:53	10:55
11:40	11:43	11:45	11:49	11:51	11:55	11:58	<b>12:03</b>	<b>12:05</b>
<b>12:50</b>	<b>12:53</b>	<b>12:55</b>	<b>12:59</b>	<b>1:01</b>	<b>1:05</b>	<b>1:08</b>	<b>1:13</b>	<b>1:15</b>
<b>2:00</b>	<b>2:03</b>	<b>2:05</b>	<b>2:09</b>	<b>2:12</b>	<b>2:15</b>	<b>2:18</b>	<b>2:23</b>	<b>2:25</b>
<b>3:10</b>	<b>3:13</b>	<b>3:15</b>	<b>3:19</b>	<b>3:22</b>	<b>3:25</b>	<b>3:28</b>	<b>3:33</b>	<b>3:35</b>
<b>4:20</b>	<b>4:23</b>	<b>4:25</b>	<b>4:29</b>	<b>4:32</b>	<b>4:35</b>	<b>4:38</b>	<b>4:43</b>	<b>4:45</b>
<b>5:30</b>	<b>5:33</b>	<b>5:36</b>	<b>5:39</b>	<b>5:42</b>	<b>5:45</b>	<b>5:48</b>	<b>5:53</b>	<b>5:55</b>
<b>6:40</b>	<b>6:33</b>	-	-	-	-	-	-	-

Updated 07.24.2021

# ROUTE 21 INBOUND

## Andover Shuttle

### MONDAY - FRIDAY

9	10	11	12	13	14	15
Bus starts at North Andover Mall	Bus Leaves from Doctor's Park	Bus Leaves from Frye Circle	Bus Leaves from Shawsheen Plaza	Bus Leaves from Andover Commons	Bus Leaves from Main St & Central St	Bus ends at The Robb Center
8:40	8:48	8:53	8:57	9:00	9:03	9:07
9:50	9:58	10:03	10:07	10:10	10:13	10:17
11:00	11:08	11:13	11:17	11:20	11:23	11:27
<b>12:10</b>	<b>12:18</b>	<b>12:23</b>	<b>12:27</b>	<b>12:30</b>	<b>12:33</b>	<b>12:37</b>
<b>1:20</b>	<b>1:28</b>	<b>1:33</b>	<b>1:37</b>	<b>1:40</b>	<b>1:43</b>	<b>1:47</b>
<b>2:30</b>	<b>2:38</b>	<b>2:43</b>	<b>2:47</b>	<b>2:50</b>	<b>2:53</b>	<b>2:57</b>
<b>3:40</b>	<b>3:48</b>	<b>3:53</b>	<b>3:57</b>	<b>4:00</b>	<b>4:03</b>	<b>4:07</b>
<b>4:50</b>	<b>4:58</b>	<b>5:03</b>	<b>5:07</b>	<b>5:10</b>	<b>4:13</b>	<b>4:17</b>
<b>6:00</b>	<b>6:08</b>	<b>6:13</b>	<b>6:17</b>	<b>6:20</b>	<b>6:23</b>	<b>6:27</b>

Updated 07.24.2021

# ROUTE 2 OUTBOUND

## Andover via South Broadway

### WEEKDAYS

1	2	3	4	5
Bus starts at Buckley Transportation Center	Bus Leaves from So Broadway and Mt. Vernon	Bus Leaves from Shawsheen Square	Bus Leaves from Main St & Central St	Bus ends at Main St & School St
5:30	5:40	5:44	5:48	5:51
6:00	6:10	6:14	6:18	6:21
6:30	6:40	6:44	6:48	6:51
7:00	7:10	7:14	7:18	7:21
7:30	7:40	7:44	7:48	7:51
8:00	8:10	8:14	8:18	8:21
8:30	8:40	8:44	8:48	8:51
9:00	9:10	9:14	9:18	9:21
9:30	9:40	9:44	9:48	9:51
10:00	10:10	10:14	10:18	10:21
10:30	10:40	10:44	10:48	10:51
11:00	11:10	11:14	11:18	11:21
11:30	11:40	11:44	11:48	11:51
<b>12:00</b>	<b>12:10</b>	<b>12:14</b>	<b>12:18</b>	<b>12:21</b>
<b>12:30</b>	<b>12:40</b>	<b>12:44</b>	<b>12:48</b>	<b>12:51</b>
<b>1:00</b>	<b>1:10</b>	<b>1:14</b>	<b>1:18</b>	<b>1:21</b>
<b>1:30</b>	<b>1:40</b>	<b>1:44</b>	<b>1:48</b>	<b>1:51</b>
<b>2:00</b>	<b>2:10</b>	<b>2:14</b>	<b>2:18</b>	<b>2:21</b>
<b>2:30</b>	<b>2:40</b>	<b>2:44</b>	<b>2:48</b>	<b>2:51</b>
<b>3:00</b>	<b>3:10</b>	<b>3:14</b>	<b>3:18</b>	<b>3:21</b>
<b>3:30</b>	<b>3:40</b>	<b>3:44</b>	<b>3:48</b>	<b>3:51</b>
<b>4:00</b>	<b>4:10</b>	<b>4:14</b>	<b>4:18</b>	<b>4:21</b>
<b>4:30</b>	<b>4:40</b>	<b>4:44</b>	<b>4:48</b>	<b>4:51</b>
<b>5:00</b>	<b>5:10</b>	<b>5:14</b>	<b>5:18</b>	<b>5:21</b>
<b>5:30</b>	<b>5:40</b>	<b>5:44</b>	<b>5:48</b>	<b>5:51</b>
<b>6:00</b>	<b>6:10</b>	<b>6:14</b>	<b>6:18</b>	<b>6:21</b>
<b>6:30</b>	<b>6:40</b>	<b>6:44</b>	<b>6:48</b>	<b>6:51</b>
<b>7:00</b>	<b>7:10</b>	<b>7:14</b>	<b>7:18</b>	<b>7:21</b>
<b>8:00</b>	<b>8:10</b>	<b>8:14</b>	<b>8:18</b>	<b>8:21</b>
<b>9:00</b>	<b>9:10</b>	<b>9:14</b>	<b>9:18</b>	<b>9:21</b>

### SATURDAYS

7:00	7:10	7:14	7:18	7:21
8:00	8:10	8:14	8:18	8:21
9:00	9:10	9:14	9:18	9:21
10:00	10:10	10:14	10:18	10:21
11:00	11:10	11:14	11:18	11:21
<b>12:00</b>	<b>12:10</b>	<b>12:14</b>	<b>12:18</b>	<b>12:21</b>
<b>1:00</b>	<b>1:10</b>	<b>1:14</b>	<b>1:18</b>	<b>1:21</b>
<b>2:00</b>	<b>2:10</b>	<b>2:14</b>	<b>2:18</b>	<b>2:21</b>
<b>3:00</b>	<b>3:10</b>	<b>3:14</b>	<b>3:18</b>	<b>3:21</b>
<b>4:00</b>	<b>4:10</b>	<b>4:14</b>	<b>4:18</b>	<b>4:21</b>
<b>5:00</b>	<b>5:10</b>	<b>5:14</b>	<b>5:18</b>	<b>5:21</b>
<b>6:00</b>	<b>6:10</b>	<b>6:14</b>	<b>6:18</b>	<b>6:21</b>

# ROUTE 2 INBOUND

## Andover via South Broadway

### WEEKDAYS

5	6	7	8	9	
Bus starts at School St & Mainl St	Bus Leaves from Andover Square	Bus Leaves from Shawsheen Square	Bus Leaves from So Broadway and Mt. Vernon	Bus ends at Buckley Transportation Center	Bus continues on as Route
-	5:24	5:31	5:34	5:45	6
5:51	5:54	6:01	6:04	6:15	6
6:21	6:24	6:31	6:34	6:45	6
6:51	6:54	7:01	7:04	7:15	6
7:21	7:24	7:31	7:34	7:45	6
7:51	7:54	8:01	8:04	8:15	6
8:21	8:24	8:31	8:34	8:45	6
8:51	8:54	9:01	9:04	9:15	6
9:21	9:24	9:31	9:34	9:45	6
9:51	9:54	10:01	10:04	10:15	6
10:21	10:24	10:31	10:34	10:45	6
10:51	10:54	11:01	11:04	11:15	6
11:21	11:24	11:31	11:34	11:45	6
11:51	11:54	12:01	12:04	<b>12:15</b>	<b>6</b>
<b>12:21</b>	<b>12:24</b>	<b>12:31</b>	<b>12:34</b>	<b>12:45</b>	<b>6</b>
<b>12:51</b>	<b>12:54</b>	<b>1:01</b>	<b>1:04</b>	<b>1:15</b>	<b>6</b>
<b>1:21</b>	<b>1:24</b>	<b>1:31</b>	<b>1:34</b>	<b>1:45</b>	<b>6</b>
<b>1:51</b>	<b>1:54</b>	<b>2:01</b>	<b>2:04</b>	<b>2:15</b>	<b>6</b>
<b>2:21</b>	<b>2:24</b>	<b>2:31</b>	<b>2:34</b>	<b>2:45</b>	<b>6</b>
<b>2:51</b>	<b>2:54</b>	<b>3:01</b>	<b>3:04</b>	<b>3:15</b>	<b>6</b>
<b>3:21</b>	<b>3:24</b>	<b>3:31</b>	<b>3:34</b>	<b>3:45</b>	<b>6</b>
<b>3:51</b>	<b>3:54</b>	<b>4:01</b>	<b>4:04</b>	<b>4:15</b>	<b>6</b>
<b>4:21</b>	<b>4:24</b>	<b>4:31</b>	<b>4:34</b>	<b>4:45</b>	<b>6</b>
<b>4:51</b>	<b>4:54</b>	<b>5:01</b>	<b>5:04</b>	<b>5:15</b>	<b>6</b>
<b>5:21</b>	<b>5:24</b>	<b>5:31</b>	<b>5:34</b>	<b>5:45</b>	<b>6</b>
<b>5:51</b>	<b>5:54</b>	<b>6:01</b>	<b>6:04</b>	<b>6:15</b>	<b>6</b>
<b>6:21</b>	<b>6:24</b>	<b>6:31</b>	<b>6:34</b>	<b>6:45</b>	<b>6</b>
<b>6:51</b>	<b>6:54</b>	<b>7:01</b>	<b>7:04</b>	<b>7:15</b>	<b>2</b>
<b>7:21</b>	<b>7:24</b>	<b>7:31</b>	<b>7:34</b>	<b>7:45</b>	<b>2</b>
<b>8:21</b>	<b>8:24</b>	<b>8:31</b>	<b>8:34</b>	<b>8:45</b>	<b>2</b>
<b>9:21</b>	<b>9:24</b>	<b>9:31</b>	<b>9:34</b>	<b>9:45</b>	<b>-</b>

### SATURDAYS

7:21	7:24	7:33	7:36	7:45	6
8:21	8:24	8:33	8:36	8:45	6
9:21	9:24	9:33	9:36	9:45	6
10:21	10:24	10:33	10:36	10:45	6
11:21	11:24	11:33	11:36	11:45	6
<b>12:21</b>	<b>12:24</b>	<b>12:33</b>	<b>12:36</b>	<b>12:45</b>	<b>6</b>
<b>1:21</b>	<b>1:24</b>	<b>1:33</b>	<b>1:36</b>	<b>1:45</b>	<b>6</b>
<b>2:21</b>	<b>2:24</b>	<b>2:33</b>	<b>2:36</b>	<b>2:45</b>	<b>6</b>
<b>3:21</b>	<b>3:24</b>	<b>3:33</b>	<b>3:36</b>	<b>3:45</b>	<b>6</b>
<b>4:21</b>	<b>4:24</b>	<b>4:33</b>	<b>4:36</b>	<b>4:45</b>	<b>6</b>
<b>5:21</b>	<b>5:24</b>	<b>5:33</b>	<b>5:36</b>	<b>5:45</b>	<b>6</b>
<b>6:21</b>	<b>6:24</b>	<b>6:33</b>	<b>6:36</b>	<b>6:45</b>	<b>-</b>

MASSDOT CRASH RATE WORKSHEETS

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# INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Andover COUNT DATE : Sep-23

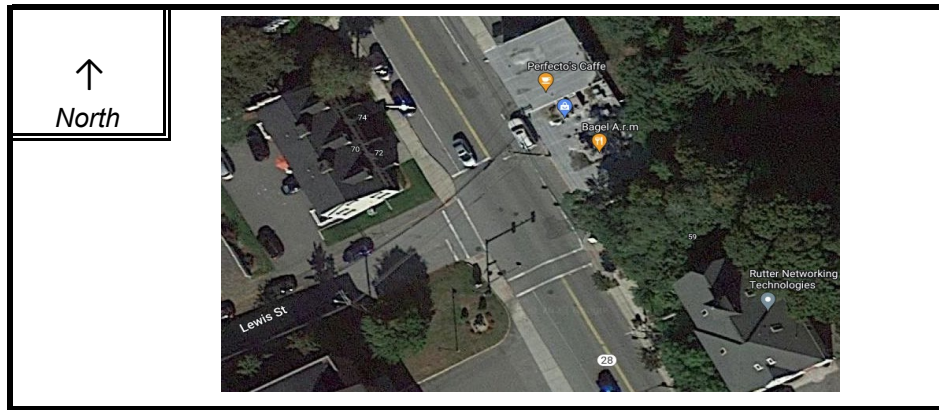
DISTRICT : 4 UNSIGNALIZED :  SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Route 28

MINOR STREET(S) : Lewis Street

**INTERSECTION  
 DIAGRAM**  
 (Label Approaches)



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM) :	6		588	452		<b>1,046</b>

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

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

Comments : Below Statewide and District Crash Rates

Project Title & Date : Proposed Andover Town Yard Redevelopment

# INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Andover COUNT DATE : Sep-23

DISTRICT : 4 UNSIGNALIZED :  SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Route 28

MINOR STREET(S) : Pearson Street

**INTERSECTION  
 DIAGRAM  
 (Label Approaches)**



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM) :	100		589	453		1,142

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

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

Comments : Below Statewide and District Crash Rates

Project Title & Date: Proposed Andover Town Yard Redevelopment

# INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Andover COUNT DATE : Sep-23

DISTRICT : 4 UNSIGNALIZED :  SIGNALIZED :

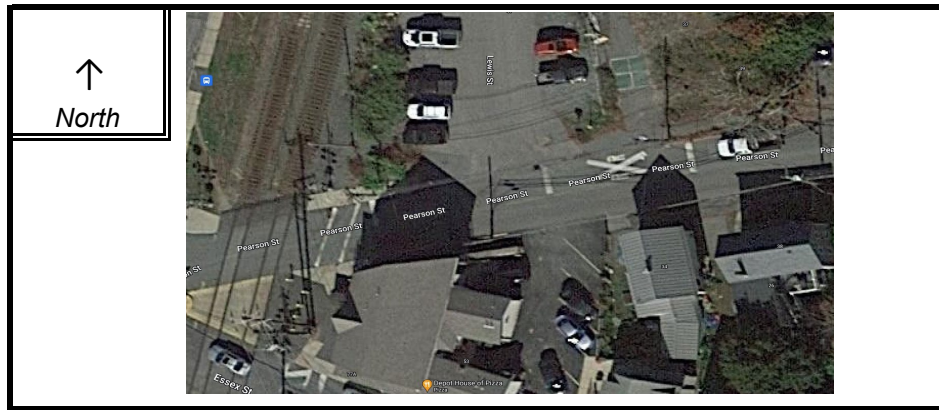
~ INTERSECTION DATA ~

MAJOR STREET : Pearson Street

MINOR STREET(S) : Site Driveway

Depot Pizza parking lot

**INTERSECTION  
 DIAGRAM  
 (Label Approaches)**



**PEAK HOUR VOLUMES**

APPROACH :	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM) :	72	38	1	4		<b>115</b>

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

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

Comments : Below Statewide and District Crash Rates

Project Title & Date : Proposed Andover Town Yard Redevelopment

## INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Andover COUNT DATE : Sep-23

DISTRICT : 4 UNSIGNALIZED :  SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Essex Street

MINOR STREET(S) : Pearson Street

Railroad Street

Dundee Park Drive

**INTERSECTION  
DIAGRAM**  
(Label Approaches)



**PEAK HOUR VOLUMES**

APPROACH :	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Total Peak Hourly Approach Volume</b>
DIRECTION :	EB	WB	NB	SB	SWB	
PEAK HOURLY VOLUMES (AM) :	344	416	107	179	56	<b>1,102</b>

" K " FACTOR :  INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :  # OF YEARS :  AVERAGE # OF CRASHES PER YEAR ( A ) :

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

Comments : Below Statewide and District Crash Rates

Project Title & Date: Proposed Andover Town Yard Redevelopment







## GROWTH RATE DATA

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**General Background Traffic Growth - Daily Traffic Volumes**

CITY/TOWN	ROUTE/STREET	LOCATION	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average Annual
North Andover	Turnpike Street	North of Andover By-pass	37,586	36,069	37,710	37,026	37,999	37,998	38,917	39,114	39,544	40,029	40,189	<b>0.91%</b>
Andover	Summer Street	West of Hillside Road	1,279	1,100	1,161	1,140	1,169	1,205	1,233	1,420	1,444	1,448	1,266	<b>1.80%</b>
Andover	Lupine Road	South of School Street	1,600	1,596	1,629	1,478	1,493	1,539	1,629	1,730	1,759	1,143	1,138	<b>-2.16%</b>
North Andover	Turnpike Street	South of Route 133	29300	29365		25350	25795	27214	28375	28744	29060	29572	29690	<b>0.96%</b>
North Andover	Andover By-pass	South of Route 114	14145	14300	16718	16408	16834	19600	19816	20074	18281	18537	17323	<b>2.67%</b>
Andover	North Main Street	South of I-495	25401	25680	26651	27467	27501	26683	26977	27328	29708	30124	30244	<b>1.71%</b>
Andover	Haverhill Street	East of Route 28	13746	13897	14398	14676	14736	14743	14905	15099	15062	15273	15334	<b>1.05%</b>
North Andover	Peters Street	North of Route 114	8965	9063	9295	9219	9380	9569	9674	9840	9449	9581	9619	<b>0.71%</b>
North Andover	Andover Street	North of Route 114	15336	16516	17233	16993	17310	18234	18453	18675	16478	16709	16776	<b>0.64%</b>
														<b>0.92%</b>

MODE SPLIT DATA

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	Base Mode Splits from Census	Adjusted Mode Splits				
		Residential	Gym	WeWorks	Com Cen	Coffee
Drove Vehicle	64	41	40	33	100	40
Public Transportation	2	25	--	33	0	--
Walked	13	13	30	34	0	30
Worked From Home	21	21	30	--	0	30
Total	100	100	100	100	100	100

TRIP GENERATION DATA

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Base Trip Generation						
Square Footage:	164	2.5	1.7	0.8	2.2	
	Multifamily (Mid-Rise)	Health Club <sup>a</sup>	Small Office	Coffee Shop	Com Cen	Totals
Daily Trips	744.56	62.575	24.463	426.856	63.404	1322
Entering	372.28	31.2875	12.2315	213.428	31.702	661
Exiting	372.28	31.2875	12.2315	213.428	31.702	661
AM Peak	60.68	3.275	2.839	68.704	4.202	140
Entering	13.9564	1.67025	2.32798	35.03904	2.77332	56
Exiting	46.7236	1.60475	0.51102	33.66496	1.42868	84
PM Peak	63.96	8.625	3.672	31.192	5.5	113
Entering	39.0156	4.91625	1.24848	15.596	2.585	64
Exiting	24.9444	3.70875	2.42352	15.596	2.915	50

<sup>a</sup> ITE does not have data on Health Clubs for daily trips. Daily rate derived from ratio of daily to peak hour rates between LUC 492 and LUC 491

Internal Trips:						
	0.1	0.1	0.1	0.1	0	
	Multifamily (Mid-Rise)	Health Club	Small Office	Coffee Shop	Com Cen	Totals
Daily Trips	670.104	56.3175	22.0167	384.1704	63.404	1197
Entering	335.052	28.15875	11.00835	192.0852	31.702	599
Exiting	335.052	28.15875	11.00835	192.0852	31.702	599
AM Peak	54.612	2.9475	2.5551	61.8336	4.202	127
Entering	12.56076	1.503225	2.095182	31.535136	2.77332	51
Exiting	42.05124	1.444275	0.459918	30.298464	1.42868	76
PM Peak	57.564	7.7625	3.3048	28.0728	5.5	103
Entering	35.11404	4.424625	1.123632	14.0364	2.585	58
Exiting	22.44996	3.337875	2.181168	14.0364	2.915	45

V.O.R.:						
	1.05	1.05	1.05	1.05	1.05	
	Multifamily (Mid-Rise)	Health Club	Small Office	Coffee Shop	Com Cen	Totals
Daily Trips	274.74264	22.527	7.265511	153.66816	63.404	522
Entering	137.37132	11.2635	3.6327555	76.83408	31.702	261
Exiting	137.37132	11.2635	3.6327555	76.83408	31.702	261
AM Peak	22.39092	1.179	0.843183	24.73344	4.202	54
Entering	5.1499116	0.60129	0.69141006	12.6140544	2.77332	22
Exiting	17.2410084	0.57771	0.15177294	12.1193856	1.42868	32
PM Peak	23.60124	3.105	1.090584	11.22912	5.5	45
Entering	14.3967564	1.76985	0.37079856	5.61456	2.585	25
Exiting	9.2044836	1.33515	0.71978544	5.61456	2.915	20

Final Trip Generation						
	Multifamily (Mid-Rise)	Health Club	Small Office	Coffee Shop	Com Cen	Totals
Daily Trips	276	24	8	154	64	526
Entering	138	12	4	77	32	263
Exiting	138	12	4	77	32	263
AM Peak	22	2	1	25	4	54
Entering	5	1	1	13	3	23
Exiting	17	1	0	12	1	31
PM Peak	24	3	1	12	6	46
Entering	15	2	0	6	3	26
Exiting	9	1	1	6	3	20

JOURNEY TO WORK

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## CAPACITY ANALYSIS

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2023 Existing Weekday Morning Peak Hour  
2023 Existing Weekday Evening Peak Hour  
2030 No-Build Weekday Morning Peak Hour  
2030 No-Build Weekday Evening Peak Hour  
2030 Build Weekday Morning Peak Hour  
2030 Build Weekday Evening Peak Hour

2023 Existing Weekday Morning Peak Hour

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2023 Existing Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/06/2023



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕				↕			↕	
Traffic Volume (vph)	130	0	12	0	3	17	1	388	1	2	537	182
Future Volume (vph)	130	0	12	0	3	17	1	388	1	2	537	182
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.988		0.865							0.961	
Flt Protected		0.956						0.998				
Satd. Flow (prot)	0	1905	0	1863	0	0	0	3417	0	0	3297	0
Flt Permitted		0.956						0.903			0.954	
Satd. Flow (perm)	0	1905	0	1863	0	0	0	3092	0	0	3145	0
Satd. Flow (RTOR)		126		496							1	
Adj. Flow (vph)	135	0	13	0	8	22	1	497	1	2	610	207
Lane Group Flow (vph)	0	148	0	8	0	0	0	521	0	0	827	0
Turn Type	Split	NA		NA		Perm	Perm	NA		Perm	NA	
Protected Phases	7	7		8				2			6	
Permitted Phases						2	2			6		
Detector Phase	7	7		8		2	2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	10.5		10.5		10.5	10.5	10.5		10.5	10.5	
Total Split (s)	25.5	25.5		15.5		54.5	54.5	54.5		54.5	54.5	
Total Split (%)	19.0%	19.0%		11.6%		40.7%	40.7%	40.7%		40.7%	40.7%	
Maximum Green (s)	20.0	20.0		10.0		49.0	49.0	49.0		49.0	49.0	
Yellow Time (s)	3.5	3.5		3.5		3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0				0.0			0.0	
Total Lost Time (s)		5.5		5.5				5.5			5.5	
Lead/Lag	Lead	Lead		Lag								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None		Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		7.3		5.7				50.7			50.7	
Actuated g/C Ratio		0.10		0.08				0.68			0.68	
v/c Ratio		0.49		0.01				0.25			0.38	
Control Delay		16.2		0.0				7.6			8.6	
Queue Delay		0.0		0.0				0.0			0.0	
Total Delay		16.2		0.0				7.6			8.6	
LOS		B		A				A			A	
Approach Delay		16.2						7.6			8.6	
Approach LOS		B						A			A	
Queue Length 50th (ft)		8		0				25			46	
Queue Length 95th (ft)		73		0				130			258	
Internal Link Dist (ft)		640		440				241			353	
Turn Bay Length (ft)												
Base Capacity (vph)		622		686				2114			2151	
Starvation Cap Reductn		0		0				0			0	
Spillback Cap Reductn		0		0				0			0	

2023 Existing Weekday Morning Peak Hour  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/06/2023

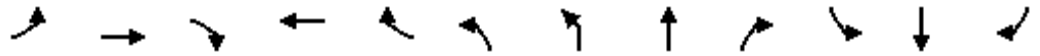


Lane Group	SBR2	SEL	Ø9
Lane Configurations			
Traffic Volume (vph)	7	0	
Future Volume (vph)	7	0	
Lane Util. Factor	0.95	1.00	
Frt			
Flt Protected			
Satd. Flow (prot)	0	1963	
Flt Permitted			
Satd. Flow (perm)	0	1963	
Satd. Flow (RTOR)			
Adj. Flow (vph)	8	0	
Lane Group Flow (vph)	0	0	
Turn Type		Prot	
Protected Phases		4	9
Permitted Phases			
Detector Phase		4	
Switch Phase			
Minimum Initial (s)		5.0	1.0
Minimum Split (s)		10.5	23.0
Total Split (s)		15.5	23.0
Total Split (%)		11.6%	17%
Maximum Green (s)		10.0	21.0
Yellow Time (s)		3.5	2.0
All-Red Time (s)		2.0	0.0
Lost Time Adjust (s)		0.0	
Total Lost Time (s)		5.5	
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)		3.0	3.0
Recall Mode		None	None
Walk Time (s)			7.0
Flash Dont Walk (s)			14.0
Pedestrian Calls (#/hr)			14
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)		415	
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			

2023 Existing Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/06/2023



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0		0				0			0	
Reduced v/c Ratio		0.24		0.01				0.25			0.38	

Intersection Summary

Cycle Length: 134

Actuated Cycle Length: 74.2

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 8.9

Intersection LOS: A

Intersection Capacity Utilization 47.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration
Ø2	54.5 s	Ø4	15.5 s	Ø7	25.5 s	Ø8	15.5 s	Ø9	23 s
Ø6	54.5 s								

2023 Existing Weekday Morning Peak Hour  
2: Route 28 & Lewis Street

10/06/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	3	6	2	404	555	6	
Future Volume (vph)	3	6	2	404	555	6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.910				0.999		
Flt Protected	0.984						
Satd. Flow (prot)	1701	0	0	1987	2047	0	
Flt Permitted	0.984			0.998			
Satd. Flow (perm)	1701	0	0	1983	2047	0	
Satd. Flow (RTOR)	8				1		
Adj. Flow (vph)	4	8	3	518	631	7	
Lane Group Flow (vph)	12	0	0	521	638	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							16
Act Effct Green (s)	5.9			49.2	49.2		
Actuated g/C Ratio	0.11			0.91	0.91		
v/c Ratio	0.06			0.29	0.34		
Control Delay	18.2			3.8	4.1		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.2			3.8	4.1		
LOS	B			A	A		
Approach Delay	18.2			3.8	4.1		
Approach LOS	B			A	A		
Queue Length 50th (ft)	1			0	0		
Queue Length 95th (ft)	13			163	250		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	323			1796	1854		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2023 Existing Weekday Morning Peak Hour  
 2: Route 28 & Lewis Street

10/06/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.04			0.29	0.34		

Intersection Summary	
Cycle Length:	65
Actuated Cycle Length:	54.3
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.34
Intersection Signal Delay:	4.1
Intersection LOS:	A
Intersection Capacity Utilization	42.1%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 2: Route 28 & Lewis Street

 36 s	 14 s	 15 s
 36 s		

2023 Existing Weekday Morning Peak Hour  
3: Route 28 & Pearson Street

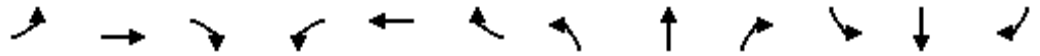
10/06/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	61	45	393	533	31
Future Volume (Veh/h)	24	61	45	393	533	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.79	0.79	0.87	0.87
Hourly flow rate (vph)	35	88	57	497	613	36
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.86	0.86	0.86			
vC, conflicting volume	1242	631	649			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1200	490	511			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	82	94			
cM capacity (veh/h)	163	501	916			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	123	57	497	649		
Volume Left	35	57	0	0		
Volume Right	88	0	0	36		
cSH	316	916	1700	1700		
Volume to Capacity	0.39	0.06	0.29	0.38		
Queue Length 95th (ft)	45	5	0	0		
Control Delay (s)	23.5	9.2	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	23.5	0.9				
Approach LOS	C					
<b>Intersection Summary</b>						
Average Delay			2.6			
Intersection Capacity Utilization			48.3%	ICU Level of Service	A	
Analysis Period (min)			15			

2023 Existing Weekday Morning Peak Hour  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

10/06/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	71	0	0	36	2	0	0	1	2	0	2
Future Volume (Veh/h)	1	71	0	0	36	2	0	0	1	2	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.79	0.79	0.79	0.25	0.25	0.25	0.50	0.50	0.50
Hourly flow rate (vph)	1	87	0	0	46	3	0	0	4	4	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	49			87			140	138	87	140	136	48
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	49			87			140	138	87	140	136	48
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1571			1522			830	756	977	830	758	1027
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	88	49	4	8								
Volume Left	1	0	0	4								
Volume Right	0	3	4	4								
cSH	1571	1522	977	918								
Volume to Capacity	0.00	0.00	0.00	0.01								
Queue Length 95th (ft)	0	0	0	1								
Control Delay (s)	0.1	0.0	8.7	9.0								
Lane LOS	A		A	A								
Approach Delay (s)	0.1	0.0	8.7	9.0								
Approach LOS			A	A								
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			14.5%	ICU Level of Service		A						
Analysis Period (min)			15									

# LANE SUMMARY

 **Site: 8975 [Andover (Site Folder: General)]**

2023 Existing Weekday Morning Peak Hour

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[ Total veh/h ]	[ HV % ]						[ Veh ]	[ Dist ]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Dundee Park Drive													
Lane 1	24	0.0	296	0.081	100	18.2	LOS C	0.3	6.8	Full	1600	0.0	0.0
Approach	24	0.0		0.081		18.2	LOS C	0.3	6.8				
East: Essex Street													
Lane 1	506	2.6	1529	0.331	100	5.0	LOS A	2.0	52.2	Full	1600	0.0	0.0
Approach	506	2.6		0.331		5.0	NA	2.0	52.2				
NorthEast: Pearson Street													
Lane 1	52	0.0	780	0.067	100	6.3	LOS A	0.4	9.1	Full	1600	0.0	0.0
Approach	52	0.0		0.067		6.3	NA	0.4	9.1				
North: Railroad Street													
Lane 1	210	0.6	325	0.646	100	34.3	LOS D	5.2	130.6	Full	1600	0.0	0.0
Approach	210	0.6		0.646		34.3	LOS D	5.2	130.6				
West: Essex Street													
Lane 1	468	1.0	1556	0.301	100	4.8	LOS A	1.6	40.5	Full	1600	0.0	0.0
Approach	468	1.0		0.301		4.8	NA	1.6	40.5				
Intersection	1260	1.5		0.646		10.1	NA	5.2	130.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)														
South: Dundee Park Drive														
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL	Ov. Ov.	Ov. Lane No.			
From S To Exit:	W	N	E									veh/h	v/c	%
Lane 1	4	13	7	24	0.0	296	0.081	100	NA	NA				
Approach	4	13	7	24	0.0		0.081							
East: Essex Street														
Mov.	L2	T1	R2	R3	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL	Ov. Ov.	Ov. Lane No.		
From E To Exit:	S	W	N	NE									veh/h	v/c

Lane 1	33	363	99	12	506	2.6	1529	0.331	100	NA	NA
Approach	33	363	99	12	506	2.6		0.331			
NorthEast: Pearson Street											
Mov.	R1	R3	Total	%HV				Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From NE To Exit:	W	N									
Lane 1	37	15	52	0.0			780	0.067	100	NA	NA
Approach	37	15	52	0.0				0.067			
North: Railroad Street											
Mov.	L3	L2	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	NE	E	S	W							
Lane 1	16	102	27	65	210	0.6	325	0.646	100	NA	NA
Approach	16	102	27	65	210	0.6		0.646			
West: Essex Street											
Mov.	L2	L1	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	NE	E	S							
Lane 1	72	65	317	13	468	1.0	1556	0.301	100	NA	NA
Approach	72	65	317	13	468	1.0		0.301			
Total %HV Deg.Satn (v/c)											
Intersection	1260	1.5		0.646							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
NorthEast Exit: Pearson Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.

2023 Existing Weekday Morning Peak Hour  
6: School Street & Essex Street

10/06/2023



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Traffic Volume (veh/h)	170	167	18	144	195	16
Future Volume (Veh/h)	170	167	18	144	195	16
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.68	0.68	0.76	0.76
Hourly flow rate (vph)	185	182	26	212	257	21
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			367		540	276
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			367		540	276
tC, single (s)			4.1		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.5
p0 queue free %			98		47	97
cM capacity (veh/h)			1203		489	724
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	367	238	278			
Volume Left	0	26	257			
Volume Right	182	0	21			
cSH	1700	1203	528			
Volume to Capacity	0.22	0.02	0.53			
Queue Length 95th (ft)	0	2	76			
Control Delay (s)	0.0	1.1	19.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.1	19.5			
Approach LOS			C			
<b>Intersection Summary</b>						
Average Delay			6.4			
Intersection Capacity Utilization			40.1%	ICU Level of Service		A
Analysis Period (min)			15			

2023 Existing Weekday Morning Peak Hour  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

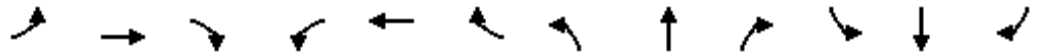
10/06/2023



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↻				↻	↻	
Traffic Volume (veh/h)	174	12	18	3	153	9	6
Future Volume (Veh/h)	174	12	18	3	153	9	6
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.91	0.91	0.70	0.70	0.70	0.81	0.81
Hourly flow rate (vph)	191	13	0	4	219	11	7
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	204		424	198
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	204		424	198
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		98	99
cM capacity (veh/h)			0	1380		589	849
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	204	223	18				
Volume Left	0	4	11				
Volume Right	13	0	7				
cSH	1700	1380	668				
Volume to Capacity	0.12	0.00	0.03				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.2	10.5				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.2	10.5				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.5						
Intersection Capacity Utilization			32.4%	ICU Level of Service			A
Analysis Period (min)	15						

2023 Existing Weekday Morning Peak Hour  
8: Lupine Road/Ridge Street & School Street

10/06/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	117	59	15	149	6	48	3	6	1	4	1
Future Volume (Veh/h)	0	117	59	15	149	6	48	3	6	1	4	1
Sign Control		Free			Free			Yield		Stop		
Grade		0%			0%			0%		0%		
Peak Hour Factor	0.76	0.76	0.76	0.77	0.77	0.77	0.79	0.79	0.79	0.30	0.30	0.30
Hourly flow rate (vph)	0	154	78	19	194	8	61	4	8	3	13	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	202			232			438	433	193	439	468	198
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	202			232			438	433	193	439	468	198
tC, single (s)	4.1			4.2			7.1	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			99			88	99	99	99	97	100
cM capacity (veh/h)	1382			1307			510	511	812	517	489	848
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	232	221	73	19								
Volume Left	0	19	61	3								
Volume Right	78	8	8	3								
cSH	1382	1307	532	529								
Volume to Capacity	0.00	0.01	0.14	0.04								
Queue Length 95th (ft)	0	1	12	3								
Control Delay (s)	0.0	0.8	12.8	12.1								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.8	12.8	12.1								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			37.2%	ICU Level of Service	A							
Analysis Period (min)			15									

2023 Existing Weekday Evening Peak Hour

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2023 Existing Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/30/2023



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Lane Configurations			↕		↕			↕		↕		
Traffic Volume (vph)	2	241	1	31	2	42	1	538	2	429	163	5
Future Volume (vph)	2	241	1	31	2	42	1	538	2	429	163	5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt			0.985							0.958		
Flt Protected			0.958					0.996				
Satd. Flow (prot)	0	0	1955	0	2153	0	0	3444	0	3310	0	0
Flt Permitted			0.958					0.851		0.954		
Satd. Flow (perm)	0	0	1955	0	2153	0	0	2942	0	3158	0	0
Satd. Flow (RTOR)			4							1		
Adj. Flow (vph)	2	271	1	35	8	44	1	566	2	482	183	6
Lane Group Flow (vph)	0	0	309	0	8	0	0	611	0	673	0	0
Turn Type	Split	Split	NA		NA	Perm	Perm	NA	Perm	NA		
Protected Phases	7	7	7		8			2		6		
Permitted Phases						2	2		6			
Detector Phase	7	7	7		8	2	2	2	6	6		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		
Minimum Split (s)	10.5	10.5	10.5		10.5	10.5	10.5	10.5	10.5	10.5		
Total Split (s)	25.5	25.5	25.5		15.5	54.5	54.5	54.5	54.5	54.5		
Total Split (%)	19.0%	19.0%	19.0%		11.6%	40.7%	40.7%	40.7%	40.7%	40.7%		
Maximum Green (s)	20.0	20.0	20.0		10.0	49.0	49.0	49.0	49.0	49.0		
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)			0.0		0.0			0.0		0.0		
Total Lost Time (s)			5.5		5.5			5.5		5.5		
Lead/Lag	Lead	Lead	Lead		Lag							
Lead-Lag Optimize?	Yes	Yes	Yes		Yes							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		
Recall Mode	Min	Min	Min		None	Max	Max	Max	Max	Max		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			20.7		6.2			50.7		50.7		
Actuated g/C Ratio			0.21		0.06			0.50		0.50		
v/c Ratio			0.76		0.06			0.41		0.42		
Control Delay			54.4		54.5			20.6		20.6		
Queue Delay			0.0		0.0			0.0		0.0		
Total Delay			54.4		54.5			20.6		20.6		
LOS			D		D			C		C		
Approach Delay			54.4		54.5			20.6		20.6		
Approach LOS			D		D			C		C		
Queue Length 50th (ft)			194		5			135		150		
Queue Length 95th (ft)			#435		6			260		280		
Internal Link Dist (ft)			640		440			241		353		
Turn Bay Length (ft)												
Base Capacity (vph)			404		221			1481		1590		
Starvation Cap Reductn			0		0			0		0		
Spillback Cap Reductn			0		0			0		0		

2023 Existing Weekday Evening Peak Hour  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/30/2023



Lane Group	SEL2	SEL	SER	SER2	Ø9
Lane Configurations					
Traffic Volume (vph)	2	0	5	3	
Future Volume (vph)	2	0	5	3	
Lane Util. Factor	1.00	1.00	1.00	1.00	
Frt		0.892			
Flt Protected		0.990			
Satd. Flow (prot)	0	1734	0	0	
Flt Permitted		0.990			
Satd. Flow (perm)	0	1734	0	0	
Satd. Flow (RTOR)		126			
Adj. Flow (vph)	4	0	10	6	
Lane Group Flow (vph)	0	20	0	0	
Turn Type	Prot	Prot			
Protected Phases	4	4			9
Permitted Phases					
Detector Phase	4	4			
Switch Phase					
Minimum Initial (s)	5.0	5.0			1.0
Minimum Split (s)	10.5	10.5			23.0
Total Split (s)	15.5	15.5			23.0
Total Split (%)	11.6%	11.6%			17%
Maximum Green (s)	10.0	10.0			21.0
Yellow Time (s)	3.5	3.5			2.0
All-Red Time (s)	2.0	2.0			0.0
Lost Time Adjust (s)		0.0			
Total Lost Time (s)		5.5			
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0			3.0
Recall Mode	None	None			None
Walk Time (s)					7.0
Flash Dont Walk (s)					14.0
Pedestrian Calls (#/hr)					27
Act Effct Green (s)		5.7			
Actuated g/C Ratio		0.06			
v/c Ratio		0.09			
Control Delay		0.8			
Queue Delay		0.0			
Total Delay		0.8			
LOS		A			
Approach Delay		0.8			
Approach LOS		A			
Queue Length 50th (ft)		0			
Queue Length 95th (ft)		0			
Internal Link Dist (ft)		415			
Turn Bay Length (ft)					
Base Capacity (vph)		291			
Starvation Cap Reductn		0			
Spillback Cap Reductn		0			

2023 Existing Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/30/2023



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Storage Cap Reductn			0		0			0		0		
Reduced v/c Ratio			0.76		0.04			0.41		0.42		

Intersection Summary

Cycle Length: 134

Actuated Cycle Length: 100.7

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 26.9

Intersection LOS: C

Intersection Capacity Utilization 78.0%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Ø2	Ø4	Ø7	Ø8	Ø9
54.5 s	15.5 s	25.5 s	15.5 s	23 s
Ø6				
54.5 s				

2023 Existing Weekday Evening Peak Hour  
2: Route 28 & Lewis Street

10/30/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	2	4	3	585	448	4	
Future Volume (vph)	2	4	3	585	448	4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.910				0.999		
Flt Protected	0.984						
Satd. Flow (prot)	1701	0	0	2007	2067	0	
Flt Permitted	0.984			0.998			
Satd. Flow (perm)	1701	0	0	2003	2067	0	
Satd. Flow (RTOR)	8				1		
Adj. Flow (vph)	4	8	3	629	498	4	
Lane Group Flow (vph)	12	0	0	632	502	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							4
Act Effct Green (s)	5.9			49.2	49.2		
Actuated g/C Ratio	0.11			0.91	0.91		
v/c Ratio	0.06			0.35	0.27		
Control Delay	18.3			4.2	3.6		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.3			4.2	3.6		
LOS	B			A	A		
Approach Delay	18.3			4.2	3.6		
Approach LOS	B			A	A		
Queue Length 50th (ft)	1			0	0		
Queue Length 95th (ft)	7			261	188		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	323			1814	1872		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2023 Existing Weekday Evening Peak Hour  
 2: Route 28 & Lewis Street

10/30/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.04			0.35	0.27		

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 54.3	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.35	
Intersection Signal Delay: 4.1	Intersection LOS: A
Intersection Capacity Utilization 45.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

Ø2 36 s	Ø4 14 s	Ø9 15 s
Ø6 36 s		

2023 Existing Weekday Evening Peak Hour  
3: Route 28 & Pearson Street

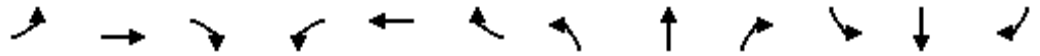
10/30/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	71	34	555	444	9
Future Volume (Veh/h)	29	71	34	555	444	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	42	103	35	578	505	10
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.92	0.92	0.92			
vC, conflicting volume	1158	510	515			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1128	422	428			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	82	97			
cM capacity (veh/h)	203	584	1049			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	145	35	578	515		
Volume Left	42	35	0	0		
Volume Right	103	0	0	10		
cSH	378	1049	1700	1700		
Volume to Capacity	0.38	0.03	0.34	0.30		
Queue Length 95th (ft)	44	3	0	0		
Control Delay (s)	20.3	8.5	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	20.3	0.5		0.0		
Approach LOS	C					
<b>Intersection Summary</b>						
Average Delay			2.6			
Intersection Capacity Utilization			41.9%	ICU Level of Service	A	
Analysis Period (min)			15			

2023 Existing Weekday Evening Peak Hour  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

10/30/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	52	0	0	55	0	0	0	0	1	0	1
Future Volume (Veh/h)	1	52	0	0	55	0	0	0	0	1	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.60	0.60	0.60	0.25	0.25	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	1	63	0	0	92	0	0	0	0	4	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	92			63			161	157	63	157	157	92
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	92			63			161	157	63	157	157	92
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1515			1553			805	738	1007	813	738	971
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	64	92	0	8								
Volume Left	1	0	0	4								
Volume Right	0	0	0	4								
cSH	1515	1553	1700	885								
Volume to Capacity	0.00	0.00	0.00	0.01								
Queue Length 95th (ft)	0	0	0	1								
Control Delay (s)	0.1	0.0	0.0	9.1								
Lane LOS	A		A	A								
Approach Delay (s)	0.1	0.0	0.0	9.1								
Approach LOS			A	A								
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			13.5%	ICU Level of Service	A							
Analysis Period (min)			15									



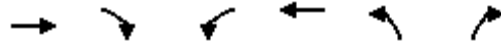
Lane 1	19	413	178	9	619	0.9	1445	0.429	100	NA	NA
Approach	19	413	178	9	619	0.9		0.429			
NorthEast: Pearson Street											
Mov.	L1	R1	R3	Total	%HV			Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From NE To Exit:	S	W	N				Cap. veh/h				
Lane 1	3	55	19	77	0.0		715	0.107	100	NA	NA
Approach	3	55	19	77	0.0			0.107			
North: Railroad Street											
Mov.	L3	L2	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	NE	E	S	W			Cap. veh/h				
Lane 1	8	75	24	86	192	1.2	300	0.642	100	NA	NA
Approach	8	75	24	86	192	1.2		0.642			
West: Essex Street											
Mov.	L2	L1	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	NE	E	S			Cap. veh/h				
Lane 1	77	48	288	48	461	0.6	1497	0.308	100	NA	NA
Approach	77	48	288	48	461	0.6		0.308			
Total %HV Deg.Satn (v/c)											
Intersection	1544	0.7		0.734							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
NorthEast Exit: Pearson Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.

2023 Existing Weekday Evening Peak Hour  
6: School Street & Essex Street

10/30/2023



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	↔
Traffic Volume (veh/h)	183	135	14	153	262	23
Future Volume (Veh/h)	183	135	14	153	262	23
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	199	147	16	180	279	24
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			346		484	272
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			346		484	272
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		48	97
cM capacity (veh/h)			1224		536	771
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	346	196	303			
Volume Left	0	16	279			
Volume Right	147	0	24			
cSH	1700	1224	582			
Volume to Capacity	0.20	0.01	0.52			
Queue Length 95th (ft)	0	1	75			
Control Delay (s)	0.0	0.8	18.1			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.8	18.1			
Approach LOS			C			
<b>Intersection Summary</b>						
Average Delay			6.7			
Intersection Capacity Utilization			40.8%	ICU Level of Service	A	
Analysis Period (min)			15			

2023 Existing Weekday Evening Peak Hour  
7: Ridge Street & Essex Street/Essex Street/Brook Street

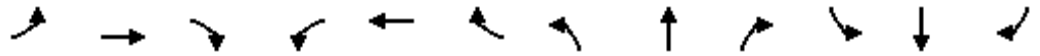
10/30/2023



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↳				↵	↵	
Traffic Volume (veh/h)	201	5	19	1	160	7	3
Future Volume (Veh/h)	201	5	19	1	160	7	3
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.92	0.83	0.83
Hourly flow rate (vph)	216	5	0	1	174	8	4
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked			0.00				
vC, conflicting volume			0	221		394	218
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	221		394	218
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		99	100
cM capacity (veh/h)			0	1360		614	826
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	221	175	12				
Volume Left	0	1	8				
Volume Right	5	0	4				
cSH	1700	1360	671				
Volume to Capacity	0.13	0.00	0.02				
Queue Length 95th (ft)	0	0	1				
Control Delay (s)	0.0	0.0	10.5				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.0	10.5				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay			0.3				
Intersection Capacity Utilization			33.7%	ICU Level of Service	A		
Analysis Period (min)			15				

2023 Existing Weekday Evening Peak Hour  
8: Lupine Road/Ridge Street & School Street

10/30/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	111	34	12	224	4	55	2	13	1	3	0
Future Volume (Veh/h)	1	111	34	12	224	4	55	2	13	1	3	0
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.33	0.33	0.33
Hourly flow rate (vph)	1	141	43	15	284	5	69	2	16	3	9	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	289			184			486	484	162	498	502	286
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	289			184			486	484	162	498	502	286
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			86	100	98	99	98	100
cM capacity (veh/h)	1284			1403			484	480	888	472	469	757
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	185	304	87	12								
Volume Left	1	15	69	3								
Volume Right	43	5	16	0								
cSH	1284	1403	528	469								
Volume to Capacity	0.00	0.01	0.16	0.03								
Queue Length 95th (ft)	0	1	15	2								
Control Delay (s)	0.0	0.5	13.2	12.9								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.0	0.5	13.2	12.9								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			37.2%	ICU Level of Service	A							
Analysis Period (min)			15									

2030 No-Build Weekday Morning Peak Hour

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2030 No-Build Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/30/2023



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕				↕			↕	
Traffic Volume (vph)	139	0	13	0	3	18	1	425	1	2	591	195
Future Volume (vph)	139	0	13	0	3	18	1	425	1	2	591	195
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.988		0.865							0.962	
Flt Protected		0.956						0.998				
Satd. Flow (prot)	0	1905	0	1863	0	0	0	3417	0	0	3300	0
Flt Permitted		0.956						0.899			0.954	
Satd. Flow (perm)	0	1905	0	1863	0	0	0	3078	0	0	3148	0
Satd. Flow (RTOR)		126		475							1	
Adj. Flow (vph)	145	0	14	0	8	23	1	545	1	2	672	222
Lane Group Flow (vph)	0	159	0	8	0	0	0	570	0	0	904	0
Turn Type	Split	NA		NA		Perm	Perm	NA		Perm	NA	
Protected Phases	7	7		8				2			6	
Permitted Phases						2	2			6		
Detector Phase	7	7		8		2	2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	10.5		10.5		10.5	10.5	10.5		10.5	10.5	
Total Split (s)	25.5	25.5		15.5		54.5	54.5	54.5		54.5	54.5	
Total Split (%)	19.0%	19.0%		11.6%		40.7%	40.7%	40.7%		40.7%	40.7%	
Maximum Green (s)	20.0	20.0		10.0		49.0	49.0	49.0		49.0	49.0	
Yellow Time (s)	3.5	3.5		3.5		3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0				0.0			0.0	
Total Lost Time (s)		5.5		5.5				5.5			5.5	
Lead/Lag	Lead	Lead		Lag								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None		Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		7.6		5.7				50.7			50.7	
Actuated g/C Ratio		0.10		0.08				0.68			0.68	
v/c Ratio		0.52		0.01				0.27			0.42	
Control Delay		17.6		0.0				7.9			9.1	
Queue Delay		0.0		0.0				0.0			0.0	
Total Delay		17.6		0.0				7.9			9.1	
LOS		B		A				A			A	
Approach Delay		17.6						7.9			9.1	
Approach LOS		B						A			A	
Queue Length 50th (ft)		13		0				30			53	
Queue Length 95th (ft)		83		0				146			294	
Internal Link Dist (ft)		640		440				241			353	
Turn Bay Length (ft)												
Base Capacity (vph)		620		667				2096			2144	
Starvation Cap Reductn		0		0				0			0	
Spillback Cap Reductn		0		0				0			0	

2030 No-Build Weekday Morning Peak Hour  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/30/2023



Lane Group	SBR2	SEL	Ø9
Lane Configurations			
Traffic Volume (vph)	7	0	
Future Volume (vph)	7	0	
Lane Util. Factor	0.95	1.00	
Frt			
Flt Protected			
Satd. Flow (prot)	0	1963	
Flt Permitted			
Satd. Flow (perm)	0	1963	
Satd. Flow (RTOR)			
Adj. Flow (vph)	8	0	
Lane Group Flow (vph)	0	0	
Turn Type			
		Prot	
Protected Phases		4	9
Permitted Phases			
Detector Phase			
		4	
Switch Phase			
Minimum Initial (s)		5.0	1.0
Minimum Split (s)		10.5	23.0
Total Split (s)		15.5	23.0
Total Split (%)		11.6%	17%
Maximum Green (s)		10.0	21.0
Yellow Time (s)		3.5	2.0
All-Red Time (s)		2.0	0.0
Lost Time Adjust (s)		0.0	
Total Lost Time (s)		5.5	
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)		3.0	3.0
Recall Mode		None	None
Walk Time (s)			7.0
Flash Dont Walk (s)			14.0
Pedestrian Calls (#/hr)			14
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)		415	
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			

2030 No-Build Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/30/2023



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0		0				0			0	
Reduced v/c Ratio		0.26		0.01				0.27			0.42	

Intersection Summary

Cycle Length: 134

Actuated Cycle Length: 74.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 9.5

Intersection LOS: A

Intersection Capacity Utilization 50.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration
Ø2	54.5 s	Ø4	15.5 s	Ø7	25.5 s	Ø8	15.5 s	Ø9	23 s
Ø6	54.5 s								

2030 No-Build Weekday Morning Peak Hour  
2: Route 28 & Lewis Street

10/30/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	3	6	2	442	610	6	
Future Volume (vph)	3	6	2	442	610	6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.910				0.999		
Flt Protected	0.984						
Satd. Flow (prot)	1701	0	0	1987	2047	0	
Flt Permitted	0.984			0.998			
Satd. Flow (perm)	1701	0	0	1983	2047	0	
Satd. Flow (RTOR)	8				1		
Adj. Flow (vph)	4	8	3	567	693	7	
Lane Group Flow (vph)	12	0	0	570	700	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							16
Act Effct Green (s)	5.9			49.2	49.2		
Actuated g/C Ratio	0.11			0.91	0.91		
v/c Ratio	0.06			0.32	0.38		
Control Delay	18.2			4.0	4.4		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.2			4.0	4.4		
LOS	B			A	A		
Approach Delay	18.2			4.0	4.4		
Approach LOS	B			A	A		
Queue Length 50th (ft)	1			0	0		
Queue Length 95th (ft)	13			182	287		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	323			1796	1854		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 No-Build Weekday Morning Peak Hour  
 2: Route 28 & Lewis Street

10/30/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.04			0.32	0.38		

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 54.3	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 45.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

Ø2	Ø4	Ø9
36 s	14 s	15 s
Ø6		
36 s		

2030 No-Build Weekday Morning Peak Hour  
3: Route 28 & Pearson Street

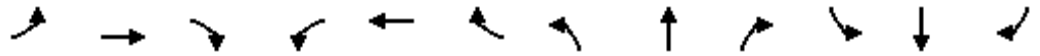
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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	26	68	50	430	586	33
Future Volume (Veh/h)	26	68	50	430	586	33
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.79	0.79	0.87	0.87
Hourly flow rate (vph)	38	99	63	544	674	38
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.83	0.83	0.83			
vC, conflicting volume	1363	693	712			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1335	527	550			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	71	78	93			
cM capacity (veh/h)	129	460	854			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	137	63	544	712		
Volume Left	38	63	0	0		
Volume Right	99	0	0	38		
cSH	269	854	1700	1700		
Volume to Capacity	0.51	0.07	0.32	0.42		
Queue Length 95th (ft)	67	6	0	0		
Control Delay (s)	31.5	9.5	0.0	0.0		
Lane LOS	D	A				
Approach Delay (s)	31.5	1.0				
Approach LOS	D					
<b>Intersection Summary</b>						
Average Delay			3.4			
Intersection Capacity Utilization			51.8%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 No-Build Weekday Morning Peak Hour  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

10/30/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	80	0	0	41	2	0	0	1	2	0	2
Future Volume (Veh/h)	1	80	0	0	41	2	0	0	1	2	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.79	0.79	0.79	0.25	0.25	0.25	0.50	0.50	0.50
Hourly flow rate (vph)	1	98	0	0	52	3	0	0	4	4	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	55			98			158	155	98	158	154	54
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	55			98			158	155	98	158	154	54
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1563			1508			810	740	963	809	741	1019
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	99	55	4	8								
Volume Left	1	0	0	4								
Volume Right	0	3	4	4								
cSH	1563	1508	963	902								
Volume to Capacity	0.00	0.00	0.00	0.01								
Queue Length 95th (ft)	0	0	0	1								
Control Delay (s)	0.1	0.0	8.8	9.0								
Lane LOS	A		A	A								
Approach Delay (s)	0.1	0.0	8.8	9.0								
Approach LOS			A	A								
Intersection Summary												
Average Delay			0.7									
Intersection Capacity Utilization			15.0%		ICU Level of Service				A			
Analysis Period (min)			15									

# LANE SUMMARY

 **Site: 8975 [Andover (Site Folder: General)]**

2030 No-Build Weekday Morning Peak Hour

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[ Total veh/h ]	[ HV % ]						[ Veh ]	[ Dist ]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Dundee Park Drive													
Lane 1	24	0.0	266	0.090	100	19.9	LOS C	0.3	7.5	Full	1600	0.0	0.0
Approach	24	0.0		0.090		19.9	LOS C	0.3	7.5				
East: Essex Street													
Lane 1	545	2.6	1525	0.357	100	5.3	LOS A	2.3	58.7	Full	1600	0.0	0.0
Approach	545	2.6		0.357		5.3	NA	2.3	58.7				
NorthEast: Pearson Street													
Lane 1	59	0.0	744	0.079	100	6.7	LOS A	0.4	10.8	Full	1600	0.0	0.0
Approach	59	0.0		0.079		6.7	NA	0.4	10.8				
North: Railroad Street													
Lane 1	223	0.6	292	0.762	100	48.0	LOS E	7.1	178.3	Full	1600	0.0	0.0
Approach	223	0.6		0.762		48.0	LOS E	7.1	178.3				
West: Essex Street													
Lane 1	508	1.0	1526	0.333	100	5.2	LOS A	2.2	56.5	Full	1600	0.0	0.0
Approach	508	1.0		0.333		5.2	NA	2.2	56.5				
Intersection	1358	1.5		0.762		12.6	NA	7.1	178.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)														
South: Dundee Park Drive														
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.				
From S						veh/h	Satn	Util.	SL	Ov.	Lane			
To Exit:	W	N	E				v/c	%	%	%	No.			
Lane 1	4	13	7	24	0.0	266	0.090	100	NA	NA				
Approach	4	13	7	24	0.0		0.090							
East: Essex Street														
Mov.	L2	T1	R2	R3	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.			
From E							veh/h	Satn	Util.	SL	Ov.	Lane		
To Exit:	S	W	N	NE				v/c	%	%	%	No.		

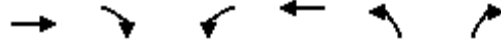
Lane 1	33	393	106	13	545	2.6	1525	0.357	100	NA	NA
Approach	33	393	106	13	545	2.6		0.357			
NorthEast: Pearson Street											
Mov.	R1	R3	Total	%HV			Cap.	Deg.	Lane	Prob.	Ov.
From NE							veh/h	Satn	Util.	SL	Lane
To Exit:	W	N						v/c	%	%	No.
Lane 1	42	16	59	0.0			744	0.079	100	NA	NA
Approach	42	16	59	0.0				0.079			
North: Railroad Street											
Mov.	L3	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N							Cap.	Satn	Util.	SL	Lane
To Exit:	NE	E	S	W			veh/h	v/c	%	%	No.
Lane 1	17	110	27	69	223	0.6	292	0.762	100	NA	NA
Approach	17	110	27	69	223	0.6		0.762			
West: Essex Street											
Mov.	L2	L1	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W							Cap.	Satn	Util.	SL	Lane
To Exit:	N	NE	E	S			veh/h	v/c	%	%	No.
Lane 1	77	75	343	13	508	1.0	1526	0.333	100	NA	NA
Approach	77	75	343	13	508	1.0		0.333			
Total %HV Deg.Satn (v/c)											
Intersection	1358	1.5	0.762								

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1	Merge Analysis not applied.										
NorthEast Exit: Pearson Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1	Merge Analysis not applied.										

2030 No-Build Weekday Morning Peak Hour  
6: School Street & Essex Street

10/30/2023



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	184	179	19	156	209	17
Future Volume (Veh/h)	184	179	19	156	209	17
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.68	0.68	0.76	0.76
Hourly flow rate (vph)	200	195	28	229	275	22
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			395		582	298
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			395		582	298
tC, single (s)			4.1		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.5
p0 queue free %			98		40	97
cM capacity (veh/h)			1175		460	704
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	395	257	297			
Volume Left	0	28	275			
Volume Right	195	0	22			
cSH	1700	1175	489			
Volume to Capacity	0.23	0.02	0.61			
Queue Length 95th (ft)	0	2	100			
Control Delay (s)	0.0	1.1	23.1			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.1	23.1			
Approach LOS			C			
<b>Intersection Summary</b>						
Average Delay			7.5			
Intersection Capacity Utilization			42.4%	ICU Level of Service		A
Analysis Period (min)			15			

2030 No-Build Weekday Morning Peak Hour  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

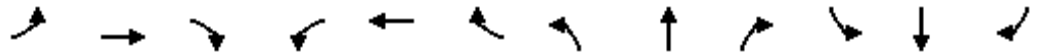
10/30/2023



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↻				↻	↻	
Traffic Volume (veh/h)	188	13	19	3	165	10	6
Future Volume (Veh/h)	188	13	19	3	165	10	6
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.91	0.91	0.70	0.70	0.70	0.81	0.81
Hourly flow rate (vph)	207	14	0	4	236	12	7
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	221		458	214
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	221		458	214
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		98	99
cM capacity (veh/h)			0	1360		563	831
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	221	240	19				
Volume Left	0	4	12				
Volume Right	14	0	7				
cSH	1700	1360	639				
Volume to Capacity	0.13	0.00	0.03				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.2	10.8				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.2	10.8				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.5						
Intersection Capacity Utilization			33.9%	ICU Level of Service			A
Analysis Period (min)	15						

2030 No-Build Weekday Morning Peak Hour  
8: Lupine Road/Ridge Street & School Street

10/30/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	125	63	16	160	6	51	3	6	1	4	1
Future Volume (Veh/h)	0	125	63	16	160	6	51	3	6	1	4	1
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.77	0.77	0.77	0.79	0.79	0.79	0.30	0.30	0.30
Hourly flow rate (vph)	0	164	83	21	208	8	65	4	8	3	13	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	216			247			469	464	206	470	501	212
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	216			247			469	464	206	470	501	212
tC, single (s)	4.1			4.2			7.1	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			98			87	99	99	99	97	100
cM capacity (veh/h)	1366			1290			486	491	799	493	467	833
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	247	237	77	19								
Volume Left	0	21	65	3								
Volume Right	83	8	8	3								
cSH	1366	1290	507	507								
Volume to Capacity	0.00	0.02	0.15	0.04								
Queue Length 95th (ft)	0	1	13	3								
Control Delay (s)	0.0	0.8	13.4	12.4								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.8	13.4	12.4								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			38.8%	ICU Level of Service	A							
Analysis Period (min)			15									

2030 No-Build Weekday Evening Peak Hour

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2030 No-Build Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/24/2023



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Lane Configurations			↔		↔			↔		↔		
Traffic Volume (vph)	2	258	1	33	2	45	1	615	2	496	175	5
Future Volume (vph)	2	258	1	33	2	45	1	615	2	496	175	5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fr <sub>t</sub>			0.985							0.960		
Fl <sub>t</sub> Protected			0.958					0.997				
Satd. Flow (prot)	0	0	1955	0	2153	0	0	3447	0	3317	0	0
Fl <sub>t</sub> Permitted			0.958					0.833		0.954		
Satd. Flow (perm)	0	0	1955	0	2153	0	0	2880	0	3165	0	0
Satd. Flow (RTOR)			4							1		
Adj. Flow (vph)	2	290	1	37	8	47	1	647	2	557	197	6
Lane Group Flow (vph)	0	0	330	0	8	0	0	695	0	762	0	0
Turn Type	Split	Split	NA		NA	Perm	Perm	NA	Perm	NA		
Protected Phases	7	7	7		8			2		6		
Permitted Phases						2	2		6			
Detector Phase	7	7	7		8	2	2	2	6	6		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		
Minimum Split (s)	10.5	10.5	10.5		10.5	10.5	10.5	10.5	10.5	10.5		
Total Split (s)	25.5	25.5	25.5		15.5	54.5	54.5	54.5	54.5	54.5		
Total Split (%)	19.0%	19.0%	19.0%		11.6%	40.7%	40.7%	40.7%	40.7%	40.7%		
Maximum Green (s)	20.0	20.0	20.0		10.0	49.0	49.0	49.0	49.0	49.0		
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)			0.0		0.0			0.0		0.0		
Total Lost Time (s)			5.5		5.5			5.5		5.5		
Lead/Lag	Lead	Lead	Lead		Lag							
Lead-Lag Optimize?	Yes	Yes	Yes		Yes							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		
Recall Mode	Min	Min	Min		None	Max	Max	Max	Max	Max		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			20.7		6.2			50.7		50.7		
Actuated g/C Ratio			0.21		0.06			0.50		0.50		
v/c Ratio			0.82		0.06			0.48		0.48		
Control Delay			58.3		54.5			21.7		21.4		
Queue Delay			0.0		0.0			0.0		0.0		
Total Delay			58.3		54.5			21.7		21.4		
LOS			E		D			C		C		
Approach Delay			58.3		54.5			21.7		21.4		
Approach LOS			E		D			C		C		
Queue Length 50th (ft)			210		5			160		175		
Queue Length 95th (ft)			#475		6			306		325		
Internal Link Dist (ft)			640		440			241		353		
Turn Bay Length (ft)												
Base Capacity (vph)			404		221			1450		1594		
Starvation Cap Reductn			0		0			0		0		
Spillback Cap Reductn			0		0			0		0		

2030 No-Build Weekday Evening Peak Hour  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/24/2023



Lane Group	SEL2	SEL	SER	SER2	Ø9
Lane Configurations					
Traffic Volume (vph)	2	0	5	3	
Future Volume (vph)	2	0	5	3	
Lane Util. Factor	1.00	1.00	1.00	1.00	
Frt		0.892			
Flt Protected		0.990			
Satd. Flow (prot)	0	1734	0	0	
Flt Permitted		0.990			
Satd. Flow (perm)	0	1734	0	0	
Satd. Flow (RTOR)		126			
Adj. Flow (vph)	4	0	10	6	
Lane Group Flow (vph)	0	20	0	0	
Turn Type	Prot	Prot			
Protected Phases	4	4			9
Permitted Phases					
Detector Phase	4	4			
Switch Phase					
Minimum Initial (s)	5.0	5.0			1.0
Minimum Split (s)	10.5	10.5			23.0
Total Split (s)	15.5	15.5			23.0
Total Split (%)	11.6%	11.6%			17%
Maximum Green (s)	10.0	10.0			21.0
Yellow Time (s)	3.5	3.5			2.0
All-Red Time (s)	2.0	2.0			0.0
Lost Time Adjust (s)		0.0			
Total Lost Time (s)		5.5			
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0			3.0
Recall Mode	None	None			None
Walk Time (s)					7.0
Flash Dont Walk (s)					14.0
Pedestrian Calls (#/hr)					27
Act Effct Green (s)		5.7			
Actuated g/C Ratio		0.06			
v/c Ratio		0.09			
Control Delay		0.8			
Queue Delay		0.0			
Total Delay		0.8			
LOS		A			
Approach Delay		0.8			
Approach LOS		A			
Queue Length 50th (ft)		0			
Queue Length 95th (ft)		0			
Internal Link Dist (ft)		415			
Turn Bay Length (ft)					
Base Capacity (vph)		291			
Starvation Cap Reductn		0			
Spillback Cap Reductn		0			

2030 No-Build Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

10/24/2023



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Storage Cap Reductn			0		0			0		0		
Reduced v/c Ratio			0.82		0.04			0.48		0.48		

Intersection Summary

Cycle Length: 134

Actuated Cycle Length: 100.7

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 28.2

Intersection LOS: C

Intersection Capacity Utilization 83.5%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Ø2	Ø4	Ø7	Ø8	Ø9
54.5 s	15.5 s	25.5 s	15.5 s	23 s
Ø6				
54.5 s				

2030 No-Build Weekday Evening Peak Hour  
2: Route 28 & Lewis Street

10/24/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	2	4	3	665	516	4	
Future Volume (vph)	2	4	3	665	516	4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.910				0.999		
Flt Protected	0.984						
Satd. Flow (prot)	1701	0	0	2007	2067	0	
Flt Permitted	0.984			0.998			
Satd. Flow (perm)	1701	0	0	2003	2067	0	
Satd. Flow (RTOR)	8				1		
Adj. Flow (vph)	4	8	3	715	573	4	
Lane Group Flow (vph)	12	0	0	718	577	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							4
Act Effct Green (s)	5.9			49.2	49.2		
Actuated g/C Ratio	0.11			0.91	0.91		
v/c Ratio	0.06			0.40	0.31		
Control Delay	18.3			4.6	3.9		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.3			4.6	3.9		
LOS	B			A	A		
Approach Delay	18.3			4.6	3.9		
Approach LOS	B			A	A		
Queue Length 50th (ft)	1			0	0		
Queue Length 95th (ft)	7			316	225		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	323			1814	1872		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 No-Build Weekday Evening Peak Hour  
 2: Route 28 & Lewis Street

10/24/2023



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.04			0.40	0.31		

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 54.3	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 49.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

Ø2	Ø4	Ø9
36 s	14 s	15 s
Ø6		
36 s		

2030 No-Build Weekday Evening Peak Hour  
3: Route 28 & Pearson Street

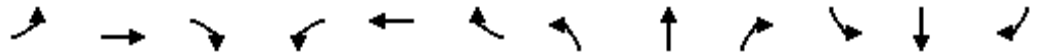
10/24/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	82	42	633	512	10
Future Volume (Veh/h)	31	82	42	633	512	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	45	119	44	659	582	11
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.89	0.89	0.89			
vC, conflicting volume	1334	588	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1313	471	477			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	70	78	95			
cM capacity (veh/h)	149	529	972			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	164	44	659	593		
Volume Left	45	44	0	0		
Volume Right	119	0	0	11		
cSH	312	972	1700	1700		
Volume to Capacity	0.53	0.05	0.39	0.35		
Queue Length 95th (ft)	72	4	0	0		
Control Delay (s)	28.7	8.9	0.0	0.0		
Lane LOS	D	A				
Approach Delay (s)	28.7	0.6				
Approach LOS	D					
<b>Intersection Summary</b>						
Average Delay			3.5			
Intersection Capacity Utilization			47.7%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 No-Build Weekday Evening Peak Hour  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

10/24/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	62	0	0	65	0	0	0	0	1	0	1
Future Volume (Veh/h)	1	62	0	0	65	0	0	0	0	1	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.60	0.60	0.60	0.25	0.25	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	1	75	0	0	108	0	0	0	0	4	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	108			75			189	185	75	185	185	108
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	108			75			189	185	75	185	185	108
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1495			1537			772	712	992	780	712	951
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	76	108	0	8								
Volume Left	1	0	0	4								
Volume Right	0	0	0	4								
cSH	1495	1537	1700	857								
Volume to Capacity	0.00	0.00	0.00	0.01								
Queue Length 95th (ft)	0	0	0	1								
Control Delay (s)	0.1	0.0	0.0	9.2								
Lane LOS	A		A	A								
Approach Delay (s)	0.1	0.0	0.0	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			14.1%	ICU Level of Service						A		
Analysis Period (min)			15									

# LANE SUMMARY

 Site: 8975 [Andover (Site Folder: General)]

2030 No-Build Weekday Evening Peak Hour

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[ Total veh/h	HV % ]						[ Veh	Dist ]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Dundee Park Drive													
Lane 1	194	0.0	226	0.860	100	74.0	LOS F	8.0	200.8	Full	1600	0.0	0.0
Approach	194	0.0		0.860		74.0	LOS F	8.0	200.8				
East: Essex Street													
Lane 1	676	0.9	1435	0.471	100	7.3	LOS A	4.2	106.4	Full	1600	0.0	0.0
Approach	676	0.9		0.471		7.3	NA	4.2	106.4				
NorthEast: Pearson Street													
Lane 1	90	0.0	663	0.136	100	7.9	LOS A	0.7	18.2	Full	1600	0.0	0.0
Approach	90	0.0		0.136		7.9	NA	0.7	18.2				
North: Railroad Street													
Lane 1	205	1.2	261	0.788	100	55.8	LOS F	7.1	178.4	Full	1600	0.0	0.0
Approach	205	1.2		0.788		55.8	LOS F	7.1	178.4				
West: Essex Street													
Lane 1	511	0.6	1454	0.351	100	5.9	LOS A	2.8	70.8	Full	1600	0.0	0.0
Approach	511	0.6		0.351		5.9	NA	2.8	70.8				
Intersection	1677	0.7		0.860		20.6	NA	8.0	200.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)													
South: Dundee Park Drive													
Mov.	L2	T1	R1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.		
From S							veh/h	Satn	Util.	SL	Ov.	Lane	
To Exit:	W	N	NE	E				v/c	%	%	%	No.	
Lane 1	69	59	7	59	194	0.0	226	0.860	100	NA	NA		
Approach	69	59	7	59	194	0.0		0.860					
East: Essex Street													
Mov.	L2	T1	R2	R3	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.		
From E							veh/h	Satn	Util.	SL	Ov.	Lane	
To Exit:	S	W	N	NE				v/c	%	%	%	No.	

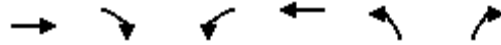
Lane 1	19	455	193	9	676	0.9	1435	0.471	100	NA	NA
Approach	19	455	193	9	676	0.9		0.471			
NorthEast: Pearson Street											
Mov.	L1	R1	R3	Total	%HV			Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From NE To Exit:	S	W	N				Cap. veh/h				
Lane 1	3	67	21	90	0.0		663	0.136	100	NA	NA
Approach	3	67	21	90	0.0			0.136			
North: Railroad Street											
Mov.	L3	L2	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	NE	E	S	W			Cap. veh/h				
Lane 1	9	81	24	92	205	1.2	261	0.788	100	NA	NA
Approach	9	81	24	92	205	1.2		0.788			
West: Essex Street											
Mov.	L2	L1	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	NE	E	S			Cap. veh/h				
Lane 1	83	60	320	48	511	0.6	1454	0.351	100	NA	NA
Approach	83	60	320	48	511	0.6		0.351			
Total %HV Deg.Satn (v/c)											
Intersection	1677	0.7		0.860							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
NorthEast Exit: Pearson Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	

2030 No-Build Weekday Evening Peak Hour  
6: School Street & Essex Street

10/24/2023



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Traffic Volume (veh/h)	202	145	15	171	282	25
Future Volume (Veh/h)	202	145	15	171	282	25
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	220	158	18	201	300	27
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			378		536	299
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			378		536	299
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		40	96
cM capacity (veh/h)			1192		500	745
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	378	219	327			
Volume Left	0	18	300			
Volume Right	158	0	27			
cSH	1700	1192	534			
Volume to Capacity	0.22	0.02	0.61			
Queue Length 95th (ft)	0	1	102			
Control Delay (s)	0.0	0.8	21.8			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.8	21.8			
Approach LOS			C			
<b>Intersection Summary</b>						
Average Delay			7.9			
Intersection Capacity Utilization			43.7%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 No-Build Weekday Evening Peak Hour  
7: Ridge Street & Essex Street/Essex Street/Brook Street

















10/24/2023



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↻				↻	↻	
Traffic Volume (veh/h)	222	5	20	1	178	8	3
Future Volume (Veh/h)	222	5	20	1	178	8	3
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.92	0.83	0.83
Hourly flow rate (vph)	239	5	0	1	193	10	4
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	244		436	242
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	244		436	242
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		98	100
cM capacity (veh/h)			0	1334		580	802
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	244	194	14				
Volume Left	0	1	10				
Volume Right	5	0	4				
cSH	1700	1334	630				
Volume to Capacity	0.14	0.00	0.02				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.0	10.8				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.0	10.8				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.4						
Intersection Capacity Utilization			35.8%	ICU Level of Service			A
Analysis Period (min)	15						

2030 No-Build Weekday Evening Peak Hour  
8: Lupine Road/Ridge Street & School Street

10/24/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	119	36	13	240	4	59	2	14	1	3	0
Future Volume (Veh/h)	1	119	36	13	240	4	59	2	14	1	3	0
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.33	0.33	0.33
Hourly flow rate (vph)	1	151	46	16	304	5	74	2	18	3	9	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	309			197			519	517	174	534	538	306
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	309			197			519	517	174	534	538	306
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	100	98	99	98	100
cM capacity (veh/h)	1263			1388			459	459	875	445	447	738
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	198	325	94	12								
Volume Left	1	16	74	3								
Volume Right	46	5	18	0								
cSH	1263	1388	505	447								
Volume to Capacity	0.00	0.01	0.19	0.03								
Queue Length 95th (ft)	0	1	17	2								
Control Delay (s)	0.0	0.5	13.8	13.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.0	0.5	13.8	13.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			39.4%		ICU Level of Service				A			
Analysis Period (min)			15									

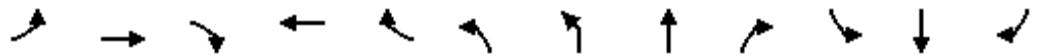
2030 Build Weekday Morning Peak Hour

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2030 Build Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/28/2024

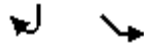


Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕				↕			↕	
Traffic Volume (vph)	139	0	13	0	3	18	1	433	1	2	598	195
Future Volume (vph)	139	0	13	0	3	18	1	433	1	2	598	195
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.988		0.865							0.962	
Flt Protected		0.956						0.998				
Satd. Flow (prot)	0	1905	0	1863	0	0	0	3417	0	0	3300	0
Flt Permitted		0.956						0.899			0.954	
Satd. Flow (perm)	0	1905	0	1863	0	0	0	3078	0	0	3148	0
Satd. Flow (RTOR)		126		472							1	
Adj. Flow (vph)	145	0	14	0	8	23	1	555	1	2	680	222
Lane Group Flow (vph)	0	159	0	8	0	0	0	580	0	0	912	0
Turn Type	Split	NA		NA		Perm	Perm	NA		Perm	NA	
Protected Phases	7	7		8				2			6	
Permitted Phases						2	2			6		
Detector Phase	7	7		8		2	2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	10.5		10.5		10.5	10.5	10.5		10.5	10.5	
Total Split (s)	25.5	25.5		15.5		54.5	54.5	54.5		54.5	54.5	
Total Split (%)	19.0%	19.0%		11.6%		40.7%	40.7%	40.7%		40.7%	40.7%	
Maximum Green (s)	20.0	20.0		10.0		49.0	49.0	49.0		49.0	49.0	
Yellow Time (s)	3.5	3.5		3.5		3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0				0.0			0.0	
Total Lost Time (s)		5.5		5.5				5.5			5.5	
Lead/Lag	Lead	Lead		Lag								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None		Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		7.6		5.7				50.7			50.7	
Actuated g/C Ratio		0.10		0.08				0.68			0.68	
v/c Ratio		0.52		0.01				0.28			0.43	
Control Delay		17.6		0.0				7.9			9.2	
Queue Delay		0.0		0.0				0.0			0.0	
Total Delay		17.6		0.0				7.9			9.2	
LOS		B		A				A			A	
Approach Delay		17.6						7.9			9.2	
Approach LOS		B						A			A	
Queue Length 50th (ft)		13		0				30			54	
Queue Length 95th (ft)		83		0				149			297	
Internal Link Dist (ft)		640		440				241			353	
Turn Bay Length (ft)												
Base Capacity (vph)		620		665				2096			2144	
Starvation Cap Reductn		0		0				0			0	
Spillback Cap Reductn		0		0				0			0	

2030 Build Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/28/2024

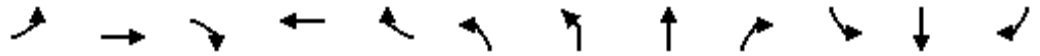


Lane Group	SBR2	SEL	Ø9
Lane Configurations			
Traffic Volume (vph)	7	0	
Future Volume (vph)	7	0	
Lane Util. Factor	0.95	1.00	
Frt			
Flt Protected			
Satd. Flow (prot)	0	1963	
Flt Permitted			
Satd. Flow (perm)	0	1963	
Satd. Flow (RTOR)			
Adj. Flow (vph)	8	0	
Lane Group Flow (vph)	0	0	
Turn Type			
		Prot	
Protected Phases		4	9
Permitted Phases			
Detector Phase			
		4	
Switch Phase			
Minimum Initial (s)		5.0	1.0
Minimum Split (s)		10.5	23.0
Total Split (s)		15.5	23.0
Total Split (%)		11.6%	17%
Maximum Green (s)		10.0	21.0
Yellow Time (s)		3.5	2.0
All-Red Time (s)		2.0	0.0
Lost Time Adjust (s)		0.0	
Total Lost Time (s)		5.5	
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)		3.0	3.0
Recall Mode		None	None
Walk Time (s)			7.0
Flash Dont Walk (s)			14.0
Pedestrian Calls (#/hr)			14
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)		415	
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			

2030 Build Weekday Morning Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/28/2024



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0		0				0			0	
Reduced v/c Ratio		0.26		0.01				0.28			0.43	

Intersection Summary

Cycle Length: 134	
Actuated Cycle Length: 74.5	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.52	
Intersection Signal Delay: 9.5	Intersection LOS: A
Intersection Capacity Utilization 50.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration
Ø2	54.5 s	Ø4	15.5 s	Ø7	25.5 s	Ø8	15.5 s	Ø9	23 s
Ø6	54.5 s								

2030 Build Weekday Morning Peak Hour  
2: Route 28 & Lewis Street

02/28/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	11	11	5	442	610	13	
Future Volume (vph)	11	11	5	442	610	13	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.932				0.997		
Flt Protected	0.976			0.999			
Satd. Flow (prot)	1728	0	0	1985	2044	0	
Flt Permitted	0.976			0.994			
Satd. Flow (perm)	1728	0	0	1975	2044	0	
Satd. Flow (RTOR)	15				2		
Adj. Flow (vph)	15	15	6	567	693	15	
Lane Group Flow (vph)	30	0	0	573	708	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							16
Act Effct Green (s)	6.3			46.5	46.5		
Actuated g/C Ratio	0.11			0.84	0.84		
v/c Ratio	0.14			0.35	0.41		
Control Delay	18.5			5.5	6.1		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.5			5.5	6.1		
LOS	B			A	A		
Approach Delay	18.5			5.5	6.1		
Approach LOS	B			A	A		
Queue Length 50th (ft)	4			0	0		
Queue Length 95th (ft)	21			193	307		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	327			1660	1719		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 Build Weekday Morning Peak Hour  
 2: Route 28 & Lewis Street

02/28/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.09			0.35	0.41		

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 55.3	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.41	
Intersection Signal Delay: 6.1	Intersection LOS: A
Intersection Capacity Utilization 45.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

Ø2 36 s	Ø4 14 s	Ø9 15 s
Ø6 36 s		

2030 Build Weekday Morning Peak Hour  
3: Route 28 & Pearson Street

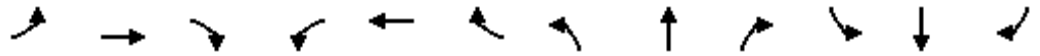
02/28/2024



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	26	71	51	433	591	33
Future Volume (Veh/h)	26	71	51	433	591	33
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.79	0.79	0.87	0.87
Hourly flow rate (vph)	38	103	65	548	679	38
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.81	0.81	0.81			
vC, conflicting volume	1376	698	717			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1347	511	534			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	69	78	92			
cM capacity (veh/h)	123	460	846			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	141	65	548	717		
Volume Left	38	65	0	0		
Volume Right	103	0	0	38		
cSH	265	846	1700	1700		
Volume to Capacity	0.53	0.08	0.32	0.42		
Queue Length 95th (ft)	72	6	0	0		
Control Delay (s)	33.0	9.6	0.0	0.0		
Lane LOS	D	A				
Approach Delay (s)	33.0	1.0				
Approach LOS	D					
<b>Intersection Summary</b>						
Average Delay	3.6					
Intersection Capacity Utilization	52.3%			ICU Level of Service	A	
Analysis Period (min)	15					

2030 Build Weekday Morning Peak Hour  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

02/28/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	10	80	0	0	41	3	0	0	1	5	0	13
Future Volume (Veh/h)	10	80	0	0	41	3	0	0	1	5	0	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.79	0.79	0.79	0.25	0.25	0.25	0.50	0.50	0.50
Hourly flow rate (vph)	12	98	0	0	52	4	0	0	4	10	0	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	56			98			202	178	98	180	176	54
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	56			98			202	178	98	180	176	54
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	99	100	97
cM capacity (veh/h)	1562			1508			737	714	963	778	716	1019
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	110	56	4	36								
Volume Left	12	0	0	10								
Volume Right	0	4	4	26								
cSH	1562	1508	963	938								
Volume to Capacity	0.01	0.00	0.00	0.04								
Queue Length 95th (ft)	1	0	0	3								
Control Delay (s)	0.9	0.0	8.8	9.0								
Lane LOS	A		A	A								
Approach Delay (s)	0.9	0.0	8.8	9.0								
Approach LOS			A	A								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			23.8%	ICU Level of Service		A						
Analysis Period (min)			15									

# LANE SUMMARY

 Site: 8975 [Andover (Site Folder: General)]

2030 Build Weekday Morning Peak Hour

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[ Total veh/h	HV %						[ Veh	Dist ] ft				
South: Dundee Park Drive													
Lane 1	24	0.0	259	0.093	100	20.3	LOS C	0.3	7.6	Full	1600	0.0	0.0
Approach	24	0.0		0.093		20.3	LOS C	0.3	7.6				
East: Essex Street													
Lane 1	548	2.6	1517	0.361	100	5.4	LOS A	2.4	60.1	Full	1600	0.0	0.0
Approach	548	2.6		0.361		5.4	NA	2.4	60.1				
NorthEast: Pearson Street													
Lane 1	74	0.0	721	0.103	100	6.9	LOS A	0.5	13.5	Full	1600	0.0	0.0
Approach	74	0.0		0.103		6.9	NA	0.5	13.5				
North: Railroad Street													
Lane 1	223	0.6	282	0.789	100	52.6	LOS F	7.6	190.1	Full	1600	0.0	0.0
Approach	223	0.6		0.789		52.6	LOS F	7.6	190.1				
West: Essex Street													
Lane 1	517	1.0	1509	0.343	100	5.4	LOS A	2.5	62.2	Full	1600	0.0	0.0
Approach	517	1.0		0.343		5.4	NA	2.5	62.2				
Intersection	1386	1.5		0.789		13.3	NA	7.6	190.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)													
South: Dundee Park Drive													
Mov.	L2	T1	R2	Total	%HV			Deg. Satn	Lane Util.	Prob. SL	Ov. Lane		
From S						Cap.		v/c	%	%	No.		
To Exit:	W	N	E			veh/h							
Lane 1	4	13	7	24	0.0	259	0.093	100	NA	NA			
Approach	4	13	7	24	0.0		0.093						
East: Essex Street													
Mov.	L2	T1	R2	R3	Total	%HV			Deg. Satn	Lane Util.	Prob. SL	Ov. Lane	
From E													
To Exit:	S	W	N	NE		Cap.		v/c	%	%	No.		
						veh/h							

Lane 1	33	393	106	16	548	2.6	1517	0.361	100	NA	NA
Approach	33	393	106	16	548	2.6		0.361			
NorthEast: Pearson Street											
Mov.	L3	R1	R3	Total	%HV			Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From NE To Exit:	E	W	N				Cap. veh/h				
Lane 1	4	53	16	74	0.0		721	0.103	100	NA	NA
Approach	4	53	16	74	0.0			0.103			
North: Railroad Street											
Mov.	L3	L2	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	NE	E	S	W			Cap. veh/h				
Lane 1	17	110	27	69	223	0.6	282	0.789	100	NA	NA
Approach	17	110	27	69	223	0.6		0.789			
West: Essex Street											
Mov.	L2	L1	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	NE	E	S			Cap. veh/h				
Lane 1	77	84	343	13	517	1.0	1509	0.343	100	NA	NA
Approach	77	84	343	13	517	1.0		0.343			
Total %HV Deg.Satn (v/c)											
Intersection	1386	1.5		0.789							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
NorthEast Exit: Pearson Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	

2030 Build Weekday Morning Peak Hour  
6: School Street & Essex Street

02/28/2024



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	185	181	19	157	210	17
Future Volume (Veh/h)	185	181	19	157	210	17
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.68	0.68	0.76	0.76
Hourly flow rate (vph)	201	197	28	231	276	22
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			398		586	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			398		586	300
tC, single (s)			4.1		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.5
p0 queue free %			98		40	97
cM capacity (veh/h)			1172		458	702
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	398	259	298			
Volume Left	0	28	276			
Volume Right	197	0	22			
cSH	1700	1172	486			
Volume to Capacity	0.23	0.02	0.61			
Queue Length 95th (ft)	0	2	101			
Control Delay (s)	0.0	1.1	23.4			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.1	23.4			
Approach LOS			C			
<b>Intersection Summary</b>						
Average Delay			7.6			
Intersection Capacity Utilization			42.5%	ICU Level of Service		A
Analysis Period (min)			15			

2030 Build Weekday Morning Peak Hour  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

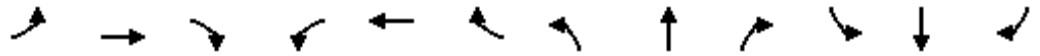
02/28/2024



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (veh/h)	189	13	19	3	166	10	6
Future Volume (Veh/h)	189	13	19	3	166	10	6
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.91	0.91	0.70	0.70	0.70	0.81	0.81
Hourly flow rate (vph)	208	14	0	4	237	12	7
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	222			460 215
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	222			460 215
tC, single (s)			0.0	4.1			6.4 6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2			3.5 3.3
p0 queue free %			0	100			98 99
cM capacity (veh/h)			0	1359			561 830
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	222	241	19				
Volume Left	0	4	12				
Volume Right	14	0	7				
cSH	1700	1359	637				
Volume to Capacity	0.13	0.00	0.03				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.2	10.8				
Lane LOS			A	B			
Approach Delay (s)	0.0	0.2	10.8				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.5						
Intersection Capacity Utilization			34.0%	ICU Level of Service			A
Analysis Period (min)	15						

2030 Build Weekday Morning Peak Hour  
 8: Lupine Road/Ridge Street & School Street

02/28/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	126	64	16	161	6	51	3	6	1	4	1
Future Volume (Veh/h)	0	126	64	16	161	6	51	3	6	1	4	1
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.77	0.77	0.77	0.79	0.79	0.79	0.30	0.30	0.30
Hourly flow rate (vph)	0	166	84	21	209	8	65	4	8	3	13	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	217			250			472	467	208	473	505	213
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	217			250			472	467	208	473	505	213
tC, single (s)	4.1			4.2			7.1	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			98			87	99	99	99	97	100
cM capacity (veh/h)	1365			1287			483	488	796	490	465	832
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	250	238	77	19								
Volume Left	0	21	65	3								
Volume Right	84	8	8	3								
cSH	1365	1287	504	504								
Volume to Capacity	0.00	0.02	0.15	0.04								
Queue Length 95th (ft)	0	1	13	3								
Control Delay (s)	0.0	0.8	13.4	12.4								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.8	13.4	12.4								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			38.9%		ICU Level of Service				A			
Analysis Period (min)			15									

2030 Build Weekday Evening Peak Hour

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2030 Build Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/28/2024



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Lane Configurations			↕		↕			↕		↕		
Traffic Volume (vph)	2	258	1	33	2	45	1	621	2	503	175	5
Future Volume (vph)	2	258	1	33	2	45	1	621	2	503	175	5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt			0.985							0.960		
Flt Protected			0.958					0.997				
Satd. Flow (prot)	0	0	1955	0	2153	0	0	3447	0	3317	0	0
Flt Permitted			0.958					0.831		0.954		
Satd. Flow (perm)	0	0	1955	0	2153	0	0	2873	0	3165	0	0
Satd. Flow (RTOR)			4							1		
Adj. Flow (vph)	2	290	1	37	8	47	1	654	2	565	197	6
Lane Group Flow (vph)	0	0	330	0	8	0	0	702	0	770	0	0
Turn Type	Split	Split	NA		NA	Perm	Perm	NA	Perm	NA		
Protected Phases	7	7	7		8			2		6		
Permitted Phases						2	2		6			
Detector Phase	7	7	7		8	2	2	2	6	6		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		
Minimum Split (s)	10.5	10.5	10.5		10.5	10.5	10.5	10.5	10.5	10.5		
Total Split (s)	25.5	25.5	25.5		15.5	54.5	54.5	54.5	54.5	54.5		
Total Split (%)	19.0%	19.0%	19.0%		11.6%	40.7%	40.7%	40.7%	40.7%	40.7%		
Maximum Green (s)	20.0	20.0	20.0		10.0	49.0	49.0	49.0	49.0	49.0		
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)			0.0		0.0			0.0		0.0		
Total Lost Time (s)			5.5		5.5			5.5		5.5		
Lead/Lag	Lead	Lead	Lead		Lag							
Lead-Lag Optimize?	Yes	Yes	Yes		Yes							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		
Recall Mode	Min	Min	Min		None	Max	Max	Max	Max	Max		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			20.7		6.2			50.7		50.7		
Actuated g/C Ratio			0.21		0.06			0.50		0.50		
v/c Ratio			0.82		0.06			0.49		0.48		
Control Delay			58.3		54.5			21.8		21.5		
Queue Delay			0.0		0.0			0.0		0.0		
Total Delay			58.3		54.5			21.8		21.5		
LOS			E		D			C		C		
Approach Delay			58.3		54.5			21.8		21.5		
Approach LOS			E		D			C		C		
Queue Length 50th (ft)			210		5			163		178		
Queue Length 95th (ft)			#475		6			311		329		
Internal Link Dist (ft)			640		440			241		353		
Turn Bay Length (ft)												
Base Capacity (vph)			404		221			1446		1594		
Starvation Cap Reductn			0		0			0		0		
Spillback Cap Reductn			0		0			0		0		

2030 Build Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/28/2024



Lane Group	SEL2	SEL	SER	SER2	Ø9
Lane Configurations					
Traffic Volume (vph)	2	0	5	3	
Future Volume (vph)	2	0	5	3	
Lane Util. Factor	1.00	1.00	1.00	1.00	
Frt		0.892			
Flt Protected		0.990			
Satd. Flow (prot)	0	1734	0	0	
Flt Permitted		0.990			
Satd. Flow (perm)	0	1734	0	0	
Satd. Flow (RTOR)		126			
Adj. Flow (vph)	4	0	10	6	
Lane Group Flow (vph)	0	20	0	0	
Turn Type	Prot	Prot			
Protected Phases	4	4			9
Permitted Phases					
Detector Phase	4	4			
Switch Phase					
Minimum Initial (s)	5.0	5.0			1.0
Minimum Split (s)	10.5	10.5			23.0
Total Split (s)	15.5	15.5			23.0
Total Split (%)	11.6%	11.6%			17%
Maximum Green (s)	10.0	10.0			21.0
Yellow Time (s)	3.5	3.5			2.0
All-Red Time (s)	2.0	2.0			0.0
Lost Time Adjust (s)		0.0			
Total Lost Time (s)		5.5			
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0			3.0
Recall Mode	None	None			None
Walk Time (s)					7.0
Flash Dont Walk (s)					14.0
Pedestrian Calls (#/hr)					27
Act Effct Green (s)		5.7			
Actuated g/C Ratio		0.06			
v/c Ratio		0.09			
Control Delay		0.8			
Queue Delay		0.0			
Total Delay		0.8			
LOS		A			
Approach Delay		0.8			
Approach LOS		A			
Queue Length 50th (ft)		0			
Queue Length 95th (ft)		0			
Internal Link Dist (ft)		415			
Turn Bay Length (ft)					
Base Capacity (vph)		291			
Starvation Cap Reductn		0			
Spillback Cap Reductn		0			

2030 Build Weekday Evening Peak Hour

1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/28/2024



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Storage Cap Reductn			0		0			0		0		
Reduced v/c Ratio			0.82		0.04			0.49		0.48		

Intersection Summary

Cycle Length: 134

Actuated Cycle Length: 100.7

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 28.2

Intersection LOS: C

Intersection Capacity Utilization 83.8%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Ø2	Ø4	Ø7	Ø8	Ø9
54.5 s	15.5 s	25.5 s	15.5 s	23 s
Ø6				
54.5 s				

2030 Build Weekday Evening Peak Hour  
2: Route 28 & Lewis Street

02/28/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	8	7	7	665	516	11	
Future Volume (vph)	8	7	7	665	516	11	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.937				0.997		
Flt Protected	0.974			0.999			
Satd. Flow (prot)	1734	0	0	2005	2064	0	
Flt Permitted	0.974			0.994			
Satd. Flow (perm)	1734	0	0	1995	2064	0	
Satd. Flow (RTOR)	14				2		
Adj. Flow (vph)	16	14	8	715	573	12	
Lane Group Flow (vph)	30	0	0	723	585	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							4
Act Effct Green (s)	6.3			46.5	46.5		
Actuated g/C Ratio	0.11			0.84	0.84		
v/c Ratio	0.14			0.43	0.34		
Control Delay	18.9			6.6	5.3		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.9			6.6	5.3		
LOS	B			A	A		
Approach Delay	18.9			6.6	5.3		
Approach LOS	B			A	A		
Queue Length 50th (ft)	4			0	0		
Queue Length 95th (ft)	12			340	241		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	327			1677	1735		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 Build Weekday Evening Peak Hour  
 2: Route 28 & Lewis Street

02/28/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.09			0.43	0.34		

Intersection Summary	
Cycle Length:	65
Actuated Cycle Length:	55.3
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.43
Intersection Signal Delay:	6.3
Intersection LOS:	A
Intersection Capacity Utilization	53.1%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 2: Route 28 & Lewis Street

Ø2	Ø4	Ø9
36 s	14 s	15 s
Ø6		
36 s		

2030 Build Weekday Evening Peak Hour  
3: Route 28 & Pearson Street

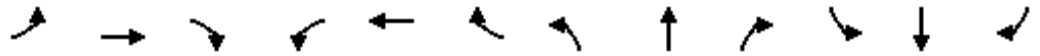
02/28/2024



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	84	46	637	515	10
Future Volume (Veh/h)	31	84	46	637	515	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	45	122	48	664	585	11
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.87	0.87	0.87			
vC, conflicting volume	1350	590	596			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1328	456	462			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	69	77	95			
cM capacity (veh/h)	143	530	967			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	167	48	664	596		
Volume Left	45	48	0	0		
Volume Right	122	0	0	11		
cSH	307	967	1700	1700		
Volume to Capacity	0.54	0.05	0.39	0.35		
Queue Length 95th (ft)	76	4	0	0		
Control Delay (s)	30.0	8.9	0.0	0.0		
Lane LOS	D	A				
Approach Delay (s)	30.0	0.6				
Approach LOS	D					
<b>Intersection Summary</b>						
Average Delay			3.7			
Intersection Capacity Utilization			47.9%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 Build Weekday Evening Peak Hour  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

02/28/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	10	62	0	0	65	4	0	0	0	3	0	8
Future Volume (Veh/h)	10	62	0	0	65	4	0	0	0	3	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.60	0.60	0.60	0.25	0.25	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	12	75	0	0	108	7	0	0	0	12	0	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	115			75			242	214	75	210	210	112
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	115			75			242	214	75	210	210	112
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	98	100	97
cM capacity (veh/h)	1487			1537			687	682	992	746	685	947
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	87	115	0	44								
Volume Left	12	0	0	12								
Volume Right	0	7	0	32								
cSH	1487	1537	1700	882								
Volume to Capacity	0.01	0.00	0.00	0.05								
Queue Length 95th (ft)	1	0	0	4								
Control Delay (s)	1.1	0.0	0.0	9.3								
Lane LOS	A		A	A								
Approach Delay (s)	1.1	0.0	0.0	9.3								
Approach LOS			A	A								
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			20.5%	ICU Level of Service		A						
Analysis Period (min)			15									

# LANE SUMMARY

 Site: 8975 [Andover (Site Folder: General)]

2030 Build Weekday Evening Peak Hour

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[ Total veh/h ]	[ HV % ]						[ Veh ]	[ Dist ]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Dundee Park Drive													
Lane 1	194	0.0	221	0.879	100	78.9	LOS F	8.5	211.8	Full	1600	0.0	0.0
Approach	194	0.0		0.879		78.9	LOS F	8.5	211.8				
East: Essex Street													
Lane 1	679	0.9	1430	0.475	100	7.4	LOS A	4.3	108.3	Full	1600	0.0	0.0
Approach	679	0.9		0.475		7.4	NA	4.3	108.3				
NorthEast: Pearson Street													
Lane 1	100	0.0	655	0.153	100	8.1	LOS A	0.8	20.2	Full	1600	0.0	0.0
Approach	100	0.0		0.153		8.1	NA	0.8	20.2				
North: Railroad Street													
Lane 1	205	1.2	254	0.808	100	59.7	LOS F	7.4	187.7	Full	1600	0.0	0.0
Approach	205	1.2		0.808		59.7	LOS F	7.4	187.7				
West: Essex Street													
Lane 1	520	0.6	1437	0.362	100	6.1	LOS A	3.0	76.5	Full	1600	0.0	0.0
Approach	520	0.6		0.362		6.1	NA	3.0	76.5				
Intersection	1699	0.7		0.879		21.6	NA	8.5	211.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)													
South: Dundee Park Drive													
Mov.	L2	T1	R1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.		
From S							veh/h	Satn	Util.	SL	Ov.	Lane	
To Exit:	W	N	NE	E				v/c	%	%	%	No.	
Lane 1	69	59	7	59	194	0.0	221	0.879	100	NA	NA		
Approach	69	59	7	59	194	0.0		0.879					
East: Essex Street													
Mov.	L2	T1	R2	R3	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.		
From E							veh/h	Satn	Util.	SL	Ov.	Lane	
To Exit:	S	W	N	NE				v/c	%	%	%	No.	

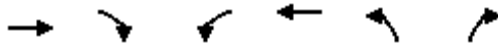
Lane 1	19	455	193	12	679	0.9	1430	0.475	100	NA	NA
Approach	19	455	193	12	679	0.9		0.475			
NorthEast: Pearson Street											
Mov.	L3	L1	R1	R3	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From NE To Exit:	E	S	W	N			Cap. veh/h				
Lane 1	3	3	74	21	100	0.0	655	0.153	100	NA	NA
Approach	3	3	74	21	100	0.0		0.153			
North: Railroad Street											
Mov.	L3	L2	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	NE	E	S	W			Cap. veh/h				
Lane 1	9	81	24	92	205	1.2	254	0.808	100	NA	NA
Approach	9	81	24	92	205	1.2		0.808			
West: Essex Street											
Mov.	L2	L1	T1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	NE	E	S			Cap. veh/h				
Lane 1	83	69	320	48	520	0.6	1437	0.362	100	NA	NA
Approach	83	69	320	48	520	0.6		0.362			
Total %HV Deg.Satn (v/c)											
Intersection	1699	0.7		0.879							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
NorthEast Exit: Pearson Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	

2030 Build Weekday Evening Peak Hour  
6: School Street & Essex Street

02/28/2024



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Traffic Volume (veh/h)	203	146	15	172	283	25
Future Volume (Veh/h)	203	146	15	172	283	25
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	221	159	18	202	301	27
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			380		538	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			380		538	300
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		40	96
cM capacity (veh/h)			1190		498	744
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	380	220	328			
Volume Left	0	18	301			
Volume Right	159	0	27			
cSH	1700	1190	532			
Volume to Capacity	0.22	0.02	0.62			
Queue Length 95th (ft)	0	1	104			
Control Delay (s)	0.0	0.8	22.0			
Lane LOS			A	C		
Approach Delay (s)	0.0	0.8	22.0			
Approach LOS			C			
<b>Intersection Summary</b>						
Average Delay			8.0			
Intersection Capacity Utilization			43.8%	ICU Level of Service		A
Analysis Period (min)			15			

2030 Build Weekday Evening Peak Hour  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

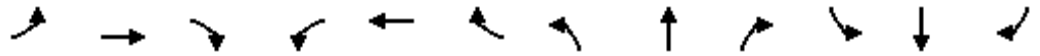
02/28/2024



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↻				↻	↻	
Traffic Volume (veh/h)	223	5	20	1	179	8	3
Future Volume (Veh/h)	223	5	20	1	179	8	3
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.92	0.83	0.83
Hourly flow rate (vph)	240	5	0	1	195	10	4
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	245		440	242
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	245		440	242
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		98	100
cM capacity (veh/h)			0	1333		578	801
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	245	196	14				
Volume Left	0	1	10				
Volume Right	5	0	4				
cSH	1700	1333	628				
Volume to Capacity	0.14	0.00	0.02				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.0	10.9				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.0	10.9				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.4						
Intersection Capacity Utilization			36.0%	ICU Level of Service			A
Analysis Period (min)	15						

2030 Build Weekday Evening Peak Hour  
8: Lupine Road/Ridge Street & School Street

02/28/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	120	36	13	241	4	59	2	14	1	3	0
Future Volume (Veh/h)	1	120	36	13	241	4	59	2	14	1	3	0
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.33	0.33	0.33
Hourly flow rate (vph)	1	152	46	16	305	5	74	2	18	3	9	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	310			198			521	519	175	536	540	308
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	310			198			521	519	175	536	540	308
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	100	98	99	98	100
cM capacity (veh/h)	1262			1387			458	458	874	444	446	737
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	199	326	94	12								
Volume Left	1	16	74	3								
Volume Right	46	5	18	0								
cSH	1262	1387	504	446								
Volume to Capacity	0.00	0.01	0.19	0.03								
Queue Length 95th (ft)	0	1	17	2								
Control Delay (s)	0.0	0.5	13.8	13.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.0	0.5	13.8	13.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			39.5%	ICU Level of Service	A							
Analysis Period (min)			15									

TRAFFIC SIGNAL WARRANT ANALYSIS REPORTS

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# HCS Warrants Report

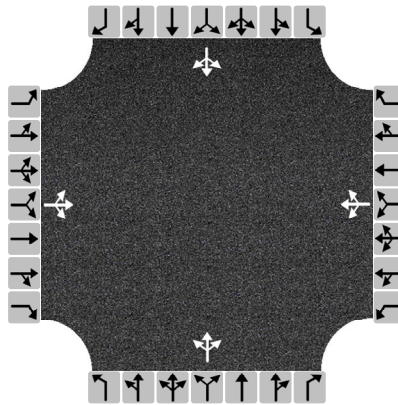
## Project Information

Analyst	TJH/SWT	Date	10/30/2023
Agency	VAI	Analysis Year	2023
Jurisdiction		Time Period Analyzed	Morning and Evening
Project Description	8975 Andover Weekday		

## General

Major Street Direction	East-West	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	25	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

## Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Number of Lanes, N	0	1	0	0	1	0	0	1	0	0	1	0
Lane Usage		LTR			LTR			LTR			LTR	
Vehicle Volumes Averages (veh/h)	17	77	7	5	81	30	6	5	6	26	5	23
Pedestrian Averages (peds/h)	0			0			0			0		
Gap Averages (gaps/h)	0			0			0			0		
Delay (s/veh)	0.0			0.0			0.0			0.0		
Delay (veh-hrs)	0.0			0.0			0.0			0.0		

## School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

## Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

<b>Volume Summary</b>														
Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A ( 100% )	1A ( 80% )	1B ( 100% )	1B ( 80% )	2 ( 100% )	3A ( 100% )	3B ( 80% )	4A ( 100% )	4B ( 80% )
07 - 08	513	130	652	0	0	No	Yes	No	No	No	No	No	No	No
08 - 09	663	188	867	0	0	Yes	Yes	No	Yes	No	No	No	No	No
09 - 10	0	0	0	0	0	No	No	No	No	No	No	No	No	No
10 - 11	0	0	0	0	0	No	No	No	No	No	No	No	No	No
11 - 12	0	0	0	0	0	No	No	No	No	No	No	No	No	No
12 - 13	0	0	0	0	0	No	No	No	No	No	No	No	No	No
13 - 14	0	0	0	0	0	No	No	No	No	No	No	No	No	No
14 - 15	0	0	0	0	0	No	No	No	No	No	No	No	No	No
15 - 16	0	0	0	0	0	No	No	No	No	No	No	No	No	No
16 - 17	730	153	965	0	0	Yes	Yes	No	Yes	No	No	No	No	No
17 - 18	736	189	1037	0	0	Yes	Yes	No	Yes	Yes	No	No	No	No
18 - 19	0	0	0	0	0	No	No	No	No	No	No	No	No	No
Total	2642	660	3521	0	0	3	4	0	3	1	0	0	0	0

<b>Warrants</b>	
<b>Warrant 1: Eight-Hour Vehicular Volume</b>	
A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	
B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	
80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	
<b>Warrant 2: Four-Hour Vehicular Volume</b>	
Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)	
<b>Warrant 3: Peak Hour</b>	
A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--	
B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	
<b>Warrant 4: Pedestrian Volume</b>	
A. Four Hour Volumes --or--	
B. One-Hour Volumes	
<b>Warrant 5: School Crossing</b>	
Gaps Same Period --and--	
Student Volumes	
Nearest Traffic Control Signal (optional)	
<b>Warrant 6: Coordinated Signal System</b>	
Degree of Platooning (Predominant direction or both directions)	
<b>Warrant 7: Crash Experience</b>	
A. Adequate trials of alternatives, observance and enforcement failed --and--	
B. Reported crashes susceptible to correction by signal (12-month period) --and--	
C. 80% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied	
<b>Warrant 8: Roadway Network</b>	
A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--	
B. Weekend Volume (Five hours total)	
<b>Warrant 9: Grade Crossing</b>	
A. Grade Crossing within 140 ft --and--	
B. Peak-Hour Vehicular Volumes	

# HCS Warrants Report

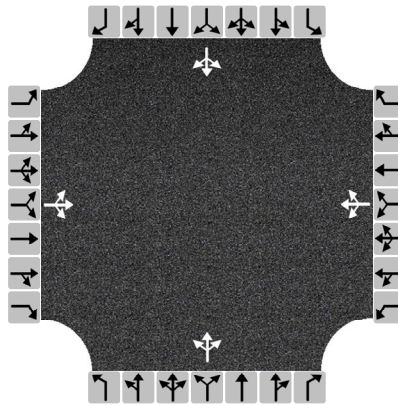
## Project Information

Analyst	TJH/SWT	Date	10/30/2023
Agency	VAI	Analysis Year	2030
Jurisdiction		Time Period Analyzed	Morning and Evening
Project Description	8975 Andover Weekday		

## General

Major Street Direction	East-West	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	25	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

## Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Number of Lanes, N	0	1	0	0	1	0	0	1	0	0	1	0
Lane Usage		LTR			LTR			LTR			LTR	
Vehicle Volumes Averages (veh/h)	19	84	7	5	89	33	6	5	6	27	5	25
Pedestrian Averages (peds/h)	0			0			0			0		
Gap Averages (gaps/h)	0			0			0			0		
Delay (s/veh)	0.0			0.0			0.0			0.0		
Delay (veh-hrs)	0.0			0.0			0.0			0.0		

## School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

## Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

<b>Volume Summary</b>														
Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (80%)	4A (100%)	4B (80%)
07 - 08	564	139	712	0	0	No	Yes	No	No	No	No	No	No	No
08 - 09	720	200	936	0	0	Yes	Yes	No	Yes	Yes	No	No	No	No
09 - 10	0	0	0	0	0	No	No	No	No	No	No	No	No	No
10 - 11	0	0	0	0	0	No	No	No	No	No	No	No	No	No
11 - 12	0	0	0	0	0	No	No	No	No	No	No	No	No	No
12 - 13	0	0	0	0	0	No	No	No	No	No	No	No	No	No
13 - 14	0	0	0	0	0	No	No	No	No	No	No	No	No	No
14 - 15	0	0	0	0	0	No	No	No	No	No	No	No	No	No
15 - 16	0	0	0	0	0	No	No	No	No	No	No	No	No	No
16 - 17	796	163	1041	0	0	Yes	Yes	Yes	Yes	Yes	No	No	No	No
17 - 18	804	201	1117	0	0	Yes	Yes	Yes	Yes	Yes	No	No	No	No
18 - 19	0	0	0	0	0	No	No	No	No	No	No	No	No	No
Total	2884	703	3806	0	0	3	4	2	3	3	0	0	0	0

<b>Warrants</b>	
<b>Warrant 1: Eight-Hour Vehicular Volume</b>	
A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	
B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	
80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	
<b>Warrant 2: Four-Hour Vehicular Volume</b>	
Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)	
<b>Warrant 3: Peak Hour</b>	
A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--	
B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	
<b>Warrant 4: Pedestrian Volume</b>	
A. Four Hour Volumes --or--	
B. One-Hour Volumes	
<b>Warrant 5: School Crossing</b>	
Gaps Same Period --and--	
Student Volumes	
Nearest Traffic Control Signal (optional)	
<b>Warrant 6: Coordinated Signal System</b>	
Degree of Platooning (Predominant direction or both directions)	
<b>Warrant 7: Crash Experience</b>	
A. Adequate trials of alternatives, observance and enforcement failed --and--	
B. Reported crashes susceptible to correction by signal (12-month period) --and--	
C. 80% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied	
<b>Warrant 8: Roadway Network</b>	
A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--	
B. Weekend Volume (Five hours total)	
<b>Warrant 9: Grade Crossing</b>	
A. Grade Crossing within 140 ft --and--	
B. Peak-Hour Vehicular Volumes	

SEASONAL ADJUSTMENT OF TSWA VOLUMES

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Seasonal	
COVID	
Background Growth	1.0%
# of Years	7

### Weekday Morning 7-8 Peak Hour

Essex Street at Railroad Street and Dundee Park Drive

Movement	Raw Data	2023 Existing
EB LT	42	42
EB TH	205	205
EB RT	9	9
WB LT	5	5
WB TH	207	207
WB RT	45	45
NB LT	2	2
NB TH	3	3
NB RT	4	4
SB LT	64	64
SB TH	12	12
SB RT	54	54

27 Main	2030 No-Build	Removed	2030 Build	
45	2	47	47	
220	1	221	4	225
10		9	9	
5		5	5	
222	1	223	7	230
48		48	48	
2		2	2	
3		3	3	
4		4	4	
69		69	69	
13		12	12	
58		58	58	

### Weekday Evening 4-5 Peak Hour

Essex Street at Railroad Street and Dundee Park Drive

Movement	Raw Data	2023 Existing
EB LT	51	51
EB TH	226	226
EB RT	36	36
WB LT	16	16
WB TH	278	278
WB RT	123	123
NB LT	30	30
NB TH	32	32
NB RT	20	20
SB LT	65	65
SB TH	16	16
SB RT	72	72

27 Main	2030 No-Build	Removed	2030 Build	
55	3	58	58	
242	3	245	4	249
39		36	36	
17		16	16	
298	3	301	4	305
132		132	132	
32		30	30	
34		32	32	
21		20	20	
70		70	70	
17		16	16	
77		77	77	

### Weekday Morning 8-9 Peak Hour

Essex Street at Railroad Street and Dundee Park Drive

Movement	Raw Data	2023 Existing
EB LT	52	52
EB TH	284	284
EB RT	17	17
WB LT	31	31
WB TH	195	195
WB RT	84	84
NB LT	2	2
NB TH	8	8
NB RT	6	6
SB LT	98	98
SB TH	21	21
SB RT	69	69

27 Main	2030 No-Build	Removed	2030 Build	
56	1	57	57	
304	1	305	4	309
18		17	17	
33		31	31	
209		209	7	216
90		90	90	
2		2	2	
9		8	8	
6		6	6	
105		105	105	
23		21	21	
74		74	74	

### Weekday Evening 5-6 Peak Hour

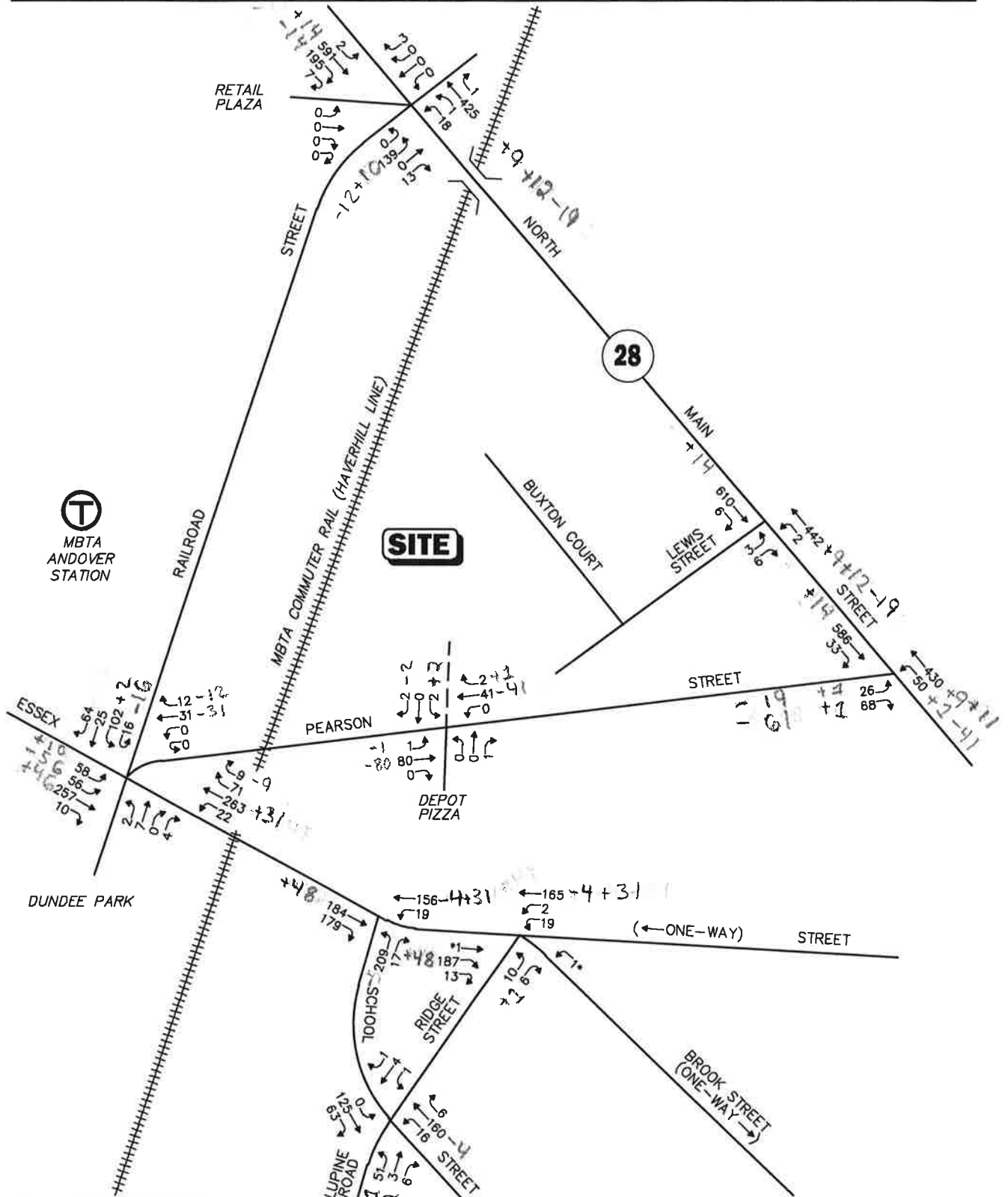
Essex Street at Railroad Street and Dundee Park Drive

Movement	Raw Data	2023 Existing
EB LT	64	64
EB TH	210	210
EB RT	30	30
WB LT	14	14
WB TH	299	299
WB RT	119	119
NB LT	39	39
NB TH	24	24
NB RT	49	49
SB LT	85	85
SB TH	18	18
SB RT	86	86

27 Main	2030 No-Build	Removed	2030 Build	
69	3	72	72	
225	3	228	5	233
32		30	30	
15		14	14	
321	3	324	3	327
128		128	128	
42		39	39	
26		24	24	
53		49	49	
91		91	91	
19		18	18	
92		92	92	

MASSWORKS ALTERNATIVE REDISTRIBUTION WORKSHEETS

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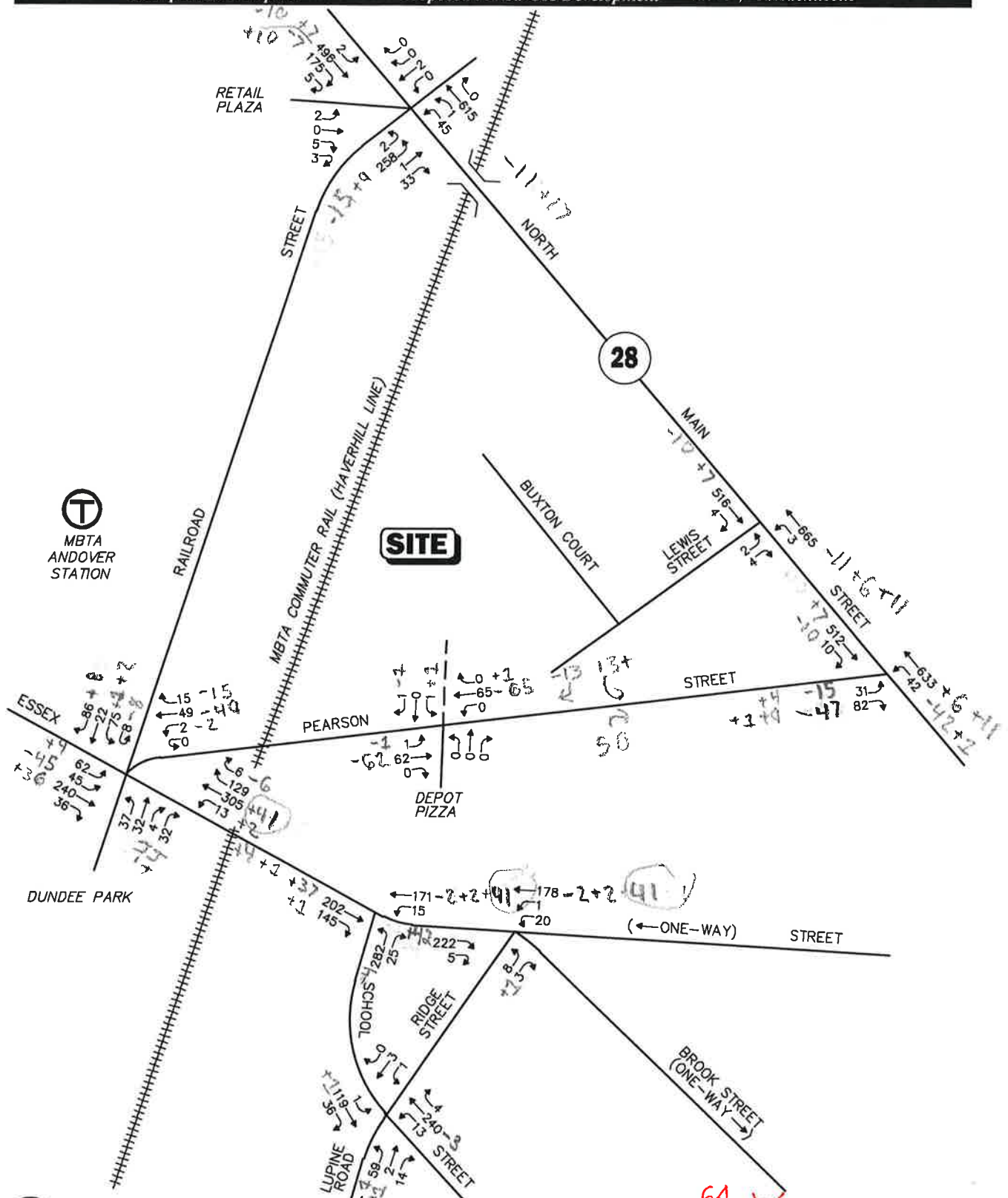
\*Illegal maneuver.  
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown. SA-W

Not To Scale

Figure 5

**VA** Vanasse & Associates inc

2030 No-Build  
Weekday Morning  
Peak-Hour Traffic Volumes  
*Alternative MassWorks*  
*MassWorks Alternative*



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.  
Not To Scale

Figure 6



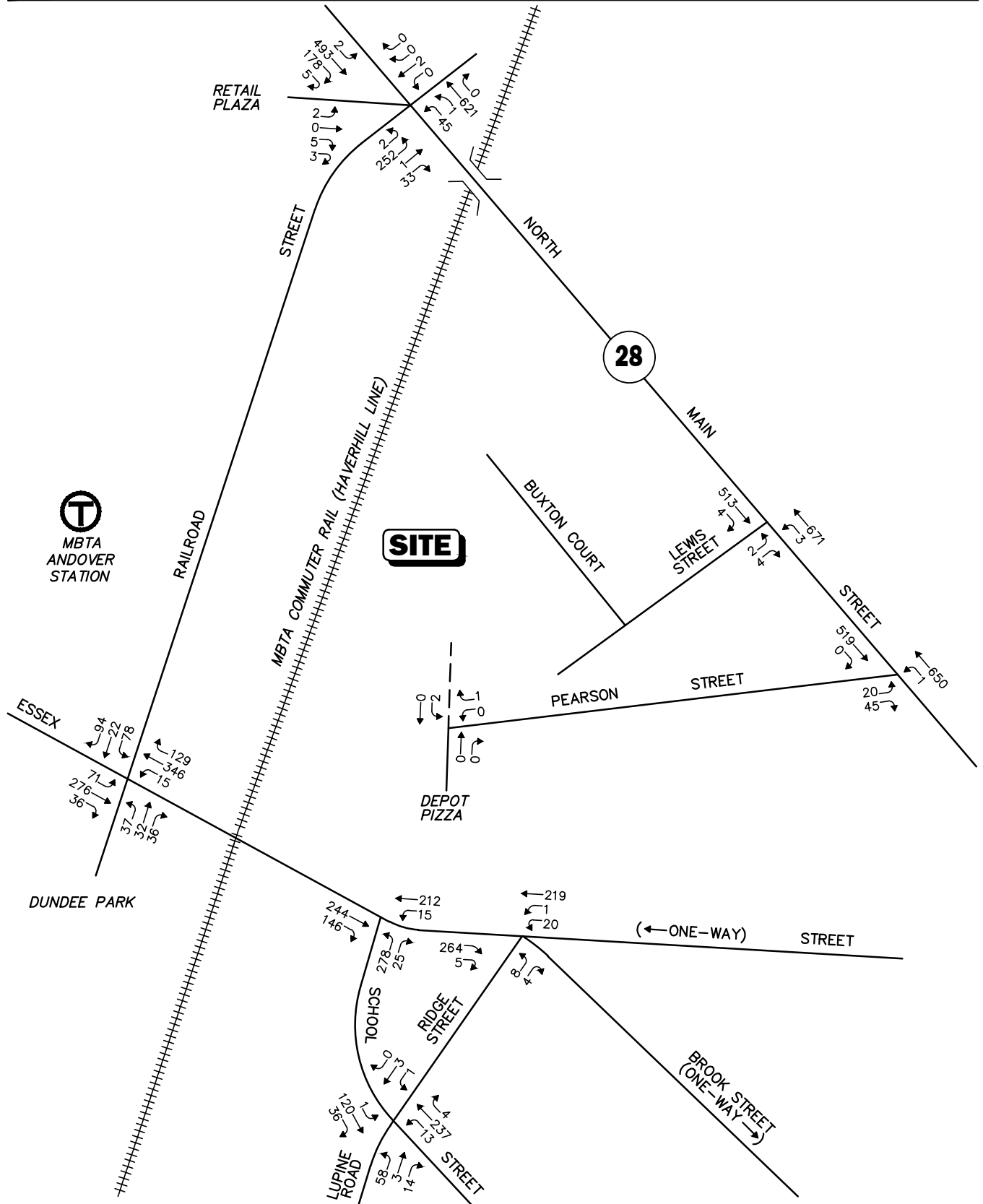
2030 No-Build  
Weekday Evening  
Peak-Hour Traffic Volumes  
~~Alternative Massworks~~  
Massworks Alternative

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MASSWORKS ALTERNATIVE FIGURES

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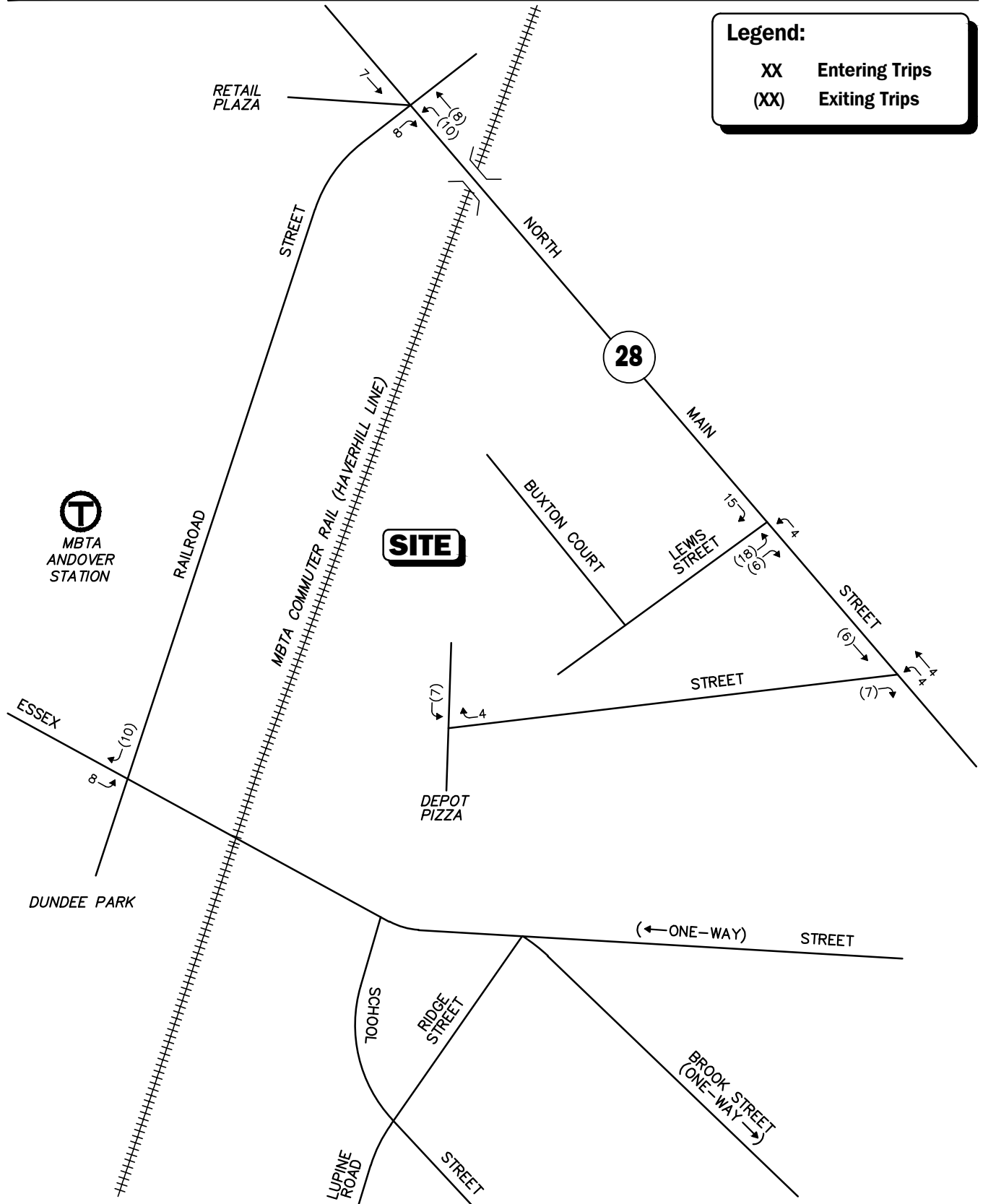


Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.  
 Not To Scale Figure 6A



**2030 No-Build  
 Weekday Evening  
 Peak-Hour Traffic Volumes  
 MassWorks Alternative**

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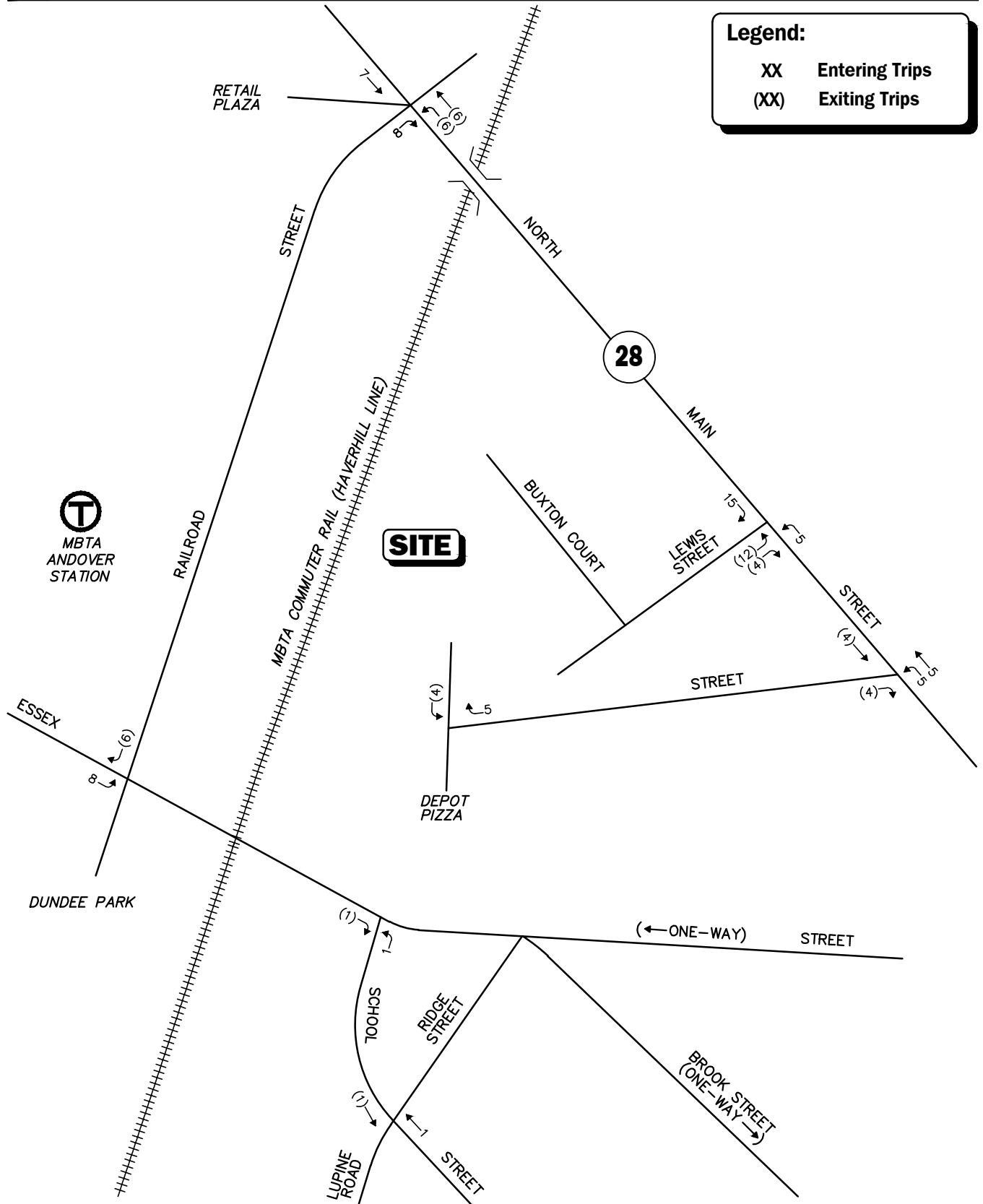


Not To Scale **Figure 8A**



**Site-Generated  
 Weekday Morning  
 Peak-Hour Traffic Volumes  
 MassWorks Alternative**

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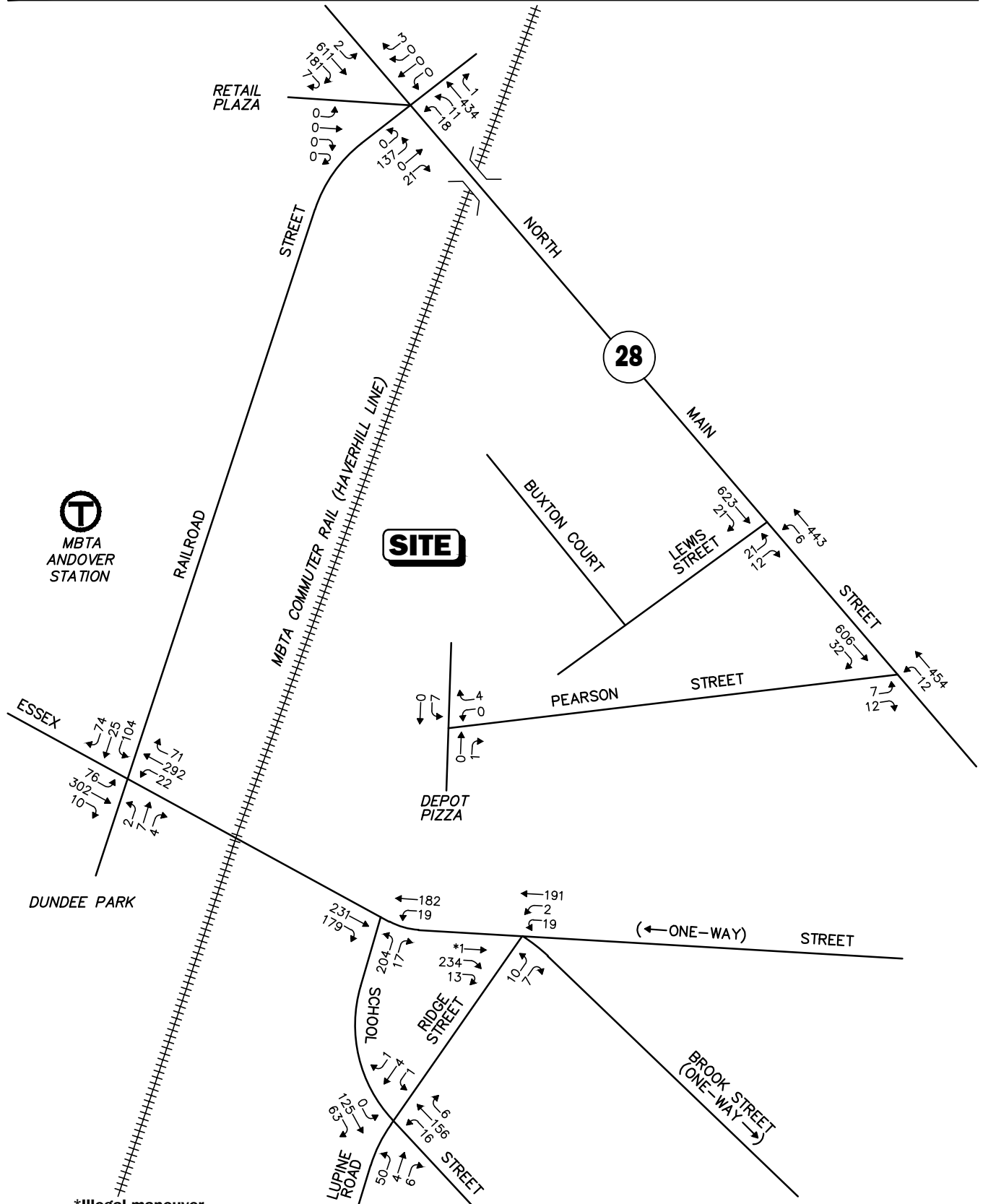


Not To Scale Figure 9A



**Site-Generated  
Weekday Evening  
Peak-Hour Traffic Volumes  
MassWorks Alternative**

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\*Illegal maneuver.

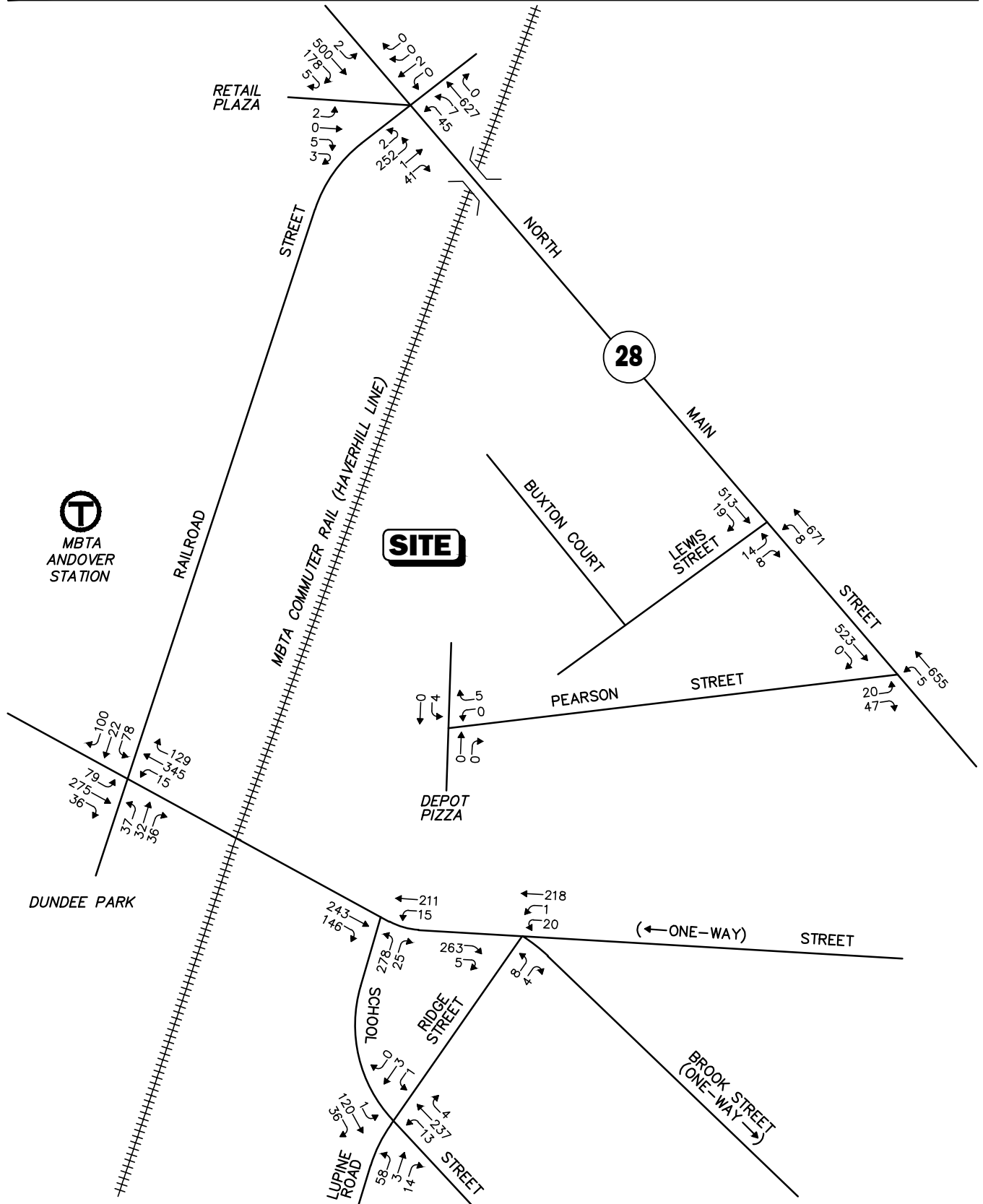
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 10A



2030 Build  
Weekday Morning  
Peak-Hour Traffic Volumes  
MassWorks Alternative



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 11A



2030 Build  
Weekday Evening  
Peak-Hour Traffic Volumes  
MassWorks Alternative

## MASSWORKS ALTERNATIVE CAPACITY ANALYSIS

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2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative

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2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/29/2024



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕				↕			↕	
Traffic Volume (vph)	137	0	13	0	3	18	1	427	1	2	605	181
Future Volume (vph)	137	0	13	0	3	18	1	427	1	2	605	181
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.988		0.865							0.964	
Flt Protected		0.956						0.998				
Satd. Flow (prot)	0	1905	0	1863	0	0	0	3417	0	0	3306	0
Flt Permitted		0.956						0.899			0.954	
Satd. Flow (perm)	0	1905	0	1863	0	0	0	3078	0	0	3154	0
Satd. Flow (RTOR)		126		476							1	
Adj. Flow (vph)	143	0	14	0	8	23	1	547	1	2	688	206
Lane Group Flow (vph)	0	157	0	8	0	0	0	572	0	0	904	0
Turn Type	Split	NA		NA		Perm	Perm	NA		Perm	NA	
Protected Phases	7	7		8				2			6	
Permitted Phases						2	2			6		
Detector Phase	7	7		8		2	2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	10.5		10.5		10.5	10.5	10.5		10.5	10.5	
Total Split (s)	25.5	25.5		15.5		54.5	54.5	54.5		54.5	54.5	
Total Split (%)	19.0%	19.0%		11.6%		40.7%	40.7%	40.7%		40.7%	40.7%	
Maximum Green (s)	20.0	20.0		10.0		49.0	49.0	49.0		49.0	49.0	
Yellow Time (s)	3.5	3.5		3.5		3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0				0.0			0.0	
Total Lost Time (s)		5.5		5.5				5.5			5.5	
Lead/Lag	Lead	Lead		Lag								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None		Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		7.6		5.7				50.8			50.8	
Actuated g/C Ratio		0.10		0.08				0.68			0.68	
v/c Ratio		0.51		0.01				0.27			0.42	
Control Delay		17.4		0.0				7.9			9.1	
Queue Delay		0.0		0.0				0.0			0.0	
Total Delay		17.4		0.0				7.9			9.1	
LOS		B		A				A			A	
Approach Delay		17.4						7.9			9.1	
Approach LOS		B						A			A	
Queue Length 50th (ft)		12		0				30			53	
Queue Length 95th (ft)		80		0				146			293	
Internal Link Dist (ft)		640		440				241			353	
Turn Bay Length (ft)												
Base Capacity (vph)		620		668				2097			2149	
Starvation Cap Reductn		0		0				0			0	
Spillback Cap Reductn		0		0				0			0	

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/29/2024



Lane Group	SBR2	SEL	Ø9
Lane Configurations			
Traffic Volume (vph)	7	0	
Future Volume (vph)	7	0	
Lane Util. Factor	0.95	1.00	
Frt			
Flt Protected			
Satd. Flow (prot)	0	1963	
Flt Permitted			
Satd. Flow (perm)	0	1963	
Satd. Flow (RTOR)			
Adj. Flow (vph)	8	0	
Lane Group Flow (vph)	0	0	
Turn Type			
		Prot	
Protected Phases		4	9
Permitted Phases			
Detector Phase			
		4	
Switch Phase			
Minimum Initial (s)		5.0	1.0
Minimum Split (s)		10.5	23.0
Total Split (s)		15.5	23.0
Total Split (%)		11.6%	17%
Maximum Green (s)		10.0	21.0
Yellow Time (s)		3.5	2.0
All-Red Time (s)		2.0	0.0
Lost Time Adjust (s)		0.0	
Total Lost Time (s)		5.5	
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)		3.0	3.0
Recall Mode		None	None
Walk Time (s)			7.0
Flash Dont Walk (s)			14.0
Pedestrian Calls (#/hr)			14
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)		415	
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02/29/2024



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0		0				0			0	
Reduced v/c Ratio		0.25		0.01				0.27			0.42	

Intersection Summary

Cycle Length: 134	
Actuated Cycle Length: 74.5	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 50.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Ø2	Ø4	Ø7	Ø8	Ø9
54.5 s	15.5 s	25.5 s	15.5 s	23 s
Ø6				
54.5 s				

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
2: Route 28 & Lewis Street

02/29/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	3	6	2	444	624	6	
Future Volume (vph)	3	6	2	444	624	6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.910				0.999		
Flt Protected	0.984						
Satd. Flow (prot)	1701	0	0	1987	2047	0	
Flt Permitted	0.984			0.998			
Satd. Flow (perm)	1701	0	0	1983	2047	0	
Satd. Flow (RTOR)	8				1		
Adj. Flow (vph)	4	8	3	569	709	7	
Lane Group Flow (vph)	12	0	0	572	716	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							16
Act Effct Green (s)	5.9			49.2	49.2		
Actuated g/C Ratio	0.11			0.91	0.91		
v/c Ratio	0.06			0.32	0.39		
Control Delay	18.2			4.0	4.5		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.2			4.0	4.5		
LOS	B			A	A		
Approach Delay	18.2			4.0	4.5		
Approach LOS	B			A	A		
Queue Length 50th (ft)	1			0	0		
Queue Length 95th (ft)	13			182	296		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	323			1796	1854		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 2: Route 28 & Lewis Street

02/29/2024





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.04			0.32	0.39		

**Intersection Summary**

Cycle Length: 65	
Actuated Cycle Length: 54.3	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.39	
Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 45.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

 Ø2	 Ø4	 Ø9
36 s	14 s	15 s
 Ø6		
36 s		

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 3: Route 28 & Pearson Street

02/29/2024



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	8	10	450	600	33
Future Volume (Veh/h)	8	8	10	450	600	33
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.79	0.79	0.87	0.87
Hourly flow rate (vph)	12	12	13	570	690	38
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.82	0.82	0.82			
vC, conflicting volume	1305	709	728			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1263	537	560			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	97	98			
cM capacity (veh/h)	150	450	839			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	24	13	570	728		
Volume Left	12	13	0	0		
Volume Right	12	0	0	38		
cSH	225	839	1700	1700		
Volume to Capacity	0.11	0.02	0.34	0.43		
Queue Length 95th (ft)	9	1	0	0		
Control Delay (s)	22.9	9.4	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	22.9	0.2				
Approach LOS	C					
<b>Intersection Summary</b>						
Average Delay	0.5					
Intersection Capacity Utilization	43.6%			ICU Level of Service	A	
Analysis Period (min)	15					

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

02/29/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	3	0	1	4	0
Future Volume (Veh/h)	0	3	0	1	4	0
Sign Control	Free		Stop			Stop
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.25	0.25	0.50	0.50
Hourly flow rate (vph)	0	4	0	4	8	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		4	0	6	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		4	0	6	2
tC, single (s)	4.1		6.5	6.2	7.1	6.5
tC, 2 stage (s)						
tF (s)	2.2		4.0	3.3	3.5	4.0
p0 queue free %	100		100	100	99	100
cM capacity (veh/h)	1636		896	1091	1016	898
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	4	4	8			
Volume Left	0	0	8			
Volume Right	4	4	0			
cSH	1636	1091	1016			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (ft)	0	0	1			
Control Delay (s)	0.0	8.3	8.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	8.3	8.6			
Approach LOS		A	A			
<b>Intersection Summary</b>						
Average Delay			6.4			
Intersection Capacity Utilization			13.3%	ICU Level of Service	A	
Analysis Period (min)			15			

# LANE SUMMARY

 **Site: 8975 [Andover (Site Folder: General)]**

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[ Total veh/h	[ HV ] %						[ Veh	Dist ] ft				
South: Dundee Park Drive													
Lane 1	24	0.0	270	0.089	100	19.7	LOS C	0.3	7.4	Full	1600	0.0	0.0
Approach	24	0.0		0.089		19.7	LOS C	0.3	7.4				
East: Essex Street													
Lane 1	578	2.6	1795	0.322	100	3.1	LOS A	0.5	14.0	Full	1600	0.0	0.0
Approach	578	2.6		0.322		3.1	NA	0.5	14.0				
North: Railroad Street													
Lane 1	208	0.7	272	0.764	100	51.0	LOS F	6.6	164.6	Full	1600	0.0	0.0
Approach	208	0.7		0.764		51.0	LOS F	6.6	164.6				
West: Essex Street													
Lane 1	508	0.8	1672	0.304	100	4.1	LOS A	1.3	33.8	Full	1600	0.0	0.0
Approach	508	0.8		0.304		4.1	NA	1.3	33.8				
Intersection	1317	1.6		0.764		11.3	NA	6.6	164.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)											
South: Dundee Park Drive											
Mov.	L2	T1	R2	Total	%HV						
From S						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	W	N	E			veh/h	v/c	Util.	SL Ov.	Lane	
								%	%	No.	
Lane 1	4	13	7	24	0.0	270	0.089	100	NA	NA	
Approach	4	13	7	24	0.0		0.089				
East: Essex Street											
Mov.	L2	T1	R2	Total	%HV						
From E						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	S	W	N			veh/h	v/c	Util.	SL Ov.	Lane	
								%	%	No.	
Lane 1	33	439	106	578	2.6	1795	0.322	100	NA	NA	
Approach	33	439	106	578	2.6		0.322				
North: Railroad Street											

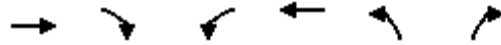
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	112	27	69	208	0.7	272	0.764	100	NA	NA
Approach	112	27	69	208	0.7		0.764			
West: Essex Street										
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	91	404	13	508	0.8	1672	0.304	100	NA	NA
Approach	91	404	13	508	0.8		0.304			
Total %HV Deg.Satn (v/c)										
Intersection	1317	1.6					0.764			

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 6: School Street & Essex Street

02/29/2024



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	↔
Traffic Volume (veh/h)	232	179	19	183	204	17
Future Volume (Veh/h)	232	179	19	183	204	17
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.68	0.68	0.76	0.76
Hourly flow rate (vph)	252	195	28	269	268	22
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			447		674	350
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			447		674	350
tC, single (s)			4.1		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.5
p0 queue free %			98		34	97
cM capacity (veh/h)			1124		406	657
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	447	297	290			
Volume Left	0	28	268			
Volume Right	195	0	22			
cSH	1700	1124	432			
Volume to Capacity	0.26	0.02	0.67			
Queue Length 95th (ft)	0	2	120			
Control Delay (s)	0.0	1.0	28.7			
Lane LOS		A	D			
Approach Delay (s)	0.0	1.0	28.7			
Approach LOS			D			
<b>Intersection Summary</b>						
Average Delay			8.3			
Intersection Capacity Utilization			43.4%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

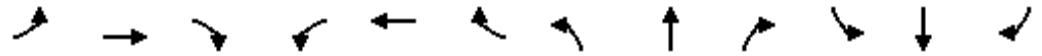
02/29/2024



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↻				↻	↻	
Traffic Volume (veh/h)	236	13	19	3	192	10	7
Future Volume (Veh/h)	236	13	19	3	192	10	7
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.91	0.91	0.70	0.70	0.70	0.81	0.81
Hourly flow rate (vph)	259	14	0	4	274	12	9
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	273			548 266
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	273			548 266
tC, single (s)			0.0	4.1			6.4 6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2			3.5 3.3
p0 queue free %			0	100			98 99
cM capacity (veh/h)			0	1302			499 778
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	273	278	21				
Volume Left	0	4	12				
Volume Right	14	0	9				
cSH	1700	1302	590				
Volume to Capacity	0.16	0.00	0.04				
Queue Length 95th (ft)	0	0	3				
Control Delay (s)	0.0	0.1	11.3				
Lane LOS			A		B		
Approach Delay (s)	0.0	0.1	11.3				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.5						
Intersection Capacity Utilization			37.9%	ICU Level of Service			A
Analysis Period (min)	15						

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 8: Lupine Road/Ridge Street & School Street

02/29/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	125	63	16	156	6	50	4	6	1	4	1
Future Volume (Veh/h)	0	125	63	16	156	6	50	4	6	1	4	1
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.77	0.77	0.77	0.79	0.79	0.79	0.30	0.30	0.30
Hourly flow rate (vph)	0	164	83	21	203	8	63	5	8	3	13	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	211			247			464	458	206	465	496	207
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	211			247			464	458	206	465	496	207
tC, single (s)	4.1			4.2			7.1	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			98			87	99	99	99	97	100
cM capacity (veh/h)	1372			1290			490	494	799	496	470	839
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	247	232	76	19								
Volume Left	0	21	63	3								
Volume Right	83	8	8	3								
cSH	1372	1290	511	510								
Volume to Capacity	0.00	0.02	0.15	0.04								
Queue Length 95th (ft)	0	1	13	3								
Control Delay (s)	0.0	0.8	13.3	12.3								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.8	13.3	12.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			38.6%	ICU Level of Service	A							
Analysis Period (min)			15									

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/04/2024



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Lane Configurations			↔		↔			↔		↔		
Traffic Volume (vph)	2	252	1	33	2	45	1	621	2	493	178	5
Future Volume (vph)	2	252	1	33	2	45	1	621	2	493	178	5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt			0.985							0.959		
Flt Protected			0.958					0.997				
Satd. Flow (prot)	0	0	1955	0	2153	0	0	3447	0	3314	0	0
Flt Permitted			0.958					0.834		0.954		
Satd. Flow (perm)	0	0	1955	0	2153	0	0	2884	0	3161	0	0
Satd. Flow (RTOR)			4							1		
Adj. Flow (vph)	2	283	1	37	8	47	1	654	2	554	200	6
Lane Group Flow (vph)	0	0	323	0	8	0	0	702	0	762	0	0
Turn Type	Split	Split	NA		NA	Perm	Perm	NA	Perm	NA		
Protected Phases	7	7	7		8			2		6		
Permitted Phases						2	2		6			
Detector Phase	7	7	7		8	2	2	2	6	6		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		
Minimum Split (s)	10.5	10.5	10.5		10.5	10.5	10.5	10.5	10.5	10.5		
Total Split (s)	25.5	25.5	25.5		15.5	54.5	54.5	54.5	54.5	54.5		
Total Split (%)	19.0%	19.0%	19.0%		11.6%	40.7%	40.7%	40.7%	40.7%	40.7%		
Maximum Green (s)	20.0	20.0	20.0		10.0	49.0	49.0	49.0	49.0	49.0		
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)			0.0		0.0			0.0		0.0		
Total Lost Time (s)			5.5		5.5			5.5		5.5		
Lead/Lag	Lead	Lead	Lead		Lag							
Lead-Lag Optimize?	Yes	Yes	Yes		Yes							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		
Recall Mode	Min	Min	Min		None	Max	Max	Max	Max	Max		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			20.7		6.2			50.7		50.7		
Actuated g/C Ratio			0.21		0.06			0.50		0.50		
v/c Ratio			0.80		0.06			0.48		0.48		
Control Delay			56.9		54.5			21.8		21.5		
Queue Delay			0.0		0.0			0.0		0.0		
Total Delay			56.9		54.5			21.8		21.5		
LOS			E		D			C		C		
Approach Delay			56.9		54.5			21.8		21.5		
Approach LOS			E		D			C		C		
Queue Length 50th (ft)			204		5			162		175		
Queue Length 95th (ft)			#463		6			311		325		
Internal Link Dist (ft)			640		440			241		353		
Turn Bay Length (ft)												
Base Capacity (vph)			404		221			1452		1592		
Starvation Cap Reductn			0		0			0		0		
Spillback Cap Reductn			0		0			0		0		

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

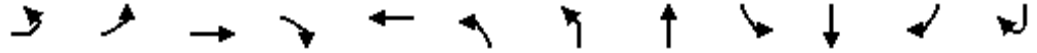
03/04/2024



Lane Group	SEL2	SEL	SER	SER2	Ø9
Lane Configurations					
Traffic Volume (vph)	2	0	5	3	
Future Volume (vph)	2	0	5	3	
Lane Util. Factor	1.00	1.00	1.00	1.00	
Frt		0.892			
Flt Protected		0.990			
Satd. Flow (prot)	0	1734	0	0	
Flt Permitted		0.990			
Satd. Flow (perm)	0	1734	0	0	
Satd. Flow (RTOR)		126			
Adj. Flow (vph)	4	0	10	6	
Lane Group Flow (vph)	0	20	0	0	
Turn Type	Prot	Prot			
Protected Phases	4	4			9
Permitted Phases					
Detector Phase	4	4			
Switch Phase					
Minimum Initial (s)	5.0	5.0			1.0
Minimum Split (s)	10.5	10.5			23.0
Total Split (s)	15.5	15.5			23.0
Total Split (%)	11.6%	11.6%			17%
Maximum Green (s)	10.0	10.0			21.0
Yellow Time (s)	3.5	3.5			2.0
All-Red Time (s)	2.0	2.0			0.0
Lost Time Adjust (s)		0.0			
Total Lost Time (s)		5.5			
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0			3.0
Recall Mode	None	None			None
Walk Time (s)					7.0
Flash Dont Walk (s)					14.0
Pedestrian Calls (#/hr)					27
Act Effct Green (s)		5.7			
Actuated g/C Ratio		0.06			
v/c Ratio		0.09			
Control Delay		0.8			
Queue Delay		0.0			
Total Delay		0.8			
LOS		A			
Approach Delay		0.8			
Approach LOS		A			
Queue Length 50th (ft)		0			
Queue Length 95th (ft)		0			
Internal Link Dist (ft)		415			
Turn Bay Length (ft)					
Base Capacity (vph)		291			
Starvation Cap Reductn		0			
Spillback Cap Reductn		0			

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/04/2024



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Storage Cap Reductn			0		0			0		0		
Reduced v/c Ratio			0.80		0.04			0.48		0.48		

Intersection Summary

Cycle Length: 134	
Actuated Cycle Length: 100.7	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 27.8	Intersection LOS: C
Intersection Capacity Utilization 83.3%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Ø2	Ø4	Ø7	Ø8	Ø9
54.5 s	15.5 s	25.5 s	15.5 s	23 s
Ø6				
54.5 s				

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
2: Route 28 & Lewis Street

03/04/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	2	4	3	671	513	4	
Future Volume (vph)	2	4	3	671	513	4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.910				0.999		
Flt Protected	0.984						
Satd. Flow (prot)	1701	0	0	2007	2067	0	
Flt Permitted	0.984			0.998			
Satd. Flow (perm)	1701	0	0	2003	2067	0	
Satd. Flow (RTOR)	8				1		
Adj. Flow (vph)	4	8	3	722	570	4	
Lane Group Flow (vph)	12	0	0	725	574	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							4
Act Effct Green (s)	5.9			49.2	49.2		
Actuated g/C Ratio	0.11			0.91	0.91		
v/c Ratio	0.06			0.40	0.31		
Control Delay	18.3			4.7	3.9		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.3			4.7	3.9		
LOS	B			A	A		
Approach Delay	18.3			4.7	3.9		
Approach LOS	B			A	A		
Queue Length 50th (ft)	1			0	0		
Queue Length 95th (ft)	7			321	223		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	323			1814	1872		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 2: Route 28 & Lewis Street

03/04/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.04			0.40	0.31		

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 54.3	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 50.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

Ø2	Ø4	Ø9
36 s	14 s	15 s
Ø6		
36 s		

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 3: Route 28 & Pearson Street

03/04/2024



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	45	1	650	519	0
Future Volume (Veh/h)	20	45	1	650	519	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	29	65	1	677	590	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.89	0.89	0.89			
vC, conflicting volume	1269	590	590			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1240	475	475			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	88	100			
cM capacity (veh/h)	173	527	975			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	94	1	677	590		
Volume Left	29	1	0	0		
Volume Right	65	0	0	0		
cSH	323	975	1700	1700		
Volume to Capacity	0.29	0.00	0.40	0.35		
Queue Length 95th (ft)	30	0	0	0		
Control Delay (s)	20.6	8.7	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	20.6	0.0		0.0		
Approach LOS	C					
<b>Intersection Summary</b>						
Average Delay			1.4			
Intersection Capacity Utilization			44.8%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

03/04/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	1	0	0	2	0
Future Volume (Veh/h)	0	1	0	0	2	0
Sign Control	Free		Stop		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	0.60	0.60	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	0	2	0	0	8	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		2	0	1	1
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		2	0	1	1
tC, single (s)	4.1		6.5	6.2	7.1	6.5
tC, 2 stage (s)						
tF (s)	2.2		4.0	3.3	3.5	4.0
p0 queue free %	100		100	100	99	100
cM capacity (veh/h)	1636		898	1091	1027	899
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	2	0	8			
Volume Left	0	0	8			
Volume Right	2	0	0			
cSH	1636	1700	1027			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (ft)	0	0	1			
Control Delay (s)	0.0	0.0	8.5			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.0	8.5			
Approach LOS		A	A			
<b>Intersection Summary</b>						
Average Delay			6.8			
Intersection Capacity Utilization			13.3%	ICU Level of Service	A	
Analysis Period (min)			15			

# LANE SUMMARY

 **Site: 8975 [Andover (Site Folder: General)]**

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[ Total veh/h	[ HV ] %						[ Veh	[ Dist ] ft				
South: Dundee Park Drive													
Lane 1	194	0.0	239	0.813	100	63.2	LOS F	7.0	174.9	Full	1600	0.0	0.0
Approach	194	0.0		0.813		63.2	LOS F	7.0	174.9				
East: Essex Street													
Lane 1	731	0.8	1832	0.399	100	3.6	LOS A	0.6	16.3	Full	1600	0.0	0.0
Approach	731	0.8		0.399		3.6	NA	0.6	16.3				
North: Railroad Street													
Lane 1	209	1.2	245	0.851	100	68.3	LOS F	8.3	210.3	Full	1600	0.0	0.0
Approach	209	1.2		0.851		68.3	LOS F	8.3	210.3				
West: Essex Street													
Lane 1	511	0.7	1581	0.323	100	4.8	LOS A	2.0	49.9	Full	1600	0.0	0.0
Approach	511	0.7		0.323		4.8	NA	2.0	49.9				
Intersection	1645	0.7		0.851		19.3	NA	8.3	210.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)											
South: Dundee Park Drive											
Mov.	L2	T1	R2	Total	%HV						
From S						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	W	N	E			veh/h	v/c	Util.	SL	Ov.	Lane
								%	%	%	No.
Lane 1	69	59	67	194	0.0	239	0.813	100	NA	NA	
Approach	69	59	67	194	0.0		0.813				
East: Essex Street											
Mov.	L2	T1	R2	Total	%HV						
From E						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	S	W	N			veh/h	v/c	Util.	SL	Ov.	Lane
								%	%	%	No.
Lane 1	22	516	193	731	0.8	1832	0.399	100	NA	NA	
Approach	22	516	193	731	0.8		0.399				
North: Railroad Street											

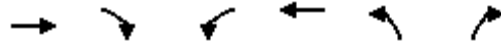
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	84	24	101	209	1.2	245	0.851	100	NA	NA
Approach	84	24	101	209	1.2		0.851			
West: Essex Street										
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	95	368	48	511	0.7	1581	0.323	100	NA	NA
Approach	95	368	48	511	0.7		0.323			
Total %HV Deg.Satn (v/c)										
Intersection	1645	0.7		0.851						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1											Merge Analysis not applied.

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 6: School Street & Essex Street

03/04/2024



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	244	146	15	212	278	25
Future Volume (Veh/h)	244	146	15	212	278	25
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	265	159	18	249	296	27
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			424		630	344
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			424		630	344
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		33	96
cM capacity (veh/h)			1146		440	703
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	424	267	323			
Volume Left	0	18	296			
Volume Right	159	0	27			
cSH	1700	1146	472			
Volume to Capacity	0.25	0.02	0.68			
Queue Length 95th (ft)	0	1	128			
Control Delay (s)	0.0	0.7	27.6			
Lane LOS			A	D		
Approach Delay (s)	0.0	0.7	27.6			
Approach LOS			D			
<b>Intersection Summary</b>						
Average Delay			9.0			
Intersection Capacity Utilization			45.6%	ICU Level of Service		A
Analysis Period (min)			15			

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

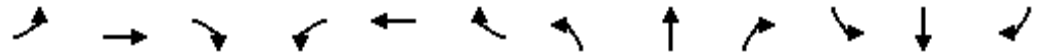
03/04/2024



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations	↻				↻	↻	
Traffic Volume (veh/h)	264	5	20	1	219	8	4
Future Volume (Veh/h)	264	5	20	1	219	8	4
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.92	0.83	0.83
Hourly flow rate (vph)	284	5	0	1	238	10	5
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	289		526	286
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	289		526	286
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		98	99
cM capacity (veh/h)			0	1284		515	757
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	289	239	15				
Volume Left	0	1	10				
Volume Right	5	0	5				
cSH	1700	1284	576				
Volume to Capacity	0.17	0.00	0.03				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.0	11.4				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.0	11.4				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.3						
Intersection Capacity Utilization			39.0%	ICU Level of Service			A
Analysis Period (min)	15						

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 8: Lupine Road/Ridge Street & School Street

03/04/2024



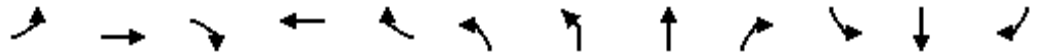
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	120	36	13	237	4	58	3	14	1	3	0
Future Volume (Veh/h)	1	120	36	13	237	4	58	3	14	1	3	0
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.33	0.33	0.33
Hourly flow rate (vph)	1	152	46	16	300	5	72	4	18	3	9	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	305			198			516	514	175	532	534	302
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	305			198			516	514	175	532	534	302
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	99	98	99	98	100
cM capacity (veh/h)	1267			1387			461	461	874	445	449	742
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	199	321	94	12								
Volume Left	1	16	72	3								
Volume Right	46	5	18	0								
cSH	1267	1387	507	448								
Volume to Capacity	0.00	0.01	0.19	0.03								
Queue Length 95th (ft)	0	1	17	2								
Control Delay (s)	0.0	0.5	13.7	13.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.0	0.5	13.7	13.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			39.3%	ICU Level of Service	A							
Analysis Period (min)			15									

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative

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2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/01/2024



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕				↕			↕	
Traffic Volume (vph)	137	0	21	0	3	18	11	434	1	2	611	181
Future Volume (vph)	137	0	21	0	3	18	11	434	1	2	611	181
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.982		0.865							0.965	
Flt Protected		0.958						0.997				
Satd. Flow (prot)	0	1900	0	1863	0	0	0	3415	0	0	3310	0
Flt Permitted		0.958						0.859			0.954	
Satd. Flow (perm)	0	1900	0	1863	0	0	0	2943	0	0	3157	0
Satd. Flow (RTOR)		126		473							1	
Adj. Flow (vph)	143	0	22	0	8	23	14	556	1	2	694	206
Lane Group Flow (vph)	0	165	0	8	0	0	0	594	0	0	910	0
Turn Type	Split	NA		NA		Perm	Perm	NA		Perm	NA	
Protected Phases	7	7		8				2			6	
Permitted Phases						2	2			6		
Detector Phase	7	7		8		2	2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	10.5		10.5		10.5	10.5	10.5		10.5	10.5	
Total Split (s)	25.5	25.5		15.5		54.5	54.5	54.5		54.5	54.5	
Total Split (%)	19.0%	19.0%		11.6%		40.7%	40.7%	40.7%		40.7%	40.7%	
Maximum Green (s)	20.0	20.0		10.0		49.0	49.0	49.0		49.0	49.0	
Yellow Time (s)	3.5	3.5		3.5		3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0				0.0			0.0	
Total Lost Time (s)		5.5		5.5				5.5			5.5	
Lead/Lag	Lead	Lead		Lag								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None		Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		7.8		5.7				50.8			50.8	
Actuated g/C Ratio		0.10		0.08				0.68			0.68	
v/c Ratio		0.53		0.01				0.30			0.42	
Control Delay		18.3		0.0				8.2			9.3	
Queue Delay		0.0		0.0				0.0			0.0	
Total Delay		18.3		0.0				8.2			9.3	
LOS		B		A				A			A	
Approach Delay		18.3						8.2			9.3	
Approach LOS		B						A			A	
Queue Length 50th (ft)		15		0				32			55	
Queue Length 95th (ft)		88		0				155			298	
Internal Link Dist (ft)		640		440				241			353	
Turn Bay Length (ft)												
Base Capacity (vph)		617		665				1998			2143	
Starvation Cap Reductn		0		0				0			0	
Spillback Cap Reductn		0		0				0			0	

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

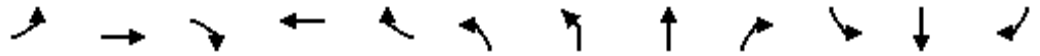
03/01/2024



Lane Group	SBR2	SEL	Ø9
Lane Configurations			
Traffic Volume (vph)	7	0	
Future Volume (vph)	7	0	
Lane Util. Factor	0.95	1.00	
Frt			
Flt Protected			
Satd. Flow (prot)	0	1963	
Flt Permitted			
Satd. Flow (perm)	0	1963	
Satd. Flow (RTOR)			
Adj. Flow (vph)	8	0	
Lane Group Flow (vph)	0	0	
Turn Type		Prot	
Protected Phases		4	9
Permitted Phases			
Detector Phase		4	
Switch Phase			
Minimum Initial (s)		5.0	1.0
Minimum Split (s)		10.5	23.0
Total Split (s)		15.5	23.0
Total Split (%)		11.6%	17%
Maximum Green (s)		10.0	21.0
Yellow Time (s)		3.5	2.0
All-Red Time (s)		2.0	0.0
Lost Time Adjust (s)		0.0	
Total Lost Time (s)		5.5	
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)		3.0	3.0
Recall Mode		None	None
Walk Time (s)			7.0
Flash Dont Walk (s)			14.0
Pedestrian Calls (#/hr)			14
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)		415	
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/01/2024



Lane Group	EBL	EBT	EBR	WBT	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0		0				0			0	
Reduced v/c Ratio		0.27		0.01				0.30			0.42	

Intersection Summary

Cycle Length: 134	
Actuated Cycle Length: 74.8	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.53	
Intersection Signal Delay: 9.8	Intersection LOS: A
Intersection Capacity Utilization 58.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration
Ø2	54.5 s	Ø4	15.5 s	Ø7	25.5 s	Ø8	15.5 s	Ø9	23 s
Ø6	54.5 s								

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
2: Route 28 & Lewis Street

03/01/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	21	12	6	443	623	21	
Future Volume (vph)	21	12	6	443	623	21	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.951				0.996		
Flt Protected	0.969			0.999			
Satd. Flow (prot)	1751	0	0	1985	2042	0	
Flt Permitted	0.969			0.991			
Satd. Flow (perm)	1751	0	0	1970	2042	0	
Satd. Flow (RTOR)	16				3		
Adj. Flow (vph)	28	16	8	568	708	24	
Lane Group Flow (vph)	44	0	0	576	732	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							16
Act Effct Green (s)	6.5			43.6	43.6		
Actuated g/C Ratio	0.12			0.82	0.82		
v/c Ratio	0.19			0.35	0.43		
Control Delay	18.1			5.9	6.9		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.1			5.9	6.9		
LOS	B			A	A		
Approach Delay	18.1			5.9	6.9		
Approach LOS	B			A	A		
Queue Length 50th (ft)	8			0	0		
Queue Length 95th (ft)	28			200	333		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	347			1623	1683		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 2: Route 28 & Lewis Street

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Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.13			0.35	0.43		

**Intersection Summary**

Cycle Length: 65	
Actuated Cycle Length: 52.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.43	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 46.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Route 28 & Lewis Street

 Ø2	 Ø4	 Ø9
36 s	14 s	15 s
 Ø6		
36 s		

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 3: Route 28 & Pearson Street

03/01/2024



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	12	12	454	606	32
Future Volume (Veh/h)	7	12	12	454	606	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.79	0.79	0.87	0.87
Hourly flow rate (vph)	10	17	15	575	697	37
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.79	0.79	0.79			
vC, conflicting volume	1320	716	734			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1273	507	530			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	98			
cM capacity (veh/h)	142	450	827			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	27	15	575	734		
Volume Left	10	15	0	0		
Volume Right	17	0	0	37		
cSH	249	827	1700	1700		
Volume to Capacity	0.11	0.02	0.34	0.43		
Queue Length 95th (ft)	9	1	0	0		
Control Delay (s)	21.2	9.4	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	21.2	0.2		0.0		
Approach LOS	C					
<b>Intersection Summary</b>						
Average Delay			0.5			
Intersection Capacity Utilization			43.8%	ICU Level of Service	A	
Analysis Period (min)			15			

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

03/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	4	0	1	7	0
Future Volume (Veh/h)	0	4	0	1	7	0
Sign Control	Free		Stop			Stop
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.25	0.25	0.50	0.50
Hourly flow rate (vph)	0	5	0	4	14	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		5	0	6	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		5	0	6	2
tC, single (s)	4.1		6.5	6.2	7.1	6.5
tC, 2 stage (s)						
tF (s)	2.2		4.0	3.3	3.5	4.0
p0 queue free %	100		100	100	99	100
cM capacity (veh/h)	1636		894	1091	1015	897
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	5	4	14			
Volume Left	0	0	14			
Volume Right	5	4	0			
cSH	1636	1091	1015			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (ft)	0	0	1			
Control Delay (s)	0.0	8.3	8.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	8.3	8.6			
Approach LOS		A	A			
<b>Intersection Summary</b>						
Average Delay			6.7			
Intersection Capacity Utilization			15.8%	ICU Level of Service	A	
Analysis Period (min)			15			

# LANE SUMMARY

 **Site: 8975 [Andover (Site Folder: General)]**

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
	[ Total veh/h	[ HV ] %						[ Veh	Dist ] ft				
South: Dundee Park Drive													
Lane 1	24	0.0	267	0.090	100	19.8	LOS C	0.3	7.4	Full	1600	0.0	0.0
Approach	24	0.0		0.090		19.8	LOS C	0.3	7.4				
East: Essex Street													
Lane 1	575	2.6	1794	0.320	100	3.1	LOS A	0.5	13.8	Full	1600	0.0	0.0
Approach	575	2.6		0.320		3.1	NA	0.5	13.8				
North: Railroad Street													
Lane 1	218	0.7	277	0.787	100	53.1	LOS F	7.2	182.0	Full	1600	0.0	0.0
Approach	218	0.7		0.787		53.1	LOS F	7.2	182.0				
West: Essex Street													
Lane 1	517	0.8	1651	0.313	100	4.3	LOS A	1.5	38.7	Full	1600	0.0	0.0
Approach	517	0.8		0.313		4.3	NA	1.5	38.7				
Intersection	1334	1.6		0.787		12.1	NA	7.2	182.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)											
South: Dundee Park Drive											
Mov.	L2	T1	R2	Total	%HV						
From S						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	W	N	E			veh/h	v/c	Util.	SL	Ov.	Lane
								%	%	%	No.
Lane 1	4	13	7	24	0.0	267	0.090	100	NA	NA	
Approach	4	13	7	24	0.0		0.090				
East: Essex Street											
Mov.	L2	T1	R2	Total	%HV						
From E						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	S	W	N			veh/h	v/c	Util.	SL	Ov.	Lane
								%	%	%	No.
Lane 1	33	436	106	575	2.6	1794	0.320	100	NA	NA	
Approach	33	436	106	575	2.6		0.320				
North: Railroad Street											

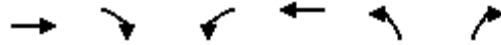
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	112	27	80	218	0.7	277	0.787	100	NA	NA
Approach	112	27	80	218	0.7		0.787			
West: Essex Street										
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	101	403	13	517	0.8	1651	0.313	100	NA	NA
Approach	101	403	13	517	0.8		0.313			
Total %HV Deg.Satn (v/c)										
Intersection	1334	1.6					0.787			

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 6: School Street & Essex Street

03/01/2024



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	231	179	19	182	204	17
Future Volume (Veh/h)	231	179	19	182	204	17
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.68	0.68	0.76	0.76
Hourly flow rate (vph)	251	195	28	268	268	22
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			446		672	348
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			446		672	348
tC, single (s)			4.1		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.5
p0 queue free %			98		34	97
cM capacity (veh/h)			1125		407	658
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	446	296	290			
Volume Left	0	28	268			
Volume Right	195	0	22			
cSH	1700	1125	434			
Volume to Capacity	0.26	0.02	0.67			
Queue Length 95th (ft)	0	2	120			
Control Delay (s)	0.0	1.0	28.5			
Lane LOS		A	D			
Approach Delay (s)	0.0	1.0	28.5			
Approach LOS			D			
<b>Intersection Summary</b>						
Average Delay			8.3			
Intersection Capacity Utilization			43.4%	ICU Level of Service		A
Analysis Period (min)			15			

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

03/01/2024



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (veh/h)	235	13	19	3	191	10	7
Future Volume (Veh/h)	235	13	19	3	191	10	7
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.91	0.91	0.70	0.70	0.70	0.81	0.81
Hourly flow rate (vph)	258	14	0	4	273	12	9
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	272	546		265
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	272	546		265
tC, single (s)			0.0	4.1	6.4		6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2	3.5		3.3
p0 queue free %			0	100	98		99
cM capacity (veh/h)			0	1303	501		779
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	272	277	21				
Volume Left	0	4	12				
Volume Right	14	0	9				
cSH	1700	1303	591				
Volume to Capacity	0.16	0.00	0.04				
Queue Length 95th (ft)	0	0	3				
Control Delay (s)	0.0	0.1	11.3				
Lane LOS			A	B			
Approach Delay (s)	0.0	0.1	11.3				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.5						
Intersection Capacity Utilization			37.8%	ICU Level of Service			A
Analysis Period (min)	15						

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative  
 8: Lupine Road/Ridge Street & School Street

03/01/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	125	63	16	156	6	50	4	6	1	4	1
Future Volume (Veh/h)	0	125	63	16	156	6	50	4	6	1	4	1
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.77	0.77	0.77	0.79	0.79	0.79	0.30	0.30	0.30
Hourly flow rate (vph)	0	164	83	21	203	8	63	5	8	3	13	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	211			247			464	458	206	465	496	207
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	211			247			464	458	206	465	496	207
tC, single (s)	4.1			4.2			7.1	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			98			87	99	99	99	97	100
cM capacity (veh/h)	1372			1290			490	494	799	496	470	839
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	247	232	76	19								
Volume Left	0	21	63	3								
Volume Right	83	8	8	3								
cSH	1372	1290	511	510								
Volume to Capacity	0.00	0.02	0.15	0.04								
Queue Length 95th (ft)	0	1	13	3								
Control Delay (s)	0.0	0.8	13.3	12.3								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.8	13.3	12.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			38.6%	ICU Level of Service		A						
Analysis Period (min)			15									

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative

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2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/04/2024



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Lane Configurations			↕		↕			↕		↕		
Traffic Volume (vph)	2	252	1	41	2	45	7	627	2	500	178	5
Future Volume (vph)	2	252	1	41	2	45	7	627	2	500	178	5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frt			0.981							0.960		
Flt Protected			0.959					0.996				
Satd. Flow (prot)	0	0	1950	0	2153	0	0	3444	0	3317	0	0
Flt Permitted			0.959					0.804		0.954		
Satd. Flow (perm)	0	0	1950	0	2153	0	0	2780	0	3165	0	0
Satd. Flow (RTOR)			5							1		
Adj. Flow (vph)	2	283	1	46	8	47	7	660	2	562	200	6
Lane Group Flow (vph)	0	0	332	0	8	0	0	714	0	770	0	0
Turn Type	Split	Split	NA		NA	Perm	Perm	NA	Perm	NA		
Protected Phases	7	7	7		8			2		6		
Permitted Phases						2	2		6			
Detector Phase	7	7	7		8	2	2	2	6	6		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		
Minimum Split (s)	10.5	10.5	10.5		10.5	10.5	10.5	10.5	10.5	10.5		
Total Split (s)	25.5	25.5	25.5		15.5	54.5	54.5	54.5	54.5	54.5		
Total Split (%)	19.0%	19.0%	19.0%		11.6%	40.7%	40.7%	40.7%	40.7%	40.7%		
Maximum Green (s)	20.0	20.0	20.0		10.0	49.0	49.0	49.0	49.0	49.0		
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5		
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)			0.0		0.0			0.0		0.0		
Total Lost Time (s)			5.5		5.5			5.5		5.5		
Lead/Lag	Lead	Lead	Lead		Lag							
Lead-Lag Optimize?	Yes	Yes	Yes		Yes							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		
Recall Mode	Min	Min	Min		None	Max	Max	Max	Max	Max		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			20.7		6.2			50.7		50.7		
Actuated g/C Ratio			0.21		0.06			0.50		0.50		
v/c Ratio			0.82		0.06			0.51		0.48		
Control Delay			58.7		54.5			22.4		21.5		
Queue Delay			0.0		0.0			0.0		0.0		
Total Delay			58.7		54.5			22.4		21.5		
LOS			E		D			C		C		
Approach Delay			58.7		54.5			22.4		21.5		
Approach LOS			E		D			C		C		
Queue Length 50th (ft)			211		5			168		178		
Queue Length 95th (ft)			#479		6			322		329		
Internal Link Dist (ft)			640		440			241		353		
Turn Bay Length (ft)												
Base Capacity (vph)			404		221			1399		1594		
Starvation Cap Reductn			0		0			0		0		
Spillback Cap Reductn			0		0			0		0		

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/04/2024



Lane Group	SEL2	SEL	SER	SER2	Ø9
Lane Configurations					
Traffic Volume (vph)	2	0	5	3	
Future Volume (vph)	2	0	5	3	
Lane Util. Factor	1.00	1.00	1.00	1.00	
Frt		0.892			
Flt Protected		0.990			
Satd. Flow (prot)	0	1734	0	0	
Flt Permitted		0.990			
Satd. Flow (perm)	0	1734	0	0	
Satd. Flow (RTOR)		126			
Adj. Flow (vph)	4	0	10	6	
Lane Group Flow (vph)	0	20	0	0	
Turn Type	Prot	Prot			
Protected Phases	4	4			9
Permitted Phases					
Detector Phase	4	4			
Switch Phase					
Minimum Initial (s)	5.0	5.0			1.0
Minimum Split (s)	10.5	10.5			23.0
Total Split (s)	15.5	15.5			23.0
Total Split (%)	11.6%	11.6%			17%
Maximum Green (s)	10.0	10.0			21.0
Yellow Time (s)	3.5	3.5			2.0
All-Red Time (s)	2.0	2.0			0.0
Lost Time Adjust (s)		0.0			
Total Lost Time (s)		5.5			
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0			3.0
Recall Mode	None	None			None
Walk Time (s)					7.0
Flash Dont Walk (s)					14.0
Pedestrian Calls (#/hr)					27
Act Effct Green (s)		5.7			
Actuated g/C Ratio		0.06			
v/c Ratio		0.09			
Control Delay		0.8			
Queue Delay		0.0			
Total Delay		0.8			
LOS		A			
Approach Delay		0.8			
Approach LOS		A			
Queue Length 50th (ft)		0			
Queue Length 95th (ft)		0			
Internal Link Dist (ft)		415			
Turn Bay Length (ft)					
Base Capacity (vph)		291			
Starvation Cap Reductn		0			
Spillback Cap Reductn		0			

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

03/04/2024



Lane Group	EBL2	EBL	EBT	EBR	WBT	NBL2	NBL	NBT	SBL	SBT	SBR	SBR2
Storage Cap Reductn			0		0			0		0		
Reduced v/c Ratio			0.82		0.04			0.51		0.48		

Intersection Summary

Cycle Length: 134	
Actuated Cycle Length: 100.7	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 28.5	Intersection LOS: C
Intersection Capacity Utilization 84.4%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: Route 28 & Railroad Street/Private Driveway & Retail Plaza Driveway

02	04	07	08	09
54.5 s	15.5 s	25.5 s	15.5 s	23 s
06				
54.5 s				

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
2: Route 28 & Lewis Street

03/04/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	14	8	8	671	513	19	
Future Volume (vph)	14	8	8	671	513	19	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.951				0.995		
Flt Protected	0.969			0.999			
Satd. Flow (prot)	1751	0	0	2005	2060	0	
Flt Permitted	0.969			0.993			
Satd. Flow (perm)	1751	0	0	1993	2060	0	
Satd. Flow (RTOR)	16				4		
Adj. Flow (vph)	28	16	9	722	570	21	
Lane Group Flow (vph)	44	0	0	731	591	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			2	6		9
Permitted Phases			2				
Detector Phase	4		2	2	6		
Switch Phase							
Minimum Initial (s)	5.0		5.0	5.0	5.0		1.0
Minimum Split (s)	9.5		11.0	11.0	11.0		15.0
Total Split (s)	14.0		36.0	36.0	36.0		15.0
Total Split (%)	21.5%		55.4%	55.4%	55.4%		23%
Maximum Green (s)	10.0		30.0	30.0	30.0		13.0
Yellow Time (s)	3.0		4.0	4.0	4.0		2.0
All-Red Time (s)	1.0		2.0	2.0	2.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	4.0			6.0	6.0		
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	None		Max	Max	Max		None
Walk Time (s)							7.0
Flash Dont Walk (s)							6.0
Pedestrian Calls (#/hr)							4
Act Effct Green (s)	6.5			43.6	43.6		
Actuated g/C Ratio	0.12			0.82	0.82		
v/c Ratio	0.19			0.45	0.35		
Control Delay	18.1			7.3	5.8		
Queue Delay	0.0			0.0	0.0		
Total Delay	18.1			7.3	5.8		
LOS	B			A	A		
Approach Delay	18.1			7.3	5.8		
Approach LOS	B			A	A		
Queue Length 50th (ft)	8			0	0		
Queue Length 95th (ft)	16			#369	251		
Internal Link Dist (ft)	365			358	462		
Turn Bay Length (ft)							
Base Capacity (vph)	347			1642	1698		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 2: Route 28 & Lewis Street

03/04/2024



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.13			0.45	0.35		

Intersection Summary

Cycle Length: 65	
Actuated Cycle Length: 52.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 7.0	Intersection LOS: A
Intersection Capacity Utilization 54.2%	ICU Level of Service A
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 2: Route 28 & Lewis Street

Ø2	Ø4	Ø9
36 s	14 s	15 s
Ø6		
36 s		

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 3: Route 28 & Pearson Street

03/04/2024



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	47	5	655	523	0
Future Volume (Veh/h)	20	47	5	655	523	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.69	0.69	0.96	0.96	0.88	0.88
Hourly flow rate (vph)	29	68	5	682	594	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					438	
pX, platoon unblocked	0.86	0.86	0.86			
vC, conflicting volume	1286	594	594			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1252	451	451			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	87	99			
cM capacity (veh/h)	165	529	968			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	97	5	682	594		
Volume Left	29	5	0	0		
Volume Right	68	0	0	0		
cSH	319	968	1700	1700		
Volume to Capacity	0.30	0.01	0.40	0.35		
Queue Length 95th (ft)	31	0	0	0		
Control Delay (s)	21.2	8.7	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	21.2	0.1				
Approach LOS	C					
<b>Intersection Summary</b>						
Average Delay	1.5					
Intersection Capacity Utilization	45.1%			ICU Level of Service	A	
Analysis Period (min)	15					

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 4: Depot Pizza Driveway/Project Site Driveway & Pearson Street

03/04/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	5	0	0	4	0
Future Volume (Veh/h)	0	5	0	0	4	0
Sign Control	Free		Stop			Stop
Grade	0%		0%			0%
Peak Hour Factor	0.60	0.60	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	0	8	0	0	16	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		8	0	4	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		8	0	4	4
tC, single (s)	4.1		6.5	6.2	7.1	6.5
tC, 2 stage (s)						
tF (s)	2.2		4.0	3.3	3.5	4.0
p0 queue free %	100		100	100	98	100
cM capacity (veh/h)	1636		891	1091	1022	896
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	8	0	16			
Volume Left	0	0	16			
Volume Right	8	0	0			
cSH	1636	1700	1022			
Volume to Capacity	0.00	0.00	0.02			
Queue Length 95th (ft)	0	0	1			
Control Delay (s)	0.0	0.0	8.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.0	8.6			
Approach LOS		A	A			
<b>Intersection Summary</b>						
Average Delay			5.7			
Intersection Capacity Utilization			13.3%	ICU Level of Service	A	
Analysis Period (min)			15			

# LANE SUMMARY

 **Site: 8975 [Andover (Site Folder: General)]**

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative

Site Category: (None)

Stop (Two-Way)

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[ Total veh/h	HV %						[ Veh	Dist ] ft				
South: Dundee Park Drive													
Lane 1	194	0.0	236	0.825	100	65.9	LOS F	7.2	180.8	Full	1600	0.0	0.0
Approach	194	0.0		0.825		65.9	LOS F	7.2	180.8				
East: Essex Street													
Lane 1	730	0.8	1832	0.398	100	3.6	LOS A	0.6	16.2	Full	1600	0.0	0.0
Approach	730	0.8		0.398		3.6	NA	0.6	16.2				
North: Railroad Street													
Lane 1	215	1.2	247	0.870	100	71.4	LOS F	9.0	227.3	Full	1600	0.0	0.0
Approach	215	1.2		0.870		71.4	LOS F	9.0	227.3				
West: Essex Street													
Lane 1	520	0.7	1556	0.334	100	5.1	LOS A	2.2	56.0	Full	1600	0.0	0.0
Approach	520	0.7		0.334		5.1	NA	2.2	56.0				
Intersection	1659	0.7		0.870		20.2	NA	9.0	227.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Minor Road Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)											
South: Dundee Park Drive											
Mov.	L2	T1	R2	Total	%HV						
From S						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	W	N	E			veh/h	v/c	Util.	SL	Ov.	Lane
								%	%	%	No.
Lane 1	69	59	67	194	0.0	236	0.825	100	NA	NA	
Approach	69	59	67	194	0.0		0.825				
East: Essex Street											
Mov.	L2	T1	R2	Total	%HV						
From E						Cap.	Deg.	Lane	Prob.	Ov.	
To Exit:	S	W	N			veh/h	v/c	Util.	SL	Ov.	Lane
								%	%	%	No.
Lane 1	22	515	193	730	0.8	1832	0.398	100	NA	NA	
Approach	22	515	193	730	0.8		0.398				
North: Railroad Street											

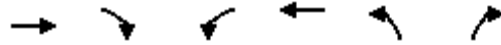
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	84	24	108	215	1.2	247	0.870	100	NA	NA
Approach	84	24	108	215	1.2		0.870			
West: Essex Street										
Mov.	L2	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	105	367	48	520	0.7	1556	0.334	100	NA	NA
Approach	105	367	48	520	0.7		0.334			
Total %HV Deg.Satn (v/c)										
Intersection	1659	0.7		0.870						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	
South Exit: Dundee Park Drive Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
East Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
North Exit: Railroad Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	
West Exit: Essex Street Merge Type: <b>Not Applied</b>												
Full Length Lane	1										Merge Analysis not applied.	

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
6: School Street & Essex Street

03/04/2024



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	243	146	15	211	278	25
Future Volume (Veh/h)	243	146	15	211	278	25
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	264	159	18	248	296	27
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			423		628	344
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			423		628	344
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		33	96
cM capacity (veh/h)			1147		442	704
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	423	266	323			
Volume Left	0	18	296			
Volume Right	159	0	27			
cSH	1700	1147	473			
Volume to Capacity	0.25	0.02	0.68			
Queue Length 95th (ft)	0	1	127			
Control Delay (s)	0.0	0.7	27.4			
Lane LOS		A	D			
Approach Delay (s)	0.0	0.7	27.4			
Approach LOS			D			
<b>Intersection Summary</b>						
Average Delay			8.9			
Intersection Capacity Utilization			45.5%	ICU Level of Service		A
Analysis Period (min)			15			

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 7: Ridge Street & Essex Street/Essex Street/Brook Street

03/04/2024



Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (veh/h)	263	5	20	1	218	8	4
Future Volume (Veh/h)	263	5	20	1	218	8	4
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.92	0.83	0.83
Hourly flow rate (vph)	283	5	0	1	237	10	5
<b>Pedestrians</b>							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked	0.00						
vC, conflicting volume			0	288		524	286
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	288		524	286
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	100		98	99
cM capacity (veh/h)			0	1286		516	758
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>				
Volume Total	288	238	15				
Volume Left	0	1	10				
Volume Right	5	0	5				
cSH	1700	1286	578				
Volume to Capacity	0.17	0.00	0.03				
Queue Length 95th (ft)	0	0	2				
Control Delay (s)	0.0	0.0	11.4				
Lane LOS		A	B				
Approach Delay (s)	0.0	0.0	11.4				
Approach LOS			B				
<b>Intersection Summary</b>							
Average Delay	0.3						
Intersection Capacity Utilization			38.9%	ICU Level of Service			A
Analysis Period (min)	15						

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative  
 8: Lupine Road/Ridge Street & School Street

03/04/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	120	36	13	237	4	58	3	14	1	3	0
Future Volume (Veh/h)	1	120	36	13	237	4	58	3	14	1	3	0
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.33	0.33	0.33
Hourly flow rate (vph)	1	152	46	16	300	5	72	4	18	3	9	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	305			198			516	514	175	532	534	302
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	305			198			516	514	175	532	534	302
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	99	98	99	98	100
cM capacity (veh/h)	1267			1387			461	461	874	445	449	742
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	199	321	94	12								
Volume Left	1	16	72	3								
Volume Right	46	5	18	0								
cSH	1267	1387	507	448								
Volume to Capacity	0.00	0.01	0.19	0.03								
Queue Length 95th (ft)	0	1	17	2								
Control Delay (s)	0.0	0.5	13.7	13.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.0	0.5	13.7	13.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			39.3%		ICU Level of Service				A			
Analysis Period (min)			15									

ELM SQUARE MEMORANDUM

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## MEMORANDUM

**TO:** Arthur G. Martineau III, P.E.  
Town Engineer of Andover  
5 Campanelli Drive  
Andover, MA 01810

**FROM:** Scott W. Thornton, P.E., Principal *and*  
Thomas Hannon, E.I.T.  
Vanasse & Associates, Inc.  
35 New England Business Center Drive,  
Suite 140  
Andover, MA 01810-1066

**DATE:** March 13, 2024

**RE:** 8975

**SUBJECT:** Updated Andover Town Yard Redevelopment Supplemental Traffic Analysis  
Andover, Massachusetts

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Vanasse & Associates, Inc. (VAI) has prepared this Supplemental Traffic Analysis Memorandum to identify traffic impacts associated with the proposed Andover Town Yard Redevelopment to be located at the former Andover Town Yard off of Pearson Street in Andover, Massachusetts (the “Project”). A January 24, 2024 memorandum provided a supplemental traffic analysis of the intersection of North Main Street (Route 28) and Main Street (Route 28) at Central Street and Elm Street, also referred to as Elm Square, as requested by Town staff at the December 12<sup>th</sup> Inter-Departmental Review (IDR) Meeting. This Updated analysis is provided due to changes in the Project’s trip distribution as identified in the March 2024 Updated Transportation Impact Assessment (UTIA) which was prepared to respond to comments provided by the town’s peer review consultant.

### **SUPPLEMENTAL TRAFFIC ANALYSIS**

The traffic volume counts from The Engineering Corp (TEC) technical memo<sup>1</sup> were used as 2023 existing traffic volumes for the 2023 Existing condition. The 2023 existing traffic signal timings were also derived from the same technical memo. The future condition, 2030 No-Build, utilizes the 2023 existing traffic volumes grown for seven years by 1 percent and incorporates the new traffic signal timings and new lane configurations. The new traffic signal timings were known as Alternative 2 in TEC’s memo. The future condition, 2030 Build, was defined as the No-Build condition with the addition of the trips generated from the proposed Andover Town Yard Redevelopment.

### **Analysis Results**

Level-of-service analyses were conducted for 2023 Existing, 2030 No-Build, and 2030 Build conditions for the Elm Square intersection. This is shown in Table 1.

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<sup>1</sup>*Elm Square Safety Improvements – Andover, Massachusetts Traffic Operations Analysis, Findings, & Recommendations*, TEC; August 2023.



**Table 1**  
**SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY**

Signalized Intersection/ Peak Hour/Movement	2023 Existing				2030 No-Build				2030 Build			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup> Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>
<b>Route 28 at Central Street and Elm Street</b>												
<i>Weekday Morning:</i>												
Central Street EB LT	0.35	25.6	C	2/3	0.73	59.5	E	2/4	0.73	59.5	E	2/4
Central Street EB TH	0.49	40.5	D	4/7	0.70	53.3	D	4/9	0.70	53.3	D	4/9
Central Street EB RT	0.05	0.1	A	0/0	0.06	0.1	A	0/0	0.06	0.1	A	0/0
Elm Street WB LT	0.38	26.2	C	2/4	0.66	49.6	D	2/7	0.66	49.6	D	2/7
Elm Street WB TH	0.70	45.9	D	7/16	1.07	111.4	F	7/20	1.07	111.4	F	7/20
Elm Street WB RT	0.09	0.2	A	0/0	0.12	0.8	A	0/1	0.12	0.8	A	0/1
Route 28 NB LT/TH/RT	0.40	15.8	B	3/6	0.93	35.9	D	6/12	0.93	36.5	D	5/12
Route 28 SB LT/TH/RT	0.59	17.1	B	7/10	--	--	--	--	--	--	--	--
Route 28 SB LT	--	--	--	--	0.16	16.5	B	1/2	0.16	16.6	B	1/2
Route 28 SB TH/RT	--	--	--	--	1.09	83.8	F	18/40	1.10	87.1	F	18/41
<b>Overall</b>	--	<b>22.6</b>	<b>C</b>	--	--	<b>65.2</b>	<b>E</b>	--	--	<b>66.6</b>	<b>E</b>	--
<i>Weekday Evening:</i>												
Central Street EB LT	0.48	23.9	C	3/6	1.13	130.0	F	3/15	1.13	132.6	F	3/16
Central Street EB TH	0.97	86.8	F	9/16	0.87	59.7	E	6/22	0.88	60.3	E	6/22
Central Street EB RT	0.05	0.1	A	0/0	0.04	0.1	A	0/0	0.04	0.1	A	0/0
Elm Street WB LT	0.58	37.1	D	2/4	0.82	72.3	E	1/8	0.83	72.6	E	2/8
Elm Street WB TH	0.48	35.8	D	5/14	0.94	74.5	E	5/20	0.94	75.3	E	5/20
Elm Street WB RT	0.16	1.3	A	0/1	0.19	3.2	A	0/1	0.20	3.6	A	0/1
Route 28 NB LT/TH/RT	0.61	25.6	C	6/8	0.79	34.8	C	5/11	0.79	34.7	C	5/11
Route 28 SB LT/TH/RT	0.67	27.7	C	6/8	--	--	--	--	--	--	--	--
Route 28 SB LT	--	--	--	--	0.42	21.9	C	1/3	0.43	21.9	C	1/3
Route 28 SB TH/RT	--	--	--	--	0.70	26.3	C	7/18	0.70	26.3	C	7/18
<b>Overall</b>	--	<b>34.8</b>	<b>C</b>	--	--	<b>50.2</b>	<b>D</b>	--	--	<b>50.5</b>	<b>D</b>	--

<sup>a</sup>Volume-to-capacity ratio.

<sup>b</sup>Control (signal) delay per vehicle in seconds.

<sup>c</sup>Level of service.

<sup>d</sup>Queue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.



As shown in Table 1, operations are relatively unchanged and there is no change in the level-of-service with the addition of proposed Project generated traffic volumes. In the No-Build condition, 2,179 vehicles travel through the intersection during the weekday morning peak hour and 2,301 vehicles during the weekday evening peak hour. The addition of the proposed Project generated traffic increases the volumes during the weekday morning and evening peak hours by 0.9 percent and 1.1 percent, respectively, over the No-Build volumes.

### **Alternative Build Analysis**

As stated in the roadway improvements section of the UTIA, the Essex Street Corridor MassWorks Grant Improvement Project will close Pearson Street east of the railroad and at the entrance to the Project. As such, an Alternative Analysis was conducted assuming Pearson Street ends and does not connect through to the Essex Street intersection. In order to do this, traffic volumes were redistributed throughout the study area as shown in the UTIA. Traffic was reassigned through the Elm Square intersection as well, and the resulting 2030 No-Build Alternative Analysis and 2030 Build Alternative Analysis results are summarized in Table 2. Traffic-volume network diagrams are provided in the Appendix demonstrating the traffic redistribution.



**Table 2**  
**SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY – WITH PEARSON STREET CLOSURE/MASSWORKS PROJECT**

Signalized Intersection/ Peak Hour/Movement	2030 No-Build				2030 No-Build Alternative				2030 Build				2030 Build Alternative			
	V/C <sup>a</sup>	Delay <sup>b</sup>	LOS <sup>c</sup>	Queue <sup>d</sup> Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>	V/C	Delay	LOS	Queue Avg/95 <sup>th</sup>
<b>Route 28 at Central Street and Elm Street</b>																
<i>Weekday Morning:</i>																
Central Street EB LT	0.73	59.5	E	2/4	0.80	68.3	E	2/5	0.75	62.1	E	2/5	0.82	70.9	E	2/5
Central Street EB TH	0.70	53.3	D	4/9	0.72	54.7	D	4/9	0.70	55.3	D	4/9	0.72	54.7	D	4/9
Central Street EB RT	0.06	0.1	A	0/0	0.12	4.0	A	0/1	0.06	0.1	A	0/0	0.12	4.0	A	0/1
Elm Street WB LT	0.66	49.6	D	2/7	0.68	51.3	D	2/7	0.66	49.6	D	2/7	0.68	51.3	D	2/7
Elm Street WB TH	1.07	111.4	F	7/20	1.10	117.8	F	7/20	1.07	111.4	F	7/20	1.10	117.8	F	7/20
Elm Street WB RT	0.12	0.8	A	0/1	0.11	0.3	A	0/1	0.12	1.0	A	0/1	0.11	0.3	A	0/1
Route 28 NB LT/TH/RT	0.91	34.5	C	5/12	1.27	36.7	D	5/12	0.91	35.1	D	5/12	1.27	36.8	D	5/12
Route 28 SB LT/TH/RT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Route 28 SB LT	0.16	16.5	B	1/2	0.14	16.5	B	1/2	0.16	16.6	B	1/2	0.14	16.5	B	1/2
Route 28 SB TH/RT	1.09	83.8	F	18/40	1.04	68.0	E	16/38	1.10	87.9	F	18/41	1.05	71.3	E	17/38
<b>Overall</b>	--	<b>64.9</b>	<b>E</b>	--	--	<b>60.2</b>	<b>E</b>	--	--	<b>66.6</b>	<b>E</b>	--	--	<b>61.5</b>	<b>E</b>	--
<i>Weekday Evening:</i>																
Central Street EB LT	1.10	121.1	F	3/15	1.24	172.1	F	3/17	1.13	129.2	F	3/15	1.26	178.1	F	3/17
Central Street EB TH	0.86	58.0	E	6/21	0.97	76.9	E	7/25	0.87	58.4	E	6/21	0.97	77.7	E	7/25
Central Street EB RT	0.04	0.1	A	0/0	0.06	0.1	A	0/0	0.04	0.1	A	0/0	0.06	0.1	A	0/0
Elm Street WB LT	0.81	70.0	E	1/8	0.84	75.2	E	1/8	0.82	70.5	E	1/8	0.84	76.0	E	2/8
Elm Street WB TH	0.92	71.9	E	5/20	0.98	83.6	F	6/21	0.93	72.6	E	5/20	0.98	84.4	F	6/21
Elm Street WB RT	0.20	3.3	A	0/1	0.18	2.4	A	0/1	0.20	3.7	A	0/1	0.18	2.8	A	0/1
Route 28 NB LT/TH/RT	0.78	34.7	C	5/11	0.81	36.0	D	5/11	0.79	34.9	C	5/11	0.81	36.4	D	5/11
Route 28 SB LT/TH/RT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Route 28 SB LT	0.43	22.5	C	1/3	0.45	22.2	C	1/4	0.44	22.8	C	1/4	0.45	22.3	C	1/4
Route 28 SB TH/RT	0.71	26.9	C	7/18	0.66	24.8	C	6/17	0.71	27.1	C	7/18	0.67	25.0	C	7/17
<b>Overall</b>	--	<b>48.8</b>	<b>D</b>	--	--	<b>58.9</b>	<b>E</b>	--	--	<b>49.8</b>	<b>D</b>	--	--	<b>59.7</b>	<b>E</b>	--

<sup>a</sup>Volume-to-capacity ratio.

<sup>b</sup>Control (signal) delay per vehicle in seconds.

<sup>c</sup>Level of service.

<sup>d</sup>Queue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.



As shown in Table 2, the redistribution of traffic due to the closure of Pearson Street has the effect of reducing traffic levels through Elm Square during the weekday morning peak hour, but increases traffic levels during the weekday evening peak hour. However, operations are again relatively unchanged with the increase in delay limited to 2 seconds or less on an overall intersection basis.

## **CONCLUSIONS**

VAI has prepared this Supplemental Traffic Analysis Memorandum to identify the effects of the Andover Town Yard Development on the Elm Square intersection in Andover, Massachusetts. We have concluded the following:

- Under 2030 No-Build conditions, with the proposed signal timing and phasing changes proposed by TEC, the level of service degrades from LOS C to LOS E during the weekday morning peak hour and from LOS C to LOS D during the weekday evening peak hour. The addition of the Project vehicle trips does not change overall LOS and increases overall delay by less than 2 seconds from the No Build condition.
- Under the redistribution of area traffic flows with the closure of Pearson Street as part of the MassWorks Grant Project, the intersection remains at LOS E during the weekday morning peak hour but degrades to LOS E during the weekday evening peak hour. However, the effect of the Project is no change in LOS and again, a 2 second delay or less during the peak hours.
- The proposed Project generated traffic increases the total volumes traveling through the Elm Square intersection by less than 2 percent over the No-Build condition.

If you have any questions about the results contained herein, please feel free to contact either of us at [sthorton@rdva.com](mailto:sthorton@rdva.com) or [thannon@rdva.com](mailto:thannon@rdva.com).

Attachments: Technical Appendix

cc: File



## ELM SQUARE CAPACITY ANALYSIS

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2023 Existing Weekday Morning Peak Hour  
2023 Existing Weekday Evening Peak Hour  
2030 No-Build Weekday Morning Peak Hour  
2030 No-Build Weekday Evening Peak Hour  
2030 Build Weekday Morning Peak Hour  
2030 Build Weekday Evening Peak Hour

2023 Existing Weekday Morning Peak Hour

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2023 Existing Weekday Morning - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	155	39	119	298	86	58	295	80	50	476	257
Future Volume (vph)	80	155	39	119	298	86	58	295	80	50	476	257
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt			0.850			0.850		0.972			0.951	
Flt Protected	0.950			0.950				0.993			0.997	
Satd. Flow (prot)	1752	1845	1615	1547	1801	1742	0	3252	0	0	3254	0
Flt Permitted	0.358			0.464				0.700			0.882	
Satd. Flow (perm)	660	1845	1615	756	1801	1742	0	2292	0	0	2878	0
Satd. Flow (RTOR)			120			175		32			120	
Adj. Flow (vph)	100	194	49	124	310	90	64	328	89	58	553	299
Lane Group Flow (vph)	100	194	49	124	310	90	0	481	0	0	910	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	18.0	23.0	9.0	18.0	18.0	18.0	18.0		9.0	23.0	
Total Split (s)	15.0	20.0	55.0	15.0	20.0	44.0	44.0	44.0		11.0	55.0	
Total Split (%)	15.0%	20.0%	55.0%	15.0%	20.0%	44.0%	44.0%	44.0%		11.0%	55.0%	
Maximum Green (s)	10.0	15.0	50.0	10.0	15.0	39.0	39.0	39.0		6.0	50.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lead/Lag	Lag		Lag	Lag						Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	C-Min	None	None	C-Min	C-Min	C-Min		None	C-Min	
Walk Time (s)		2.0	2.0		2.0	2.0	2.0	2.0			2.0	
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0			11.0	
Pedestrian Calls (#/hr)		10	10		10	10	10	10			10	
Act Effct Green (s)	29.6	21.4	51.6	33.0	24.7	51.6		51.6			51.6	
Actuated g/C Ratio	0.30	0.21	0.52	0.33	0.25	0.52		0.52			0.52	
v/c Ratio	0.35	0.49	0.05	0.38	0.70	0.09		0.40			0.59	
Control Delay	25.6	40.5	0.1	26.2	45.9	0.2		15.8			17.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	25.6	40.5	0.1	26.2	45.9	0.2		15.8			17.1	
LOS	C	D	A	C	D	A		B			B	
Approach Delay		30.4			33.4			15.8			17.1	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	41	106	0	52	178	0		87			176	
Queue Length 95th (ft)	75	170	0	105	#401	0		144			251	
Internal Link Dist (ft)		370			601			254			176	
Turn Bay Length (ft)	100		50	100		50						
Base Capacity (vph)	323	393	905	336	445	983		1198			1569	
Starvation Cap Reductn	0	0	0	0	0	0		0			0	
Spillback Cap Reductn	0	0	0	0	0	0		0			0	

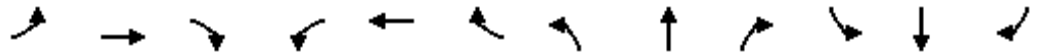
2023 Existing Weekday Morning - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024

Lane Group	Ø10	Ø11	Ø12	Ø13
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Lane Util. Factor				
Frt				
Flt Protected				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Satd. Flow (RTOR)				
Adj. Flow (vph)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	10	11	12	13
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	3.0	3.0	3.0	3.0
Minimum Split (s)	5.0	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0	5.0
Total Split (%)	5%	5%	5%	5%
Maximum Green (s)	3.0	3.0	3.0	3.0
Yellow Time (s)	2.0	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0	0.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag	Lead	Lead	Lead	Lead
Lead-Lag Optimize?				
Vehicle Extension (s)	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None
Walk Time (s)	3.0	3.0	3.0	3.0
Flash Dont Walk (s)	0.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)	10	10	10	10
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
LOS				
Approach Delay				
Approach LOS				
Queue Length 50th (ft)				
Queue Length 95th (ft)				
Internal Link Dist (ft)				
Turn Bay Length (ft)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				

2023 Existing Weekday Morning - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0			0	
Reduced v/c Ratio	0.31	0.49	0.05	0.37	0.70	0.09		0.40			0.58	

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 16 (16%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green  
 Natural Cycle: 65  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.70  
 Intersection Signal Delay: 22.6  
 Intersection LOS: C  
 Intersection Capacity Utilization 72.0%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Route 28 & Central Street/Elm Street



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Lane Group	Ø10	Ø11	Ø12	Ø13
Storage Cap Reductn				
Reduced v/c Ratio				
Intersection Summary				

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2023 Existing Weekday Evening Peak Hour

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2023 Existing Weekday Evening - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	282	28	109	243	110	65	369	125	98	317	104
Future Volume (vph)	174	282	28	109	243	110	65	369	125	98	317	104
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt			0.850			0.850		0.966			0.970	
Flt Protected	0.950			0.950				0.994			0.991	
Satd. Flow (prot)	1805	1900	1599	1624	1766	1777	0	3246	0	0	3401	0
Flt Permitted	0.593			0.169				0.758			0.645	
Satd. Flow (perm)	1127	1900	1599	289	1766	1777	0	2476	0	0	2214	0
Satd. Flow (RTOR)			120			175		44			44	
Adj. Flow (vph)	191	310	31	121	270	122	68	384	130	109	352	116
Lane Group Flow (vph)	191	310	31	121	270	122	0	582	0	0	577	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	18.0	23.0	9.0	18.0	18.0	18.0	18.0		9.0	23.0	
Total Split (s)	15.0	20.0	55.0	15.0	20.0	44.0	44.0	44.0		11.0	55.0	
Total Split (%)	15.0%	20.0%	55.0%	15.0%	20.0%	44.0%	44.0%	44.0%		11.0%	55.0%	
Maximum Green (s)	10.0	15.0	50.0	10.0	15.0	39.0	39.0	39.0		6.0	50.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lead/Lag	Lag		Lag	Lag						Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	C-Min	None	None	C-Min	C-Min	C-Min		None	C-Min	
Walk Time (s)		2.0	2.0		2.0	2.0	2.0	2.0			2.0	
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0			11.0	
Pedestrian Calls (#/hr)		10	10		10	10	10	10			10	
Act Effct Green (s)	28.3	16.9	37.7	35.3	31.8	37.7		37.7			37.7	
Actuated g/C Ratio	0.28	0.17	0.38	0.35	0.32	0.38		0.38			0.38	
v/c Ratio	0.48	0.97	0.05	0.58	0.48	0.16		0.61			0.67	
Control Delay	23.9	86.8	0.1	37.1	35.8	1.3		25.6			27.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	23.9	86.8	0.1	37.1	35.8	1.3		25.6			27.7	
LOS	C	F	A	D	D	A		C			C	
Approach Delay		59.2			27.9			25.6			27.7	
Approach LOS		E			C			C			C	
Queue Length 50th (ft)	63	~218	0	53	129	0		142			145	
Queue Length 95th (ft)	141	#392	0	#106	#342	12		188			196	
Internal Link Dist (ft)		370			601			247			232	
Turn Bay Length (ft)	100		50	100		50						
Base Capacity (vph)	410	320	859	235	561	814		1014			1129	
Starvation Cap Reductn	0	0	0	0	0	0		0			0	
Spillback Cap Reductn	0	0	0	0	0	0		0			0	

2023 Existing Weekday Evening - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024

Lane Group	Ø10	Ø11	Ø12	Ø13
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Lane Util. Factor				
Frt				
Flt Protected				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Satd. Flow (RTOR)				
Adj. Flow (vph)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	10	11	12	13
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	3.0	3.0	3.0	3.0
Minimum Split (s)	5.0	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0	5.0
Total Split (%)	5%	5%	5%	5%
Maximum Green (s)	3.0	3.0	3.0	3.0
Yellow Time (s)	2.0	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0	0.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag	Lead	Lead	Lead	Lead
Lead-Lag Optimize?				
Vehicle Extension (s)	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Max
Walk Time (s)	3.0	3.0	3.0	3.0
Flash Dont Walk (s)	0.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)	10	10	15	0
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
LOS				
Approach Delay				
Approach LOS				
Queue Length 50th (ft)				
Queue Length 95th (ft)				
Internal Link Dist (ft)				
Turn Bay Length (ft)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				



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Lane Group	Ø10	Ø11	Ø12	Ø13
Storage Cap Reductn				
Reduced v/c Ratio				
Intersection Summary				

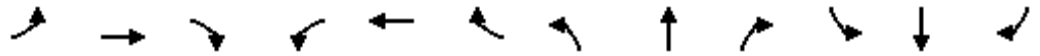
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2030 No-Build Weekday Morning Peak Hour

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2030 No-Build Weekday Morning - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024

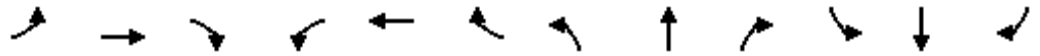


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	173	42	128	330	92	62	316	86	54	510	291
Future Volume (vph)	95	173	42	128	330	92	62	316	86	54	510	291
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Fr <sub>t</sub>			0.850			0.850		0.972			0.946	
Fl <sub>t</sub> Protected	0.950			0.950				0.993		0.950		
Satd. Flow (prot)	1752	1845	1615	1547	1801	1742	0	3252	0	1752	1706	0
Fl <sub>t</sub> Permitted	0.253			0.378				0.517		0.357		
Satd. Flow (perm)	467	1845	1615	616	1801	1742	0	1693	0	659	1706	0
Satd. Flow (RTOR)			109			159						
Adj. Flow (vph)	119	216	53	133	344	96	69	351	96	63	593	338
Lane Group Flow (vph)	119	216	53	133	344	96	0	516	0	63	931	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5		11.0	11.5	
Total Split (s)	10.0	21.0	52.0	11.0	22.0	41.0	41.0	41.0		11.0	52.0	
Total Split (%)	9.1%	19.1%	47.3%	10.0%	20.0%	37.3%	37.3%	37.3%		10.0%	47.3%	
Maximum Green (s)	4.5	15.5	46.5	5.5	16.5	35.5	35.5	35.5		6.0	46.5	
Yellow Time (s)	3.0	4.0	3.5	3.0	4.0	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5		5.5		5.0	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	20.4	15.8	47.3	22.4	16.8	38.6		38.6		47.8	47.3	
Actuated g/C Ratio	0.22	0.17	0.50	0.24	0.18	0.41		0.41		0.51	0.50	
v/c Ratio	0.73	0.70	0.06	0.66	1.07	0.12		0.93dl		0.16	1.09	
Control Delay	59.5	53.3	0.1	49.6	111.4	0.8		35.9		16.5	83.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	59.5	53.3	0.1	49.6	111.4	0.8		35.9		16.5	83.8	
LOS	E	D	A	D	F	A		D		B	F	
Approach Delay		47.9			78.5			35.9			79.5	
Approach LOS		D			E			D			E	
Queue Length 50th (ft)	46	106	0	52	182	0		115		14	449	
Queue Length 95th (ft)	#111	#225	0	#176	#489	5		#297		51	#1011	
Internal Link Dist (ft)		370			601			174			229	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	163	308	863	201	320	806		692		404	855	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	24%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 No-Build Weekday Morning - Elm Square  
 9: Route 28 & Central Street/Elm Street

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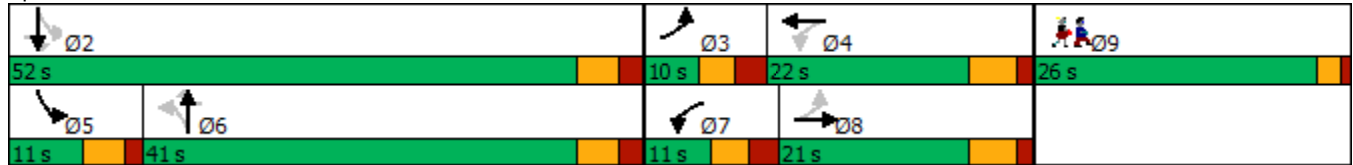


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	0.73	0.70	0.06	0.66	1.07	0.12		0.75		0.16	1.09	

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 94.4  
 Natural Cycle: 150  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.09  
 Intersection Signal Delay: 65.2  
 Intersection LOS: E  
 Intersection Capacity Utilization 97.2%  
 ICU Level of Service F  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 9: Route 28 & Central Street/Elm Street



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Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

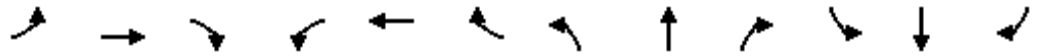
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2030 No-Build Weekday Evening Peak Hour

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2030 No-Build Weekday Evening - Elm Square  
 9: Route 28 & Central Street/Elm Street

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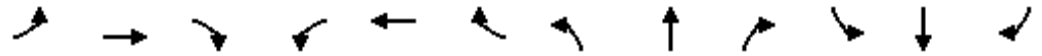


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	330	30	117	288	118	70	396	134	105	340	148
Future Volume (vph)	225	330	30	117	288	118	70	396	134	105	340	148
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.966			0.955	
Flt Protected	0.950			0.950				0.994		0.950		
Satd. Flow (prot)	1805	1900	1599	1624	1766	1777	0	3246	0	1805	1768	0
Flt Permitted	0.243			0.240				0.761		0.251		
Satd. Flow (perm)	462	1900	1599	410	1766	1777	0	2485	0	477	1768	0
Satd. Flow (RTOR)			105			155						
Adj. Flow (vph)	247	363	33	130	320	131	73	413	140	117	378	164
Lane Group Flow (vph)	247	363	33	130	320	131	0	626	0	117	542	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	8.5	9.5	10.0	9.5	9.5	9.5	9.5		9.5	9.5	
Total Split (s)	11.0	22.0	62.0	10.0	21.0	52.5	52.5	52.5		9.5	62.0	
Total Split (%)	9.2%	18.3%	51.7%	8.3%	17.5%	43.8%	43.8%	43.8%		7.9%	51.7%	
Maximum Green (s)	5.5	17.5	56.5	4.0	15.5	47.0	47.0	47.0		4.0	56.5	
Yellow Time (s)	3.0	3.0	3.5	3.5	4.0	3.5	3.5	3.5		4.0	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	4.5	5.5	6.0	5.5	5.5		5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?		Yes			Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	23.6	18.8	37.7	20.4	16.6	27.5		27.5		37.7	37.7	
Actuated g/C Ratio	0.28	0.22	0.44	0.24	0.19	0.32		0.32		0.44	0.44	
v/c Ratio	1.13	0.87	0.04	0.82	0.94	0.19		0.79		0.42	0.70	
Control Delay	130.0	59.7	0.1	72.3	74.5	3.2		34.8		21.9	26.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	130.0	59.7	0.1	72.3	74.5	3.2		34.8		21.9	26.3	
LOS	F	E	A	E	E	A		C		C	C	
Approach Delay		83.6			57.9			34.8			25.5	
Approach LOS		F			E			C			C	
Queue Length 50th (ft)	74	145	0	37	131	0		125		27	171	
Queue Length 95th (ft)	#386	#542	0	#206	#506	27		272		87	439	
Internal Link Dist (ft)		370			601			236			220	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	219	416	1161	158	342	1108		1461		276	1250	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	22%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 No-Build Weekday Evening - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.13	0.87	0.03	0.82	0.94	0.12		0.43		0.42	0.43	

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 85.8	
Natural Cycle: 130	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.13	
Intersection Signal Delay: 50.2	Intersection LOS: D
Intersection Capacity Utilization 90.1%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 9: Route 28 & Central Street/Elm Street

Ø2	Ø3	Ø4	Ø9
62 s	11 s	21 s	26 s
Ø5	Ø6	Ø7	Ø8
9.5 s	52.5 s	10 s	22 s

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Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

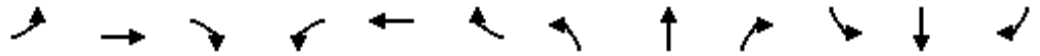
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2030 Build Weekday Morning Peak Hour

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2030 Build Weekday Morning - Elm Square  
 9: Route 28 & Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	173	42	128	330	93	62	319	86	55	517	291
Future Volume (vph)	95	173	42	128	330	93	62	319	86	55	517	291
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Fr't			0.850			0.850		0.972			0.946	
Flt Protected	0.950			0.950				0.993		0.950		
Satd. Flow (prot)	1752	1845	1615	1547	1801	1742	0	3252	0	1752	1706	0
Flt Permitted	0.253			0.378				0.513		0.355		
Satd. Flow (perm)	467	1845	1615	616	1801	1742	0	1680	0	655	1706	0
Satd. Flow (RTOR)			109			159						
Adj. Flow (vph)	119	216	53	133	344	97	69	354	96	64	601	338
Lane Group Flow (vph)	119	216	53	133	344	97	0	519	0	64	939	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5		11.0	11.5	
Total Split (s)	10.0	21.0	52.0	11.0	22.0	41.0	41.0	41.0		11.0	52.0	
Total Split (%)	9.1%	19.1%	47.3%	10.0%	20.0%	37.3%	37.3%	37.3%		10.0%	47.3%	
Maximum Green (s)	4.5	15.5	46.5	5.5	16.5	35.5	35.5	35.5		6.0	46.5	
Yellow Time (s)	3.0	4.0	3.5	3.0	4.0	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5		5.5		5.0	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	20.4	15.8	47.3	22.4	16.8	38.6		38.6		47.8	47.3	
Actuated g/C Ratio	0.22	0.17	0.50	0.24	0.18	0.41		0.41		0.51	0.50	
v/c Ratio	0.73	0.70	0.06	0.66	1.07	0.12		0.93dl		0.16	1.10	
Control Delay	59.5	53.3	0.1	49.6	111.4	0.8		36.5		16.6	87.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	59.5	53.3	0.1	49.6	111.4	0.8		36.5		16.6	87.1	
LOS	E	D	A	D	F	A		D		B	F	
Approach Delay		47.9			78.4			36.5			82.6	
Approach LOS		D			E			D			F	
Queue Length 50th (ft)	46	106	0	52	182	0		116		14	457	
Queue Length 95th (ft)	#111	#225	0	#176	#489	6		#301		51	#1023	
Internal Link Dist (ft)		370			601			289			238	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	163	308	863	201	320	806		687		402	855	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	24%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 Build Weekday Morning - Elm Square

9: Route 28 & Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	0.73	0.70	0.06	0.66	1.07	0.12		0.76		0.16	1.10	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 94.4

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 66.6

Intersection LOS: E

Intersection Capacity Utilization 97.3%

ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 9: Route 28 & Elm Street

Ø2	Ø3	Ø4	Ø9
52 s	10 s	22 s	26 s
Ø5	Ø6	Ø7	Ø8
11 s	41 s	11 s	21 s

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Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

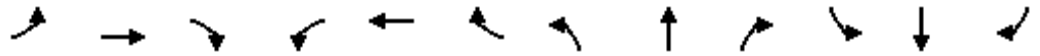
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2030 Build Weekday Evening Peak Hour

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2030 Build Weekday Evening - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	330	30	117	288	122	70	400	134	106	345	148
Future Volume (vph)	225	330	30	117	288	122	70	400	134	106	345	148
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Fr <sub>t</sub>			0.850			0.850		0.967			0.955	
Fl <sub>t</sub> Protected	0.950			0.950				0.994		0.950		
Satd. Flow (prot)	1805	1900	1599	1624	1766	1777	0	3250	0	1805	1769	0
Fl <sub>t</sub> Permitted	0.241			0.240				0.759		0.250		
Satd. Flow (perm)	458	1900	1599	410	1766	1777	0	2481	0	475	1769	0
Satd. Flow (RTOR)			105			155						
Adj. Flow (vph)	247	363	33	130	320	136	73	417	140	118	383	164
Lane Group Flow (vph)	247	363	33	130	320	136	0	630	0	118	547	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	8.5	9.5	10.0	9.5	9.5	9.5	9.5		9.5	9.5	
Total Split (s)	11.0	22.0	62.0	10.0	21.0	52.5	52.5	52.5		9.5	62.0	
Total Split (%)	9.2%	18.3%	51.7%	8.3%	17.5%	43.8%	43.8%	43.8%		7.9%	51.7%	
Maximum Green (s)	5.5	17.5	56.5	4.0	15.5	47.0	47.0	47.0		4.0	56.5	
Yellow Time (s)	3.0	3.0	3.5	3.5	4.0	3.5	3.5	3.5		4.0	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	4.5	5.5	6.0	5.5	5.5		5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?		Yes			Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	23.6	18.8	38.0	20.4	16.6	27.8		27.8		38.0	38.0	
Actuated g/C Ratio	0.27	0.22	0.44	0.24	0.19	0.32		0.32		0.44	0.44	
v/c Ratio	1.13	0.88	0.04	0.83	0.94	0.20		0.79		0.43	0.70	
Control Delay	132.6	60.2	0.1	72.6	75.0	3.6		34.8		22.0	26.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	132.6	60.2	0.1	72.6	75.0	3.6		34.8		22.0	26.4	
LOS	F	E	A	E	E	A		C		C	C	
Approach Delay		84.9			57.9			34.8			25.6	
Approach LOS		F			E			C			C	
Queue Length 50th (ft)	75	145	0	37	132	0		126		28	173	
Queue Length 95th (ft)	#387	#546	0	#207	#509	30		274		87	445	
Internal Link Dist (ft)		370			601			236			220	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	218	414	1158	157	341	1106		1455		275	1247	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	22%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 Build Weekday Evening - Elm Square  
 9: Route 28 & Central Street/Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.13	0.88	0.03	0.83	0.94	0.12		0.43		0.43	0.44	

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 86	
Natural Cycle: 130	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.13	
Intersection Signal Delay: 50.5	Intersection LOS: D
Intersection Capacity Utilization 90.5%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 9: Route 28 & Central Street/Elm Street

Ø2	Ø3	Ø4	Ø9
62 s	11 s	21 s	26 s
Ø5	Ø6	Ø7	Ø8
9.5 s	52.5 s	10 s	22 s

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Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

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## ELM SQUARE MASSWORKS ALTERNATIVE CAPACITY ANALYSIS

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2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative

2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative

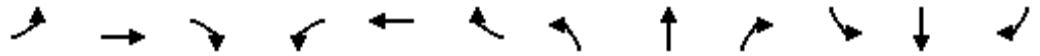
2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative

2030 No-Build Weekday Morning Peak Hour MassWorks Grant Alternative

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2030 No-Build Weekday Morning - Elm Square - MassWorks Grant Alternative  
 9: Route 28 & Central Street/Elm Street

03/13/2024

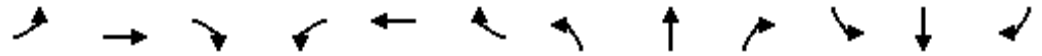


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	178	84	128	337	85	85	293	86	49	468	292
Future Volume (vph)	105	178	84	128	337	85	85	293	86	49	468	292
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Fr <sub>t</sub>			0.850			0.850		0.972			0.942	
Fl <sub>t</sub> Protected	0.950			0.950				0.991		0.950		
Satd. Flow (prot)	1752	1845	1615	1547	1801	1742	0	3244	0	1752	1698	0
Fl <sub>t</sub> Permitted	0.253			0.361				0.509		0.357		
Satd. Flow (perm)	467	1845	1615	588	1801	1742	0	1666	0	659	1698	0
Satd. Flow (RTOR)			109			159						
Adj. Flow (vph)	131	223	105	133	351	89	94	326	96	57	544	340
Lane Group Flow (vph)	131	223	105	133	351	89	0	516	0	57	884	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5		11.0	11.5	
Total Split (s)	10.0	21.0	52.0	11.0	22.0	41.0	41.0	41.0		11.0	52.0	
Total Split (%)	9.1%	19.1%	47.3%	10.0%	20.0%	37.3%	37.3%	37.3%		10.0%	47.3%	
Maximum Green (s)	4.5	15.5	46.5	5.5	16.5	35.5	35.5	35.5		6.0	46.5	
Yellow Time (s)	3.0	4.0	3.5	3.0	4.0	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5		5.5		5.0	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	20.4	15.8	47.3	22.4	16.8	38.6		38.6		47.8	47.3	
Actuated g/C Ratio	0.22	0.17	0.50	0.24	0.18	0.41		0.41		0.51	0.50	
v/c Ratio	0.80	0.72	0.12	0.68	1.10	0.11		1.27dl		0.14	1.04	
Control Delay	68.3	54.7	4.0	51.3	117.8	0.3		36.7		16.5	68.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	68.3	54.7	4.0	51.3	117.8	0.3		36.7		16.5	68.0	
LOS	E	D	A	D	F	A		D		B	E	
Approach Delay		47.0			84.1			36.7			64.9	
Approach LOS		D			F			D			E	
Queue Length 50th (ft)	51	110	0	52	186	0		116		13	404	
Queue Length 95th (ft)	#130	#237	22	#180	#499	1		#301		47	#946	
Internal Link Dist (ft)		370			601			174			229	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	163	308	863	196	320	806		681		404	850	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	24%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 No-Build Weekday Morning - Elm Square - MassWorks Grant Alternative  
 9: Route 28 & Central Street/Elm Street

03/13/2024

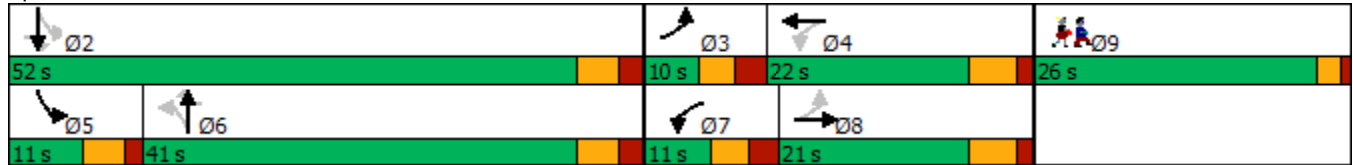


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	0.80	0.72	0.12	0.68	1.10	0.11		0.76		0.14	1.04	

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 94.4  
 Natural Cycle: 150  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.10  
 Intersection Signal Delay: 60.2  
 Intersection LOS: E  
 Intersection Capacity Utilization 97.6%  
 ICU Level of Service F  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 9: Route 28 & Central Street/Elm Street



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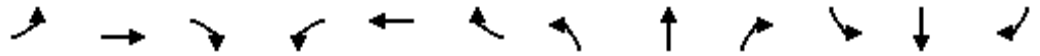
Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

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2030 No-Build Weekday Evening Peak Hour MassWorks Grant Alternative

2030 No-Build Weekday Evening - Elm Square - MassWorks Grant Alternative  
 9: Route 28 & Central Street/Elm Street

03/13/2024

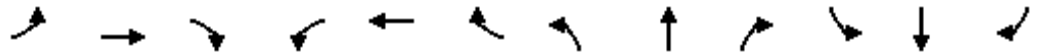


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	232	361	40	117	295	111	94	372	134	115	309	160
Future Volume (vph)	232	361	40	117	295	111	94	372	134	115	309	160
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.966			0.949	
Flt Protected	0.950			0.950				0.992		0.950		
Satd. Flow (prot)	1805	1900	1599	1624	1766	1777	0	3241	0	1805	1756	0
Flt Permitted	0.215			0.240				0.717		0.259		
Satd. Flow (perm)	408	1900	1599	410	1766	1777	0	2343	0	492	1756	0
Satd. Flow (RTOR)			105			155						
Adj. Flow (vph)	255	397	44	130	328	123	98	388	140	128	343	178
Lane Group Flow (vph)	255	397	44	130	328	123	0	626	0	128	521	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	8.5	9.5	10.0	9.5	9.5	9.5	9.5		9.5	9.5	
Total Split (s)	11.0	22.0	62.0	10.0	21.0	52.5	52.5	52.5		9.5	62.0	
Total Split (%)	9.2%	18.3%	51.7%	8.3%	17.5%	43.8%	43.8%	43.8%		7.9%	51.7%	
Maximum Green (s)	5.5	17.5	56.5	4.0	15.5	47.0	47.0	47.0		4.0	56.5	
Yellow Time (s)	3.0	3.0	3.5	3.5	4.0	3.5	3.5	3.5		4.0	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	4.5	5.5	6.0	5.5	5.5		5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?		Yes			Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	23.6	18.8	39.5	20.4	16.6	29.3		29.3		39.5	39.5	
Actuated g/C Ratio	0.27	0.21	0.45	0.23	0.19	0.33		0.33		0.45	0.45	
v/c Ratio	1.25	0.98	0.06	0.84	0.98	0.18		0.80		0.45	0.66	
Control Delay	176.5	78.0	0.1	76.0	84.6	2.4		35.5		22.1	24.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	176.5	78.0	0.1	76.0	84.6	2.4		35.5		22.1	24.7	
LOS	F	E	A	E	F	A		D		C	C	
Approach Delay		109.1			65.3			35.5			24.2	
Approach LOS		F			E			D			C	
Queue Length 50th (ft)	~84	168	0	39	140	0		127		30	162	
Queue Length 95th (ft)	#419	#613	0	#211	#529	22		278		93	416	
Internal Link Dist (ft)		370			601			236			220	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	204	407	1139	155	335	1089		1350		286	1216	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	22%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 No-Build Weekday Evening - Elm Square - MassWorks Grant Alternative  
 9: Route 28 & Central Street/Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.25	0.98	0.04	0.84	0.98	0.11		0.46		0.45	0.43	

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 87.6	
Natural Cycle: 130	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.25	
Intersection Signal Delay: 59.5	Intersection LOS: E
Intersection Capacity Utilization 90.0%	ICU Level of Service E
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 9: Route 28 & Central Street/Elm Street

62 s	11 s	21 s	26 s
9.5 s	52.5 s	10 s	22 s

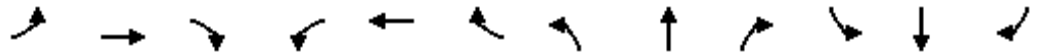
Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

2030 Build Weekday Morning Peak Hour MassWorks Grant Alternative

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2030 Build Weekday Morning - Em Square - MassWorks Grant Alternative  
 9: Route 28 & Elm Street

03/13/2024

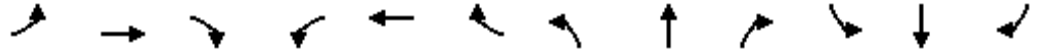


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	178	84	128	337	86	85	296	86	50	475	295
Future Volume (vph)	107	178	84	128	337	86	85	296	86	50	475	295
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Fr <sub>t</sub>			0.850			0.850		0.972			0.943	
Fl <sub>t</sub> Protected	0.950			0.950				0.991		0.950		
Satd. Flow (prot)	1752	1845	1615	1547	1801	1742	0	3244	0	1752	1700	0
Fl <sub>t</sub> Permitted	0.253			0.361				0.510		0.355		
Satd. Flow (perm)	467	1845	1615	588	1801	1742	0	1669	0	655	1700	0
Satd. Flow (RTOR)			109			159						
Adj. Flow (vph)	134	223	105	133	351	90	94	329	96	58	552	343
Lane Group Flow (vph)	134	223	105	133	351	90	0	519	0	58	895	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5		11.0	11.5	
Total Split (s)	10.0	21.0	52.0	11.0	22.0	41.0	41.0	41.0		11.0	52.0	
Total Split (%)	9.1%	19.1%	47.3%	10.0%	20.0%	37.3%	37.3%	37.3%		10.0%	47.3%	
Maximum Green (s)	4.5	15.5	46.5	5.5	16.5	35.5	35.5	35.5		6.0	46.5	
Yellow Time (s)	3.0	4.0	3.5	3.0	4.0	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5		5.5		5.0	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	20.4	15.8	47.3	22.4	16.8	38.6		38.6		47.8	47.3	
Actuated g/C Ratio	0.22	0.17	0.50	0.24	0.18	0.41		0.41		0.51	0.50	
v/c Ratio	0.82	0.72	0.12	0.68	1.10	0.11		1.27dl		0.14	1.05	
Control Delay	70.9	54.7	4.0	51.3	117.8	0.3		36.8		16.5	71.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	70.9	54.7	4.0	51.3	117.8	0.3		36.8		16.5	71.3	
LOS	E	D	A	D	F	A		D		B	E	
Approach Delay		47.9			84.0			36.8			67.9	
Approach LOS		D			F			D			E	
Queue Length 50th (ft)	52	110	0	52	186	0		116		13	414	
Queue Length 95th (ft)	#135	#237	22	#180	#499	1		#302		47	#961	
Internal Link Dist (ft)		370			601			289			238	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	163	308	863	196	320	806		682		402	852	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	24%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 Build Weekday Morning - Em Square - MassWorks Grant Alternative  
 9: Route 28 & Elm Street

03/13/2024

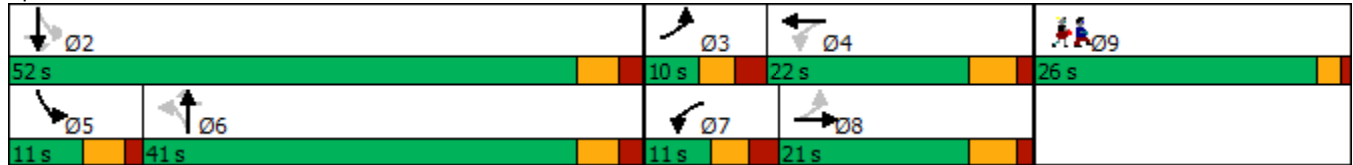


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	0.82	0.72	0.12	0.68	1.10	0.11		0.76		0.14	1.05	

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 94.4  
 Natural Cycle: 150  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.10  
 Intersection Signal Delay: 61.5  
 Intersection LOS: E  
 Intersection Capacity Utilization 98.4%  
 ICU Level of Service F  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 9: Route 28 & Elm Street



Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

2030 Build Weekday Evening Peak Hour MassWorks Grant Alternative

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2030 Build Weekday Evening - Elm Square - MassWorks Grant Alternative  
 9: Route 28 & Central Street/Elm Street

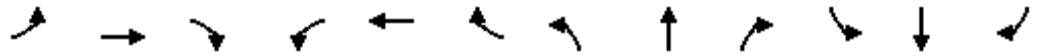
03/13/2024

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	234	361	40	117	295	115	94	376	134	116	314	162
Future Volume (vph)	234	361	40	117	295	115	94	376	134	116	314	162
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.967			0.949	
Flt Protected	0.950			0.950				0.992		0.950		
Satd. Flow (prot)	1805	1900	1599	1624	1766	1777	0	3244	0	1805	1756	0
Flt Permitted	0.213			0.240				0.712		0.258		
Satd. Flow (perm)	405	1900	1599	410	1766	1777	0	2329	0	490	1756	0
Satd. Flow (RTOR)			105			155						
Adj. Flow (vph)	257	397	44	130	328	128	98	392	140	129	349	180
Lane Group Flow (vph)	257	397	44	130	328	128	0	630	0	129	529	0
Turn Type	pm+pt	NA	custom	pm+pt	NA	custom	Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			6		5	2	
Permitted Phases	8		2	4		6	6			2		
Detector Phase	3	8	2	7	4	6	6	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	9.5	8.5	9.5	10.0	9.5	9.5	9.5	9.5		9.5	9.5	
Total Split (s)	11.0	22.0	62.0	10.0	21.0	52.5	52.5	52.5		9.5	62.0	
Total Split (%)	9.2%	18.3%	51.7%	8.3%	17.5%	43.8%	43.8%	43.8%		7.9%	51.7%	
Maximum Green (s)	5.5	17.5	56.5	4.0	15.5	47.0	47.0	47.0		4.0	56.5	
Yellow Time (s)	3.0	3.0	3.5	3.5	4.0	3.5	3.5	3.5		4.0	3.5	
All-Red Time (s)	2.5	1.5	2.0	2.5	1.5	2.0	2.0	2.0		1.5	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	5.5	4.5	5.5	6.0	5.5	5.5		5.5		5.5	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?		Yes			Yes	Yes	Yes	Yes				
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	Min	None	None	Min	Min	Min		None	Min	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	23.6	18.8	39.8	20.4	16.6	29.6		29.6		39.8	39.8	
Actuated g/C Ratio	0.27	0.21	0.45	0.23	0.19	0.34		0.34		0.45	0.45	
v/c Ratio	1.27	0.98	0.06	0.84	0.98	0.18		0.80		0.45	0.67	
Control Delay	183.2	79.2	0.1	76.8	85.6	2.8		35.7		22.1	24.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	183.2	79.2	0.1	76.8	85.6	2.8		35.7		22.1	24.9	
LOS	F	E	A	E	F	A		D		C	C	
Approach Delay		112.5			65.6			35.7			24.3	
Approach LOS		F			E			D			C	
Queue Length 50th (ft)	~88	169	0	39	141	0		129		30	166	
Queue Length 95th (ft)	#422	#613	0	#211	#529	25		282		94	425	
Internal Link Dist (ft)		370			601			236			220	
Turn Bay Length (ft)	100		50	100		50				200		
Base Capacity (vph)	202	405	1135	154	334	1085		1336		286	1211	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	22%
Maximum Green (s)	23.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

2030 Build Weekday Evening - Elm Square - MassWorks Grant Alternative  
 9: Route 28 & Central Street/Elm Street

03/13/2024



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.27	0.98	0.04	0.84	0.98	0.12		0.47		0.45	0.44	

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 87.9	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.27	
Intersection Signal Delay: 60.4	Intersection LOS: E
Intersection Capacity Utilization 90.6%	ICU Level of Service E
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 9: Route 28 & Central Street/Elm Street

Ø2	Ø3	Ø4	Ø9
62 s	11 s	21 s	26 s
Ø5	Ø6	Ø7	Ø8
9.5 s	52.5 s	10 s	22 s

Lane Group	Ø9
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	