



Traffic Impact and Access Study

Station Avenue Area Rezoning Proposal

Groton, Massachusetts

Prepared For:

**Town of Groton Planning Board
Groton Town Hall
173 Main Street
P.O. Box 669
Groton, MA 01450**

By:

**Fay, Spofford & Thorndike
15 Broad Street, Suite 301
Boston, MA 02109**

February 2007

Contents

	<u>Page</u>
I. INTRODUCTION - SETTING AND KEY CIRCULATION ISSUES	1
II. EXISTING CIRCULATION CONDITIONS	6
a. Study Area Summary	9
b. Counts Summary	8
c. Peak Hour Level of Service Analysis Results	13
III. FUTURE 2017 NO-ACTION CONDITIONS	15
IV. FUTURE 2017 REZONED BUILD-OUT CONDITIONS	19
V. CONCLUSIONS AND RECOMMENDATIONS	27

TECHNICAL APPENDIX

Manual Count Data (Source: FST Count Program 1/10/07)

Automatic Count Data (Source: Historical Data Sources)

AM/PM Peak Traffic Operations Analysis Sheets - 2007 Existing Conditions

AM/PM Peak Traffic Operations Analysis Sheets - 2017 No-Action Conditions

AM/PM Peak Traffic Operations Analysis Sheets - 2017 Re-zoned Buildout Conditions

Detailed Trip Generation Analysis

Parking Analysis

List of Figures

	<u>Page</u>	
1	USGS and Nashua River Rail Trail Vicinity Maps	2
2	Station Avenue Area Study Intersections	3
3	Station Avenue Study Area- Aerial View	4
4	2007 AM Average Annual Existing Traffic Volumes	10
5	2007 Midday Average Annual Existing Traffic Volumes	11
6	2007 PM Average Annual Existing Traffic Volumes	12
7	2017 No-Action AM Average Annual Traffic Volumes	10
8	2017 No-Action PM Average Annual Traffic Volumes	12
9	Station Avenue 'New' Trip Distribution Pattern	23
10	2017 Re-developed Full-Build AM Peak Hour Traffic Volumes	24
11	2017 Re-developed Full-Build PM Peak Hour Traffic Volumes	25
12	Recommended Access Strategy	30

List of Tables

		<u>Page</u>
1	Level of Service Criteria	13
2	2007 AM, Midday, and PM Peak Hour Intersection Capacity Analysis	14
3	2017 AM and PM Peak Hour Intersection Capacity Analysis with 'No-Action'	18
4	Trip Generation Estimates – Groton Station Area	20
4A	Trip Generation Estimates – Long Term Dodson Plan	22
5	2017 AM and PM Peak Hour Intersection Capacity Analysis with Moderate Rezoning	23

I. INTRODUCTION – SETTING AND KEY CIRCULATION ISSUES

At the request of the Town of Groton, FST was retained to explore the circulation impacts associated with potential re-zoning of the Station Avenue Area illustrated on Figures 1-3. Figure 1 shows the Station Avenue Area's (the Area) location on the Nashua River Rail Trail and on a US Geological Society base map. Figure 2 is a close-up of the traffic study intersections evaluated and Figure 3 provides aerial view of the Area.

In its entirety, the Area consists of 12 separate parcels on approximately 6.8 acres of public and privately-owned land generally located on the southwest segment of Station Avenue between Court Street and Broadmeadow Road. **(Note, 3 new parcels were added along the west side Station Avenue south of Town Hall; while the areas are not shown on the displays, traffic from these parcels is included in the analysis).** Inbound vehicle access to the site is provided via Broadmeadow Road, Station Avenue, Court Street, Adams Avenue and Playground Road (technically not a public way). Because Court Street and Broadmeadow Road are one-way westbound, egress from the land can only occur via Station Avenue, and to a less degree, Adams Avenue and Playground Road.

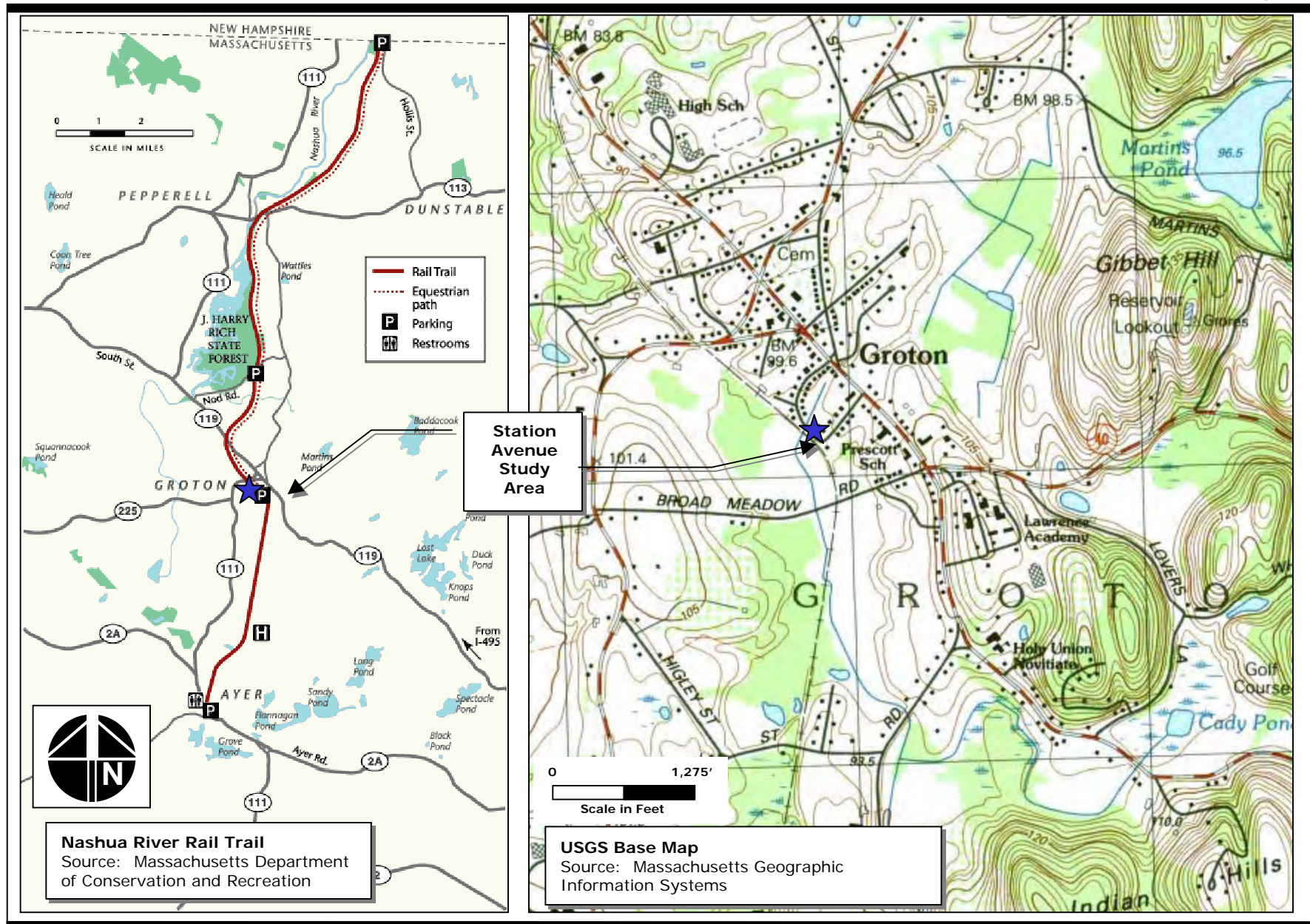
The Area is characterized by a mix of existing land uses including:

- ❑ Groton Electric Light Department;
- ❑ Buckingham Bus Lines;
- ❑ Office uses;
- ❑ Commercial (light industrial) uses;
- ❑ 3 single family homes; and
- ❑ Nashua River Rail Trail (Department of Conservation and Recreation).

At issue is a desire of the Town to improve the character of the Station Avenue Area as a Town resource for recreational activities, in particular the attractiveness and use of the Nashua River Rail Trail by Town residents. It is envisioned that the Station Avenue Area rezoning will allow the Town to enhance access to the Rail Trail and transform existing Station Avenue Area land uses into land uses that function around the clock. From a Town financial perspective, it is our understanding the Area re-zoning should either be revenue neutral or increase Groton's tax base. Increasing recreational and commuter bicycle use of the Nashua River Rail Trail is an important aspect of the redevelopment of the Station Avenue Area. The Nashua River Rail trail extends approximately 11 miles between Ayer, Massachusetts and Nashua, New Hampshire. The Nashua River Rail Trail was dedicated in October 2002. It has an equestrian path from the Station Avenue area northerly. It allows users, for example, to travel between Station Avenue and the MBTA Commuter Rail Station in Ayer, a 3-4 mile distance, in 15-20 minutes. It would therefore provide a travel option for new residents who might otherwise choose to travel in single or low occupancy autos and is expected to incorporate restroom facilities and biking amenities (ice cream shop) to increase its public use. Also, the plan calls for the provision of additional parking spaces for persons wishing to use the Rail Trail.

While enhancing the character of the Area is the goal, the Court Street residential neighborhood needs to be protected from the negative impacts of increased traffic and, possibly, increased parking demands. The Town is also very concerned about how the potential redevelopment of the Station Avenue Area will affect traffic in Groton's Center. Already, traffic through the Area is congested on Main Street during the morning and evening peak hours. This study addresses the traffic impacts of the re-zoning, and whether access for all necessary travel modes – autos, cars, trucks, emergency vehicles, buses, and pedestrians – can be adequately accommodated without adversely affecting the Groton Center or the Court Street neighborhood.

Figure 1

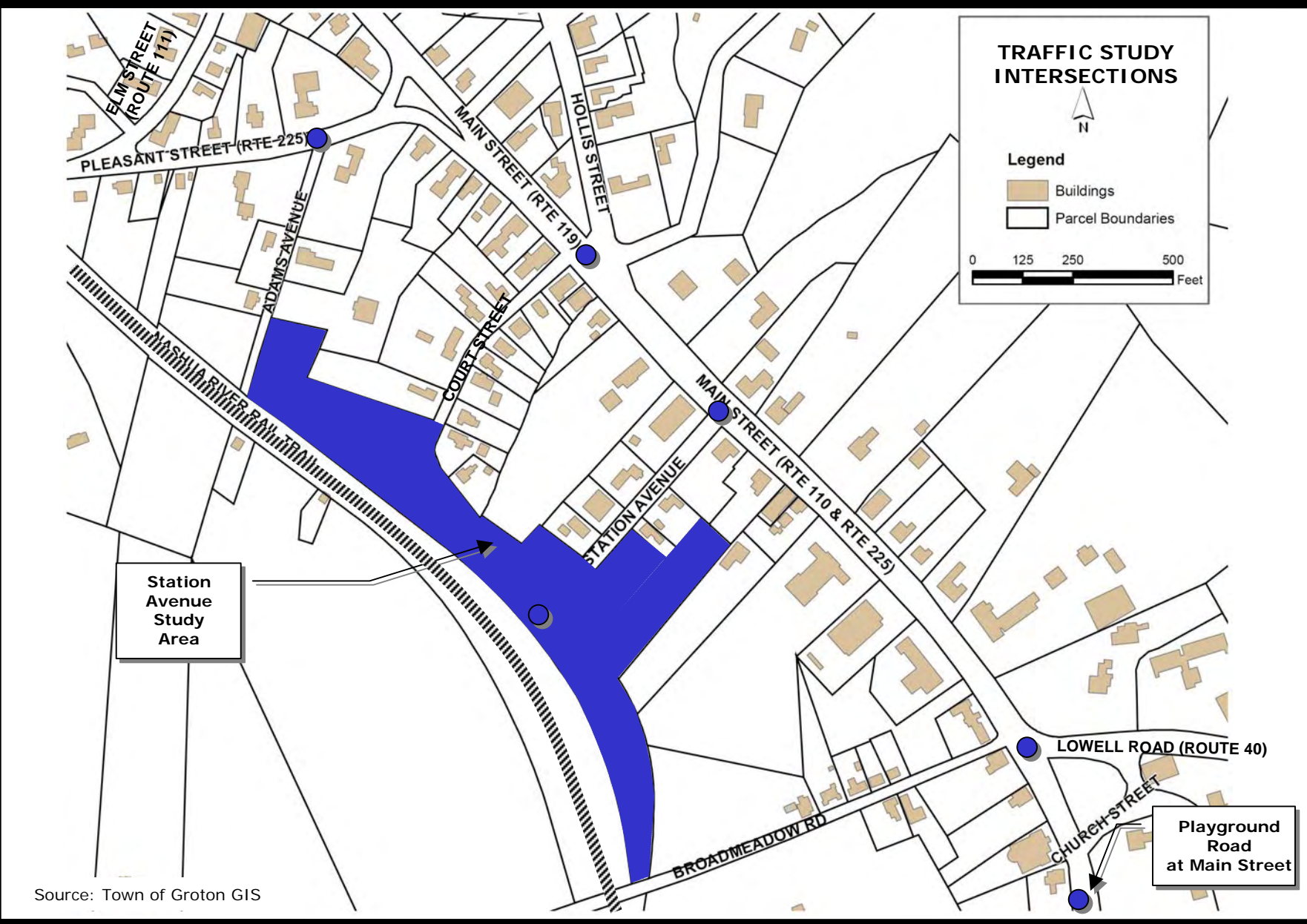


Fay, Spofford & Thorndike

Groton, Massachusetts
Station Avenue Area Redevelopment Study

USGS and Nashua River Rail Trail Vicinity Maps

Figure 2



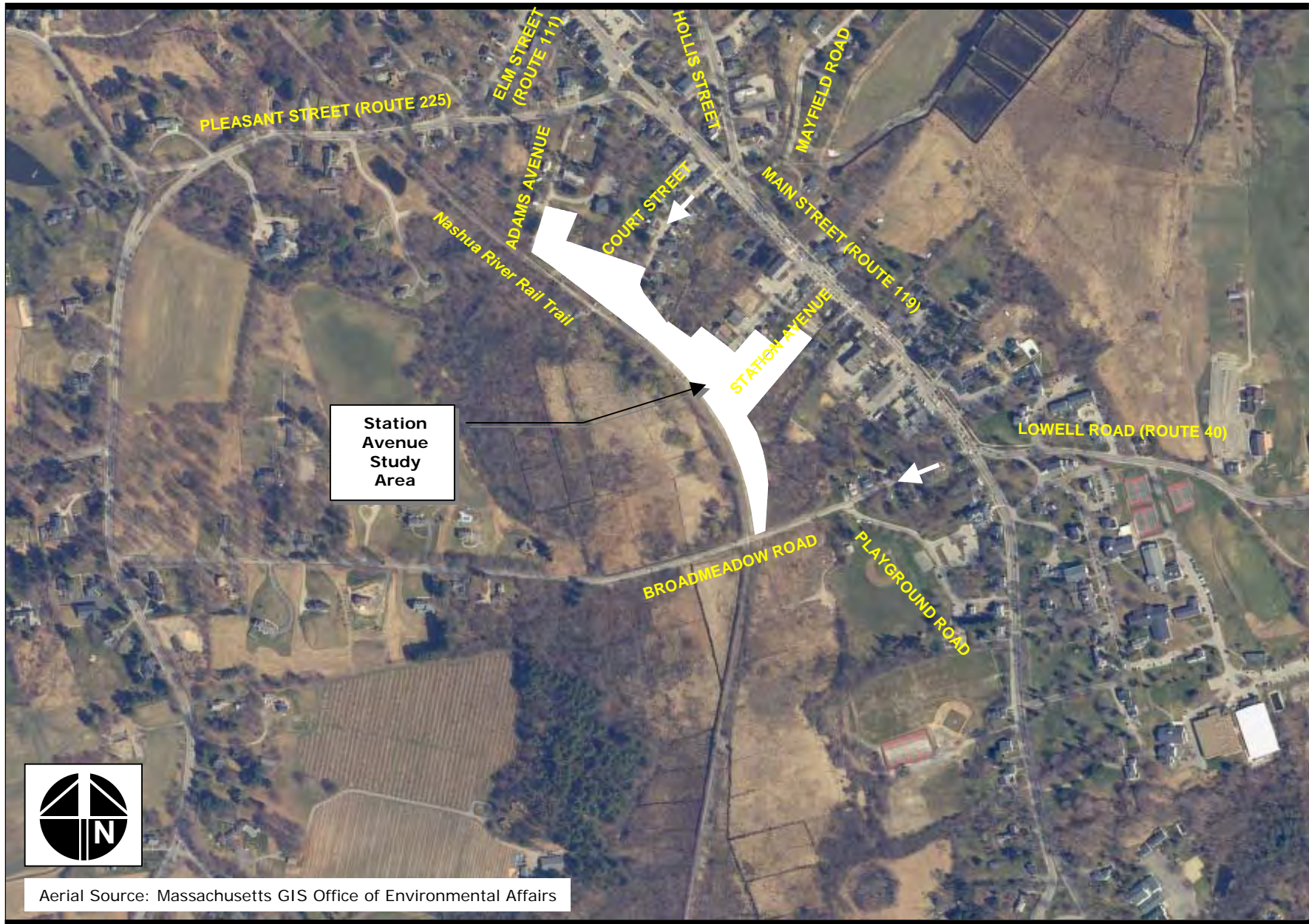
Source: Town of Groton GIS

Fay, Spofford & Thorndike

Groton, Massachusetts
Station Avenue Area Redevelopment Study

Station Avenue Area Study Intersections

Figure 3



Station Avenue Study Area – Aerial View

During fall, 2005, the Town of Groton prepared a “*GELD Station Avenue Land Use Committee Final Report*” and asked for proposals to redevelop the Station Avenue Area. Two responses were submitted -- one by Capstone Properties and the other by Beaudane Properties, LLC. The Beaudane Properties proposal envisioned a larger, higher-density development scenario of the entire 6.2-acre Area, while the Capstone proposal dealt with the 3.4-acre area under public control south of Station Avenue. It is our understanding the Town accepted the Capstone Properties proposal. In its entirety, the Capstone proposal includes 22 one-two bedroom residences and approximately 11,000 square feet of retail space, comprised of a 4,600 square foot restaurant and 6,400 square feet of unspecified retail space.

This traffic circulation study evaluates existing traffic, pedestrian, and bike circulation conditions in the area and a long-term scenario with and without the redevelopment.

To provide a conservative analysis, FST has evaluated the Town-accepted Capstone Properties plan in conjunction with long-term features of the Beaudane Properties plan outside the Capstone Properties area for a potential 2017 horizon year. From the Beaudane Properties proposal, FST assumed a long-term plan with an additional 32 residential condominium units (a grand total of 54 units for the Area) plus an additional 5,400 square feet of unspecified retail space filling out the remainder of 6.2-acre Area.¹

¹ To provide a highly conservative analysis, this includes an assumption that the unspecified future development site on the Beaudane Properties draft plan would be developed with an estimated 5,400 square feet of unspecified ground floor retail space with 6 residential units above the ground floor space.

II. EXISTING CIRCULATION CONDITIONS

a. Study Area Summary

To identify existing circulation conditions around the Station Avenue Area, FST conducted observations and manual turning movement counts at the six intersections cited on Figure 2. From Figure 2, the count locations, from west to east, included the following intersections:

- **Adams Avenue at Pleasant Street (Route 225)**

Adams Avenue is a residential street with 2 single-family homes, one small apartment building, and one business along it. Adams Avenue is a two-way road. It has no sidewalks and its curb-to-curb width is approximately 15-16 feet. Pleasant Street is 23 feet wide and has edge lines and a double yellow centerline, with one lane in each direction. A new 6-foot sidewalk that includes 2 feet of vegetation was recently constructed on the north side of Pleasant Street, as indicated on the photo at right.



Looking west on Pleasant at Adams Avenue



Court Street looking east to Main Street

- **Court Street, Hollis Street, and Main Street (Routes 119 & 225)**

Court Street is one-way westbound between its intersection with Main Street and the bus company parcel adjacent to the Nashua River Rail Trail. Between Main Street and the bus company parcel, Court Street has closely-spaced single family residential dwelling units. Court Street has a 4 – 6 foot sidewalk on its north side and parking is permitted on both sides. Its approximate curb-to-curb width west of Main Street varies from just under

20 to 28 feet on its approach to Main Street. Hollis Street has a channelized island to separate left turns from Hollis Street onto Main Street. The island allows left turning

vehicles to intersect Main Street at a 90° angle. However, southeastbound left-turns from Main Street must make an acute-angled left turn movement to access Hollis Street. Both Main Street and Hollis Street have one travel lane in each direction. Main Street has parking on both sides, except along 60 feet on the westbound side at Hollis Road. Crosswalks are provided on the west side and across the Court Street opening (see photo to the right). Main Street is approximately 48 feet curb-to-curb north of Hollis Street, while Hollis Street is approximately 34-35 feet curb-to-curb northeast of the channelization island. Sidewalks are provided on both sides of Hollis Street. The sidewalk on the northbound side is 7 feet wide while the sidewalk on the southbound side is 3.5 feet wide.



Looking east on Main Street to Hollis Road away from Court Street

- **Station Avenue at Main Street (Route 119)**



Looking northwest on Main Street from Station

Station Avenue is two-way between Main Street and Court Street. Station Avenue is stop-sign controlled at its intersection with Main Street. On its approach to Main Street, Station Avenue is approximately 36 feet wide, wide enough to accommodate separate left and right turning vehicles approaching simultaneously. Parking is permitted on both sides of Station Avenue.

Main Street has one lane in each direction approaching Station Street with parking and sidewalks on both sides and a double yellow centerline. Station Avenue has a crosswalk on



Looking east on Station Avenue from GELD

its approach to Main Street ending at Town Hall on the southbound side and on the northbound side there is a crosswalk from Station Avenue #11 to Main Street. Both sidewalks are 5.5 feet wide. Station Avenue is 35.5 feet wide curb-to-curb just west of Main Street, and Main Street is 48 feet wide curb-to-curb just north of Station Avenue.

- **Broadmeadow Rd., Lowell Rd. (Route 40), and Main Street (Route 119)**



Looking south to Main Street across Lowell Road



Looking north on Main Street at Broadmeadow Road

Lowell Road intersects Main Street on northerly skew to form a four-way intersection with Broadmeadow Road. It has one travel lane in each direction and no on-street parking. Broadmeadow Road is one-way westbound away from Main Street and is slightly offset from Lowell Road at Main Street. Main Street also has one lane in each direction and a double yellow centerline.



Looking east on Broadmeadow Road at Playground Road

The Town is considering modest safety modifications to the Main Street at Broadmeadow and Lowell Roads intersection to improve its geometry without traffic signalization. Main Street is approximately 40 feet curb-to-curb north of Lowell Road. At its intersection with Main Street, Broadmeadow Road is approximately 21 feet curb-to-curb, and Lowell Road is approximately 25 feet curb-to-curb. Broadmeadow Road is bounded by low-density residential uses and rural open space.



Looking east on Main Street near Playground Road

- **Main Street and Playground Road (this is a driveway, *not* a public way)**

Playground Road is approximately 14 feet wide curb-to-curb on its approach to Main Street. Playground Road is one-way eastbound to Main Street and also serves the Groton Public Library parking lot via a left-turn from Broadmeadow Road. Playground Road is 18 feet wide near its intersection at Broadmeadow Road.

Light Department (GELD) driveway and the Rail Trail parking area at the Court Street Extension



Station Avenue looking northeast from the Nashua River Rail Trail

- **Station Avenue near Nashua River Rail Trail and the Groton Electric**

Station Avenue is uncontrolled at its intersection with Court Street and the paved parking lot serving the rail trail. Station Avenue is approximately 22 feet wide curb-to-curb east of its intersection with the Court Street extension.

b. Counts Summary

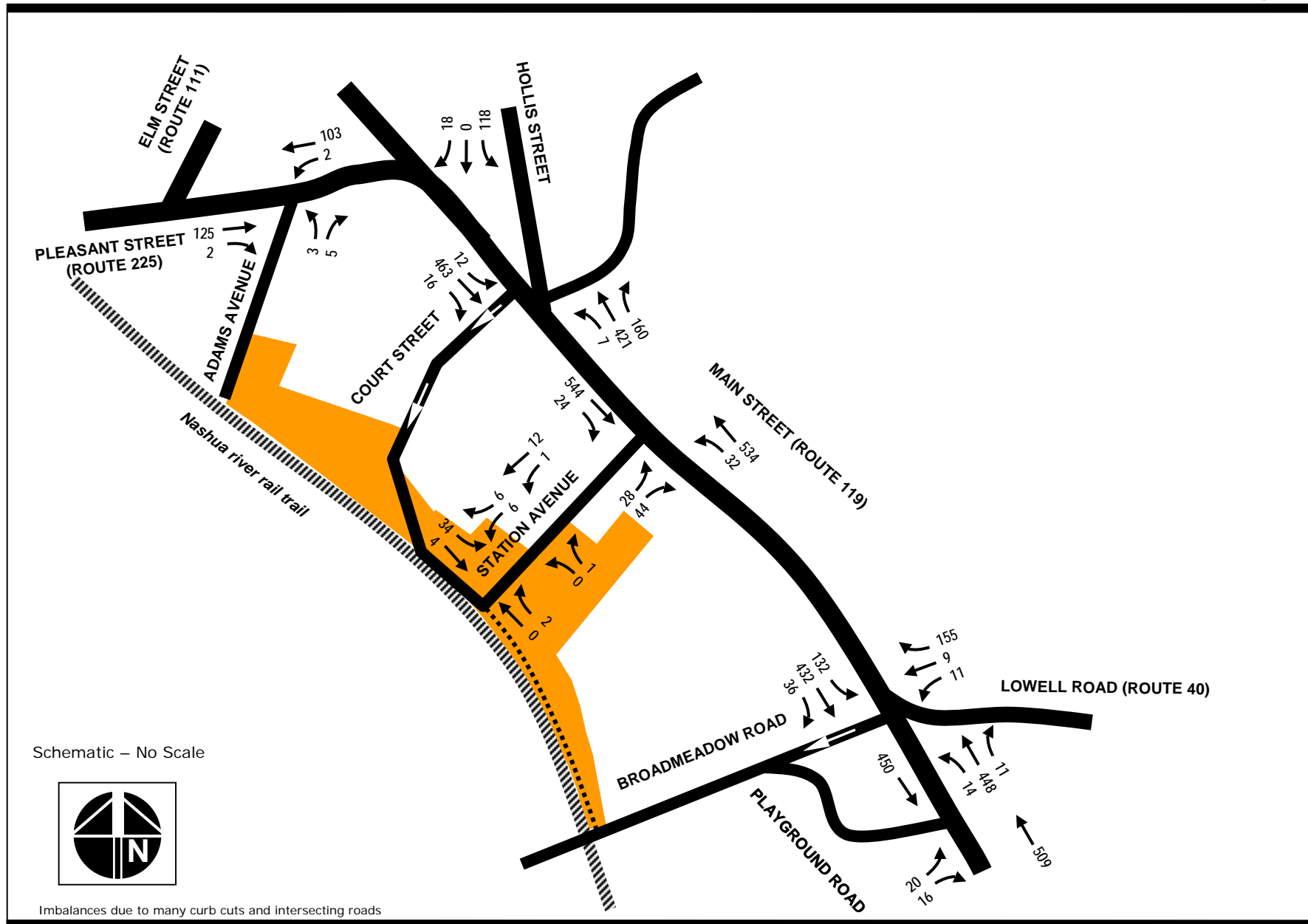
The Groton Station Area Study count program was conducted during the hours of 7-9 AM, 11-1 PM, and 4-6 PM on Wednesday, January 10, 2007. From the count data, the AM, Midday, and PM peak hours were identified and are illustrated on Figures 4 to 6. Additionally,

automatic traffic recorder count data was obtained from the Montachusett Regional Planning Commission. From the automatic traffic recorder information, Main Street carries approximately 16,400 vehicles per day south of Lowell Road.

Illustrated peak hour counts were adjusted to reflect average annual conditions for the year 2007. In accordance with the MassHighway statewide monthly factors for count data obtained between during 2006, traffic volumes counted during the month of January should be increased by 2% to estimate average annual traffic volumes. Therefore, the counted January volumes illustrated on Figures 4-6 are 2% higher than the volumes counted in the field to provide a conservative analysis.

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GROTON	AT PEPPERELL T.L.								14,600		
GROTON	WEST OF SCHOOL ST.	16,400			14,200			16,100			15,900
GROTON	NORTH OF RTE.225								15,900		
GROTON	NORTH OF RTE.40								20,800		
GROTON	SOUTH OF RTE.40										16,400

Figure 5



Fay, Spofford & Thorndike

Groton, Massachusetts
Station Avenue Area Redevelopment Study

2007 Midday Average Annual Peak Hour Traffic Volumes

c. Peak Hour Level of Service Analysis Results

Intersection Capacity Analysis

Traffic level of service results from the Synchro®6 computer analysis program, which employs the Highway Capacity Manual (HCM2000) analysis methodology, were used to assess peak hour traffic conditions. Levels of service were calculated for the five study area intersections with Main Street. A level of service (LOS) is assigned based upon the average amount of delay each motorist experiences entering the intersection during the peak 15 minute period of the peak hour. This is then translated into a simple scorecard-like rating from A to F. LOS A is optimal with no or very little delay. LOS E is considered to represent capacity or near capacity conditions. LOS F is the least desirable condition, representing average motorist delays of 50 seconds or more at unsignalized locations.

The criteria for unsignalized intersections such as those in Groton, are provided in Table 1 below. **Only critical opposing movements are calculated in the V/C.** In reality, when congestion occurs at unsignalized intersections, the through traffic capacity *is* affected by conflicting movements from side streets. When left and right turn conflicting movements from the side streets have insufficient gaps to enter the main streams of traffic flow, they can change the dynamics of how ‘gap acceptance’ works. For example, in Groton (as in many communities), when the peak direction of Main Street (Route 119) becomes congested, motorists on Main Street have been observed to alternate access to Main Street between through and conflicting movements.

At unsignalized intersections, the volume/capacity (V/C) ratio is generally more critical than the Level of Service. If the V/C exceeds 1 with an LOS F, it means that there are an insufficient number of gaps in traffic to allow traffic to complete desired turning or crossing movements from a stop-controlled intersection (e.g., a left or right turn), which could represent a hazardous condition. When LOS F is calculated for an individual movement where the V/C is less than 1, it means the motorist, without slowing of the through traffic to forced flow conditions, has sufficient traffic gaps to make the movement, but with delay greater than 50 seconds, on average during the peak 15-minute period of the peak hour.

**TABLE 1 - LEVEL OF SERVICE CRITERIA
UNSIGNALIZED INTERSECTIONS¹**

Level of Service	Average Delay Per Vehicle (sec/veh) ²
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

- 1 Highway Capacity Manual (HCM2000), Transportation Research Board.
- 2 seconds per vehicle during the peak 15 minute period of the peak hour.

Table 2 on the page that follows summarizes existing levels of service on an average annual basis at the intersections where counts were performed.

TABLE 2 – 2007 AM, MIDDAY, AND PM PEAK HOUR INTERSECTION CAPACITY ANALYSIS – STATION STUDY AREA

INTERSECTION BY APPROACH			
	Avg. Delay in seconds/vehicle ¹	V/C ratio ²	LOS ³
AM (Midday) [PM] - Peak Hours			
Pleasant Street (Rte. 225) at Adams Avenue			
Pleasant St eastbound	0 (0) [0]	0.09 (0.08) [0.08]	A (A) [A]
Pleasant St westbound	<1 (0) [<1]	0.00 (0.00) [0.00]	A (A) [A]
Adams Avenue northbound	9 (9) [9]	0.02 (0.01) [0.02]	A (A) [A]
Main Street (Rte. 119) at Hollis Street and Court Street			
Main Street southeast ⁴	<1 (0) [1]	0.01 (0.01) [0.02]	A ⁴ (A) [A]
Main Street northwest	0 (0) [<1]	0.00 (0.01) [0.01]	A (A) [A]
Hollis Street southwest	100+ (59) [100+]	1+ (0.73) [1+]	F (F) [F]
Main Street at Station Avenue			
Main Street southeast ⁴	0 (0) [0]	0.82 (0.36) [0.38]	A ⁴ (A) [A]
Main Street northwest	0 (1) [1]	0.04 (0.04) [0.03]	A (A) [A]
Station Avenue northeast	44 (19) [47]	0.27 (0.16) [0.48]	E (C) [F]
Main Street at Broadmeadow Road and Lowell Road (Rte. 40)			
Main Street southeast	6 (3) [6]	0.21 (0.13) [0.22]	A ⁴ (A) [A]
Main Street northwest	1 (<1) [1]	0.04 (0.01) [0.04]	A (A) [A]
Lowell Road west	64 (21) [100+]	0.79 (0.47) [1+]	F (C) [F]
Main Street at Playground Road			
Main Street southbound	0 (0) [0]	0.64 (0.29) [0.28]	A ⁴ (A) [A]
Main Street northbound	0 (0) [0]	0.30 (0.33) [0.69]	A (A) [A]
Playground Road eastbound	27 (17) [31]	0.10 (0.12) [0.21]	D (C) [D]

1 Av. Delay - Average Delay expressed in seconds per vehicle for worst movement during the **15 minute peak period of the peak hour.**

2 V/C Ratio - Volume to Capacity Ratio from Synchro 6 Analysis

3 LOS – Level of Service A-F, where A is the best, F the worst.

4 Congestion observed during AM peak on Main Street due to upstream traffic conflicts.

From the above table, turning movements from Hollis Street and Lowell Road onto Main Street are operating the worst of the intersections studied. Only the intersection of Pleasant Street with Adams Avenue and Playground Road at Main Street operate at levels A-D during all three periods evaluated.

During the AM and PM peak hours, turning movements from Station Avenue onto Main Street are operating with congestion, although the volume to capacity ratio is less than 1, meaning there are sufficient gaps in traffic on Main Street to allow Station Avenue traffic to access it.

III. FUTURE 2017 'NO-ACTION' CONDITIONS

If the Station Avenue Area is not rezoned, over time, background traffic unrelated to the Station Avenue redevelopment will continue to grow modestly. While potential long-range improvements to the Nashua River Rail Trail parking area, such as a new parking lot, may occur, the 'No-Action' Alternative assumes retention of the status quo.

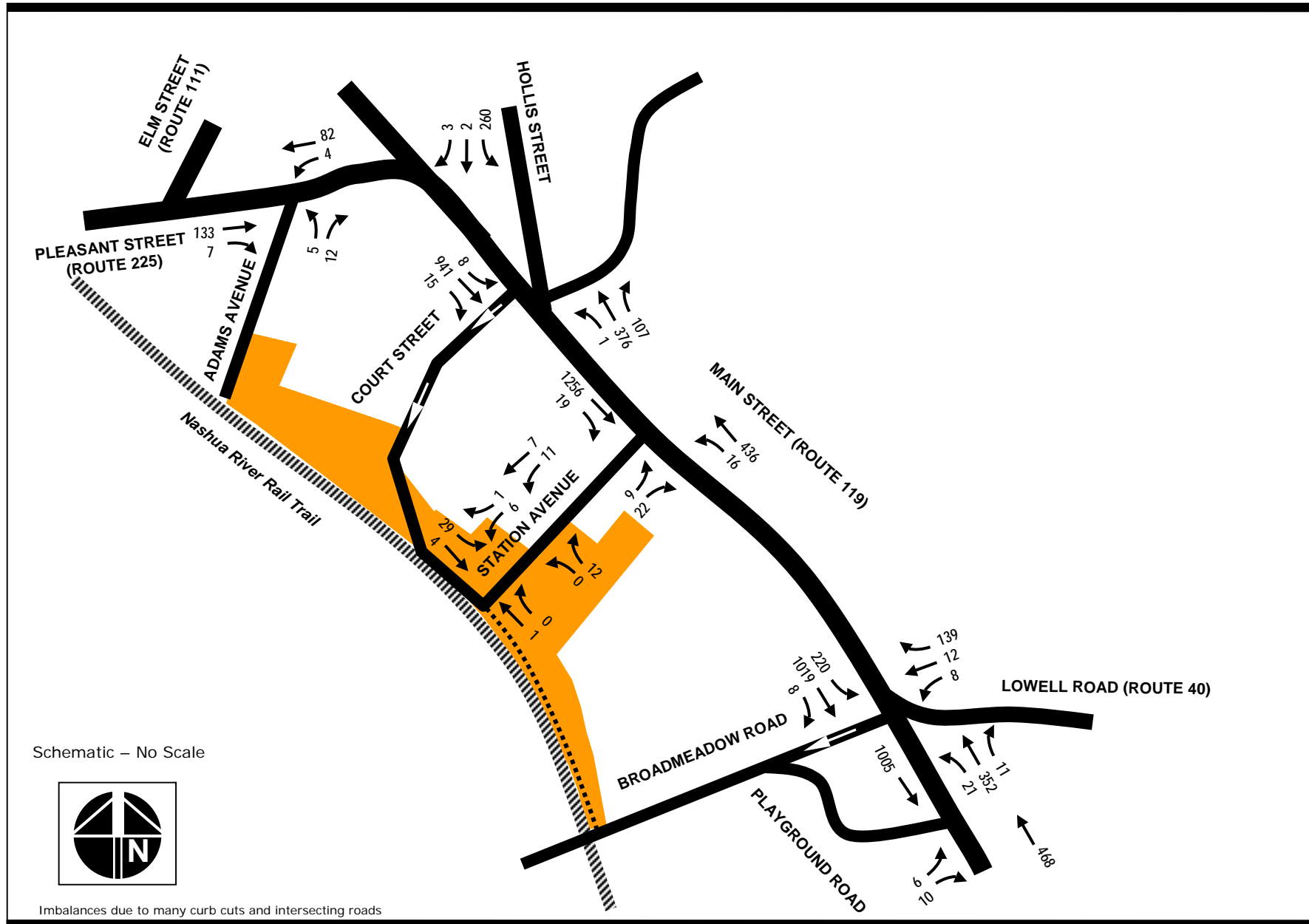
Because peak hour congestion already occurs on Main Street (Route 119) in the Station Avenue area -- southeastbound during the AM peak hour and northeastbound during the PM peak hour -- traffic volumes in the peak direction are expected to stabilize. The duration of congestion will increase as time goes on, but the physical ability of Main Street to accommodate additional traffic will remain as it is today. **It is our understanding that the Town is committed not to alter the roadway capacity from physical changes to Main Street through its historic Center.** The 'No-Action' Alternative also assumes all the uses in the potential Station Avenue rezoned Area remain as they are today. Therefore traffic volumes entering and leaving Court Street and Station Avenue are assumed as they are today. Traffic volumes on other roadways that are connected to areas outside the Area (i.e., Broadmeadow Road, Pleasant Street, Lowell Road, etc.) were also increased 10% to reflect background traffic growth.

For analysis purposes, the 'No-Action' Alternative allows growth in both directions of Main Street (Route 119) traffic, even though the peak direction of traffic *is* capacity-restrained. Observations indicate the peak direction capacity of Main Street (Route 119) is already exceeded during the morning peak hour. *Therefore, traffic growth projected in the peak direction may not be processed under typical conditions.* With the exception of Court Street and Station Avenue, to keep projections consistent, we have assumed an overall growth in peak hour traffic of 10% between 2007 and 2015 to assess 'No-Action' conditions to the 'Re-zoned Build' conditions. We arrived at this estimate by assuming that over the next ten years, traffic through Groton will increase in accordance with Groton's projected increase in population (6%)² times the inverse of the projected change in its population per household (2.85 in 2005 vs. 2.8 projected in 2015). We anticipate this is a conservative estimate of peak hour traffic growth, as the increase in traffic generated in nearby communities that use Groton's roadway system is not expected to be as high as Groton's population growth. Additionally, on a 24-hour basis, traffic volumes may actually be higher than 10% assuming that off-peak traffic volumes grow at a greater rate than peak hour traffic volumes.

Projected 2017 'No-Action' AM and PM peak hour traffic volumes are provided on Figures 7 and 8. Projected intersection capacity conditions are provided on Table 3, which can be compared to the analysis results from Table 2. Basically, identified AM and PM peak hour congestion issues from Table 2 are, not surprisingly, expected to worsen slightly by the year 2017 with the assumed growth in background traffic.

² MRPC 2003 Regional Transportation Plan.

Figure 4

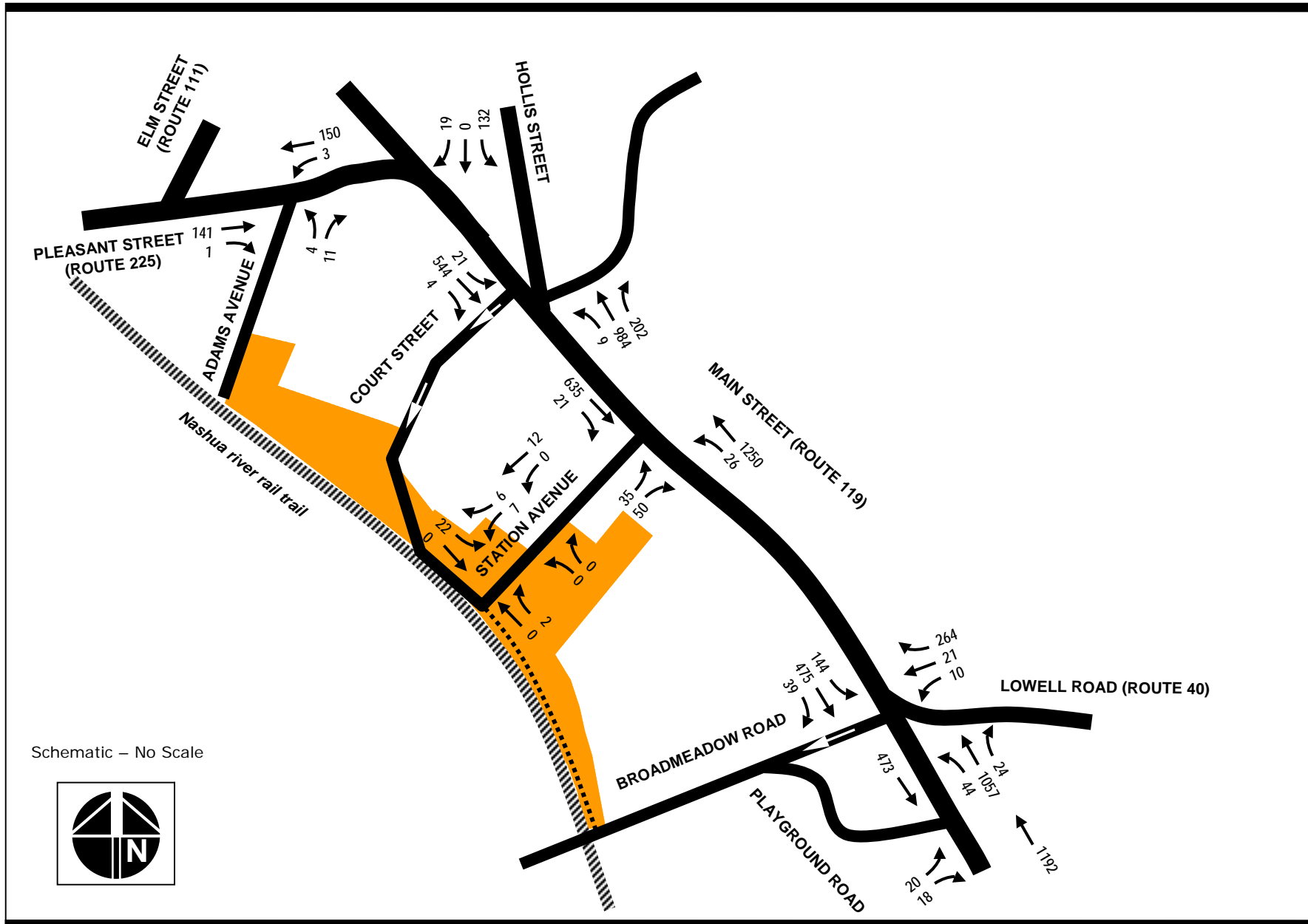


Fay, Spofford & Thorndike

Groton, Massachusetts
Station Avenue Area Redevelopment Study

2007 AM Average Annual Peak Hour Traffic Volumes

Figure 8



Fay, Spofford & Thorndike

Groton, Massachusetts
Station Avenue Area Redevelopment Study

2017 PM No-Action Peak Hour Traffic Volumes

TABLE 3 – 2017 AM AND PM PEAK HOUR INTERSECTION CAPACITY ANALYSIS – STATION STUDY AREA WITH ‘NO-ACTION’

INTERSECTION BY APPROACH			
	Avg. Delay in seconds/vehicle ¹	V/C ratio ²	LOS ³
AM [PM] Peak Hours			
Pleasant Street (Rte. 225) at Adams Avenue			
Pleasant St eastbound	0 [0]	0.10 [0.09]	A [A]
Pleasant St westbound	<1 [<1]	0.00 [0.00]	A [A]
Adams Avenue northbound	10 [10]	0.03 [0.02]	A [A]
Main Street (Rte. 119) at Hollis Street and Court Street			
Main Street southeast ⁴	<1 [1]	0.01 [0.05]	A ⁴ [A]
Main Street northwest	0 [<1]	0.00 [0.01]	A [A]
Hollis Street southwest	100+ [100+]	1+ [1+]	F [F]
Main Street at Station Avenue			
Main Street southeast ⁴	0 [0]	0.90 [0.38]	A ⁴ [A]
Main Street northwest	0 [2]	0.04 [0.03]	A [A]
Station Avenue northeast	49[76]	0.19 [0.70]	E [F]
Main Street at Broadmeadow Road and Lowell Road (Rte. 40)			
Main Street southeast	8 [7]	0.23 [0.26]	A ⁴ [A]
Main Street northwest	1 [2]	0.04 [0.05]	A [A]
Lowell Road west	100+ [100+]	1+ [1+]	F [F]
Main Street at Playground Road			
Main Street southbound	0 [0]	0.71 [0.30]	A ⁴ [A]
Main Street northbound	0 [0]	0.33 [0.76]	A [A]
Playground Road eastbound	33 [40]	0.13 [0.29]	D [E]

1 Av. Delay - Average Delay expressed in seconds per vehicle for worst movement during the **15 minute peak period of the peak hour.**

2 V/C Ratio - Volume to Capacity Ratio from Synchro 6 Analysis

3 LOS – Level of Service A-F, where A is the best, F the worst.

4 Congestion observed during AM peak on Main Street due to upstream traffic conflicts.

IV. FUTURE 2017 RE-ZONED FULL BUILDOUT CONDITIONS

The Town has accepted the Capstone proposal for the Station Avenue Area. However, to provide a conservative long-term analysis for the Station Avenue area, FST has assumed that the Capstone proposal and elements of the Beaudane proposal outside the Capstone proposal area will be redeveloped. As cited in the Introduction, this means that the following will occur:

- Capstone Proposal (accepted by the Town):
 - 22 one-two bedroom residential ‘flats’;
 - 4,600 square foot restaurant/depot near the Nashua River Rail Trail; and
 - 6,400 square feet of ground floor retail uses adjacent to the south side of Station Avenue.
- In the long term, the following additional Station Avenue Area development was assumed:
 - 32 additional condominium dwelling units; and
 - 5,400 square feet of additional ground floor retail on the north side of Station Avenue.

To assist the Town in its consideration of the long-term use of the Station Avenue Area, FST has also estimated the trip generation associated with the Capstone Proposal. These estimates are detailed on Table 4.

From Table 4, FST concludes that expected new trip generation from the *short-term* redevelopment of the Station Avenue Area (i.e., the Capstone redevelopment plan) will:

- Increase vehicle traffic on a 24-hour typical weekday by approximately 656 vehicle trips per day (328 trips in and out) compared to existing conditions of approximately 310 vehicle trips per day (155 trips in and out); and
- Due to the nature of the proposed land uses, traffic is expected to decrease during the morning peak hour, and increase by approximately 33 vehicle trips during the PM peak hour. Of these, approximately 27 ‘new’ vehicle trips will be inbound to the Area, while 4 ‘new’ vehicle trips will be added outbound from the Area compared to the existing land uses.

And, the expected new trip generation from the conservative *long-term* redevelopment plan will:

- Increase vehicle traffic on a 24-hour typical weekday by approximately 1,078 vehicle trips per day (539 trips in and out); and
- Similar to the short-term situation, due to the nature of the proposed land uses, traffic is expected to decrease during the morning peak hour, and increase by approximately 69 vehicle trips during the PM peak hour. Of these, approximately 47 ‘new’ vehicle trips will be inbound to the Area, while 22 ‘new’ vehicle trips will be added outbound from the Area compared to the existing land uses.

**Table 4
Trip Generation Estimates - Groton Station Area**

Groton, Massachusetts									
POTENTIAL LONG TERM Total Trips for Existing and Proposed Station Avenue Redevelopment									
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr		
<i>Existing Uses</i>									
Buckingham Bus Lines	5,000 sf	N/A	54	18	18	0	0		
GELD	8,335 sf	N/A	54	18	18	0	0		
Residential	3	Single Family Detached	29	2	3	30	3		
Office	5,000 sf	Office	55	8	7	12	2		
Commercial	1,500 sf	Office	17	2	2	4	1		
Rail Trail	N/A	N/A	100	10	10	150	15	FST estimate average annual	
Total			308	58	59	196	20		
<i>Proposed (Capstone and Beaudane) Uses</i>									
Rail Trail	N/A	N/A	150	15	15	200	20	FST estimate average annual	
Retail	11,800 sf	Shopping Center	507	12	44	590	59		
Small Restaurant	4,600 sf	Quality Restaurant	414	N/A	41	402	50		
Residential Condos/ Townhouse	54 units	Residential Condo/ Townhouse	316	24	28	306	25		
Rail Trail Depot	1,200 sf	<i>Trail related retail - no new vehicle trips</i>							
Total			1387	51	128	1498	154		
Total Difference (proposed - existing)			1078	-7	69	1302	133		
Total Entering Trips for Existing and Proposed Station Avenue Redevelopment									
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr		
<i>Existing Uses</i>									
Buckingham Bus Lines	5,000 sf	N/A	27	11	7	0	0		
GELD	8,335 sf	N/A	27	11	7	0	0		
Residential	3	Single Family Detached	14	1	2	15	2		
Office	5,000 sf	Office	28	7	1	6	1		
Commercial	1,500 sf	Office	8	2	0	2	0		
Rail Trail	N/A	N/A	50	10	0	75	15	FST estimate average annual	
Total			154	41	18	98	18		
<i>Proposed (Capstone and Beaudane) Uses</i>									
Rail Trail	N/A	N/A	75	15	0	100	20	FST estimate average annual	
Retail	11,800 sf	Shopping Center	254	5	21	295	31		
Small Restaurant	4,600 sf	Quality Restaurant	207	N/A	26	201	29		
Residential Condos/ Townhouse	54 units	Residential Condo/ Townhouse	158	4	18	153	14		
Rail Trail Depot	1,200 sf	<i>Trail related retail - no new vehicle trips</i>							
Total			693	24	65	749	93		
Total Difference (proposed - existing)			539	-17	47	651	75		
Total Exiting Trips for Existing and Proposed Station Avenue Redevelopment									
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr		
<i>Existing Uses</i>									
Buckingham Bus Lines	5,000 sf	N/A	27	7	11	0	0		
GELD	8,335 sf	N/A	27	7	11	0	0		
Residential	3	Single Family Detached	14	2	1	15	1		
Office	5,000 sf	Office	28	1	6	6	1		
Commercial	1,500 sf	Office	8	0	2	2	0		
Rail Trail	N/A	N/A	50	0	10	75	0	FST estimate average annual	
Total			154	17	41	98	3		
<i>Proposed (Capstone and Beaudane) Uses</i>									
Rail Trail	N/A	N/A	75	0	15	100	0	FST estimate average annual	
Retail	11,800 sf	Shopping Center	254	7	23	295	28		
Small Restaurant	4,600 sf	Quality Restaurant	207	N/A	16	201	20		
Residential Condos/ Townhouse	54 units	Residential Condo/ Townhouse	158	20	10	153	12		
Rail Trail Depot	1,200 sf	<i>Trail related retail - no new vehicle trips</i>							
Total			693	27	64	749	60		
Total Difference (proposed - existing)			539	10	22	651	58		

Groton, Massachusetts									
POTENTIAL SHORT TERM Total Trips for Existing and Proposed Station Avenue Redevelopment									
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr		
<i>Existing Uses</i>									
Buckingham Bus Lines	5,000 sf	N/A	54	18	18	0	0		
GELD	8,335 sf	N/A	54	18	18	0	0		
Residential	3	Single Family Detached	29	2	3	30	3		
Office	5,000 sf	Office	55	8	7	12	2		
Commercial	1,500 sf	Office	17	2	2	4	1		
Rail Trail	N/A	N/A	100	10	10	150	15	FST estimate average annual	
Total			308	58	59	196	20		
<i>Proposed (Capstone) Uses</i>									
Rail Trail	N/A	N/A	150	15	15	200	20	FST estimate average annual	
Retail	6,400 sf	Shopping Center	275	7	24	320	32		
Small Restaurant	4,600 sf	Quality Restaurant	414	N/A	41	402	50		
Residential Condos/ Townhouse	22 units	Residential Condo/ Townhouse	125	10	11	125	10		
Total			964	32	91	1047	112		
Total Difference (exist./prop.)			656	-26	33	852	91		
Total Entering Trips for Existing and Proposed Station Avenue Redevelopment									
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr		
<i>Existing Uses</i>									
Buckingham Bus Lines	5,000 sf	N/A	27	11	7	0	0		
GELD	8,335 sf	N/A	27	11	7	0	0		
Residential	3	Single Family Detached	14	1	2	15	2		
Office	5,000 sf	Office	28	7	1	6	1		
Commercial	1,500 sf	Office	8	2	0	2	0		
Rail Trail	N/A	N/A	50	10	0	75	15	FST estimate average annual	
Total			154	41	18	98	18		
<i>Proposed (Capstone) Uses</i>									
Rail Trail	N/A	N/A	75	15	0	100	20	FST estimate average annual	
Retail	6,400 sf	Shopping Center	138	3	12	160	17		
Small Restaurant	4,600 sf	Quality Restaurant	207	N/A	26	201	29		
Residential Condos/ Townhouse	22 units	Residential Condo/ Townhouse	63	2	7	63	5		
Total			482	20	44	524	71		
Total Difference (exist./prop.)			328	-22	27	426	53		
Total Exiting Trips for Existing and Proposed Station Avenue Redevelopment									
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr		
<i>Existing Uses</i>									
Buckingham Bus Lines	5,000 sf	N/A	27	7	11	0	0		
GELD	8,335 sf	N/A	27	7	11	0	0		
Residential	3	Single Family Detached	14	2	1	15	1		
Office	5,000 sf	Office	28	1	6	6	1		
Commercial	1,500 sf	Office	8	0	2	2	0		
Rail Trail	N/A	N/A	50	0	10	75	0	FST estimate average annual	
Total			154	17	41	98	3		
<i>Proposed (Capstone) Uses</i>									
Rail Trail	N/A	N/A	75	0	15	100	0	FST estimate average annual	
Retail	6,400 sf	Shopping Center	138	4	12	160	15		
Small Restaurant	4,600 sf	Quality Restaurant	207	N/A	16	201	20		
Residential Condos/ Townhouse	22 units	Residential Condo/ Townhouse	63	8	4	63	5		
Total			482	12	47	524	40		
Total Difference (exist./prop.)			328	-4	6	426	38		

To assess the changes in trip generation due to the conservative long range redevelopment of the Station Avenue Area, FST applied the additional traffic from Table 4 and prepared a traffic projection with the Area during the typical weekday AM and PM peak hours for the long range analysis year of 2017 – a 10-year planning horizon.

Summarized on Table 4A, the Town also provided a summary of the full site development option developed by Dodson Associates. The Dodson long-range development scenario produces higher trip generation than the combined Beaudane/Capstone proposal discussed above. Compared to the existing trip generation from the Area, trip generation from the Dodson *long-term* redevelopment plan would be expected to:

- Increase vehicle traffic on a 24-hour typical weekday by approximately 1,660 vehicle trips per day (830 trips in and out); and
- Due to the nature of the proposed land uses, traffic is expected to increase during the morning and evening peak hour by approximately 24 vehicle 125 vehicle trips, respectively. During the morning peak hour, approximately 4 ‘new’ vehicle trips will be inbound to the Area, while 20 ‘new’ vehicle trips will be added outbound from the Area compared to the existing land uses. During the evening peak hour, approximately 69 ‘new’ vehicle trips will be inbound to the Area, while 56 ‘new’ vehicle trips will be added outbound from the Area compared to the existing land uses.

Using the journey-to-work data, in conjunction with the turning movement findings from the newly obtained count data, FST identified a composite traffic projection pattern for new vehicle trips expected to be generated by the Area during the 2017 AM and PM peak hours. Refer to Figure 9 for the assumed trip distribution pattern for new Station Area development. Resulting traffic volumes are presented on Figures 10 and 11.

Assuming the 2017 AM and PM peak hour volume projections from Figures 10 and 11, we projected traffic operating conditions at the affected intersections and summarized the results on Table 5. Because the 2017 AM peak hour is projected to create a net loss in vehicle trips compared to the ‘No-Action’ Alternative, projected full build out traffic operations with the conservative Station Avenue Area rezoning concept are nearly identical to those projected with the ‘No-Action’ Alternative.

During the PM peak hour, because a net increase of 22 vehicles is anticipated in vehicle trips leaving from the Station Avenue Area redevelopment site, slight reductions in levels of service/delay are projected compared to the ‘No-Action’ Alternative. Comparing Table 5 to Table 4, the only notable change is at the intersection of Station Avenue with Main Street. While the level of service would be LOS F with or without the rezoning change, left turning motorists will notice an increase in delay involving left turns, because the v/c for left turning motorist on the Station Avenue approach to Main Street will be greater than 1 (i.e., 1.01). While the ‘No-Action’ Alternative, Station Avenue would have a 95th percentile queue length of approximately 3 vehicles (72 feet), the Station Avenue Area rezoning concept results in a 95th percentile queue length of approximately 4 vehicles (105 feet). While the delays with or without the development would be significant, the ability to turn left out of Station Avenue will be made somewhat more difficult during the PM peak period by increasing the left turning volume by approximately 12 vehicles per hour or an additional left turning vehicle every 5 minutes.

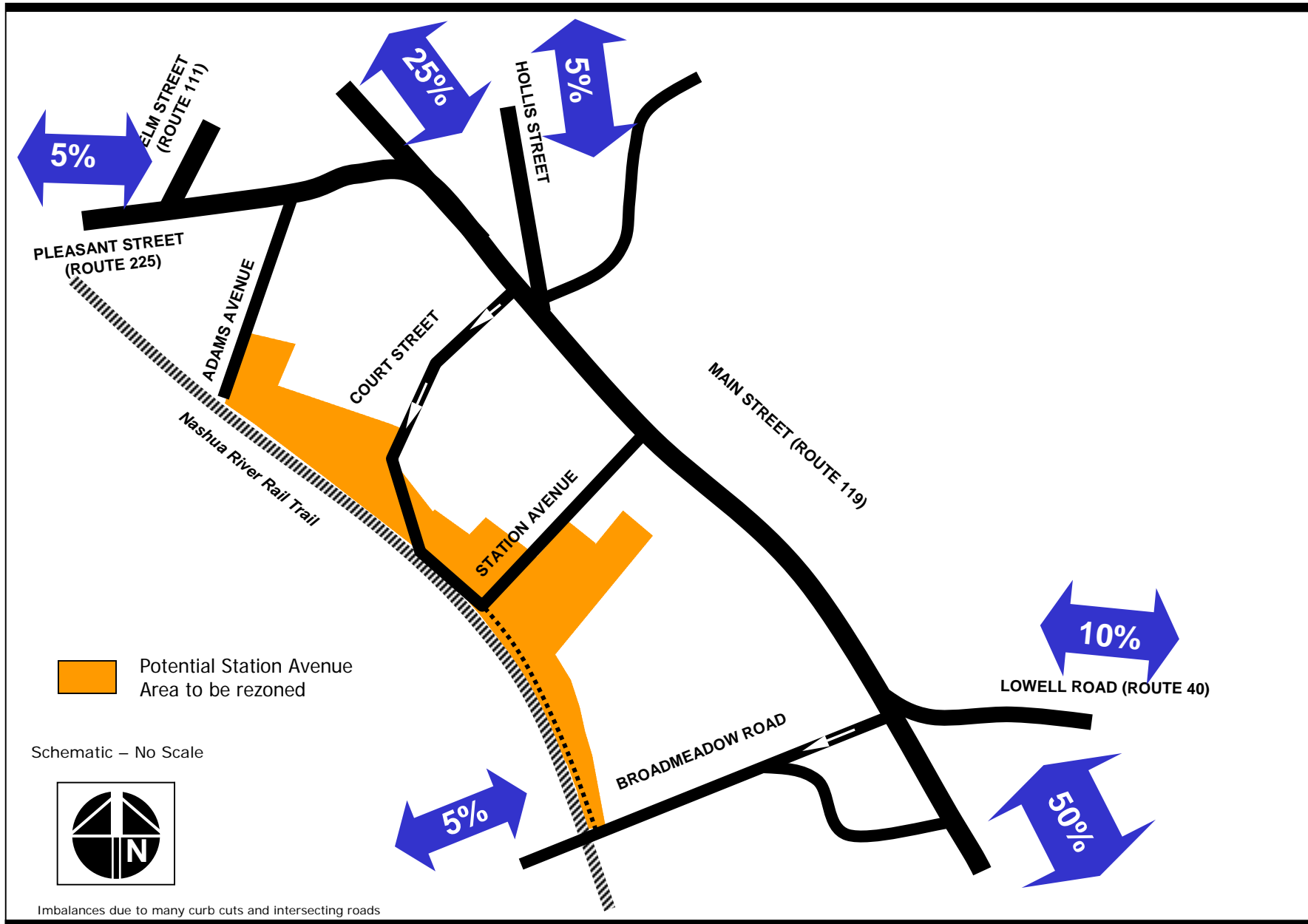
Table 4A

Trip Generation Estimates - Long Term Dodson Plan

POTENTIAL LONG TERM Total Trips for Existing and Proposed Station Avenue Redevelopment

Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr	
<i>Existing Uses</i>								
Buckingham Bus Lines	5,000 sf	N/A	54	18	18	0	0	
GELD	8,335 sf	N/A	54	18	18	0	0	
Residential	3	Single Family Detached	29	2	3	30	3	
Office	5,000 sf	Office	55	8	7	12	2	
Commercial	1,500 sf	Office	17	2	2	4	1	
Rail Trail	N/A	N/A	100	10	10	150	15	FST estimate average annual
Total			308	58	59	196	20	
<i>Proposed Dodson Uses</i>								
Rail Trail	N/A	N/A	150	15	15	200	20	FST estimate average annual
Retail	22,900 sf	Shopping Center	983	24	86	1144	114	
Small Restaurant	4,600 sf	Quality Restaurant	414	4	41	434	50	
Residential Condos/ Townhouse	56 units	Residential Condo/ Townhouse	316	24	28	306	25	
New Office Space	9,600 sf	General Office	106	15	14	23	4	
Total			1969	82	184	2107	213	
Total Difference (proposed - existing)			1660	24	125	1910	192	
Total Entering Trips for Existing and Proposed Station Avenue Redevelopment								
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr	
<i>Existing Uses</i>								
Buckingham Bus Lines	5,000 sf	N/A	27	11	7	0	0	
GELD	8,335 sf	N/A	27	11	7	0	0	
Residential	3	Single Family Detached	14	1	2	15	2	
Office	5,000 sf	Office	28	7	1	6	1	
Commercial	1,500 sf	Office	8	2	0	2	0	
Rail Trail	N/A	N/A	50	10	0	75	15	FST estimate average annual
Total			154	41	18	98	18	
<i>Proposed Dodson Uses</i>								
Rail Trail	N/A	N/A	75	15	0	100	20	FST estimate average annual
Retail	22,900 sf	Shopping Center	492	9	41	572	59	
Small Restaurant	4,600 sf	Quality Restaurant	207	3	26	217	29	
Residential Condos/ Townhouse	56 units	Residential Condo/ Townhouse	158	4	18	153	14	
New Office Space	9,600 sf	General Office	53	13	2	11	2	
Total			984	45	87	1053	124	
Total Difference (proposed - existing)			830	4	69	955	106	
Total Exiting Trips for Existing and Proposed Station Avenue Redevelopment								
Description	Units	ITE Trip Generation Usage	Weekday	AM Peak	PM Peak	Sat.	Sat. Pk Hr	
<i>Existing Uses</i>								
Buckingham Bus Lines	5,000 sf	N/A	27	7	11	0	0	
GELD	8,335 sf	N/A	27	7	11	0	0	
Residential	3	Single Family Detached	14	2	1	15	1	
Office	5,000 sf	Office	28	1	6	6	1	
Commercial	1,500 sf	Office	8	0	2	2	0	
Rail Trail	N/A	N/A	50	0	10	75	0	FST estimate average annual
Total			154	17	41	98	3	
<i>Proposed Dodson Uses</i>								
Rail Trail	N/A	N/A	75	0	15	100	0	FST estimate average annual
Retail	22,900 sf	Shopping Center	492	15	45	572	55	
Small Restaurant	4,600 sf	Quality Restaurant	207	N/A	16	217	20	
Residential Condos/ Townhouse	56 units	Residential Condo/ Townhouse	158	20	10	153	12	
New Office Space	9,600 sf	General Office	53	2	12	11	2	
Total			984	37	98	1053	89	
Total Difference (proposed - existing)			830	20	56	955	86	

Figure 9

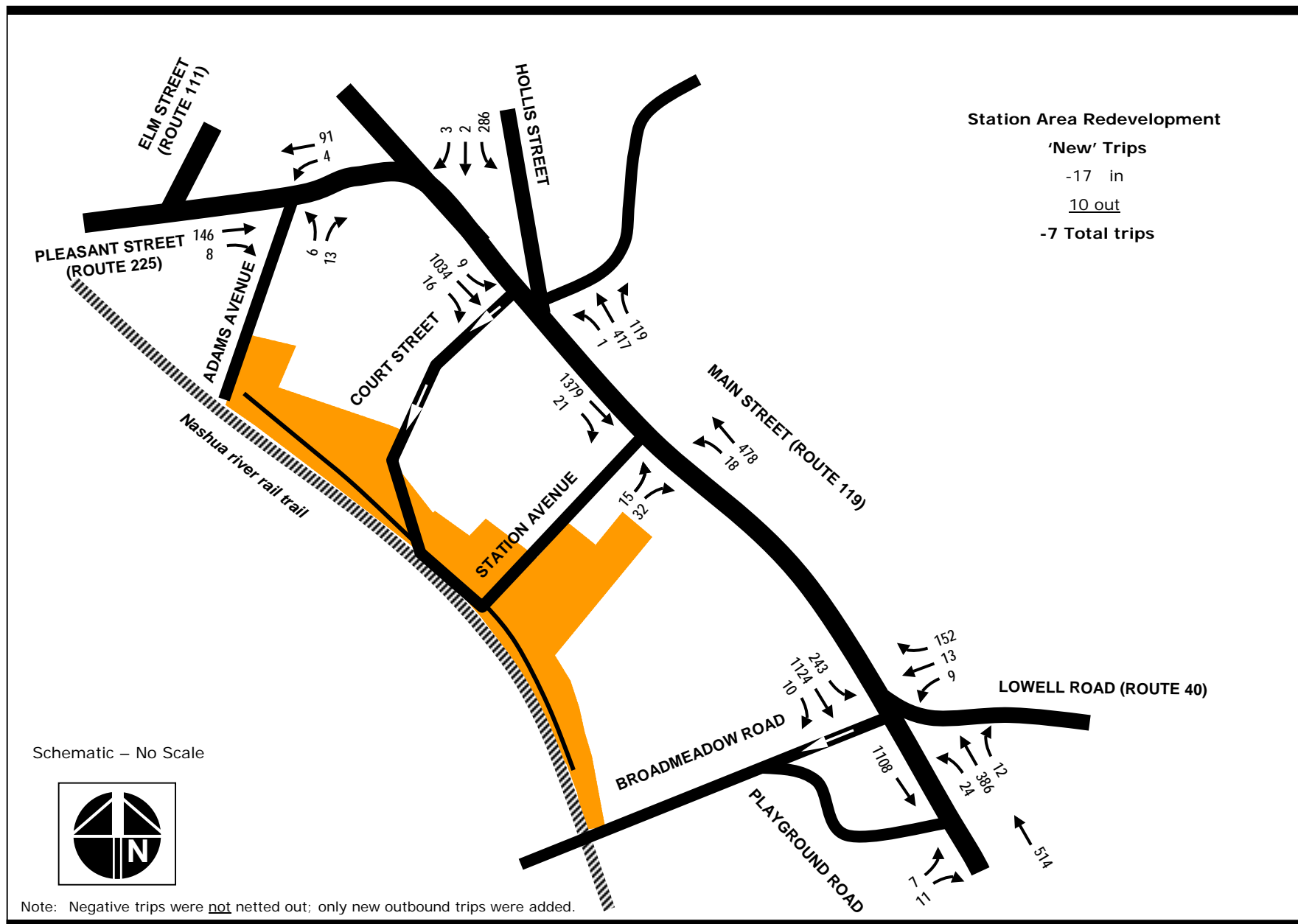


Fay, Spofford & Thorndike

Groton, Massachusetts
Station Avenue Area Redevelopment Study

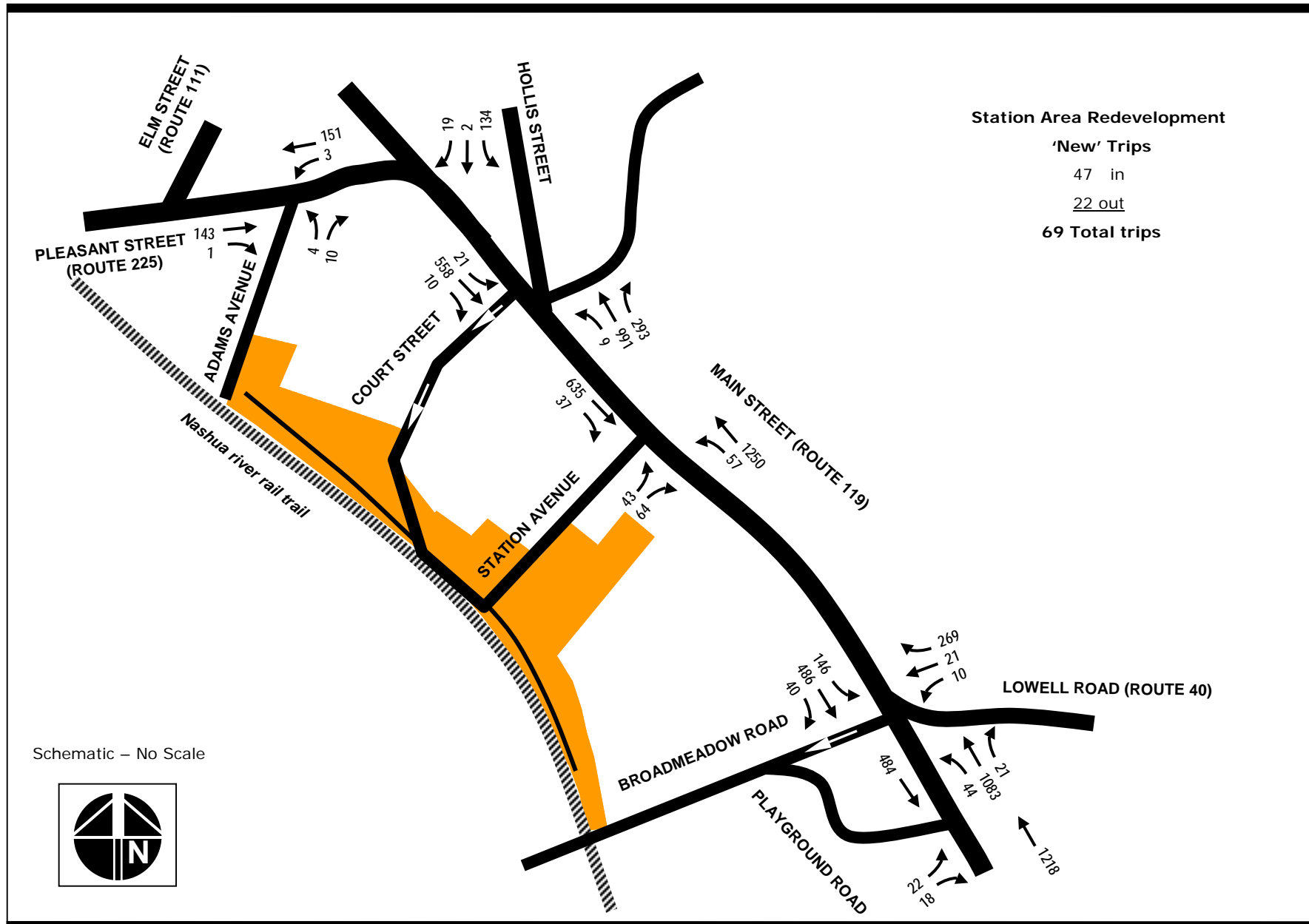
Station Avenue 'New' Trips Distribution Pattern

Figure 10



2017 Re-developed Full-Build AM Peak Hour Traffic Volumes

Figure 11



2017 Re-developed Build PM Peak Hour Traffic Volumes

TABLE 5 – 2017 AM AND PM PEAK HOUR INTERSECTION CAPACITY ANALYSIS – STATION STUDY AREA WITH REZONING FULL BUILDOUT (ASSUMES FST MODERATE ESTIMATE)

INTERSECTION BY APPROACH			
	Avg. Delay in seconds/vehicle ¹	v/c ratio ²	LOS ³
AM [PM] Peak Hours			
Pleasant Street (Rte. 225) at Adams Avenue			
Pleasant St eastbound	0 [0]	0.10 [0.09]	A [A]
Pleasant St westbound	<1 [<1]	0.00 [0.00]	A [A]
Adams Avenue northbound	10 [10]	0.03 [0.02]	A [A]
Main Street (Rte. 119) at Hollis Street and Court Street			
Main Street southeast ⁴	1 [1]	0.01 [0.05]	A ⁴ [A]
Main Street northwest	0 [<1]	0.00 [0.01]	A [A]
Hollis Street southwest	100+ [100+]	1+ [1+]	F [F]
Main Street at Station Avenue			
Main Street southeast ⁴	0 [0]	0.90 [0.43]	A ⁴ [A]
Main Street northwest	0 [2]	0.04 [0.03]	A [A]
Station Avenue northeast	54 ⁵ [119]	0.29 [1.01]	F [F]
Main Street at Broadmeadow Road and Lowell Road (Rte. 40)			
Main Street southeast	8 [7]	0.23 [0.27]	A ⁴ [A]
Main Street northwest	1 [2]	0.05 [0.05]	A [A]
Lowell Road west	100+ [100+]	1+ [1+]	F [F]
Main Street at Playground Road			
Main Street southbound	0 [0]	0.71 [0.31]	A ⁴ [A]
Main Street northbound	0 [0]	0.33 [0.78]	A [A]
Playground Road eastbound	33 [45]	0.13 [0.33]	D [E]

- 1 Av. Delay - Average Delay expressed in seconds per vehicle for worst movement during the **15 minute peak period of the peak hour.**
- 2 V/C Ratio - Volume to Capacity Ratio from Synchro 6 Analysis
- 3 LOS – Level of Service A-F, where A is the best, F the worst.
- 4 Congestion observed during AM peak on Main Street due to upstream traffic conflicts.
- 5 Assumes vehicles separate into left and right lanes on the approach to Main Street.

IV. CONCLUSIONS AND RECOMMENDATIONS

From the trip generation analysis, we find that the redevelopment of the Station Avenue Area will add slightly over 1,000 new vehicle trips per day in aggregate to study area roadways vs. over 1,600 vehicle trips per day with the Dodson redevelopment proposal. This assumes no reduction for pass-by trips related to the retail development (one could assume that at least 25% of retail trips will come from the passing traffic on Main Street. The vast majority of the new trips will be realized on Station Avenue (vs. Court Street).

Our summary recommended access strategy is provided on Figure 12.

On the basis of observations and the count program, our strategic access recommendations and conclusions are as follows:

- Station Avenue should, and will be, the primary multi-modal access road to the site. Good pedestrian (sidewalks) and bike access should be provided along it between Town Hall and the Rail Trail. Court Street, Adams Avenue, and Broadmeadow Roads all have issues relative to sensitive abutters and we conclude it is unnecessary to provide general vehicle access to them to and from the potentially rezoned Station Avenue Area.
- Vehicle access serving the new development along Station Avenue should be provided as far north (east) on Station Avenue as possible to discourage access via Court Street. Exits could be provided as far south as necessary for uses south of Station Avenue.
- General vehicle access should not be provided via Broadmeadow Road, Court Street, or Adams Avenue. However, it is recommended that good pedestrian and bike access as well as provisions for emergency access should be provided along each of these access routes that have narrow layouts and residential uses.
- A traffic calming gateway feature, such as a speed hump might be considered at the southerly end of Court Street where it joins the prospective re-zoned area. Other more stringent measures (e.g., a gate accessed only by Court Street residences) should only be considered if residents find that noticeable vehicle intrusions are occurring. The Court Street/Adams Avenue Extension should be two-way between Station Avenue and the westerly terminus of Adams Avenue. Court Street's access to what is now the Court Street extension needs to remain, such that Court Street residents can exit via Station Avenue, as they do today. An access looping between Court Street and Adams Avenue is acceptable from a circulation perspective *if it is acceptable to the abutters of both streets* under an assumption that residential development would be focused on the loop road connecting the two westerly terminuses of Court Street and Adams Avenue.
- Like Court Street, the character of Adams Avenue, which has a narrower cross-section than Court Street, should be retained. An emergency access gate via Adams Avenue should also be considered to enhance its emergency access via the new Court Street/Adams Avenue Extension that should be designed in such a manner to accommodate fire trucks (from the Station Avenue fire station). Consideration should be given to the possible installation of a new 4-foot sidewalk on the southeast side of Adams

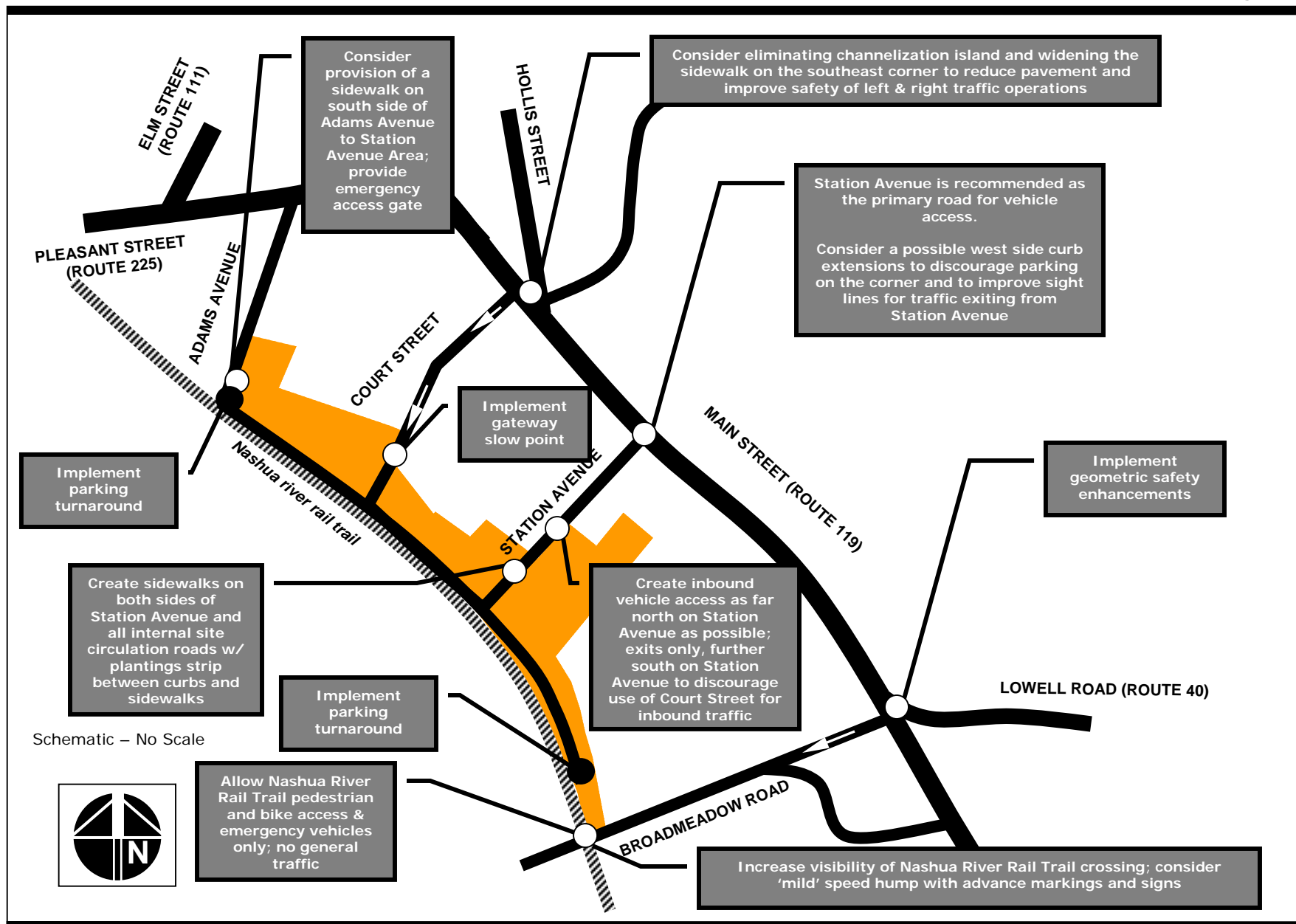
Avenue to enhance pedestrian access via Pleasant Street, as long as a 20-foot travel way can be maintained. Adams Avenue, as a low volume street, should also be used to provide bicycle access to the Nashua River Rail Trail.

- Crash rates at study area intersections were found to be below statewide average crash rates. Therefore, one should be advised that ‘if it isn’t broken, don’t fix it’. Nonetheless, a review of field conditions prompted some suggestions of measures that might enhance safety at the intersections with the worst historical safety records:
 - *Hollis Street at Court and Main Streets* experienced 11 reported crashes, or just under 4 reported crashes per year, between 2003 and 2005, a three-year period. Its crash rate is below the statewide average for unsignalized intersections. The Hollis Street intersection with Main Street, Mayfield Road, and Court Street will be minimally affected by the potential rezoning of the Station Avenue Area. Its geometry should be considered for revisions to eliminate the existing channelization island and create a slower right turn movement from Main Street to Hollis Street and allow left turns to enter from the same intersection as the right turning traffic. This would also reduce the length of the Hollis Street pedestrian crossing. Any potential changes to Hollis Street should be considered within the historical context of the area.
 - *Station Avenue with Main Street* experienced 8 reported crashes, or just under 3 reported crashes per year between 2003 and 2005. The majority of these crashes were rear-end crashes. Consideration might be given to a corner curb extensions in front of Town Hall to improve the east and west sight lines for left and right turning movements from Station Avenue onto Main Street, especially since the Station Avenue redevelopment will have the most significant impacts on traffic volumes at this intersection – its volumes could grow 2-2.5 times existing volumes, or just under what is currently being carried by Pleasant Street on its approach to Main Street.
 - *Main Street intersection with Lowell Road and Broadmeadow Road*, the Town has proposed modest intersection improvements. While it does not have a high crash rate, this intersection experienced 8 reported crashes or just under 3 reported crashes per year between 2003 and 2005. It is recommended that the proposed modifications be implemented.
 - *Pleasant Street at Main Street* also experienced 8 reported crashes or just under 2 reported crashes per year between 2003 and 2005. Speculative geometric measures including a potential modern roundabout and realignment of the intersection that could reduce the lengths of pedestrian crossings would need to be considered within the historical context of the area.
- Measures should be taken to increase the visibility of the Nashua River Rail Trail crossing of Broadmeadow Road. Possibly consider a mildly raised crossing with appropriate pavement markings (e.g., Durotherm® inlaid markings and minimal

additional signage to provide better warning of the crossing and slow warning signs. Whatever changes are made should be done to increase the visibility of the crosswalk, drawing greater attention to it *without changing the ability to plow it or traverse it at its designated 30 miles per hour speed limit.*

- Parking turnarounds should be created on both ends of the Station Avenue development area for the roadway between Adams Avenue and Broadmeadow Road with provisions for emergency access and bicycle/pedestrian access. We anticipate that if Broadmeadow Road is open to general traffic (other than during emergencies), an undesirable significant increase in traffic will occur on Broadmeadow and Playground Roads, particularly for outbound traffic attempting to access Main Street to the southeast.

Figure 12



Recommended Access Strategy

Technical Appendix

Manual Count Data

N/S Street : Main Street
 E/W Street: Hollis St / Court St
 City/State : Groton, MA
 Weather : Clear

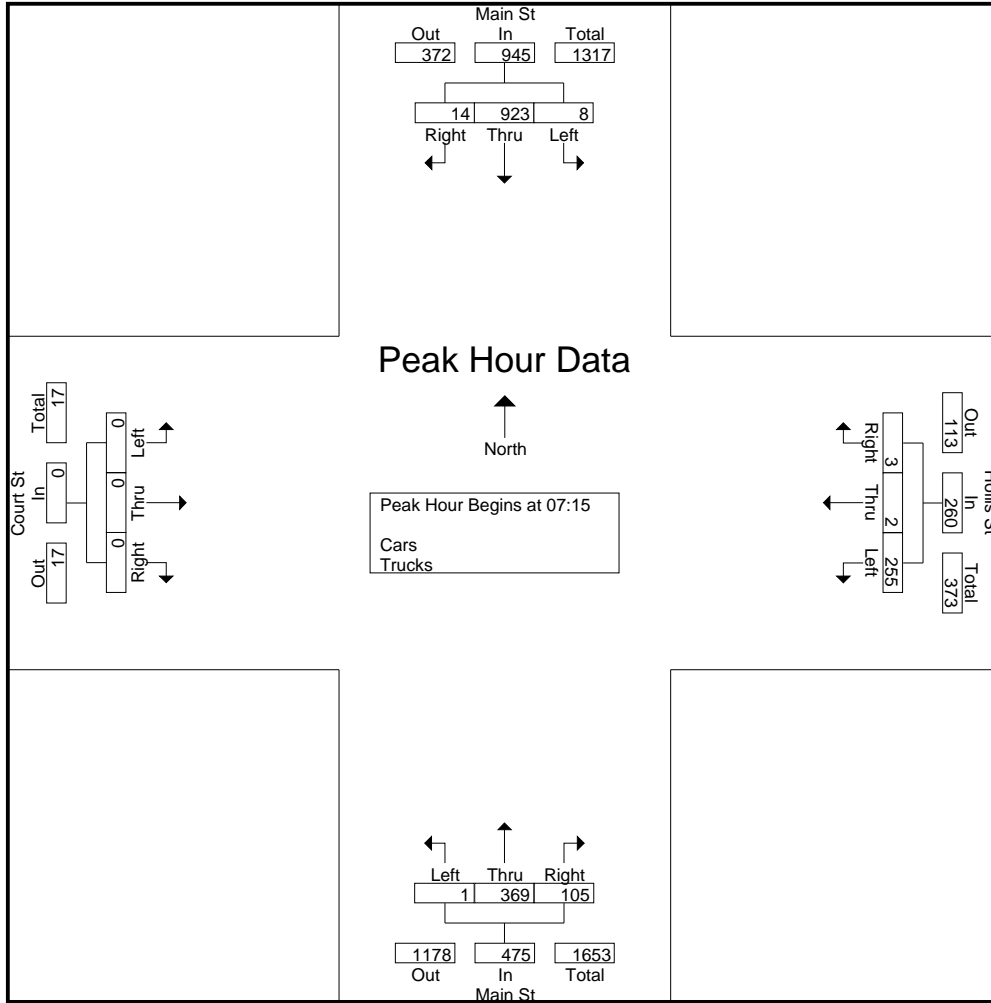
Accurate Counts
 978-664-2565

File Name : 02400002
 Site Code : 02400002
 Start Date : 1/10/2007
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main St From North			Hollis St From East			Main St From South			Court St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00	1	249	1	46	1	1	0	38	19	0	0	0	356
07:15	4	261	4	56	0	0	0	57	39	0	0	0	421
07:30	1	237	2	74	1	2	0	100	19	0	0	0	436
07:45	3	204	3	67	0	1	0	115	25	0	0	0	418
Total	9	951	10	243	2	4	0	310	102	0	0	0	1631
08:00	0	221	5	58	1	0	1	97	22	0	0	0	405
08:15	3	248	2	59	1	3	0	65	22	0	0	0	403
08:30	1	183	5	61	1	3	0	82	34	0	0	0	370
08:45	2	138	3	54	4	4	0	101	29	0	0	0	335
Total	6	790	15	232	7	10	1	345	107	0	0	0	1513
Grand Total	15	1741	25	475	9	14	1	655	209	0	0	0	3144
Apprch %	0.8	97.8	1.4	95.4	1.8	2.8	0.1	75.7	24.2	0	0	0	
Total %	0.5	55.4	0.8	15.1	0.3	0.4	0	20.8	6.6	0	0	0	
Cars	13	1681	23	459	9	13	1	597	196	0	0	0	2992
% Cars	86.7	96.6	92	96.6	100	92.9	100	91.1	93.8	0	0	0	95.2
Trucks	2	60	2	16	0	1	0	58	13	0	0	0	152
% Trucks	13.3	3.4	8	3.4	0	7.1	0	8.9	6.2	0	0	0	4.8

Start Time	Main St From North				Hollis St From East				Main St From South				Court 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 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15																	
07:15	4	261	4	269	56	0	0	56	0	57	39	96	0	0	0	0	421
07:30	1	237	2	240	74	1	2	77	0	100	19	119	0	0	0	0	436
07:45	3	204	3	210	67	0	1	68	0	115	25	140	0	0	0	0	418
08:00	0	221	5	226	58	1	0	59	1	97	22	120	0	0	0	0	405
Total Volume	8	923	14	945	255	2	3	260	1	369	105	475	0	0	0	0	1680
% App. Total	0.8	97.7	1.5		98.1	0.8	1.2		0.2	77.7	22.1		0	0	0		
PHF	.500	.884	.700	.878	.861	.500	.375	.844	.250	.802	.673	.848	.000	.000	.000	.000	.963



N/S Street : Main Street
 E/W Street: Hollis St / Court St
 City/State : Groton, MA
 Weather : Clear

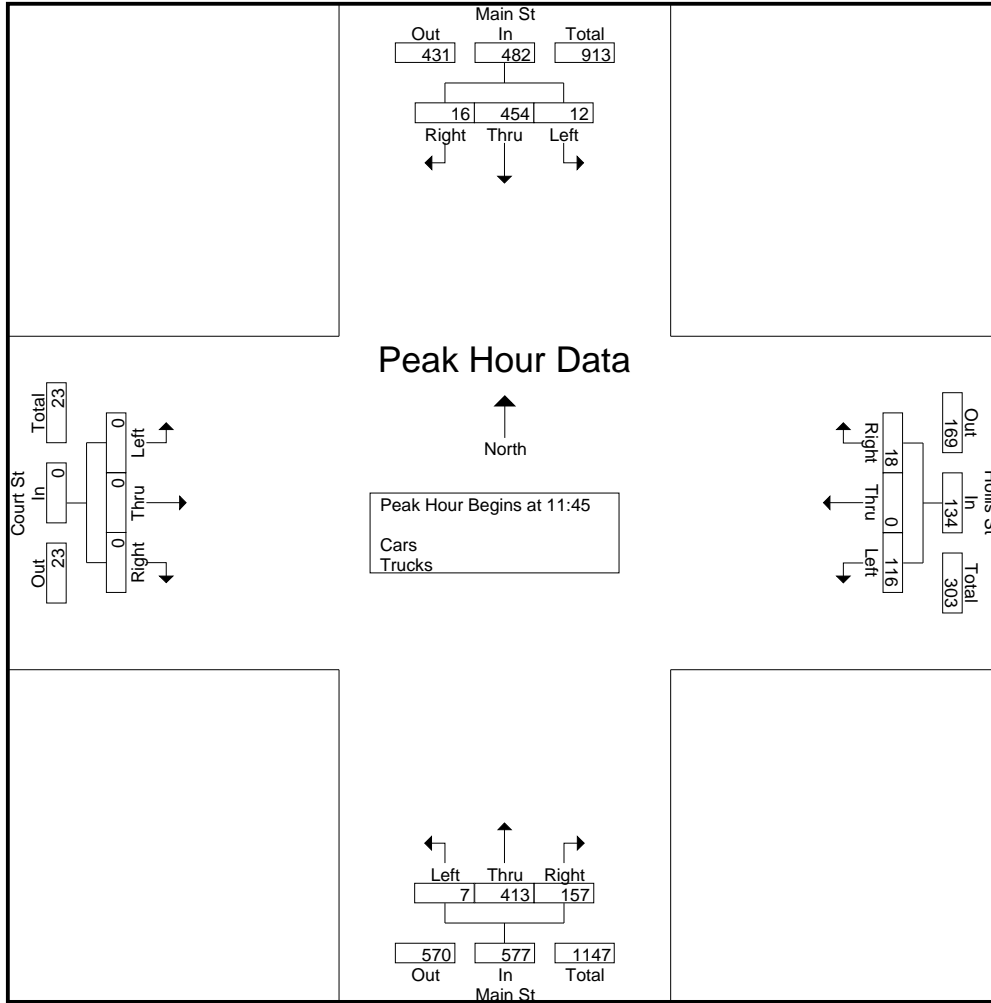
Accurate Counts
 978-664-2565

File Name : 02400002
 Site Code : 02400002
 Start Date : 1/10/2007
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main St From North			Hollis St From East			Main St From South			Court St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
11:00	3	115	3	24	1	2	1	96	27	0	0	0	272
11:15	1	122	4	29	1	0	1	87	25	0	0	0	270
11:30	4	99	3	32	1	2	0	99	21	0	0	0	261
11:45	4	109	5	27	0	4	0	104	33	0	0	0	286
Total	12	445	15	112	3	8	2	386	106	0	0	0	1089
12:00	5	124	4	29	0	6	3	107	43	0	0	0	321
12:15	1	114	5	23	0	3	1	107	44	0	0	0	298
12:30	2	107	2	37	0	5	3	95	37	0	0	0	288
12:45	3	122	4	25	0	3	1	99	26	0	0	0	283
Total	11	467	15	114	0	17	8	408	150	0	0	0	1190
Grand Total	23	912	30	226	3	25	10	794	256	0	0	0	2279
Apprch %	2.4	94.5	3.1	89	1.2	9.8	0.9	74.9	24.2	0	0	0	
Total %	1	40	1.3	9.9	0.1	1.1	0.4	34.8	11.2	0	0	0	
Cars	22	855	23	217	3	24	10	725	244	0	0	0	2123
% Cars	95.7	93.8	76.7	96	100	96	100	91.3	95.3	0	0	0	93.2
Trucks	1	57	7	9	0	1	0	69	12	0	0	0	156
% Trucks	4.3	6.2	23.3	4	0	4	0	8.7	4.7	0	0	0	6.8

Start Time	Main St From North				Hollis St From East				Main St From South				Court 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 11:00 to 12:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 11:45																	
11:45	4	109	5	118	27	0	4	31	0	104	33	137	0	0	0	0	286
12:00	5	124	4	133	29	0	6	35	3	107	43	153	0	0	0	0	321
12:15	1	114	5	120	23	0	3	26	1	107	44	152	0	0	0	0	298
12:30	2	107	2	111	37	0	5	42	3	95	37	135	0	0	0	0	288
Total Volume	12	454	16	482	116	0	18	134	7	413	157	577	0	0	0	0	1193
% App. Total	2.5	94.2	3.3		86.6	0	13.4		1.2	71.6	27.2		0	0	0		
PHF	.600	.915	.800	.906	.784	.000	.750	.798	.583	.965	.892	.943	.000	.000	.000	.000	.929



N/S Street : Main Street
 E/W Street: Hollis St / Court St
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

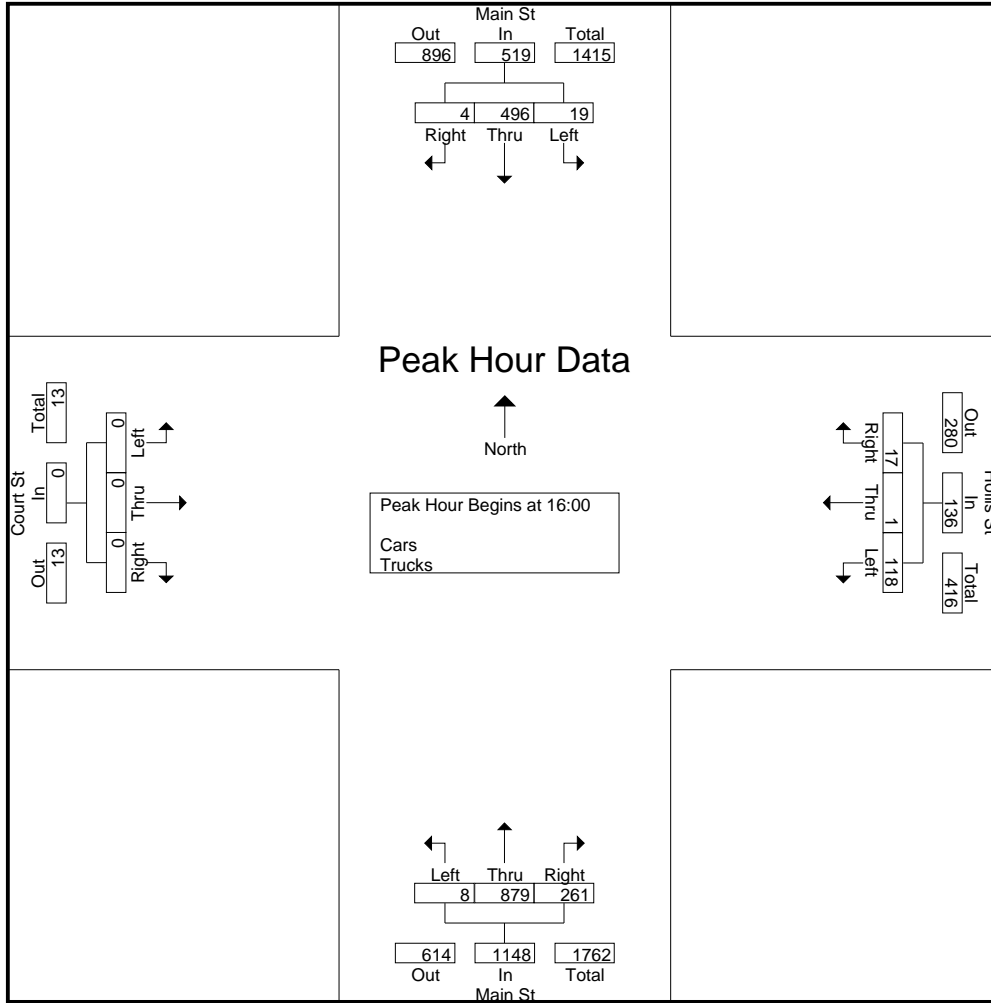
File Name : 02400002
 Site Code : 02400002
 Start Date : 1/10/2007
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main St From North			Hollis St From East			Main St From South			Court St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	5	125	2	34	0	6	2	216	68	0	0	0	458
16:15	4	124	0	24	0	3	3	195	71	0	0	0	424
16:30	4	130	2	26	0	4	1	222	61	0	0	0	450
16:45	6	117	0	34	1	4	2	246	61	0	0	0	471
Total	19	496	4	118	1	17	8	879	261	0	0	0	1803
17:00	7	111	2	19	0	4	0	216	60	0	0	0	419
17:15	4	109	1	19	0	9	0	239	71	0	0	0	452
17:30	3	102	0	22	0	4	2	231	58	0	0	0	422
17:45	6	85	3	22	1	7	1	254	59	0	0	0	438
Total	20	407	6	82	1	24	3	940	248	0	0	0	1731
Grand Total	39	903	10	200	2	41	11	1819	509	0	0	0	3534
Apprch %	4.1	94.9	1.1	82.3	0.8	16.9	0.5	77.8	21.8	0	0	0	
Total %	1.1	25.6	0.3	5.7	0.1	1.2	0.3	51.5	14.4	0	0	0	
Cars	39	877	10	200	2	39	11	1790	504	0	0	0	3472
% Cars	100	97.1	100	100	100	95.1	100	98.4	99	0	0	0	98.2
Trucks	0	26	0	0	0	2	0	29	5	0	0	0	62
% Trucks	0	2.9	0	0	0	4.9	0	1.6	1	0	0	0	1.8

Start Time	Main St From North				Hollis St From East				Main St From South				Court 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	
16:00	5	125	2	132	34	0	6	40	2	216	68	286	0	0	0	0	458
16:15	4	124	0	128	24	0	3	27	3	195	71	269	0	0	0	0	424
16:30	4	130	2	136	26	0	4	30	1	222	61	284	0	0	0	0	450
16:45	6	117	0	123	34	1	4	39	2	246	61	309	0	0	0	0	471
Total Volume	19	496	4	519	118	1	17	136	8	879	261	1148	0	0	0	0	1803
% App. Total	3.7	95.6	0.8		86.8	0.7	12.5		0.7	76.6	22.7		0	0	0		
PHF	.792	.954	.500	.954	.868	.250	.708	.850	.667	.893	.919	.929	.000	.000	.000	.000	.957

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 16:00



N/S Street : Main Street
 E/W Street: Lowell Rd / Broadmeadow Rd
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

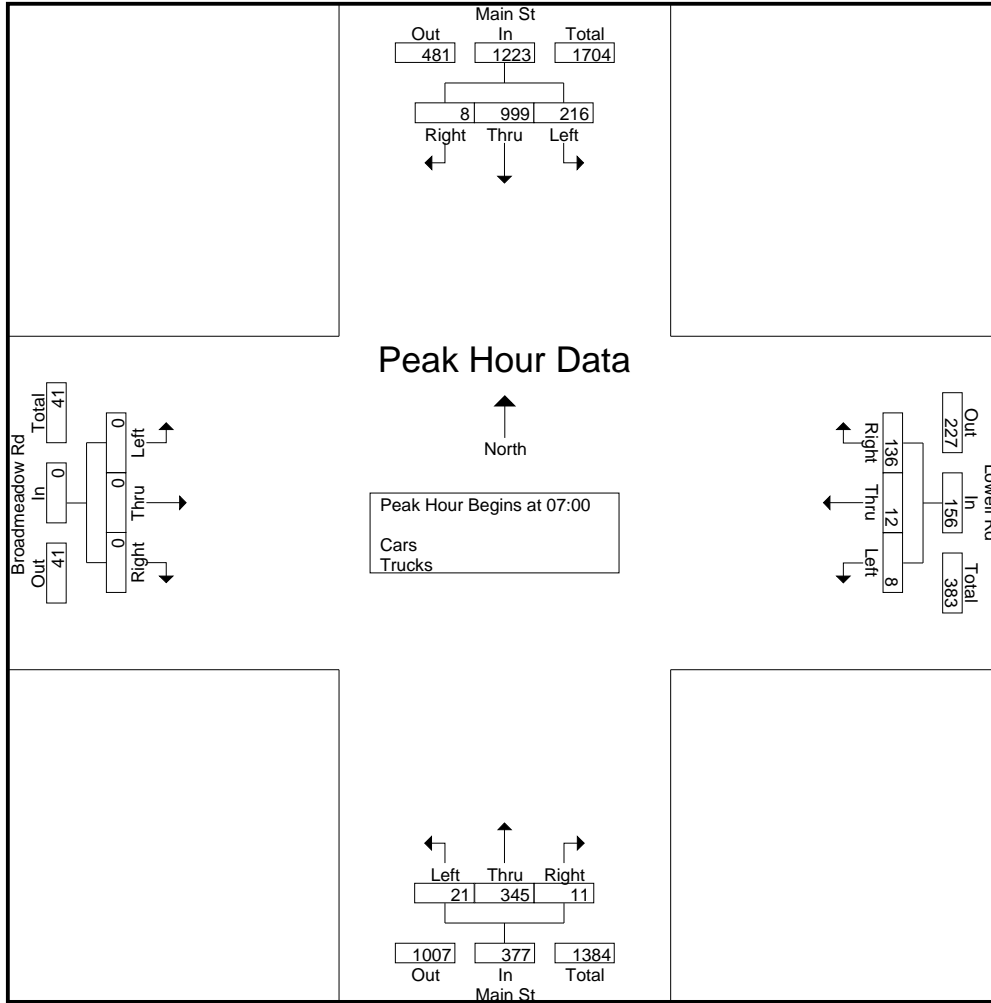
File Name : 02400004
 Site Code : 02400004
 Start Date : 1/10/2007
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main St From North			Lowell Rd From East			Main St From South			Broadmeadow Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00	47	275	1	1	4	18	3	85	1	0	0	0	435
07:15	51	276	1	1	0	31	4	64	2	0	0	0	430
07:30	61	240	3	3	4	42	7	88	5	0	0	0	453
07:45	57	208	3	3	4	45	7	108	3	0	0	0	438
Total	216	999	8	8	12	136	21	345	11	0	0	0	1756
08:00	55	220	4	2	5	29	3	74	0	0	0	0	392
08:15	45	245	3	0	4	27	7	66	0	0	0	0	397
08:30	38	174	5	1	7	36	5	115	2	0	0	2	385
08:45	35	142	4	0	2	45	3	90	6	0	0	0	327
Total	173	781	16	3	18	137	18	345	8	0	0	2	1501
Grand Total	389	1780	24	11	30	273	39	690	19	0	0	2	3257
Apprch %	17.7	81.2	1.1	3.5	9.6	86.9	5.2	92.2	2.5	0	0	100	
Total %	11.9	54.7	0.7	0.3	0.9	8.4	1.2	21.2	0.6	0	0	0.1	
Cars	384	1752	24	10	30	268	39	657	18	0	0	2	3184
% Cars	98.7	98.4	100	90.9	100	98.2	100	95.2	94.7	0	0	100	97.8
Trucks	5	28	0	1	0	5	0	33	1	0	0	0	73
% Trucks	1.3	1.6	0	9.1	0	1.8	0	4.8	5.3	0	0	0	2.2

Start Time	Main St From North				Lowell Rd From East				Main St From South				Broadmeadow 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	
07:00	47	275	1	323	1	4	18	23	3	85	1	89	0	0	0	0	435
07:15	51	276	1	328	1	0	31	32	4	64	2	70	0	0	0	0	430
07:30	61	240	3	304	3	4	42	49	7	88	5	100	0	0	0	0	453
07:45	57	208	3	268	3	4	45	52	7	108	3	118	0	0	0	0	438
Total Volume	216	999	8	1223	8	12	136	156	21	345	11	377	0	0	0	0	1756
% App. Total	17.7	81.7	0.7		5.1	7.7	87.2		5.6	91.5	2.9		0	0	0		
PHF	.885	.905	.667	.932	.667	.750	.756	.750	.750	.799	.550	.799	.000	.000	.000	.000	.969

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 07:00



N/S Street : Main Street
 E/W Street: Lowell Rd / Broadmeadow Rd
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

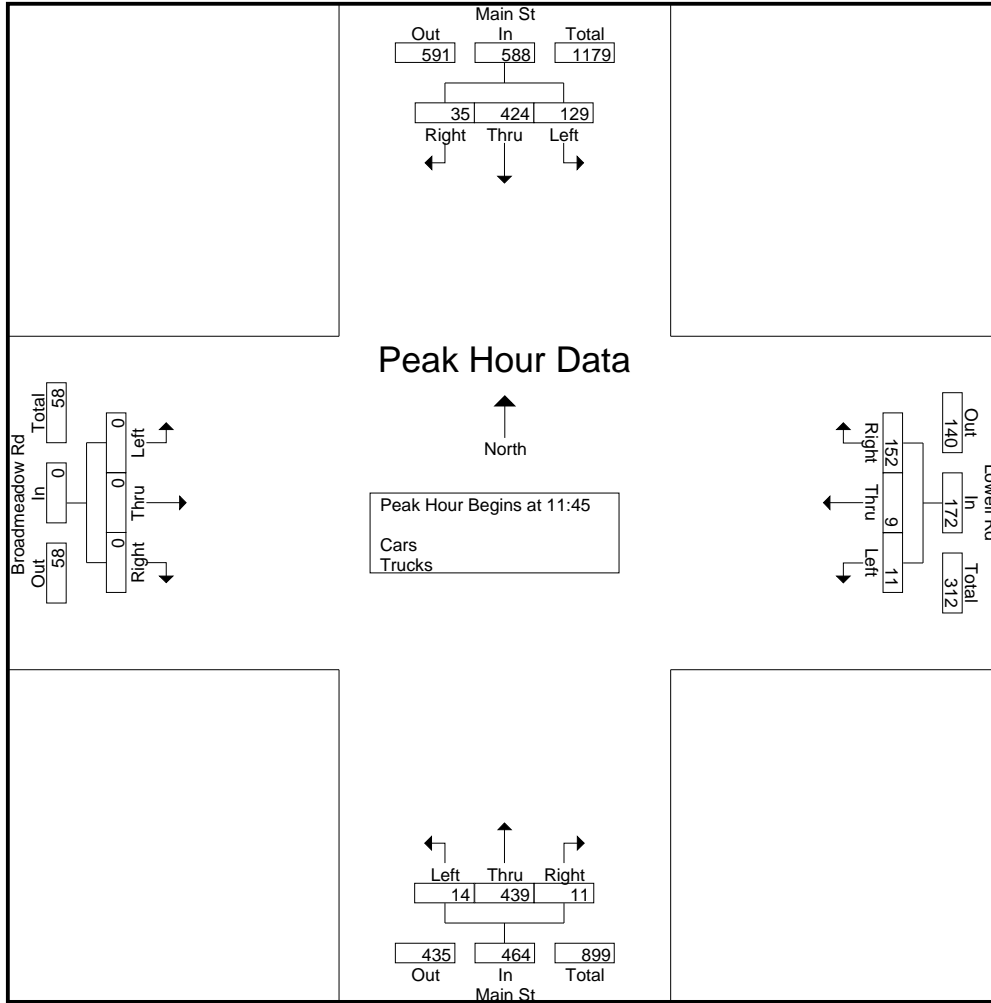
File Name : 02400004
 Site Code : 02400004
 Start Date : 1/10/2007
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main St From North			Lowell Rd From East			Main St From South			Broadmeadow Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
11:00	34	100	3	3	3	25	7	113	4	0	0	0	292
11:15	27	118	8	4	3	21	3	93	2	0	0	0	279
11:30	30	103	8	2	0	25	10	104	2	0	1	0	285
11:45	43	110	8	1	1	35	4	96	4	0	0	0	302
Total	134	431	27	10	7	106	24	406	12	0	1	0	1158
12:00	37	94	3	4	4	40	5	137	1	0	0	0	325
12:15	26	116	10	3	2	38	5	106	2	0	0	0	308
12:30	23	104	14	3	2	39	0	100	4	0	0	0	289
12:45	28	111	5	4	0	30	3	95	2	0	0	0	278
Total	114	425	32	14	8	147	13	438	9	0	0	0	1200
Grand Total	248	856	59	24	15	253	37	844	21	0	1	0	2358
Apprch %	21.3	73.6	5.1	8.2	5.1	86.6	4.1	93.6	2.3	0	100	0	
Total %	10.5	36.3	2.5	1	0.6	10.7	1.6	35.8	0.9	0	0	0	
Cars	228	822	59	19	15	235	37	788	21	0	0	0	2224
% Cars	91.9	96	100	79.2	100	92.9	100	93.4	100	0	0	0	94.3
Trucks	20	34	0	5	0	18	0	56	0	0	1	0	134
% Trucks	8.1	4	0	20.8	0	7.1	0	6.6	0	0	100	0	5.7

Start Time	Main St From North				Lowell Rd From East				Main St From South				Broadmeadow 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	
11:45	43	110	8	161	1	1	35	37	4	96	4	104	0	0	0	0	302
12:00	37	94	3	134	4	4	40	48	5	137	1	143	0	0	0	0	325
12:15	26	116	10	152	3	2	38	43	5	106	2	113	0	0	0	0	308
12:30	23	104	14	141	3	2	39	44	0	100	4	104	0	0	0	0	289
Total Volume	129	424	35	588	11	9	152	172	14	439	11	464	0	0	0	0	1224
% App. Total	21.9	72.1	6		6.4	5.2	88.4		3	94.6	2.4		0	0	0		
PHF	.750	.914	.625	.913	.688	.563	.950	.896	.700	.801	.688	.811	.000	.000	.000	.000	.942

Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 11:45



N/S Street : Main Street
 E/W Street: Lowell Rd / Broadmeadow Rd
 City/State : Groton, MA
 Weather : Clear

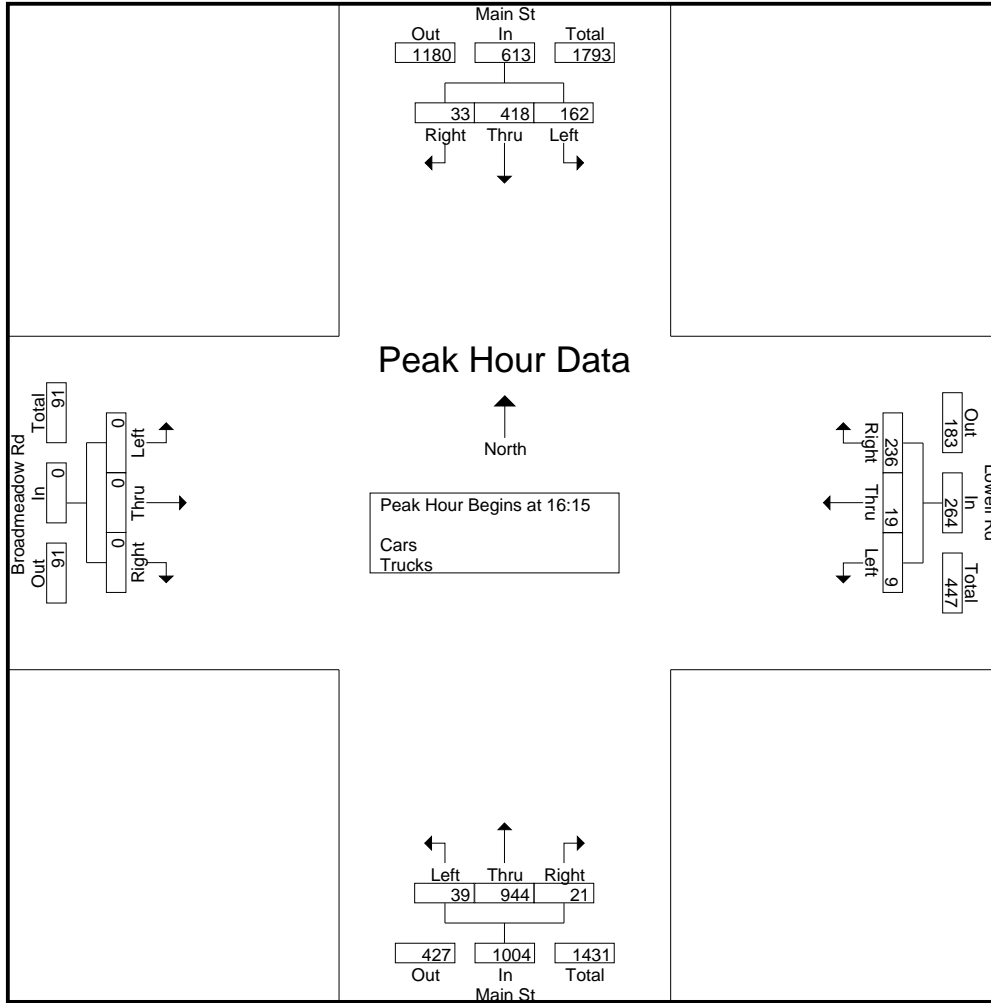
Accurate Counts
 978-664-2565

File Name : 02400004
 Site Code : 02400004
 Start Date : 1/10/2007
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Main St From North			Lowell Rd From East			Main St From South			Broadmeadow Rd From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	39	117	13	0	4	55	18	209	6	0	0	0	461
16:15	38	112	9	4	0	54	7	242	7	0	0	0	473
16:30	43	117	10	1	9	58	14	223	2	0	0	0	477
16:45	41	86	8	1	5	61	10	247	6	0	0	0	465
Total	161	432	40	6	18	228	49	921	21	0	0	0	1876
17:00	40	103	6	3	5	63	8	232	6	0	0	0	466
17:15	37	83	8	1	3	79	10	228	5	0	0	0	454
17:30	31	98	4	2	7	54	13	252	4	0	0	0	465
17:45	27	66	4	4	4	61	24	241	2	0	0	0	433
Total	135	350	22	10	19	257	55	953	17	0	0	0	1818
Grand Total	296	782	62	16	37	485	104	1874	38	0	0	0	3694
Apprch %	26	68.6	5.4	3	6.9	90.1	5.2	93	1.9	0	0	0	
Total %	8	21.2	1.7	0.4	1	13.1	2.8	50.7	1	0	0	0	
Cars	296	769	62	16	37	482	104	1858	38	0	0	0	3662
% Cars	100	98.3	100	100	100	99.4	100	99.1	100	0	0	0	99.1
Trucks	0	13	0	0	0	3	0	16	0	0	0	0	32
% Trucks	0	1.7	0	0	0	0.6	0	0.9	0	0	0	0	0.9

Start Time	Main St From North				Lowell Rd From East				Main St From South				Broadmeadow 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 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:15																	
16:15	38	112	9	159	4	0	54	58	7	242	7	256	0	0	0	0	473
16:30	43	117	10	170	1	9	58	68	14	223	2	239	0	0	0	0	477
16:45	41	86	8	135	1	5	61	67	10	247	6	263	0	0	0	0	465
17:00	40	103	6	149	3	5	63	71	8	232	6	246	0	0	0	0	466
Total Volume	162	418	33	613	9	19	236	264	39	944	21	1004	0	0	0	0	1881
% App. Total	26.4	68.2	5.4		3.4	7.2	89.4		3.9	94	2.1		0	0	0		
PHF	.942	.893	.825	.901	.563	.528	.937	.930	.696	.955	.750	.954	.000	.000	.000	.000	.986



N/S Street : Adams Avenue
 E/W Street: Pleasant Street
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400001
 Site Code : 02400001
 Start Date : 1/10/2007
 Page No : 1

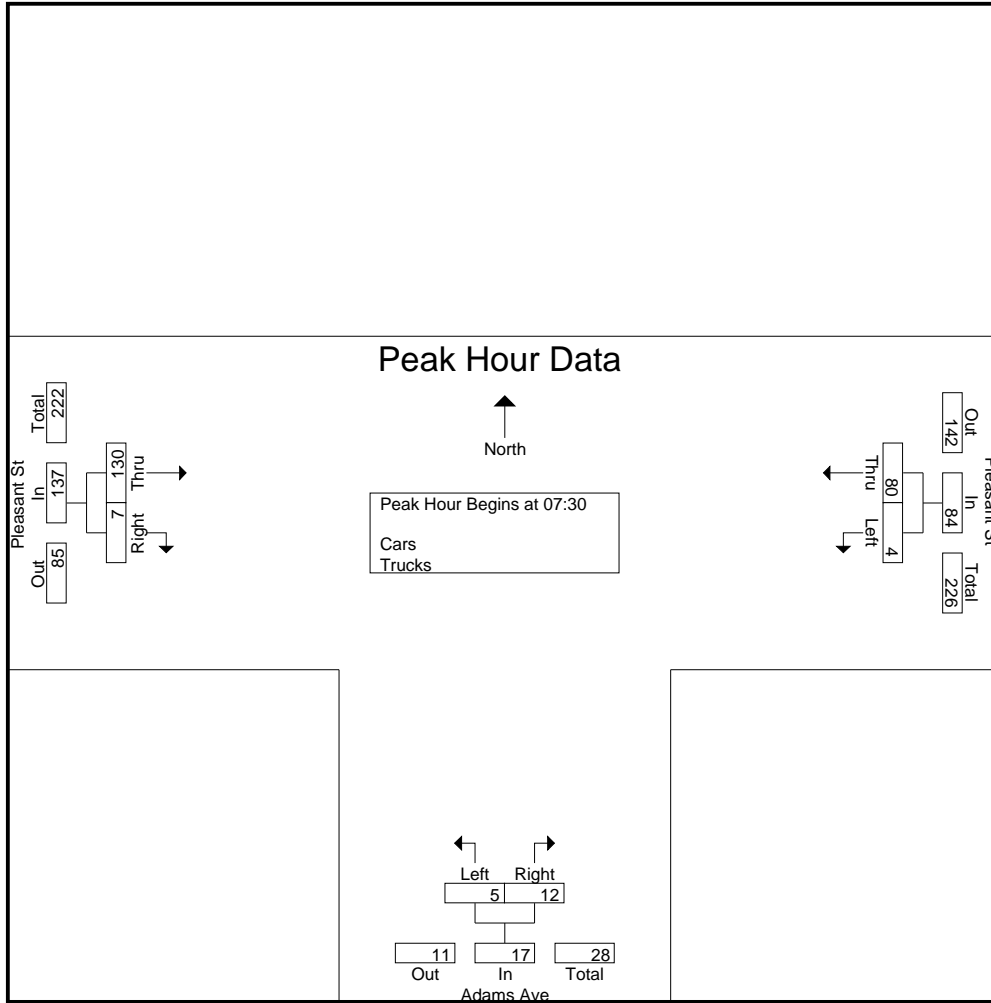
Groups Printed- Cars - Trucks

Start Time	Pleasant St From East		Adams Ave From South		Pleasant St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00	1	12	1	0	31	1	46
07:15	0	7	0	0	39	2	48
07:30	1	30	1	4	28	3	67
07:45	0	22	2	4	41	1	70
Total	2	71	4	8	139	7	231
08:00	2	19	1	3	25	2	52
08:15	1	9	1	1	36	1	49
08:30	1	12	0	2	28	0	43
08:45	2	25	0	1	28	3	59
Total	6	65	2	7	117	6	203
Grand Total	8	136	6	15	256	13	434
Apprch %	5.6	94.4	28.6	71.4	95.2	4.8	
Total %	1.8	31.3	1.4	3.5	59	3	
Cars	8	127	5	14	247	12	413
% Cars	100	93.4	83.3	93.3	96.5	92.3	95.2
Trucks	0	9	1	1	9	1	21
% Trucks	0	6.6	16.7	6.7	3.5	7.7	4.8

Start Time	Pleasant St From East			Adams Ave From South			Pleasant St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
07:30	1	30	31	1	4	5	28	3	31	67
07:45	0	22	22	2	4	6	41	1	42	70
08:00	2	19	21	1	3	4	25	2	27	52
08:15	1	9	10	1	1	2	36	1	37	49
Total Volume	4	80	84	5	12	17	130	7	137	238
% App. Total	4.8	95.2		29.4	70.6		94.9	5.1		
PHF	.500	.667	.677	.625	.750	.708	.793	.583	.815	.850

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

Peak Hour for Entire Intersection Begins at 07:30



N/S Street : Adams Avenue
 E/W Street: Pleasant Street
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400001
 Site Code : 02400001
 Start Date : 1/10/2007
 Page No : 1

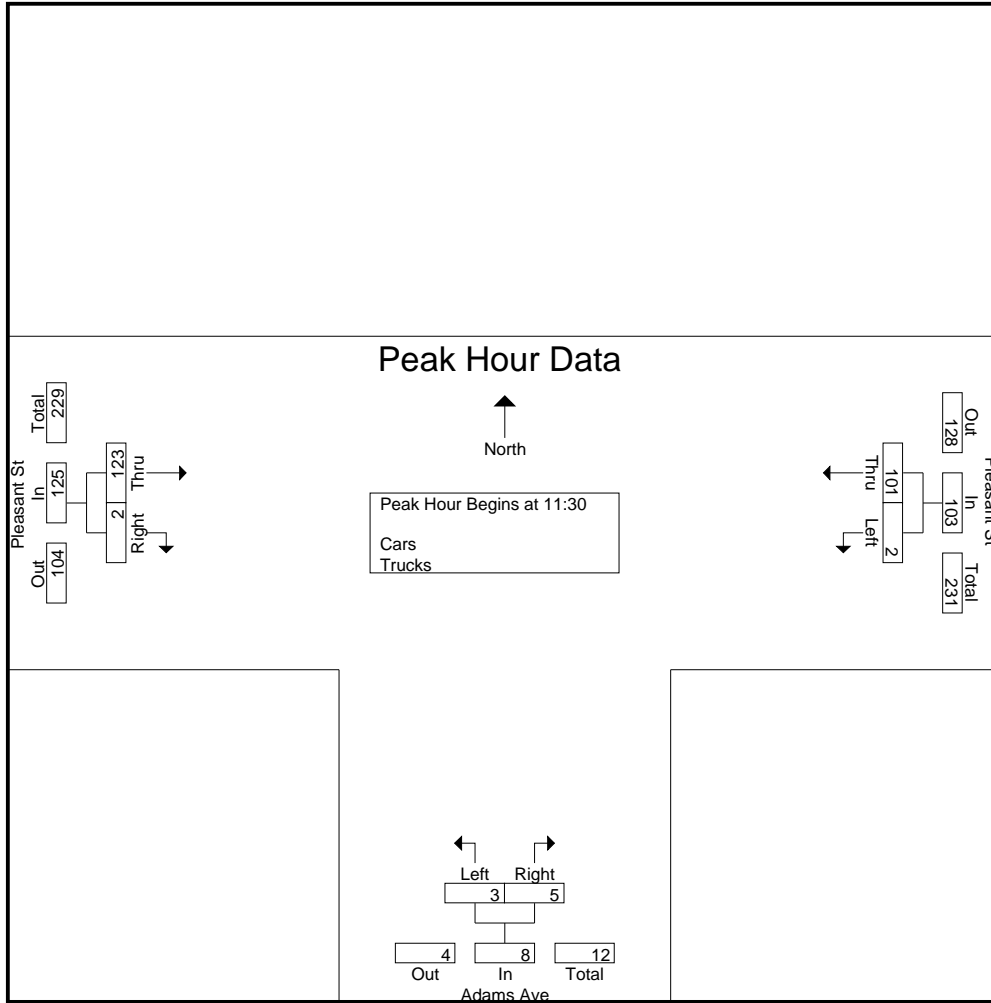
Groups Printed- Cars - Trucks

Start Time	Pleasant St From East		Adams Ave From South		Pleasant St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
11:00	1	14	1	2	19	1	38
11:15	0	20	0	1	29	1	51
11:30	2	26	0	1	26	1	56
11:45	0	22	1	2	35	0	60
Total	3	82	2	6	109	3	205
12:00	0	25	2	1	33	1	62
12:15	0	28	0	1	29	0	58
12:30	0	17	1	0	21	0	39
12:45	2	26	0	1	28	0	57
Total	2	96	3	3	111	1	216
Grand Total	5	178	5	9	220	4	421
Apprch %	2.7	97.3	35.7	64.3	98.2	1.8	
Total %	1.2	42.3	1.2	2.1	52.3	1	
Cars	4	167	4	8	211	2	396
% Cars	80	93.8	80	88.9	95.9	50	94.1
Trucks	1	11	1	1	9	2	25
% Trucks	20	6.2	20	11.1	4.1	50	5.9

Start Time	Pleasant St From East			Adams Ave From South			Pleasant St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
11:30	2	26	28	0	1	1	26	1	27	56
11:45	0	22	22	1	2	3	35	0	35	60
12:00	0	25	25	2	1	3	33	1	34	62
12:15	0	28	28	0	1	1	29	0	29	58
Total Volume	2	101	103	3	5	8	123	2	125	236
% App. Total	1.9	98.1		37.5	62.5		98.4	1.6		
PHF	.250	.902	.920	.375	.625	.667	.879	.500	.893	.952

Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:30



N/S Street : Adams Avenue
 E/W Street: Pleasant Street
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400001
 Site Code : 02400001
 Start Date : 1/10/2007
 Page No : 1

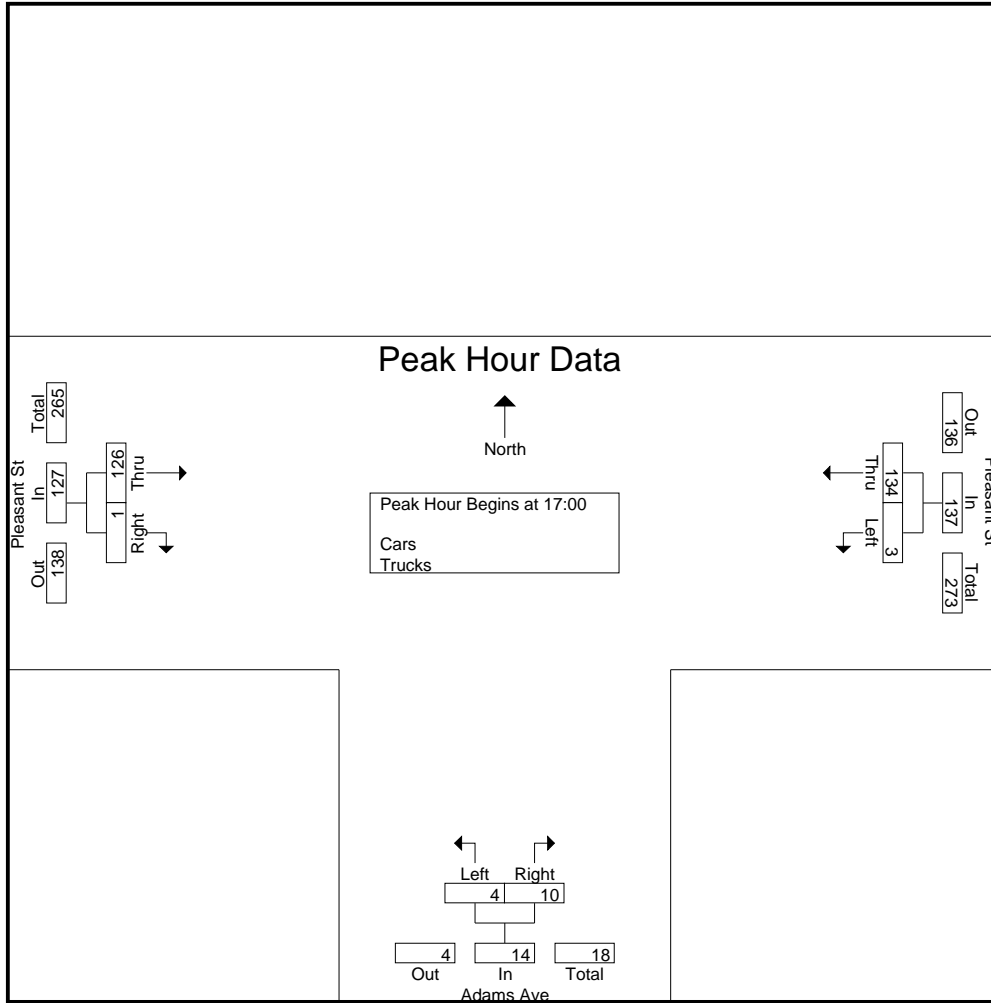
Groups Printed- Cars - Trucks

Start Time	Pleasant St From East		Adams Ave From South		Pleasant St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
16:00	1	29	3	0	28	1	62
16:15	2	31	2	2	30	0	67
16:30	1	25	1	0	26	1	54
16:45	0	37	0	0	27	0	64
Total	4	122	6	2	111	2	247
17:00	0	26	1	3	25	1	56
17:15	0	45	1	4	34	0	84
17:30	1	31	1	0	35	0	68
17:45	2	32	1	3	32	0	70
Total	3	134	4	10	126	1	278
Grand Total	7	256	10	12	237	3	525
Apprch %	2.7	97.3	45.5	54.5	98.8	1.2	
Total %	1.3	48.8	1.9	2.3	45.1	0.6	
Cars	7	253	10	12	234	1	517
% Cars	100	98.8	100	100	98.7	33.3	98.5
Trucks	0	3	0	0	3	2	8
% Trucks	0	1.2	0	0	1.3	66.7	1.5

Start Time	Pleasant St From East			Adams Ave From South			Pleasant St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
17:00	0	26	26	1	3	4	25	1	26	56
17:15	0	45	45	1	4	5	34	0	34	84
17:30	1	31	32	1	0	1	35	0	35	68
17:45	2	32	34	1	3	4	32	0	32	70
Total Volume	3	134	137	4	10	14	126	1	127	278
% App. Total	2.2	97.8		28.6	71.4		99.2	0.8		
PHF	.375	.744	.761	1.000	.625	.700	.900	.250	.907	.827

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 17:00



N/S Street : Court Street
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400006
 Site Code : 02400006
 Start Date : 1/10/2007
 Page No : 1

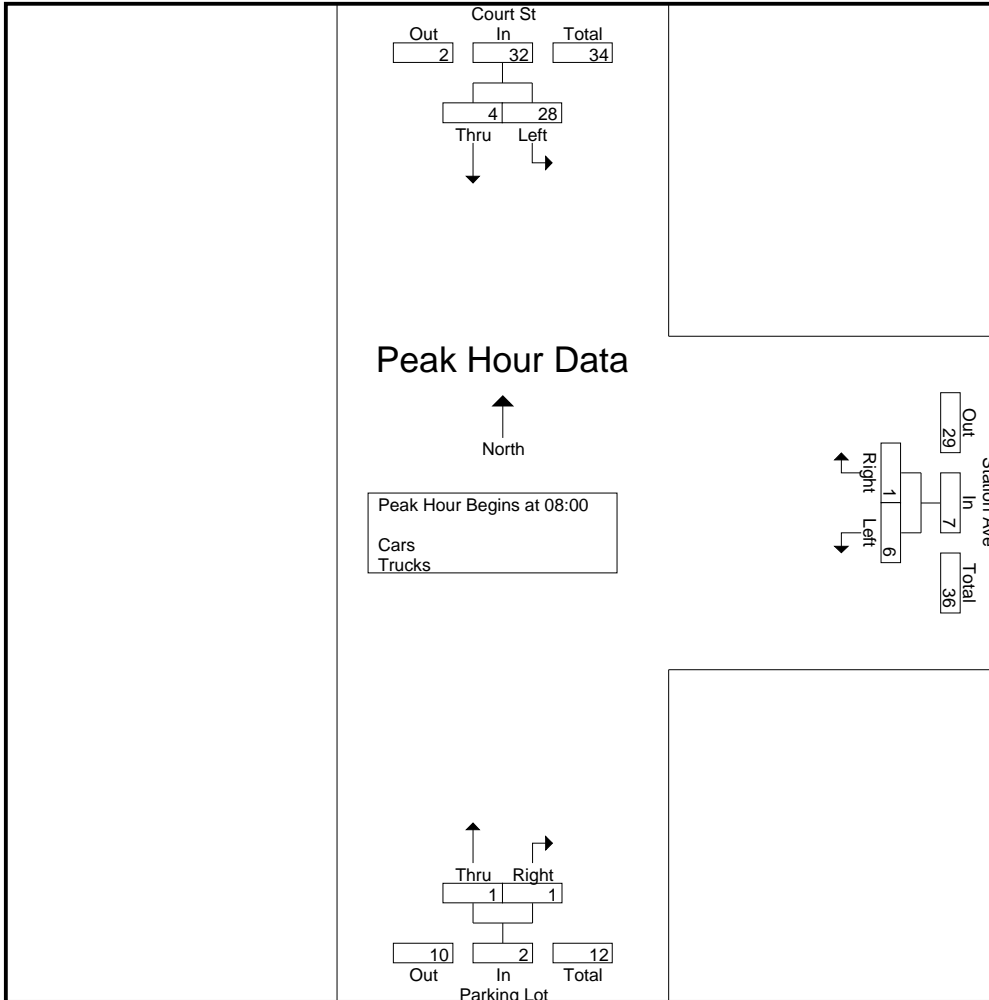
Groups Printed- Cars - Trucks

Start Time	Court St From North		Station Ave From East		Parking Lot From South		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00	5	0	0	2	0	0	7
07:15	7	0	2	2	0	0	11
07:30	5	1	0	1	0	2	9
07:45	1	0	0	1	1	0	3
Total	18	1	2	6	1	2	30
08:00	6	0	2	0	0	0	8
08:15	8	1	2	1	0	1	13
08:30	8	0	0	0	0	0	8
08:45	6	3	2	0	1	0	12
Total	28	4	6	1	1	1	41
Grand Total	46	5	8	7	2	3	71
Apprch %	90.2	9.8	53.3	46.7	40	60	
Total %	64.8	7	11.3	9.9	2.8	4.2	
Cars	42	4	8	7	2	3	66
% Cars	91.3	80	100	100	100	100	93
Trucks	4	1	0	0	0	0	5
% Trucks	8.7	20	0	0	0	0	7

Start Time	Court St From North			Station Ave From East			Parking Lot From South			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
08:00	6	0	6	2	0	2	0	0	0	8
08:15	8	1	9	2	1	3	0	1	1	13
08:30	8	0	8	0	0	0	0	0	0	8
08:45	6	3	9	2	0	2	1	0	1	12
Total Volume	28	4	32	6	1	7	1	1	2	41
% App. Total	87.5	12.5		85.7	14.3		50	50		
PHF	.875	.333	.889	.750	.250	.583	.250	.250	.500	.788

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

Peak Hour for Entire Intersection Begins at 08:00



N/S Street : Court Street
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400006
 Site Code : 02400006
 Start Date : 1/10/2007
 Page No : 1

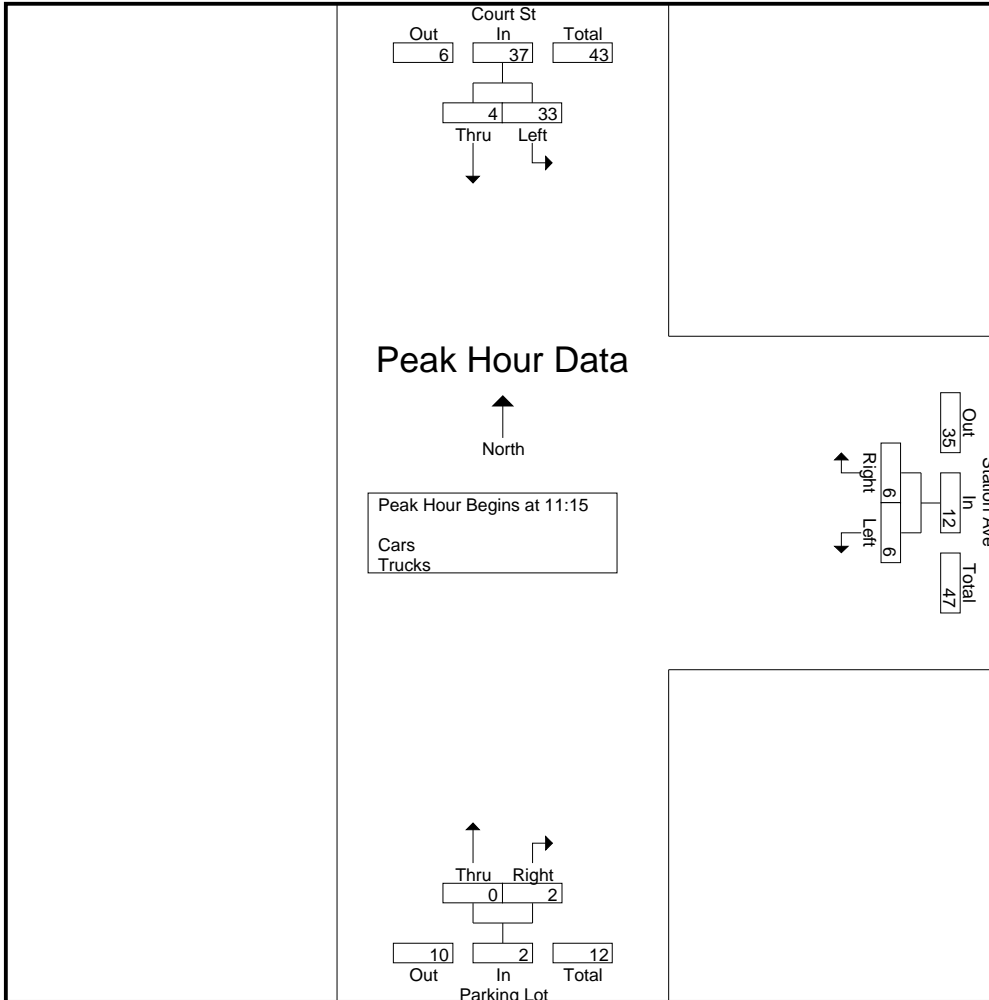
Groups Printed- Cars - Trucks

Start Time	Court St From North		Station Ave From East		Parking Lot From South		Int. Total
	Left	Thru	Left	Right	Thru	Right	
11:00	9	0	0	0	0	0	9
11:15	7	2	3	2	0	0	14
11:30	9	0	1	2	0	1	13
11:45	7	1	1	1	0	0	10
Total	32	3	5	5	0	1	46
12:00	10	1	1	1	0	1	14
12:15	4	0	1	1	1	0	7
12:30	6	0	0	1	0	0	7
12:45	7	1	2	3	0	2	15
Total	27	2	4	6	1	3	43
Grand Total	59	5	9	11	1	4	89
Apprch %	92.2	7.8	45	55	20	80	
Total %	66.3	5.6	10.1	12.4	1.1	4.5	
Cars	53	2	9	10	1	3	78
% Cars	89.8	40	100	90.9	100	75	87.6
Trucks	6	3	0	1	0	1	11
% Trucks	10.2	60	0	9.1	0	25	12.4

Start Time	Court St From North			Station Ave From East			Parking Lot From South			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
11:15	7	2	9	3	2	5	0	0	0	14
11:30	9	0	9	1	2	3	0	1	1	13
11:45	7	1	8	1	1	2	0	0	0	10
12:00	10	1	11	1	1	2	0	1	1	14
Total Volume	33	4	37	6	6	12	0	2	2	51
% App. Total	89.2	10.8		50	50		0	100		
PHF	.825	.500	.841	.500	.750	.600	.000	.500	.500	.911

Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:15



N/S Street : Court Street
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400006
 Site Code : 02400006
 Start Date : 1/10/2007
 Page No : 1

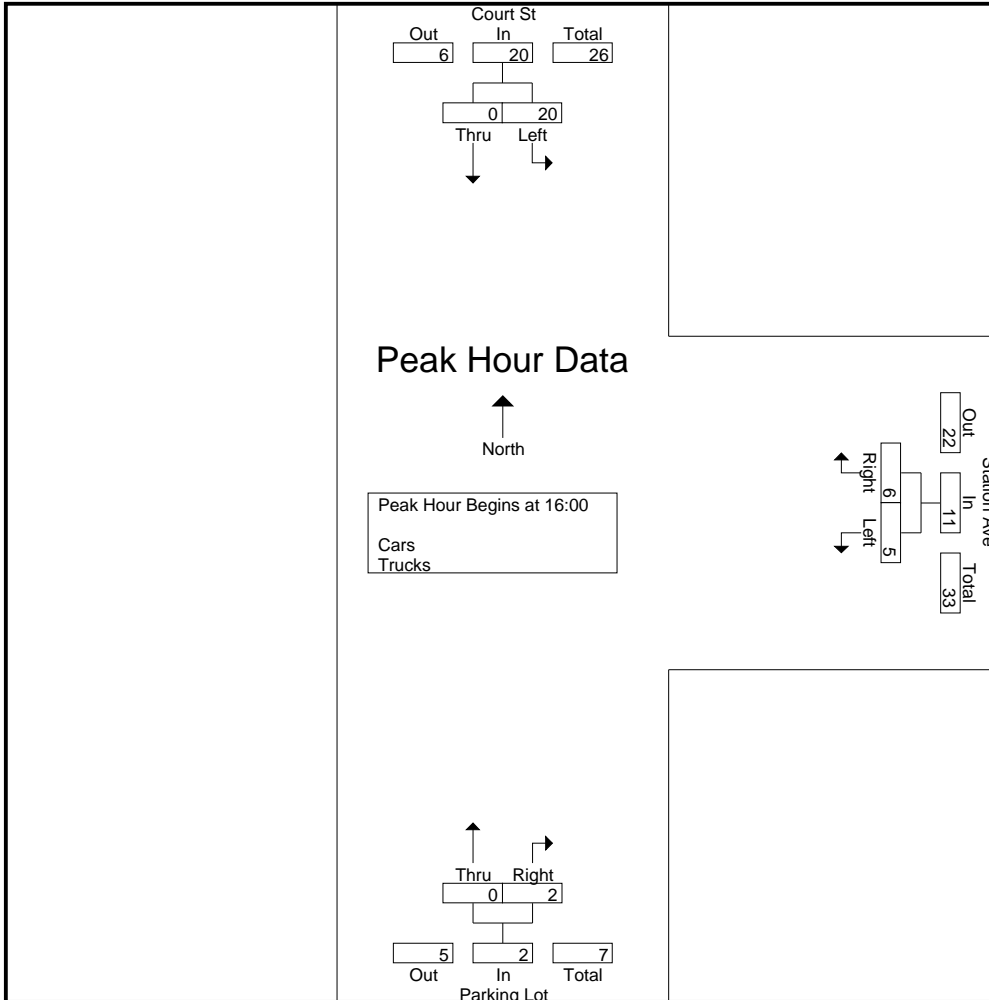
Groups Printed- Cars - Trucks

Start Time	Court St From North		Station Ave From East		Parking Lot From South		Int. Total
	Left	Thru	Left	Right	Thru	Right	
16:00	5	0	2	3	0	2	12
16:15	6	0	2	0	0	0	8
16:30	7	0	1	2	0	0	10
16:45	2	0	0	1	0	0	3
Total	20	0	5	6	0	2	33
17:00	5	1	0	1	0	1	8
17:15	2	0	0	1	0	0	3
17:30	3	0	0	1	0	0	4
17:45	4	0	2	1	0	0	7
Total	14	1	2	4	0	1	22
Grand Total	34	1	7	10	0	3	55
Apprch %	97.1	2.9	41.2	58.8	0	100	
Total %	61.8	1.8	12.7	18.2	0	5.5	
Cars	34	1	7	8	0	3	53
% Cars	100	100	100	80	0	100	96.4
Trucks	0	0	0	2	0	0	2
% Trucks	0	0	0	20	0	0	3.6

Start Time	Court St From North			Station Ave From East			Parking Lot From South			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
16:00	5	0	5	2	3	5	0	2	2	12
16:15	6	0	6	2	0	2	0	0	0	8
16:30	7	0	7	1	2	3	0	0	0	10
16:45	2	0	2	0	1	1	0	0	0	3
Total Volume	20	0	20	5	6	11	0	2	2	33
% App. Total	100	0		45.5	54.5		0	100		
PHF	.714	.000	.714	.625	.500	.550	.000	.250	.250	.688

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:00



N/S Street : GELD Drive
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400007
 Site Code : 02400007
 Start Date : 1/10/2007
 Page No : 1

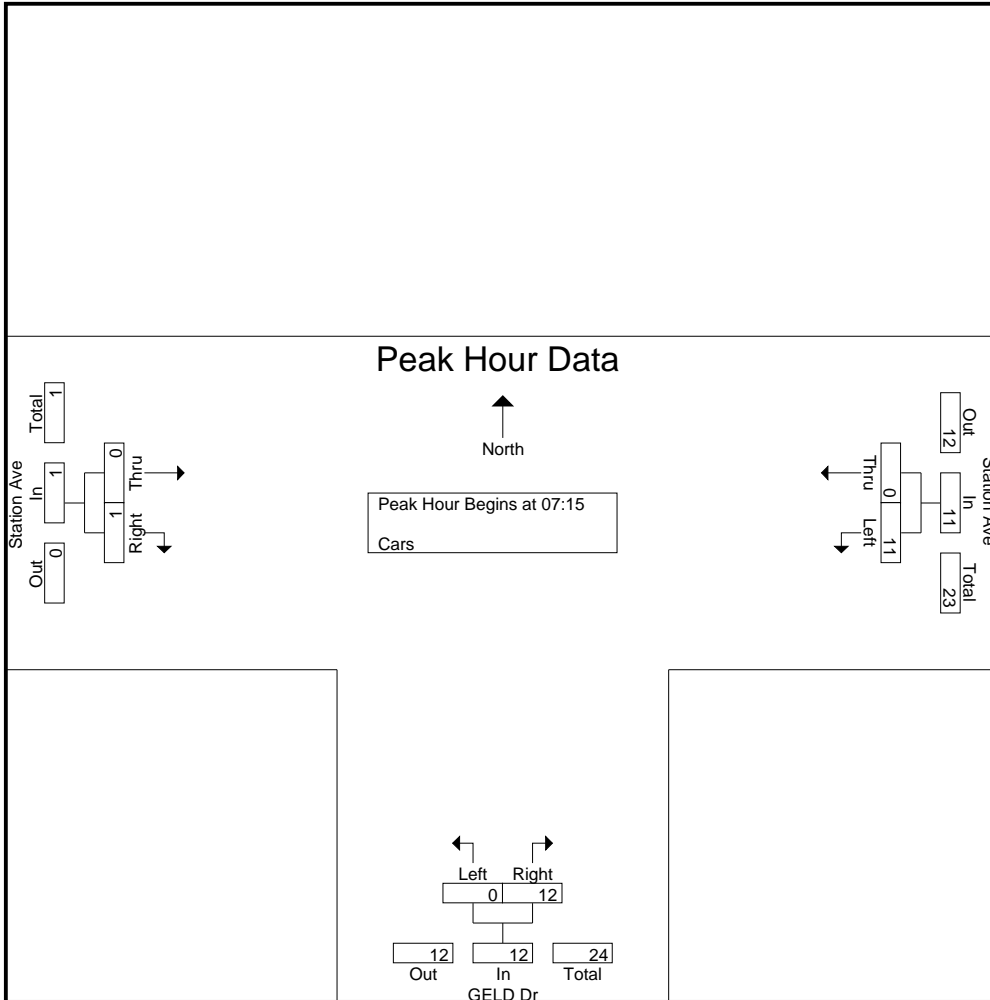
Groups Printed- Cars

Start Time	Station Ave From East		GELD Dr From South		Station Ave From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00	1	0	0	0	0	0	1
07:15	6	0	0	4	0	0	10
07:30	1	0	0	1	0	1	3
07:45	2	0	0	2	0	0	4
Total	10	0	0	7	0	1	18
08:00	2	0	0	5	0	0	7
08:15	0	0	0	2	0	0	2
08:30	1	0	0	1	0	0	2
08:45	0	0	0	3	0	0	3
Total	3	0	0	11	0	0	14
Grand Total	13	0	0	18	0	1	32
Apprch %	100	0	0	100	0	100	
Total %	40.6	0	0	56.2	0	3.1	

Start Time	Station Ave From East			GELD Dr From South			Station Ave From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
07:15	6	0	6	0	4	4	0	0	0	10
07:30	1	0	1	0	1	1	0	1	1	3
07:45	2	0	2	0	2	2	0	0	0	4
08:00	2	0	2	0	5	5	0	0	0	7
Total Volume	11	0	11	0	12	12	0	1	1	24
% App. Total	100	0		0	100		0	100		
PHF	.458	.000	.458	.000	.600	.600	.000	.250	.250	.600

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

Peak Hour for Entire Intersection Begins at 07:15



N/S Street : GELD Drive
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400007
 Site Code : 02400007
 Start Date : 1/10/2007
 Page No : 1

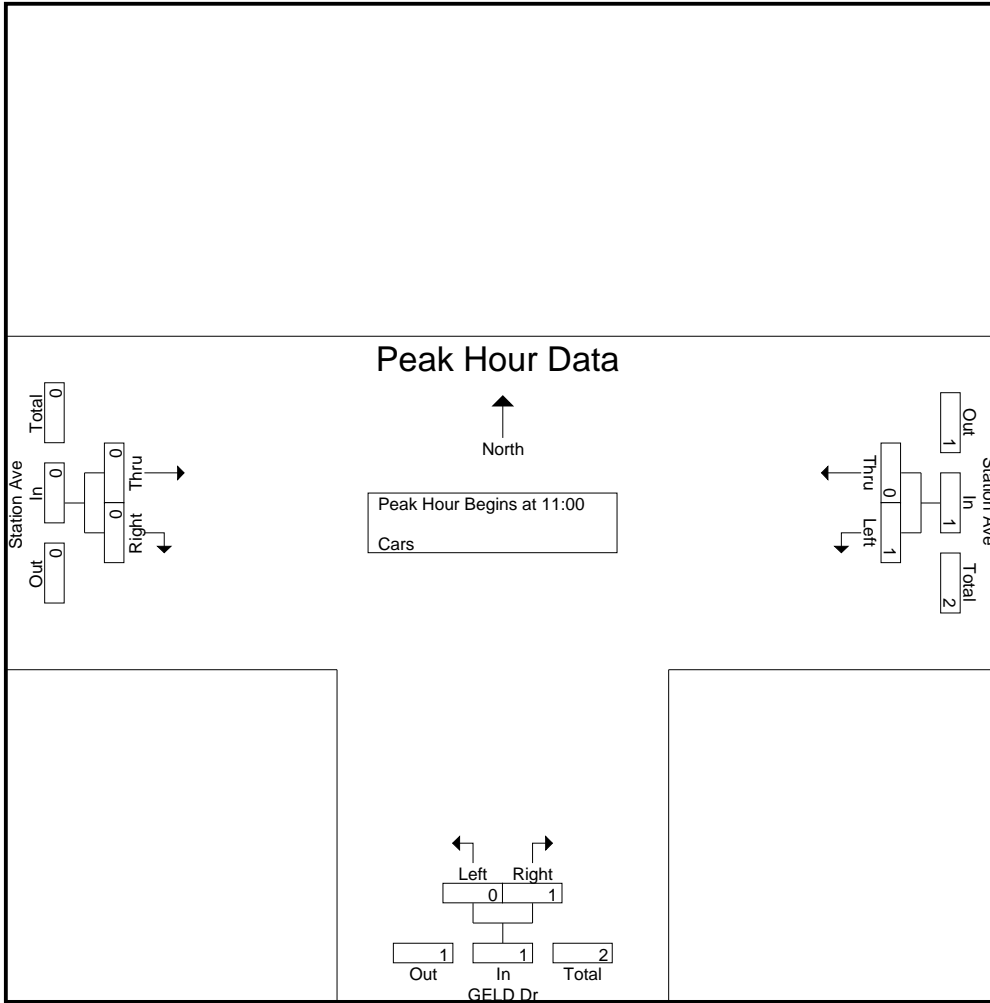
Groups Printed- Cars

Start Time	Station Ave From East		GELD Dr From South		Station Ave From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
11:00	1	0	0	1	0	0	2
11:15	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0
Total	1	0	0	1	0	0	2
12:00	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Grand Total	1	0	0	1	0	0	2
Apprch %	100	0	0	100	0	0	
Total %	50	0	0	50	0	0	

Start Time	Station Ave From East			GELD Dr From South			Station Ave From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
11:00	1	0	1	0	1	1	0	0	0	2
11:15	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0
Total Volume	1	0	1	0	1	1	0	0	0	2
% App. Total	100	0		0	100		0	0		
PHF	.250	.000	.250	.000	.250	.250	.000	.000	.000	.250

Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:00



N/S Street : GELD Drive
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400007
 Site Code : 02400007
 Start Date : 1/10/2007
 Page No : 1

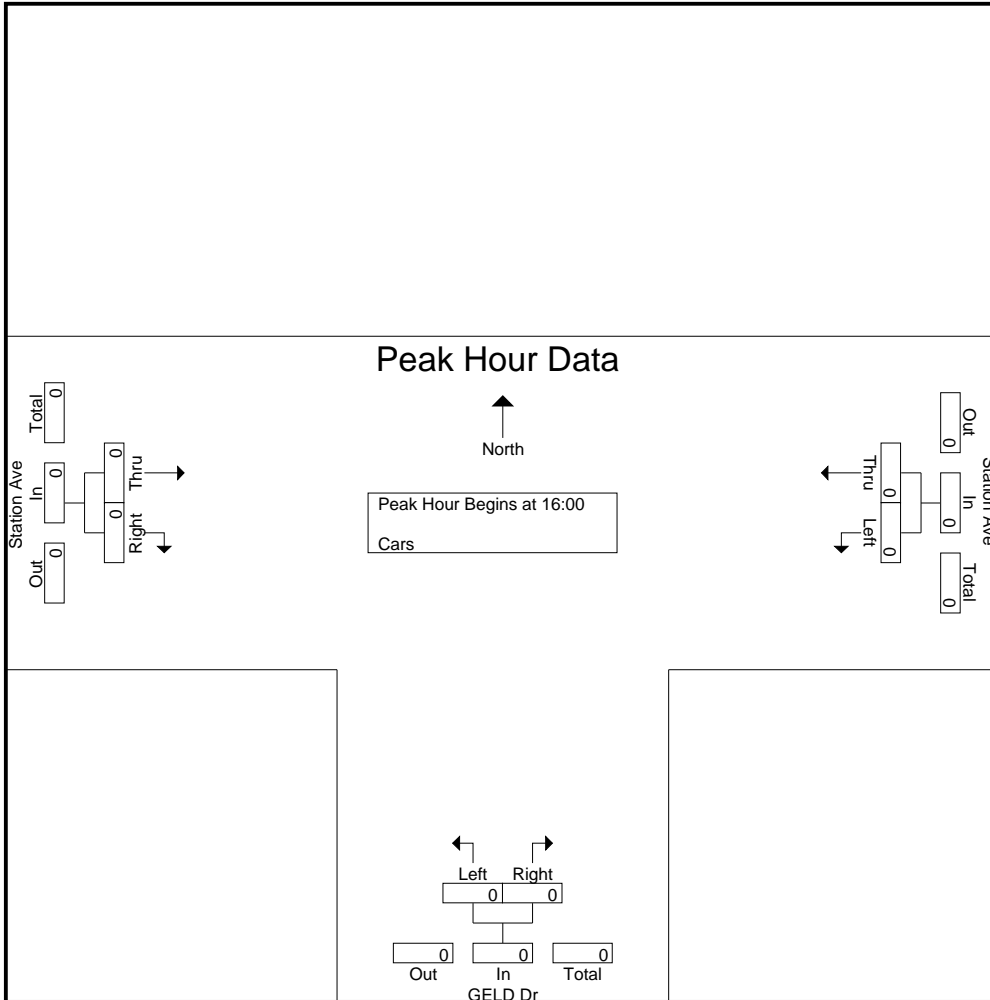
Groups Printed- Cars

Start Time	Station Ave From East		GELD Dr From South		Station Ave From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
16:00	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	0
Total %							

Start Time	Station Ave From East			GELD Dr From South			Station Ave From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
16:00	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0		0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:00



N/S Street : Main Street
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400003
 Site Code : 02400003
 Start Date : 1/10/2007
 Page No : 1

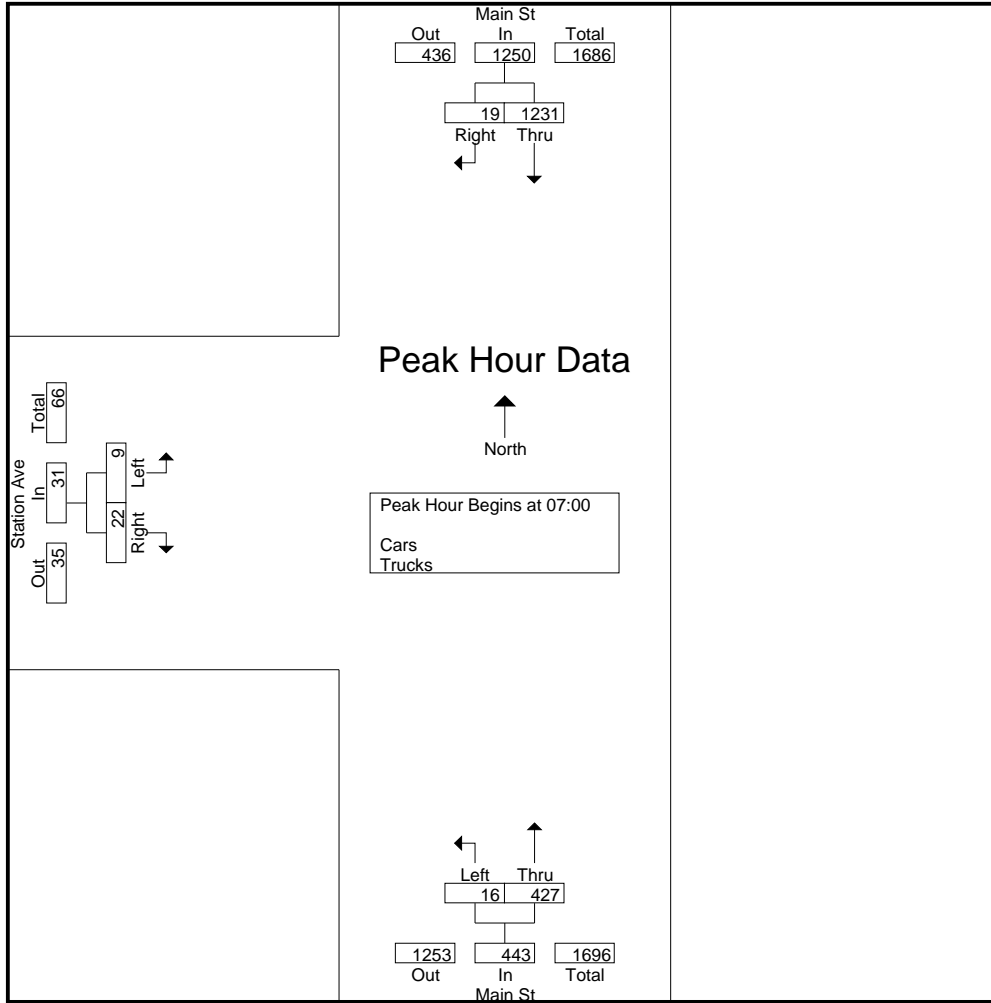
Groups Printed- Cars - Trucks

Start Time	Main St From North		Main St From South		Station Ave From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00	330	3	1	86	3	2	425
07:15	328	5	5	86	2	9	435
07:30	297	2	4	115	3	7	428
07:45	276	9	6	140	1	4	436
Total	1231	19	16	427	9	22	1724
08:00	269	11	4	96	6	6	392
08:15	294	7	4	80	3	7	395
08:30	227	4	7	119	2	6	365
08:45	187	5	3	136	6	8	345
Total	977	27	18	431	17	27	1497
Grand Total	2208	46	34	858	26	49	3221
Apprch %	98	2	3.8	96.2	34.7	65.3	
Total %	68.6	1.4	1.1	26.6	0.8	1.5	
Cars	2140	45	34	788	21	46	3074
% Cars	96.9	97.8	100	91.8	80.8	93.9	95.4
Trucks	68	1	0	70	5	3	147
% Trucks	3.1	2.2	0	8.2	19.2	6.1	4.6

Start Time	Main St From North			Main St From South			Station Ave From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
07:00	330	3	333	1	86	87	3	2	5	425
07:15	328	5	333	5	86	91	2	9	11	435
07:30	297	2	299	4	115	119	3	7	10	428
07:45	276	9	285	6	140	146	1	4	5	436
Total Volume	1231	19	1250	16	427	443	9	22	31	1724
% App. Total	98.5	1.5		3.6	96.4		29	71		
PHF	.933	.528	.938	.667	.763	.759	.750	.611	.705	.989

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

Peak Hour for Entire Intersection Begins at 07:00



N/S Street : Main Street
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400003
 Site Code : 02400003
 Start Date : 1/10/2007
 Page No : 1

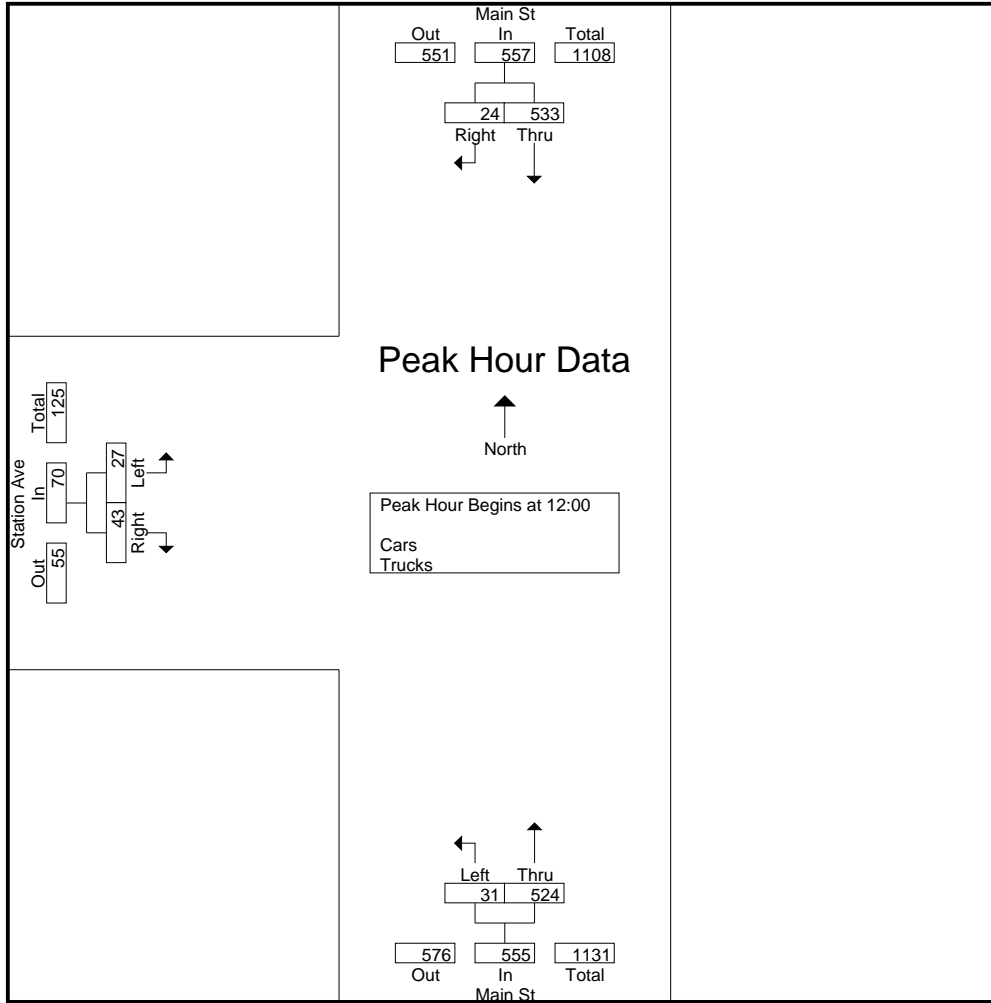
Groups Printed- Cars - Trucks

Start Time	Main St From North		Main St From South		Station Ave From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
11:00	123	4	7	119	3	11	267
11:15	133	13	11	103	7	14	281
11:30	128	10	5	118	17	11	289
11:45	135	8	9	116	4	11	283
Total	519	35	32	456	31	47	1120
12:00	135	3	8	157	4	9	316
12:15	128	8	8	128	8	10	290
12:30	136	6	9	124	6	10	291
12:45	134	7	6	115	9	14	285
Total	533	24	31	524	27	43	1182
Grand Total	1052	59	63	980	58	90	2302
Apprch %	94.7	5.3	6	94	39.2	60.8	
Total %	45.7	2.6	2.7	42.6	2.5	3.9	
Cars	980	58	61	898	55	85	2137
% Cars	93.2	98.3	96.8	91.6	94.8	94.4	92.8
Trucks	72	1	2	82	3	5	165
% Trucks	6.8	1.7	3.2	8.4	5.2	5.6	7.2

Start Time	Main St From North			Main St From South			Station Ave From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
12:00	135	3	138	8	157	165	4	9	13	316
12:15	128	8	136	8	128	136	8	10	18	290
12:30	136	6	142	9	124	133	6	10	16	291
12:45	134	7	141	6	115	121	9	14	23	285
Total Volume	533	24	557	31	524	555	27	43	70	1182
% App. Total	95.7	4.3		5.6	94.4		38.6	61.4		
PHF	.980	.750	.981	.861	.834	.841	.750	.768	.761	.935

Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 12:00



N/S Street : Main Street
 E/W Street: Station Avenue
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400003
 Site Code : 02400003
 Start Date : 1/10/2007
 Page No : 1

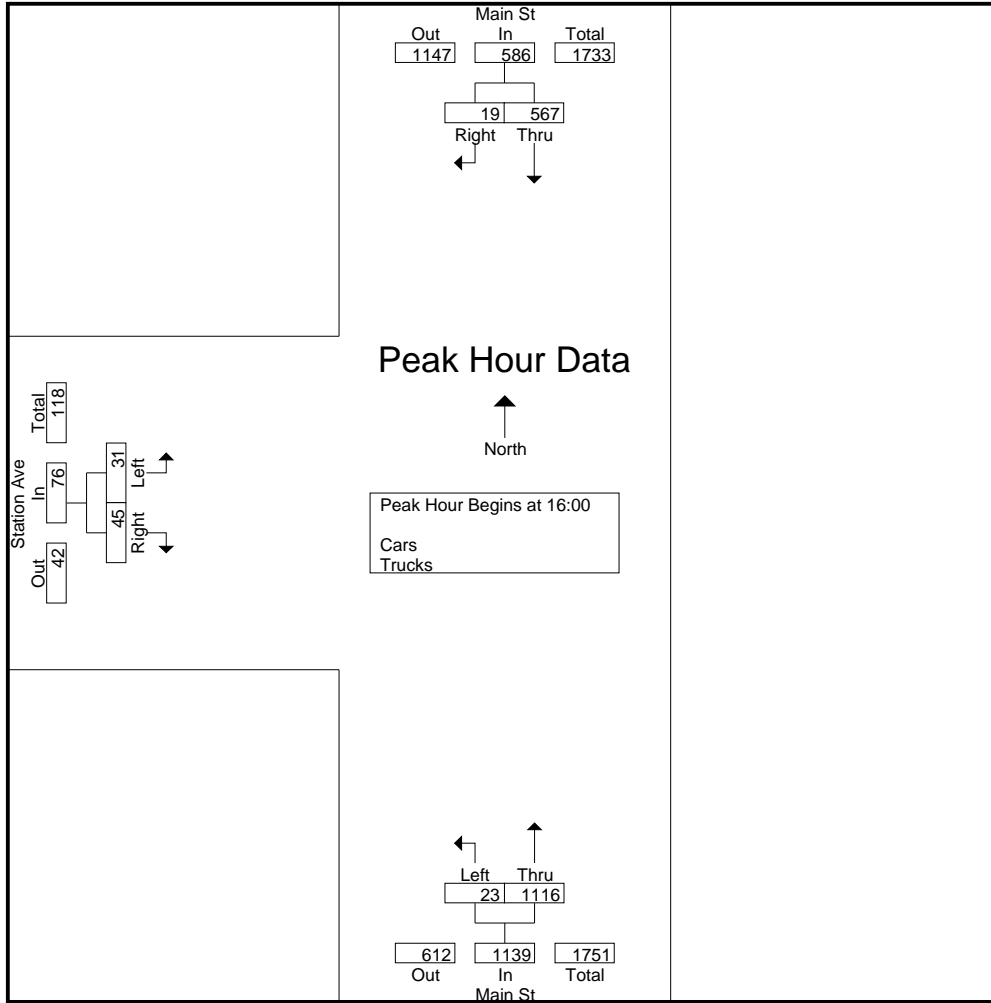
Groups Printed- Cars - Trucks

Start Time	Main St From North		Main St From South		Station Ave From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
16:00	141	8	9	262	14	17	451
16:15	140	3	9	279	8	15	454
16:30	150	5	5	272	4	8	444
16:45	136	3	0	303	5	5	452
Total	567	19	23	1116	31	45	1801
17:00	127	2	9	279	7	5	429
17:15	120	7	2	297	6	2	434
17:30	123	4	3	305	3	4	442
17:45	99	5	7	299	9	9	428
Total	469	18	21	1180	25	20	1733
Grand Total	1036	37	44	2296	56	65	3534
Apprch %	96.6	3.4	1.9	98.1	46.3	53.7	
Total %	29.3	1	1.2	65	1.6	1.8	
Cars	1011	35	44	2267	56	65	3478
% Cars	97.6	94.6	100	98.7	100	100	98.4
Trucks	25	2	0	29	0	0	56
% Trucks	2.4	5.4	0	1.3	0	0	1.6

Start Time	Main St From North			Main St From South			Station Ave From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
16:00	141	8	149	9	262	271	14	17	31	451
16:15	140	3	143	9	279	288	8	15	23	454
16:30	150	5	155	5	272	277	4	8	12	444
16:45	136	3	139	0	303	303	5	5	10	452
Total Volume	567	19	586	23	1116	1139	31	45	76	1801
% App. Total	96.8	3.2		2	98		40.8	59.2		
PHF	.945	.594	.945	.639	.921	.940	.554	.662	.613	.992

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:00



N/S Street : Main Street
 E/W Street: Playground Road
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400005
 Site Code : 02400005
 Start Date : 1/10/2007
 Page No : 1

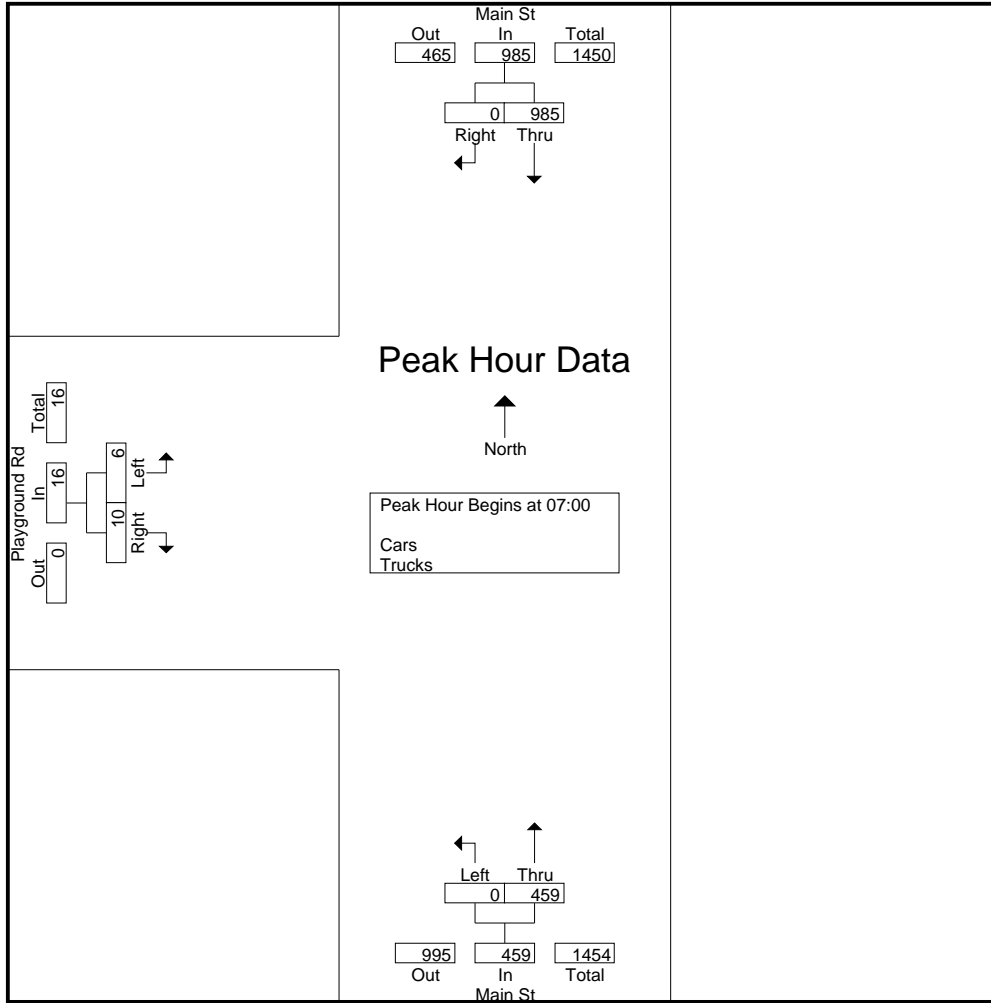
Groups Printed- Cars - Trucks

Start Time	Main St From North		Main St From South		Playground Rd From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
07:00	268	0	0	93	1	2	364
07:15	277	0	0	100	0	3	380
07:30	256	0	0	136	1	1	394
07:45	184	0	0	130	4	4	322
Total	985	0	0	459	6	10	1460
08:00	218	0	0	82	0	3	303
08:15	231	0	0	74	2	0	307
08:30	193	0	0	122	5	5	325
08:45	141	0	0	109	7	4	261
Total	783	0	0	387	14	12	1196
Grand Total	1768	0	0	846	20	22	2656
Apprch %	100	0	0	100	47.6	52.4	
Total %	66.6	0	0	31.9	0.8	0.8	
Cars	1739	0	0	814	20	22	2595
% Cars	98.4	0	0	96.2	100	100	97.7
Trucks	29	0	0	32	0	0	61
% Trucks	1.6	0	0	3.8	0	0	2.3

Start Time	Main St From North			Main St From South			Playground Rd From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
07:00	268	0	268	0	93	93	1	2	3	364
07:15	277	0	277	0	100	100	0	3	3	380
07:30	256	0	256	0	136	136	1	1	2	394
07:45	184	0	184	0	130	130	4	4	8	322
Total Volume	985	0	985	0	459	459	6	10	16	1460
% App. Total	100	0		0	100		37.5	62.5		
PHF	.889	.000	.889	.000	.844	.844	.375	.625	.500	.926

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

Peak Hour for Entire Intersection Begins at 07:00



N/S Street : Main Street
 E/W Street: Playground Road
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400005
 Site Code : 02400005
 Start Date : 1/10/2007
 Page No : 1

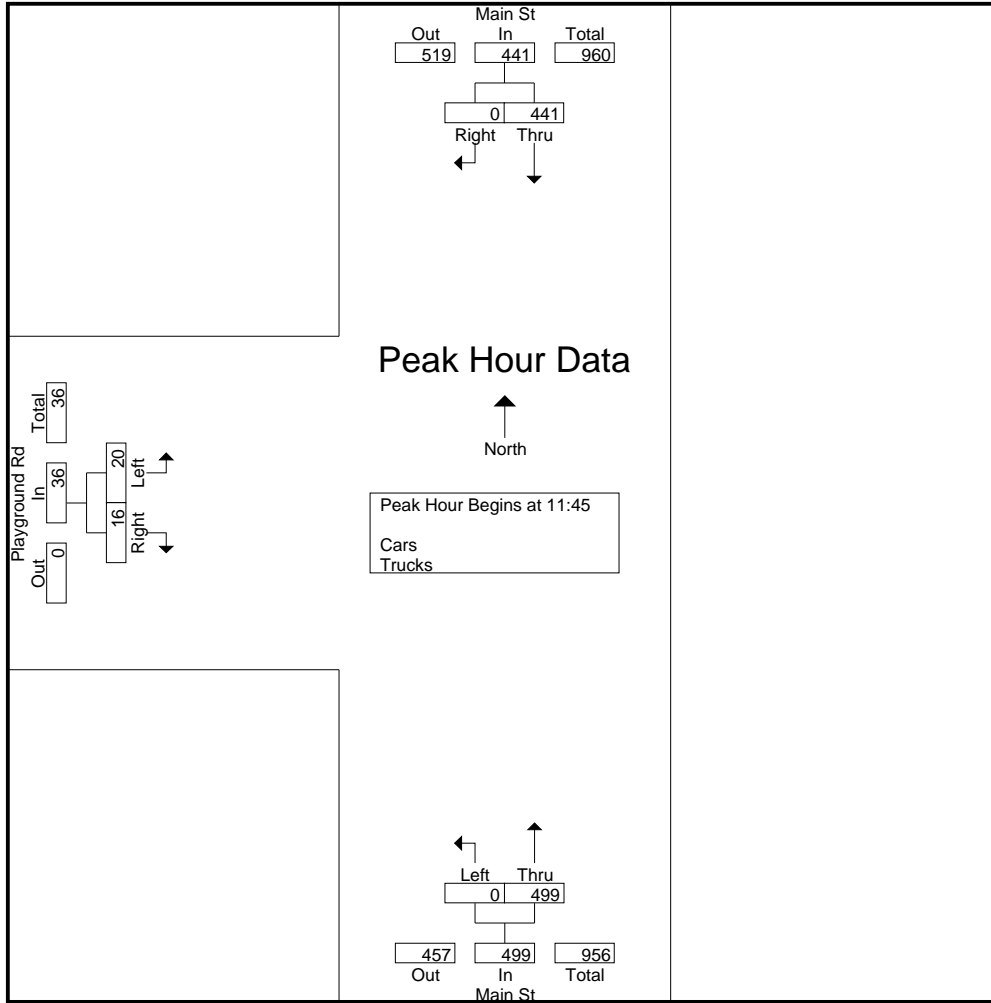
Groups Printed- Cars - Trucks

Start Time	Main St From North		Main St From South		Playground Rd From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
11:00	106	0	1	139	4	5	255
11:15	124	0	0	104	2	2	232
11:30	110	0	0	110	0	3	223
11:45	107	0	0	117	8	4	236
Total	447	0	1	470	14	14	946
12:00	106	0	0	132	8	7	253
12:15	116	0	0	135	2	3	256
12:30	112	0	0	115	2	2	231
12:45	116	0	0	112	3	3	234
Total	450	0	0	494	15	15	974
Grand Total	897	0	1	964	29	29	1920
Apprch %	100	0	0.1	99.9	50	50	
Total %	46.7	0	0.1	50.2	1.5	1.5	
Cars	858	0	1	909	29	29	1826
% Cars	95.7	0	100	94.3	100	100	95.1
Trucks	39	0	0	55	0	0	94
% Trucks	4.3	0	0	5.7	0	0	4.9

Start Time	Main St From North			Main St From South			Playground Rd From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
11:45	107	0	107	0	117	117	8	4	12	236
12:00	106	0	106	0	132	132	8	7	15	253
12:15	116	0	116	0	135	135	2	3	5	256
12:30	112	0	112	0	115	115	2	2	4	231
Total Volume	441	0	441	0	499	499	20	16	36	976
% App. Total	100	0		0	100		55.6	44.4		
PHF	.950	.000	.950	.000	.924	.924	.625	.571	.600	.953

Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:45



N/S Street : Main Street
 E/W Street: Playground Road
 City/State : Groton, MA
 Weather : Clear

Accurate Counts
 978-664-2565

File Name : 02400005
 Site Code : 02400005
 Start Date : 1/10/2007
 Page No : 1

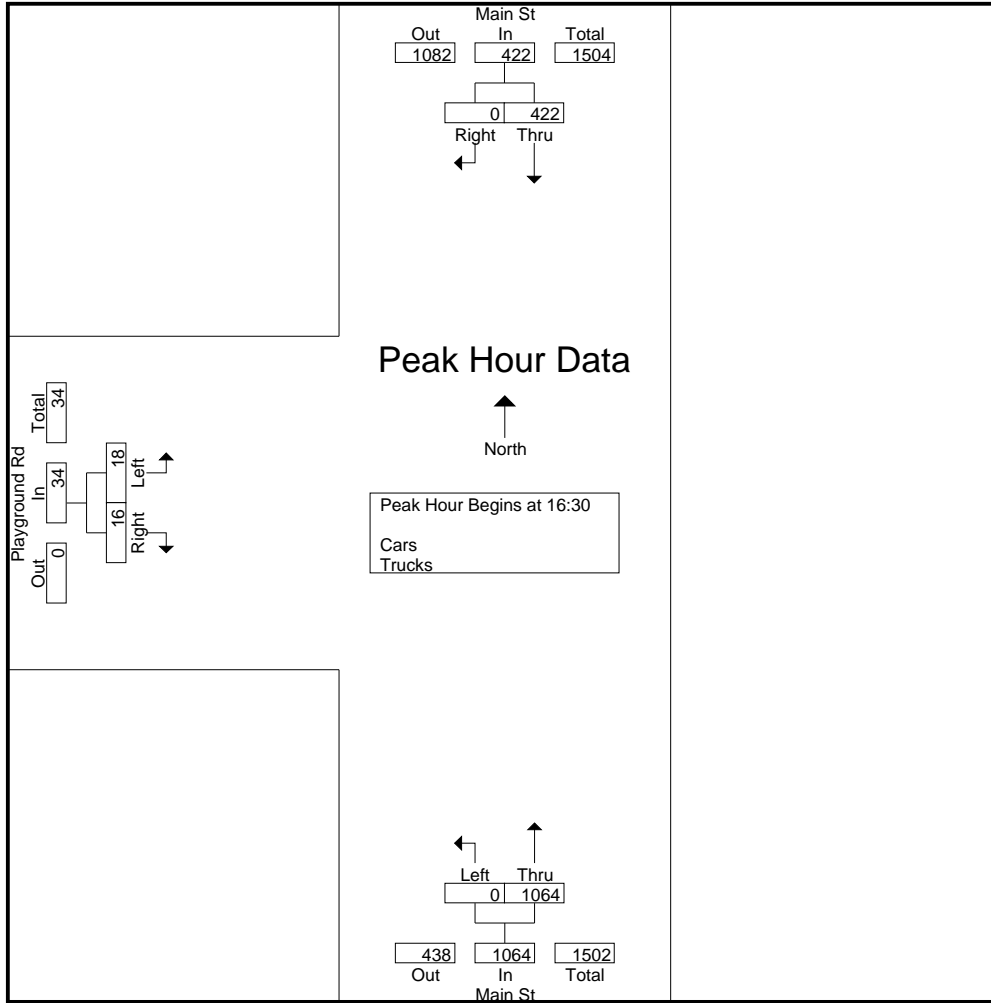
Groups Printed- Cars - Trucks

Start Time	Main St From North		Main St From South		Playground Rd From West		Int. Total
	Thru	Right	Left	Thru	Left	Right	
16:00	120	0	0	245	3	3	371
16:15	116	0	0	241	0	2	359
16:30	119	0	0	280	4	1	404
16:45	102	0	0	267	6	7	382
Total	457	0	0	1033	13	13	1516
17:00	100	0	0	261	6	7	374
17:15	101	0	0	256	2	1	360
17:30	96	0	0	260	3	1	360
17:45	83	0	0	276	2	0	361
Total	380	0	0	1053	13	9	1455
Grand Total	837	0	0	2086	26	22	2971
Apprch %	100	0	0	100	54.2	45.8	
Total %	28.2	0	0	70.2	0.9	0.7	
Cars	821	0	0	2070	26	22	2939
% Cars	98.1	0	0	99.2	100	100	98.9
Trucks	16	0	0	16	0	0	32
% Trucks	1.9	0	0	0.8	0	0	1.1

Start Time	Main St From North			Main St From South			Playground Rd From West			Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	
16:30	119	0	119	0	280	280	4	1	5	404
16:45	102	0	102	0	267	267	6	7	13	382
17:00	100	0	100	0	261	261	6	7	13	374
17:15	101	0	101	0	256	256	2	1	3	360
Total Volume	422	0	422	0	1064	1064	18	16	34	1520
% App. Total	100	0		0	100		52.9	47.1		
PHF	.887	.000	.887	.000	.950	.950	.750	.571	.654	.941

Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:30



Historical Crash Data

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Groton, MA COUNT DATE : 1/10/2007

MHD USE ONLY

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street

RIN #

MINOR STREET(S) : Hollis Road

RIN #

Years 2003-2005

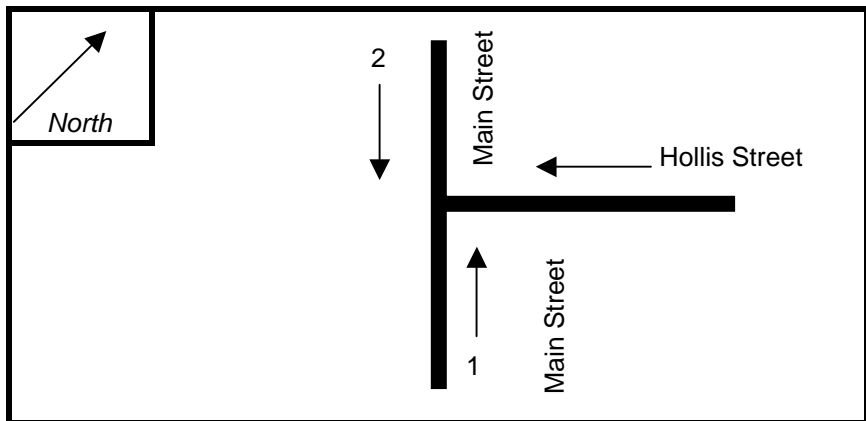
RIN #

(counted volumes adjusted to average annual)

RIN #

RIN #

**INTERSECTION
DIAGRAM**
(Label Approaches)



INTERSECTION
REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	NB	SB	WB			
VOLUMES (AM/PM) :	1171	519	147			

" K " FACTOR : APPROACH ADT : ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : # OF YEARS : AVERAGE # OF ACCIDENTS (A) :

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

Comments : Location is lower than District 4 average crash rate of 0.63 and statewide. and statewide crash rate of 0.66 crashes per million entering vehicles

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Groton, MA COUNT DATE : 1/10/2007

MHD USE ONLY

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Rt. 119)

RIN #

MINOR STREET(S) : Lowell Road and Broadmeadow Road

RIN #

Years 2003-2005

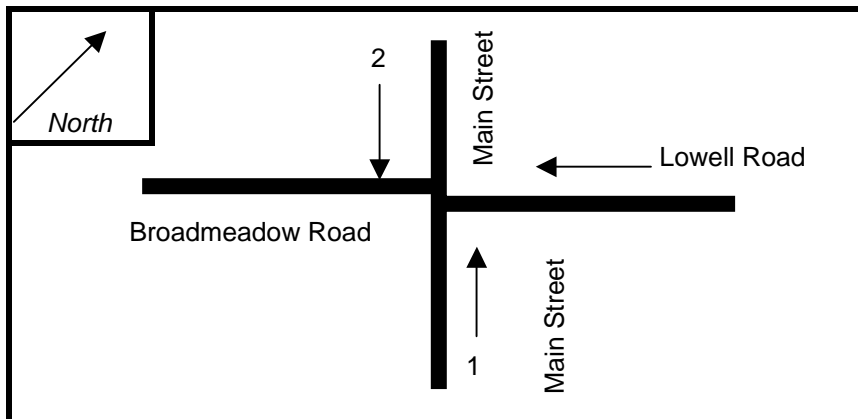
RIN #

(counted volumes adjusted to average annual)

RIN #

RIN #

**INTERSECTION
DIAGRAM**
(Label Approaches)



INTERSECTION
REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	NB	SB	WB			
VOLUMES (AM/PM) :	1043	600	269			

" K " FACTOR : APPROACH ADT : ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : # OF YEARS : AVERAGE # OF ACCIDENTS (A) :

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

Comments : Location is lower than District 4 average crash rate of 0.63 and statewide and statewide crash rate of 0.66 crashes per million entering vehicles

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Groton, MA COUNT DATE : 1/10/2007

MHD USE ONLY

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (119)

RIN #

MINOR STREET(S) : Pleasant Street (225)

RIN #

Years 2003-2005

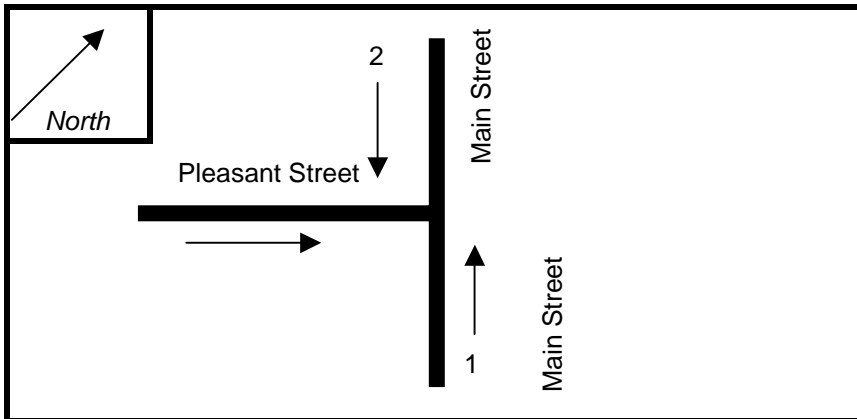
RIN #

(counted volumes adjusted to average annual)

RIN #

RIN #

**INTERSECTION
DIAGRAM
(Label Approaches)**



INTERSECTION
REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	NB	SB	EB			
VOLUMES (AM/PM) :	914	396	139			

" K " FACTOR : APPROACH ADT : ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : # OF YEARS : AVERAGE # OF ACCIDENTS (A) :

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

Comments : Location is lower than District 4 average crash rate of 0.63 and statewide. and statewide crash rate of 0.66 crashes per million entering vehicles

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Groton, MA COUNT DATE : 1/10/2007

MHD USE ONLY

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Main Street (Rt. 119)

RIN #

MINOR STREET(S) : Station Avenue

RIN #

Years 2003-2005

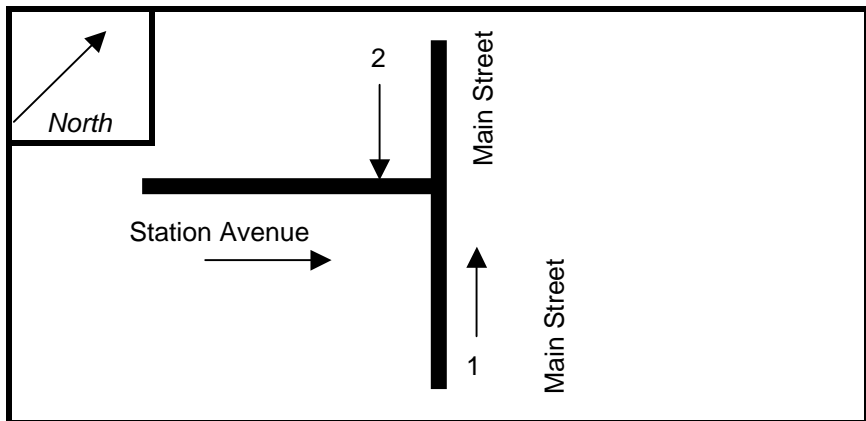
RIN #

(counted volumes adjusted to average annual)

RIN #

RIN #

**INTERSECTION
DIAGRAM
(Label Approaches)**



INTERSECTION

REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	NB	SB	WB			
VOLUMES (AM/PM) :	1161	597	78			

" K " FACTOR : APPROACH ADT : ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS : # OF YEARS : AVERAGE # OF ACCIDENTS (A) :

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

Comments : Location is lower than District 4 average crash rate of 0.63 and statewide. and statewide crash rate of 0.66 crashes per million entering vehicles

2003-2005 Crashes - Station Avenue Area (Main Street)																					
Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicles Travel Directions	Most Harmful Events	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Address	X Coordinate	Y Coordinate
1842038	GROTON	09-Feb-2005	11:55 AM	Non-fatal injury	2	1	0	Angle	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy		195 MAIN STREET				195 MAIN STREET	194060.047719385	928725.945606364
1604826	GROTON	14-Jun-2003	1:57 AM	Property damage only (none injured)	2	0	0	Angle	V1:Eastbound / V2:Eastbound	V1: Collision with parked motor vehicle / V2: Collision with motor vehicle in traffic	Wet	Dark - lighted roadway	Rain		209 MAIN STREET Rte 115				209 MAIN STREET Rte 119 E		
1822212	GROTON	20-Dec-2004	3:55 PM	Property damage only (none injured)	2	0	0	Angle	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Snow	Daylight	Cloudy	HOLLIS STREET / MAIN STREET							
1776285	GROTON	18-Aug-2004	5:33 PM	Property damage only (none injured)	2	0	0	Angle	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear/Clear	MAIN STREET Rte 119 E / HOLLIS STREET							
1823681	GROTON	28-Dec-2004	7:46 AM	Property damage only (none injured)	2	0	0	Angle	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Clear	MAIN STREET Rte 119 W / HOLLIS STREET							
1579809	GROTON	22-Apr-2003	3:04 PM	Property damage only (none injured)	2	0	0	Angle	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Cloudy/Rain	MAIN STREET Rte 119 W / HOLLIS STREET							
1667409	GROTON	21-Nov-2003	6:55 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Dark - lighted roadway	Clear		500 feet W from Intersection 201 MAIN STREET Rte 119 / HOLLIS STREET				201 MAIN STREET Rte 115		
1579819	GROTON	28-Mar-2003	11:44 AM	Property damage only (none injured)	2	0	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET / COURT STREET							
1667397	GROTON	31-Oct-2003	1:08 PM	Non-fatal injury	2	1	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 119 E / COURT STREET / HOLLIS STREET							
1579833	GROTON	25-Mar-2003	6:30 PM	Non-fatal injury	2	1	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Dark - lighted roadway	Clear	MAIN STREET Rte 119 E / HOLLIS STREET							
1615722	GROTON	24-Jul-2003	4:00 PM	Non-fatal injury	2	1	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 119 W / COURT STREET							
1603060	GROTON	27-May-2003	5:25 PM	Property damage only (none injured)	2	0	0	Angle	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	LOWELL ROAD Rte 40 W / MAIN STREET Rte 119 E / BROADMEADOW ROAD							
1860671	GROTON	02-Jun-2004	4:41 AM	Property damage only (none injured)	2	0	0	Angle	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	Wet	Daylight	Cloudy	MAIN STREET Rte 119 / BROADMEADOW ROAD							
1708901	GROTON	08-Mar-2004	10:56 AM	Non-fatal injury	2	3	0	Angle	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy/Cloudy	MAIN STREET Rte 119 E / LOWELL ROAD / BROADMEADOW ROAD							
1602606	GROTON	07-Jun-2003	12:25 PM	Property damage only (none injured)	2	0	0	Angle	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Cloudy/Rain	MAIN STREET Rte 119 W / BROADMEADOW ROAD / LOWELL ROAD Rte 40							
1723103	GROTON	22-Apr-2004	9:33 AM	Property damage only (none injured)	1	0	0	Angle	V1:Eastbound	V1: Collision with highway traffic sign post	Dry	Daylight	Cloudy	MAIN STREET Rte 119 W / LOWELL ROAD Rte 40 E							
1667395	GROTON	21-Nov-2003	3:15 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear/Clear	120 MAIN STREET Rte 115					120 MAIN STREET Rte 115		
1602865	GROTON	27-May-2003	3:00 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	126 MAIN STREET Rte 115					126 MAIN STREET Rte 119 N		
1615869	GROTON	25-Jul-2003	6:04 PM	Non-fatal injury	2	1	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 119 W / BROADMEADOW ROAD / LOWELL ROAD							
1819006	GROTON	11-May-2004	5:10 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear	MAIN STREET Rte 119 / PLEASANT STREET							
1761979	GROTON	02-Aug-2004	5:55 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear/Clear	PLEASANT STREET / MAIN STREET Rte 119 E							
1574670	GROTON	27-Feb-2003	5:17 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	PLEASANT STREET Rte 111 / MAIN STREET Rte 119 E							
1778313	GROTON	13-Sep-2004	4:25 PM	Non-fatal injury	2	1	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	PLEASANT STREET Rte 225 / MAIN STREET Rte 115							
1641483	GROTON	09-Sep-2003	10:59 AM	Non-fatal injury	2	1	0	Rear-end	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy	PLEASANT STREET Rte 225 E / MAIN STREET Rte 119 E							
1603001	GROTON	17-Jun-2003	11:41 AM	Property damage only (none injured)	2	0	0	Angle	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear		173 MAIN STREET Rte 115				173 MAIN STREET Rte 119 W (TOWN HALL)		
1733281	GROTON	22-May-2004	11:21 AM	Property damage only (none injured)	2	0	0	Angle	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Cloudy/Rain	MAIN STREET Rte 119 E / STATION AVENUE							
1891290	GROTON	19-May-2005	10:06 AM	Property damage only (none injured)	2	0	0	Rear-end	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy/Clear	173 MAIN STREET					173 MAIN STREET	194149.657628341	928628.547885291
1962371	GROTON	23-Nov-2005	9:03 AM	Property damage only (none injured)	3	0	0	Rear-end	V1:Eastbound / V2:Eastbound / V3:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy/Cloudy	173 MAIN STREET Rte 119 E					173 MAIN STREET Rte 119 E	194149.657628341	928628.547885291
1552382	GROTON	10-Feb-2003	9:46 AM	Property damage only (none injured)	2	0	0	Rear-end	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy/Cloudy	MAIN STREET Rte 119 E / STATION AVENUE							
1761802	GROTON	31-Jul-2004	12:30 PM	Non-fatal injury	2	2	0	Rear-end	V1:Not reported / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 119 W / STATION AVENUE							
1600172	GROTON	21-May-2003	1:25 PM	Non-fatal injury	2	2	0	Rear-end	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Wet	Daylight	Rain/Cloudy	MAIN STREET Rte 119 W / STATION AVENUE							
1613408	GROTON	16-Jul-2003	12:00 PM	Property damage only (none injured)	2	0	0	Rear-end	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	MAIN STREET Rte 119 W / STATION AVENUE							

Detailed Trip Generation Analysis

Detailed Trip Generation Analysis

MAXIMUM LONG TERM
Groton Center Redevelopment - Retail Component
22.9 k Land Use Code 820 - Shopping Center
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	492	Fitted Curve Equation Ln(T)=	0.650 Ln(X)+5.83
Trips Out	492	Trips In	1303
42.94 trips/000 SF	983	Trips Out	1303
		Total Trips	2605
AM PEAK HOUR		AM PEAK HOUR	
Trips In	14	Fitted Curve Equation Ln(T)=	0.60 Ln(X)+2.29
Trips Out	9	Trips In	39
1.03 trips/000 SF	24	Trips Out	25
		Total Trips	65
PM PEAK HOUR		PM PEAK HOUR	
Trips In	41	Fitted Curve Equation Ln(T)=	0.66 Ln(X)+3.40
Trips Out	45	Trips In	114
3.75 trips/000 SF	86	Trips Out	123
		Total Trips	237
SATURDAY		SATURDAY	
Trips In	572	Fitted Curve Equation Ln(T)=	0.63 Ln(X)+6.23
Trips Out	572	Trips In	1825
49.97 trips/000 SF	1144	Trips Out	1825
		Total Trips	3650
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	59	Fitted Curve Equation Ln(T)=	0.65 Ln(X)+3.77
Trips Out	55	Trips In	173
4.97 trips/000 SF	114	Trips Out	159
		Total Trips	332

SHORT TERM (CAPSTONE)
Groton Center Redevelopment - Retail Component
6.4 k Land Use Code 820 - Shopping Center
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	137	Fitted Curve Equation Ln(T)=	0.650 Ln(X)+5.83
Trips Out	137	Trips In	569
42.94 trips/000 SF	275	Trips Out	569
		Total Trips	1138
AM PEAK HOUR		AM PEAK HOUR	
Trips In	4	Fitted Curve Equation Ln(T)=	0.60 Ln(X)+2.29
Trips Out	3	Trips In	18
1.03 trips/000 SF	7	Trips Out	12
		Total Trips	30
PM PEAK HOUR		PM PEAK HOUR	
Trips In	12	Fitted Curve Equation Ln(T)=	0.66 Ln(X)+3.40
Trips Out	12	Trips In	49
3.75 trips/000 SF	24	Trips Out	53
		Total Trips	102
SATURDAY		SATURDAY	
Trips In	160	Fitted Curve Equation Ln(T)=	0.63 Ln(X)+6.23
Trips Out	160	Trips In	818
49.97 trips/000 SF	320	Trips Out	818
		Total Trips	1635
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	17	Fitted Curve Equation Ln(T)=	0.65 Ln(X)+3.77
Trips Out	15	Trips In	75
4.97 trips/000 SF	32	Trips Out	70
		Total Trips	145

Groton Center Redevelopment - Residential Components (apartments)
56 Units Land Use Code 220 - Apartments
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	188	Fitted Curve Equation T=	6.01(X)+150.35
Trips Out	188	Trips In	243
6.72 trips/unit	376	Trips Out	243
		Total Trips	487
AM PEAK HOUR		AM PEAK HOUR	
Trips In	6	Fitted Curve Equation T=	0.49(X)+3.73
Trips Out	23	Trips In	6
0.51 trips/unit	29	Trips Out	25
		Total Trips	31
PM PEAK HOUR		PM PEAK HOUR	
Trips In	23	Fitted Curve Equation T=	0.55(X)+17.65
Trips Out	12	Trips In	31
0.62 trips/unit	35	Trips Out	17
		Total Trips	48
SATURDAY		SATURDAY	
Trips In	179	Fitted Curve Equation T=	7.85(X)-256.19
Trips Out	179	Trips In	92
6.39 trips/unit	358	Trips Out	92
		Total Trips	183
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	15	Fitted Curve Equation T=	0.41(X)+19.23
Trips Out	15	Trips In	21
0.52 trips/unit	29	Trips Out	21
		Total Trips	42

Groton Center Redevelopment - Residential Components (apartments)
22 Units Land Use Code 220 - Apartments
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	74	Fitted Curve Equation T=	6.01(X)+150.35
Trips Out	74	Trips In	141
6.72 trips/unit	148	Trips Out	141
		Total Trips	283
AM PEAK HOUR		AM PEAK HOUR	
Trips In	2	Fitted Curve Equation T=	0.49(X)+3.73
Trips Out	9	Trips In	3
0.51 trips/unit	11	Trips Out	12
		Total Trips	15
PM PEAK HOUR		PM PEAK HOUR	
Trips In	9	Fitted Curve Equation T=	0.55(X)+17.65
Trips Out	5	Trips In	10
0.62 trips/unit	14	Trips Out	30
		Total Trips	40
SATURDAY		SATURDAY	
Trips In	70	Fitted Curve Equation T=	7.85(X)-256.19
Trips Out	70	Trips In	-42
6.39 trips/unit	141	Trips Out	-82
		Total Trips	-43
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	6	Fitted Curve Equation T=	0.41(X)+19.23
Trips Out	6	Trips In	14
0.52 trips/unit	11	Trips Out	14
		Total Trips	28

* Source of Trip Generation Rates: ITE Trip Generation, 7th Edition, 2003

* Source of Trip Generation Rates: ITE Trip Generation, 7th Edition, 2003

Groton Center Redevelopment - Residential Components (condominiums)
56 Units Land Use Code 230 - Residential Condominium/Townhouse
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	164	Fitted Curve Equation Ln(T)=	0.850 Ln(X)+2.55
Trips Out	164	Trips In	196
5.86 trips/unit	328	Trips Out	196
		Total Trips	392
AM PEAK HOUR		AM PEAK HOUR	
Trips In	4	Fitted Curve Equation Ln(T)=	0.80 Ln(X)+.26
Trips Out	20	Trips In	6
0.44 trips/unit	25	Trips Out	27
		Total Trips	32
PM PEAK HOUR		PM PEAK HOUR	
Trips In	20	Fitted Curve Equation Ln(T)=	0.82 Ln(X)+.32
Trips Out	10	Trips In	25
0.52 trips/unit	29	Trips Out	12
		Total Trips	37
SATURDAY		SATURDAY	
Trips In	159	Fitted Curve Equation T=	3.62(X)+427.93
Trips Out	159	Trips In	315
5.67 trips/unit	318	Trips Out	315
		Total Trips	631
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	14	Fitted Curve Equation T=	0.29(X)+42.63
Trips Out	12	Trips In	32
0.47 trips/unit	26	Trips Out	27
		Total Trips	59

Groton Center Redevelopment - Residential Components (condominiums)
22 Units Land Use Code 230 - Residential Condominium/Townhouse
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	64	Fitted Curve Equation Ln(T)=	0.850 Ln(X)+2.55
Trips Out	64	Trips In	89
5.86 trips/unit	129	Trips Out	89
		Total Trips	177
AM PEAK HOUR		AM PEAK HOUR	
Trips In	2	Fitted Curve Equation Ln(T)=	0.80 Ln(X)+.26
Trips Out	8	Trips In	3
0.44 trips/unit	10	Trips Out	13
		Total Trips	15
PM PEAK HOUR		PM PEAK HOUR	
Trips In	8	Fitted Curve Equation Ln(T)=	0.82 Ln(X)+.32
Trips Out	4	Trips In	12
0.52 trips/unit	11	Trips Out	6
		Total Trips	17
SATURDAY		SATURDAY	
Trips In	62	Fitted Curve Equation T=	3.62(X)+427.93
Trips Out	62	Trips In	254
5.67 trips/unit	125	Trips Out	254
		Total Trips	508
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	6	Fitted Curve Equation T=	0.29(X)+42.63
Trips Out	5	Trips In	26
0.47 trips/unit	10	Trips Out	23
		Total Trips	49

FST Trip Generation Computations

Groton Center Redevelopment - Office Components (Dodson Associates)
9.6 K Land Use Code 710 - General Office
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	53	Fitted Curve Equation Ln(T)=	0.77 Ln(X)+3.65
Trips Out	53	Trips In	110
11.01 trips/unit	106	Trips Out	110
		Total Trips	220
AM PEAK HOUR		AM PEAK HOUR	
Trips In	13	Fitted Curve Equation Ln(T)=	0.80 Ln(X)+1.55
Trips Out	2	Trips In	5
1.55 trips/unit	15	Trips Out	24
		Total Trips	29
PM PEAK HOUR		PM PEAK HOUR	
Trips In	2	Fitted Curve Equation T=	1.12 (X)+78.81
Trips Out	12	Trips In	15
1.49 trips/unit	14	Trips Out	74
		Total Trips	90
SATURDAY		SATURDAY	
Trips In	11	Fitted Curve Equation T=	2.14 (X)+18.47
Trips Out	11	Trips In	20
2.37 trips/unit	23	Trips Out	20
		Total Trips	39
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	2	Fitted Curve Equation Ln(T)=	0.81 Ln(X)-.12
Trips Out	2	Trips In	1
0.41 trips/unit	4	Trips Out	5
		Total Trips	6

FST Trip Generation Computations

Groton Center Redevelopment - Quality Restaurant Results
4.6 K Land Use Code 931 - Quality Restaurant
Average Rate Results Fitted Curve Equation Results

WEEKDAY		WEEKDAY	
Trips In	207	Fitted Curve Equation Ln(T)=	n/a
Trips Out	207	Trips In	n/a
89.95 trips/unit	414	Trips Out	n/a
		Total Trips	n/a
AM PEAK HOUR		AM PEAK HOUR	
Trips In	3	Fitted Curve Equation Ln(T)=	n/a
Trips Out	1	Trips In	n/a
0.81 trips/unit	4	Trips Out	n/a
		Total Trips	n/a
PM PEAK HOUR		PM PEAK HOUR	
Trips In	6	Fitted Curve Equation T=	n/a
Trips Out	29	Trips In	n/a
7.49 trips/unit	34	Trips Out	n/a
		Total Trips	n/a
SATURDAY		SATURDAY	
Trips In	217	Fitted Curve Equation T=	1.04 Ln(X)+4.41
Trips Out	217	Trips In	201
94.36 trips/unit	434	Trips Out	201
		Total Trips	402
SATURDAY PEAK HOUR		SATURDAY PEAK HOUR	
Trips In	27	Fitted Curve Equation Ln(T)=	n/a
Trips Out	23	Trips In	n/a
10.82 trips/unit	50	Trips Out	n/a
		Total Trips	n/a

Preliminary Parking Estimates

Table 7

Parking Generation Estimates - Groton Station Area W/DODSON ASSOCIATES LONG TERM PLAN and CAPSTONE SHORT TERM PLAN

Parking Supply/Demand Analysis (Dodson Plan)			
--ITE Parking Generation, 3rd Edition, 2004--			
Use	GLA/GFA	Parking	Av. Estimate
Shopping Center	22,900	70 and 68	83 and 80
Small Restaurant*	4,600	55 and 43	65 and 51
Residential Condominiums	56 units	82 and 82	97 and 97
Office Space**	9,600	28	33
30 spaces for Nashua River Rail Trail	N/A	N/A	30
Total Parking Demand (peak day)		251	
Projected Parking Supply Requirement			308

* Seat estimate not available; assumes 100 seats.
41 supply

Parking Supply/Demand Analysis (Dodson Plan)			
--Town of Groton Parking Zoning Requirements--			
Use	GLA/GFA	Requirement	Total
Shopping Center	22,900	1/250 feet	92
Small Restaurant*	4,600	5+1/2 person seat	55
Residential Condominiums	56 units	2/unit	112
Office Space**	9,600	2+1/250 gsf	55
30 spaces for Nashua River Rail Trail	N/A	N/A	30
Total Zoning Parking Requirement		251	344

* Seat estimate not available; assumes 100 seats.
in excess of 500 sf or 79 parking spaces if entirely devoted to medical office space.

Parking Supply/Demand Analysis (Capstone Plan)			
--ITE Parking Generation, 3rd Edition, 2004--			
Use	GLA/GFA	Fri/Sat Peak Parking Generation (average rate)	Fri/Sat Supply Av. Estimate (Peak Parking Generation * 1.18)
Shopping Center	6,400	20 and 19	24 and 23
Small Restaurant*	4,600	55 and 43	65 and 51
Residential Condominiums	22 units	32 and 32	39 and 39
30 spaces for Nashua River Rail Trail	N/A	N/A	30
Total Parking Demand (peak day)		107	
Projected Parking Supply Requirement			157

* Seat estimate not available; assumes 100 seats.

Parking Supply/Demand Analysis (Capstone Plan)			
--Town of Groton Parking Zoning Requirements--			
Use	GLA/GFA	Zoning Requirement Units	Total
Shopping Center	6,400	1/250 feet	26
Small Restaurant	4,600	5+1/2 person seat	55
Residential Condominiums	22 units	2/unit	44
30 spaces for Nashua River Rail Trail	N/A	N/A	30
Total Zoning Parking Requirement			155

* Assumes general, no medical, office space; medical office space would be 6+1/125 feet in excess of 500 sf or 79 parking spaces if entirely devoted to medical office space.

** Seat estimate not available; assumes 7 spaces/ thousand square feet.

To be conservative, assumes no shared parking