

Devens Traffic Monitoring Program

2015 Five-Year Traffic Report

DEVENS, MASSACHUSETTS

December 2015

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Executive Summary

Introduction

The 1995 Devens Final Environmental Impact Report (FEIR), issued by the United States Department of the Army, allowed portions of Fort Devens to be redeveloped as a mixed use planned community in accordance with the Devens Reuse Plan. Massachusetts Development Finance Agency (MassDevelopment, formerly The Massachusetts Land Bank) is the public agency with the exclusive responsibility to maintain, control, and redevelop the Devens community. As part of the 1995 FEIR, MassDevelopment committed to a traffic monitoring program at select locations to identify trends (changes) in traffic patterns and traffic volumes in the adjacent communities.

The Devens Base Reuse Plan limited development to 8.5 million square feet, and a daily vehicle-trip threshold of 59,265 trips was calculated based on projected development levels in the EIR. This study is the fourth 5-year Traffic Monitoring Report.

Data Collection

The study area for this report was defined in the EIR. Devens is a regional enterprise zone established by legislation and comprised of parts of Ayer, Shirley, Harvard, and Lancaster. Surrounding towns of Boxborough, Groton, Littleton, and Lunenburg are included in the study area as potential impact communities.

Traffic data were collected during Spring 2015 in the study area in order to develop an understanding of traffic operations at critical roadways and intersections within the study area. The following data were collected for this study:

- Weekday morning (7-9AM) and weekday afternoon (4-6PM) peak period Turning Movement Counts (TMCs) at thirteen (13) intersections internal to Devens, at ten (10) business driveways, and at fourteen (14) intersections in towns surrounding Devens (external);
- 48-hour and 7-day Automatic Traffic Recorder (ATR) counts at key locations consistent with previous reports, located both within Devens and in the surrounding communities;
- Origin-destination studies at each of the five Devens access/egress gates;
- Transportation surveys of both residents and employees of businesses in Devens;
- Commuter rail transit ridership data from the Massachusetts Bay Transportation Authority (MBTA).

Findings

To evaluate the 2015 conditions, the traffic volume data and the results of the capacity analyses were compared to those from previous reports, including the 2000, 2005, and 2010 years. The findings are summarized below:

- Collectively, the traffic volumes on roadways external to Devens have experienced a decrease of 9% in traffic volumes when compared to the 2010 volumes. Additionally, the 7-day traffic volume trends show that the traffic volumes along Route 2 in the vicinity of Devens appear to have peaked in 2004 and have been steadily declining since. This indicates that while Devens continues to generate more traffic each year, roadways external to Devens are experiencing a decrease in traffic volumes.
- Weekday traffic volumes at all Devens Gates have increased by 11% since 2010 (Figure ES-1). Grant Road Gate has seen the largest increase of 39% (+587 vehicles per day). Prior to 2010, traffic growth had been stabilizing. On a daily basis, the distribution of traffic throughout the gates (which are used to access Devens) has remained constant, with Jackson at 47%, Barnum at 20%, Verbeck at 19%, Grant at 8%, and Shirley at 6%.

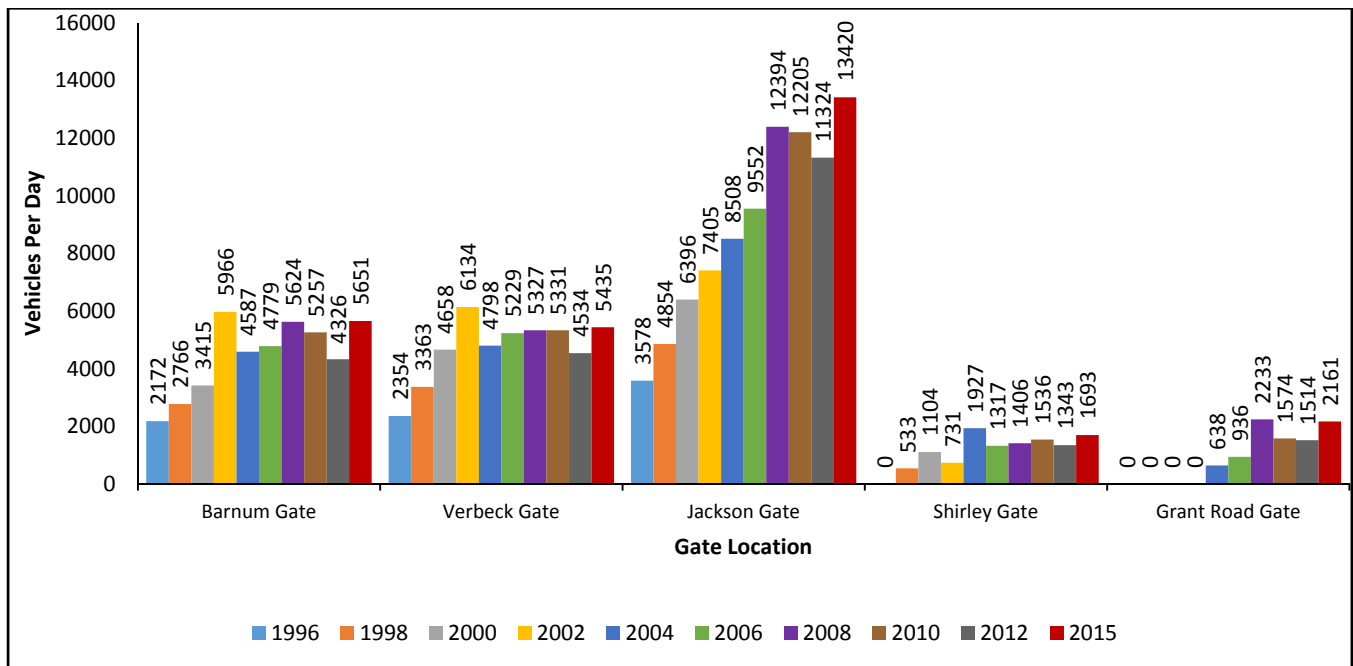


Figure ES-1: Average Weekday Daily Traffic – Devens Gates

- Overall, average weekday daily truck traffic has increased by 55% (+1,149) per day since 2010. 85% of truck traffic passes through Jackson Gate (55%) and Barnum Gate (30%). Truck traffic in Devens has increased at all gates with the exception of Verbeck Gate, which experienced a 51% decrease in truck volume. Grant and Jackson Gates experienced the most significant increases in truck traffic, having seen increases of 123% and 121% respectively.
- It was determined that in 2015, 34 percent of vehicles which enter Devens use Devens roadways as cut-through routes. This percentage has increased by 2 percent from 2010 and by 14 percent from 2005. The total number of cut-through trips decreased between the times

of 9:00 AM and 2:00 PM, suggesting that fewer drivers are using Devens as a cut-through during non-peak hour times than in 2010. This shows that Devens is used as a cut-through mainly by commuters traveling to and from the regional highway network. The highest number of cut-through trips occur during the afternoon peak hour. Overall, cut-through traffic continues to increase every year.

- Transportation surveys prepared by MassDevelopment were distributed to residents and employees of businesses in Devens. The purpose of the surveys was to collect information about commutes to and from Devens. The results of the survey, which were received from 670 people (81 residents and 589 employees) are summarized below:
 - 86 percent drive, 12 percent carpool, 1 percent walk, 1 percent drive to transit, and none travel by bicycle;
 - Jackson Gate continues to be the most utilized gate, used by 54% of those surveyed. This percentage excludes surveys taken by employees of Quiet Logistics (427 of 589 total business surveys), where 98% indicated that they use Barnum Gate to commute to work. Since the gates no longer physically exist, employees may have confused “Barnum Gate” with “Barnum Road.” It is suggested that in the future, the transportation surveys clarify “gate” locations. Due to this discrepancy, figures for results both including and excluding Quiet Logistics employees have been included.
- The Massachusetts Bay Transportation Authority (MBTA) Fitchburg commuter rail line services Devens and the surrounding communities at four stations: Ayer, Shirley, North Leominster, and Fitchburg. Between 2009 and 2013, daily boardings have fluctuated each year. Between 2009 and 2010, ridership decreased by 13%. It then increased by 26% in 2011, but fell by 11% in 2012. The latest MBTA data available (2013) shows an increase of 10% since 2012.
- The occupied development in Devens has increased 1.05 million square feet from 3,662,758 square feet in 2010 to 4,708,099 square feet in 2015.
- Using ITE trip generation rates, it is estimated that existing Devens developments would generate 37,207 vehicle-trips on weekdays. After being adjusted for cut-through trips, the actual traffic counts at the gates indicate an average weekday daily traffic volume of 18,718 vehicle-trips in 2015. This means that Devens is currently generating traffic at a rate of 50% of what ITE projects a comparable development would generate. In 2010, results indicated that Devens was generating traffic at a rate of 53% of what a comparable development would generate.
- Previous reports utilized a yearly build-out projection of 225,000 square feet per year. Conversations with MassDevelopment indicate that this rate should be held for the 2015 5-Year Traffic Monitoring Report. Using this rate, measured traffic volume data, and current development, it is estimated that the 59,625 vehicle-trip threshold would not be reached until 2039, assuming 10,109,900 square feet of occupied development in Devens. With implementation of Traffic Demand Management Strategies reducing traffic volumes by 7.5%, this threshold is not expected to be reached until 2042. (Figure ES-2).

- The 2005 5-year Traffic Monitoring Report estimated that this threshold would be reached in 2014 with 7,360,854 square feet of development. This shows that Devens is currently generating significantly less traffic and being developed at a slower rate than projected. The Scenario 2 build-out limit of 8,500,000 square feet is projected to be reached in 2032, corresponding with an AWDT of 47,390 trips per day based on projections from actual data.

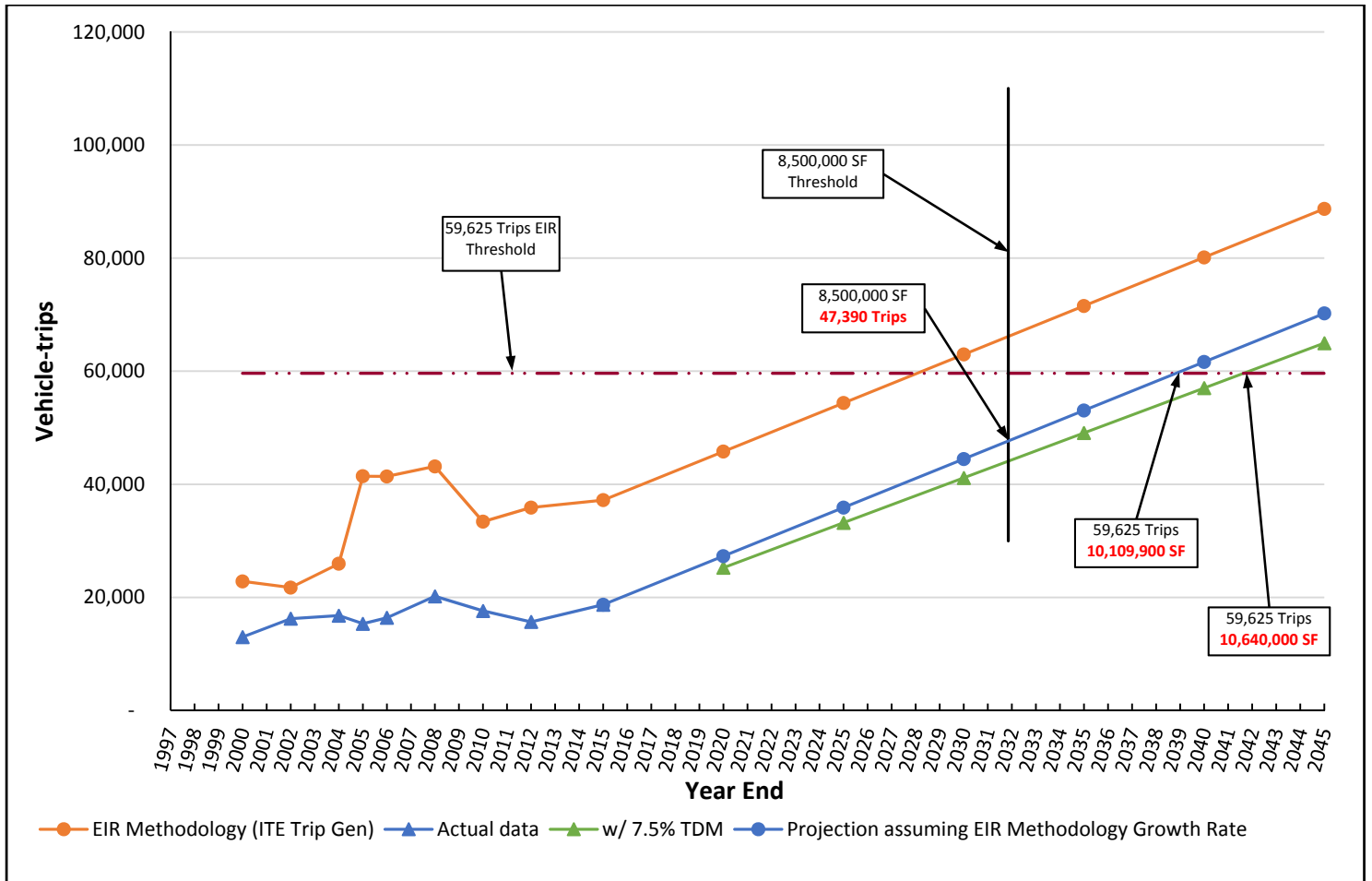


Figure ES-2: Devens Build-Out Summary by Year – Trips

- Intersection Level of Service analyses were performed at fourteen study intersections external to Devens for the morning and evening peak hours using methodologies from the 2000 Highway Capacity Manual. The results indicate that eight of the fourteen analyzed intersections experience no change in level of service from 1996 to 2015. Three study intersections have deteriorated by only one level of service and three study intersections have deteriorated by two or more levels of service.
- Based on the review of the past 20 years of data, traffic in the regional roadway network has remained steady or in some instances decreased. Trips associated with the development of Devens have increased less than anticipated, resulting in minimal impacts on surrounding roadways and intersections.



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Chapter 1: Introduction

1.1 Project Purpose and Goals

The 1995 Devens Final Environmental Impact Report (FEIR), issued by the United States Department of the Army, allowed portions of Fort Devens to be redeveloped as a mixed use planned community in accordance with the Devens Reuse Plan. Massachusetts Development Finance Agency (MassDevelopment, formerly The Massachusetts Land Bank) is the public agency with the exclusive responsibility to maintain, control, and redevelop the Devens community. As part of the 1995 FEIR, MassDevelopment committed to a traffic monitoring program at selected locations to identify trends (changes) in traffic patterns and traffic volumes on the adjacent communities.

The Devens Base Reuse Plan limited development to 8.5 million square feet, and a daily vehicle-trip threshold of 59,265 trips was calculated based on projected development levels in the EIR. This study is the fourth 5-year Traffic Monitoring Report, comprised of the following:

1. A comprehensive review of current traffic trends;
2. Detailed comparison with previous traffic data from the EIR and 2000-2010 Traffic Monitoring Reports;
3. Future traffic projections based on current traffic trends and methodology presented in the EIR.

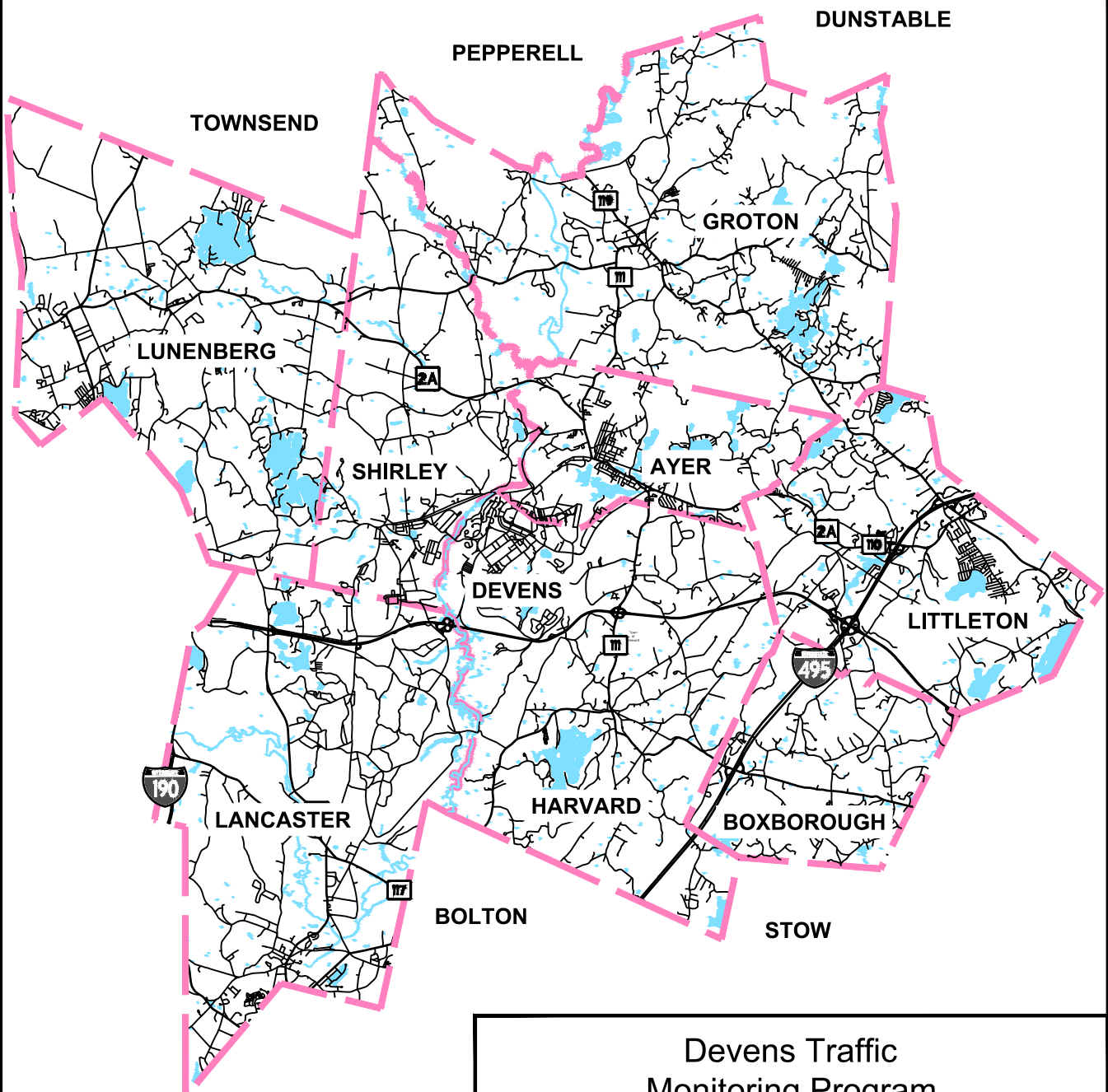
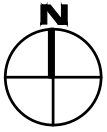
1.2 Study Area

The study area for this report was defined in the EIR (Figure 1-1). Devens is a regional enterprise zone established by legislation and comprised of parts of Ayer, Shirley, Harvard, and Lancaster. Surrounding towns of Boxborough, Groton, Littleton, and Lunenburg are included in the study area as potential impact communities.

1.3 Scope of Work

The tasks completed in this study are as follows:

- Automatic traffic recorder volumes
- Turning movement traffic volumes
- Origin-destination study
- Devens resident and business transportation survey
- Build-out analysis of Devens for future traffic volumes
- Traffic model update
- Level of Service analysis for existing conditions, future no-build, and future build scenarios



Devens Traffic
Monitoring Program

Figure 1-1
Study Area
April 2015
Devens, Massachusetts

Not to Scale



1.4 Project Coordination

Communities surrounding Devens were contacted in order to gain an understanding of development patterns in the region. Each community was asked to provide an overview of the type and size of current, planned, proposed, and approved projects within its town. The following communities were contacted:

- Ayer
- Boxborough
- Groton
- Harvard
- Lancaster
- Littleton
- Lunenburg
- Shirley

The Montachusset Regional Planning Commission (MRPC) was also contacted in order to obtain historic background growth rate data, recent traffic trends, and planned development in the region that could affect the study transportation area.



Chapter 2: Traffic Data Collection and Research

2.1 Overview

Extensive traffic data were obtained at locations identified in previous reports for consistency and comparison for traffic trends. The locations were both internal (Figure 2-1) and external (Figure 2-2) to Devens. The following traffic data were collected:

- Intersection turning movement counts
- Average daily traffic counts
- Federal Highway Administration (FHWA) vehicle classifications
- Origin-destination survey
- Transportation Survey of Devens residents and employees
- Transit ridership provided by the Massachusetts Bay Transportation Authority (2013 data)

2.2 Intersection Turning Movement Counts

Existing intersection traffic volumes were collected during the weekday AM (7-9) and PM (4-6) peak hours to establish a baseline 2015 condition. The locations and intersection numbering system used in this study are consistent with those from previous studies. Intersection turning movement counts were conducted at locations both internal (Figure 2-1) and external (Figure 2-2) to Devens.

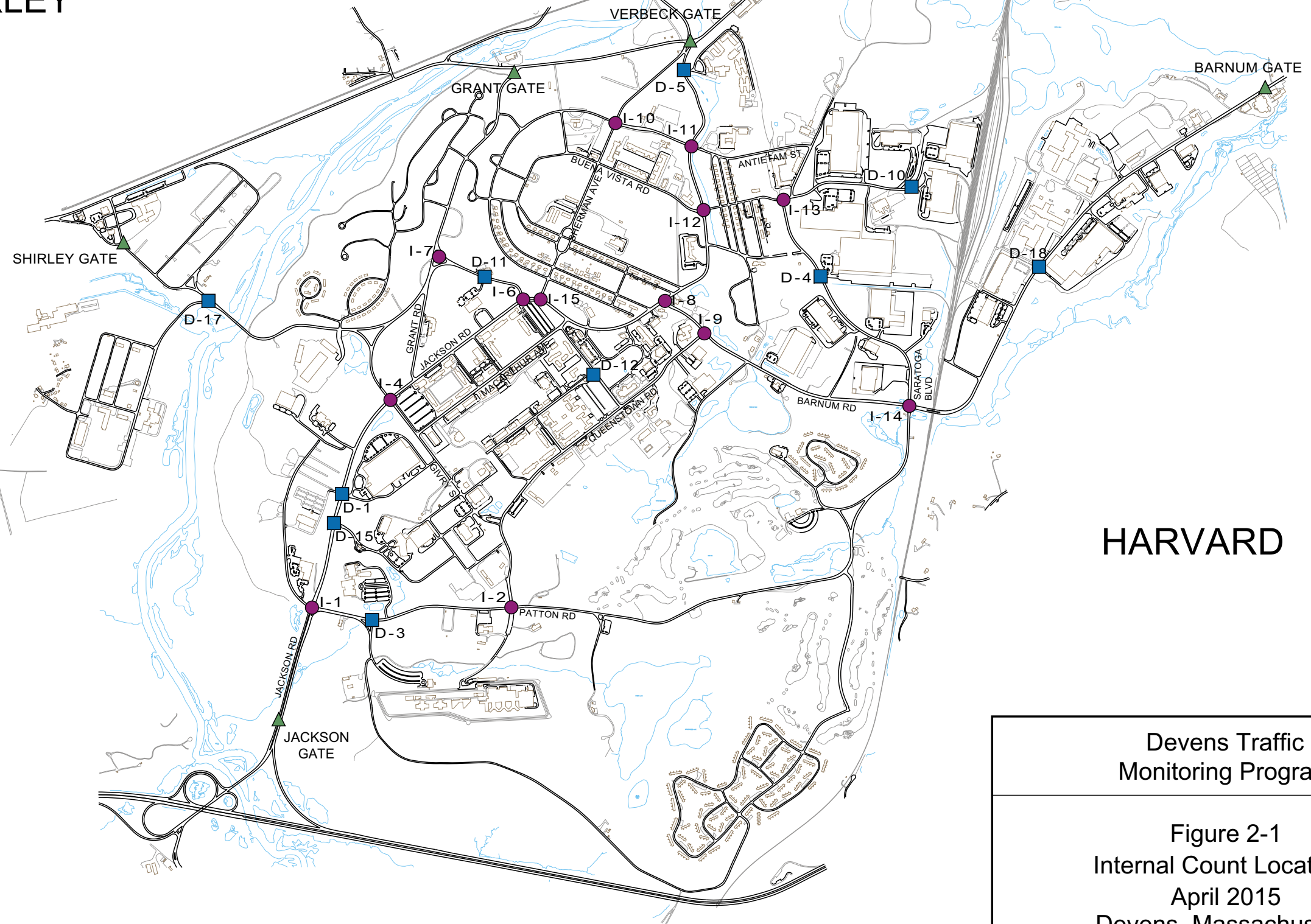
2.2.1 Internal Counts

Intersection turning movement counts were conducted at thirteen locations internal to Devens during the weekday morning (7-9AM) and weekday afternoon (4-6PM) peak hours on Wednesday April 29, 2015 and Tuesday May 5, 2015. These counts classified cars, heavy vehicles, pedestrians, and bicycles. The locations and count dates are listed on page 7 with corresponding intersection ID numbers, which will be used to identify the locations throughout this report. Morning and afternoon peak hour turning movement counts at internal intersections are provided in Figures 2-3 and 2-4, respectively.



SHIRLEY

AYER



HARVARD

LANCASTER

Devens Traffic
Monitoring Program

Figure 2-1
Internal Count Locations
April 2015
Devens, Massachusetts

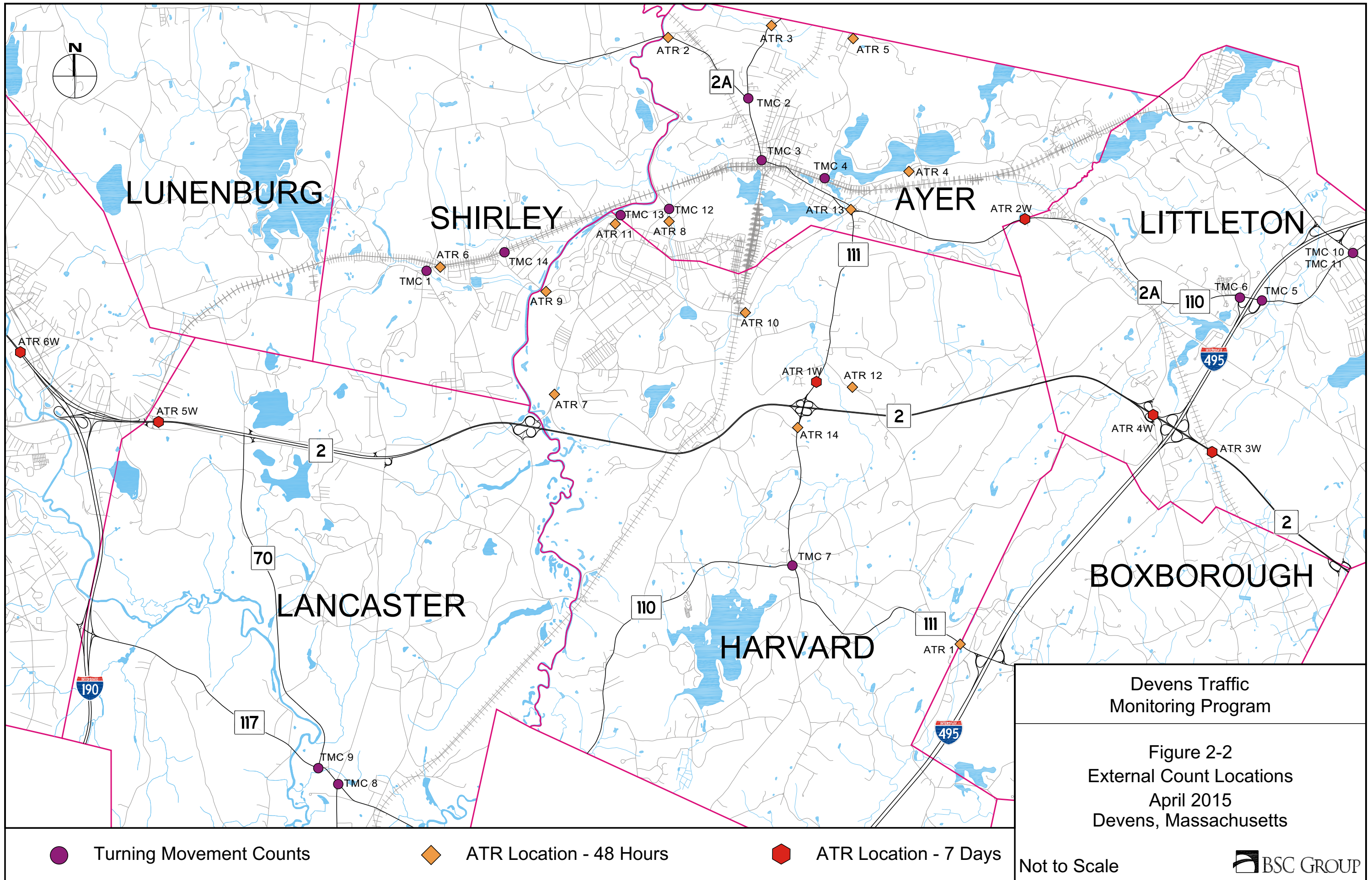
● Intersection Count Location

■ Driveway Count Location

▲ O-D Station

Not to Scale





ID	Intersection	Date
I-1	Jackson Road/ Patton Road	4/29/2015
I-2	Patton Road/ Queenstown Street	4/29/2015
I-3	<i>Eliminated (2010)</i>	
I-4	Jackson Road/ Givry Street	4/29/2015
I-5	<i>Eliminated (2010)</i>	
I-6	Jackson Road/ Pine Road	4/29/2015
I-7	Grant Road/ Pine Road	5/5/2015
I-8	Jackson Road/ Barnum Road	4/29/2015
I-9	Queenstown Street/ Barnum Road	5/5/2015
I-10	Antietam Street/ Sherman Avenue	5/5/2015
I-11	Antietam Street/ Jackson Road	5/5/2015
I-12	Buena Vista Street/ Jackson Road	4/29/2015
I-13	Buena Vista Street/ Saratoga Boulevard/ Independence Drive	5/5/2015
I-14	Patton Road/ Barnum Road/ Saratoga Boulevard	4/29/2015
I-15	Jackson Road/ Sherman Avenue	4/29/2015

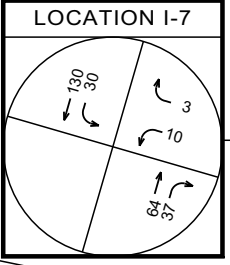
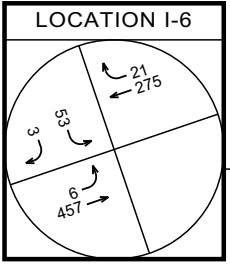
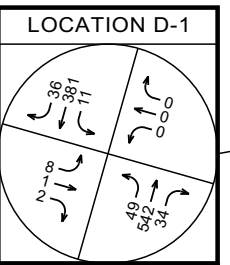
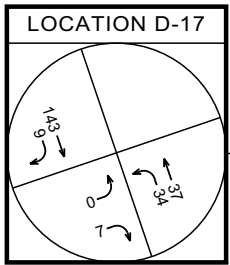
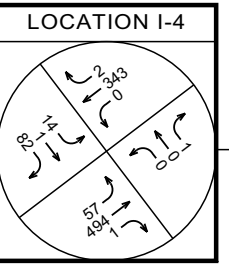
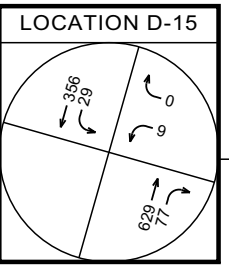
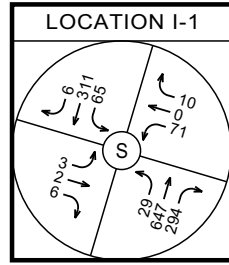
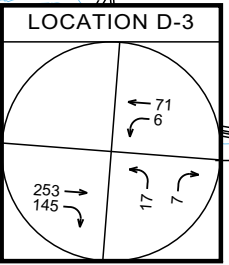
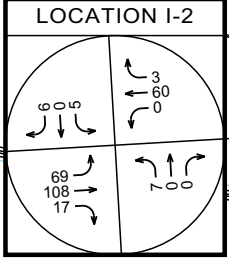
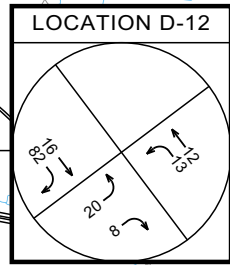
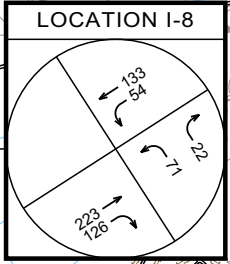
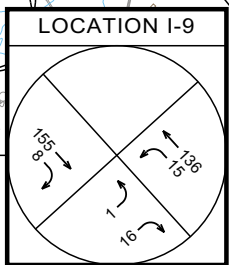
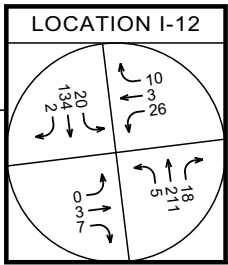
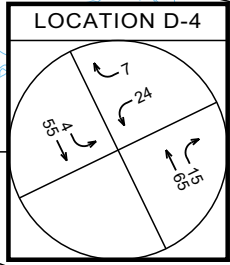
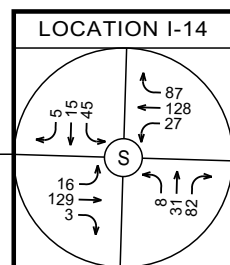
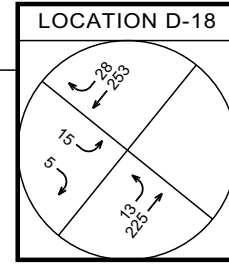
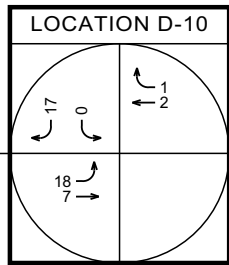
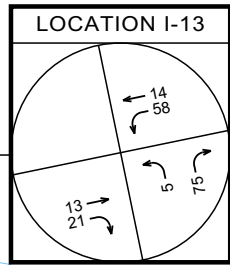
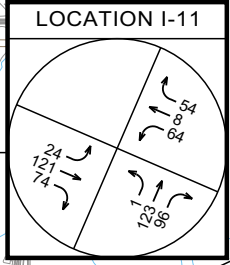
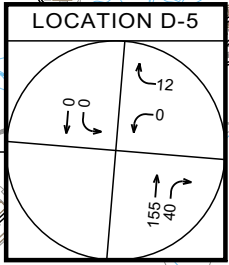
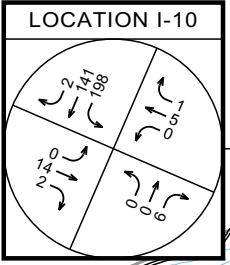
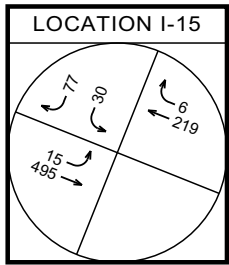
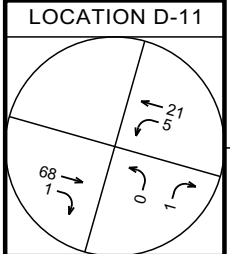
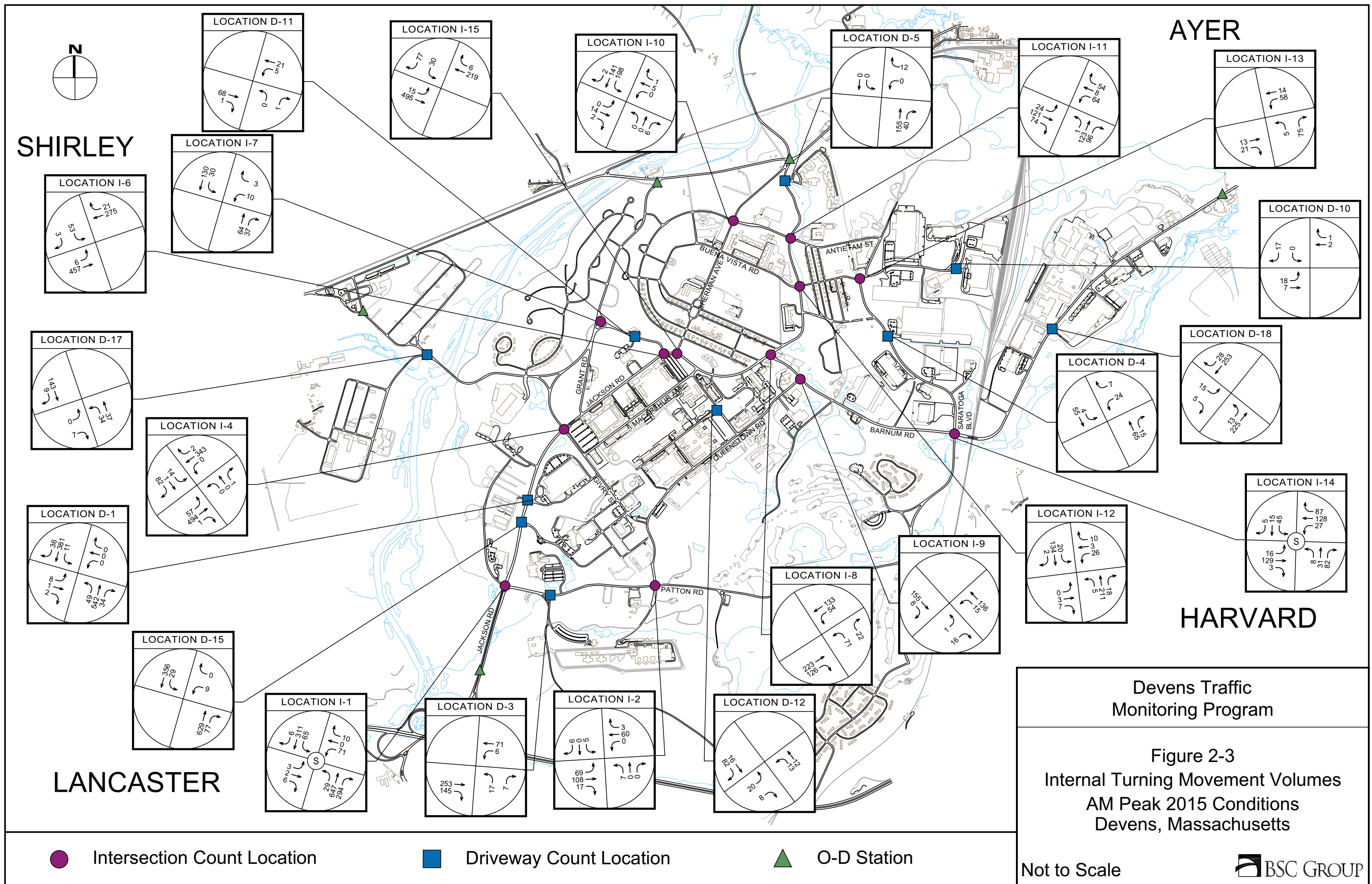
Internal intersections I-3 and I-5 were eliminated in the 2010 study. Intersection I-7 was relocated from Jackson Road/ MacArthur Road to Grant Road/ Pine Road in order to establish a baseline scenario for a new residential development to be constructed in the vicinity of this intersection.

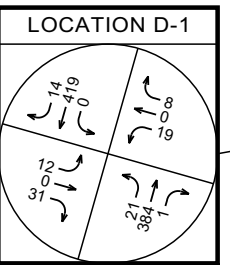
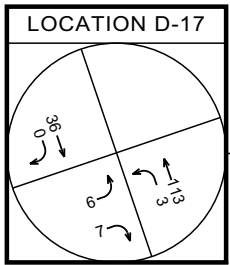
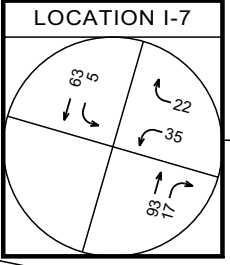
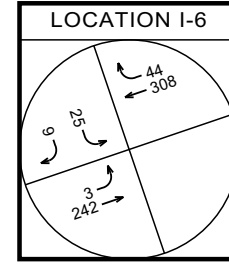
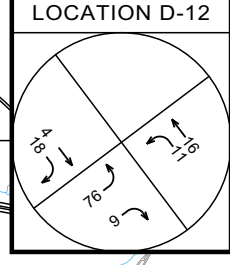
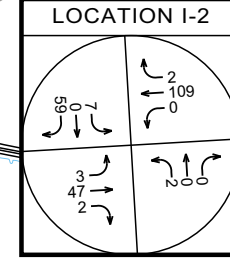
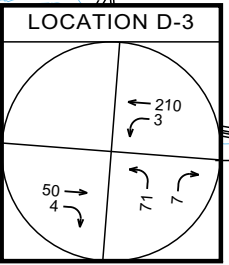
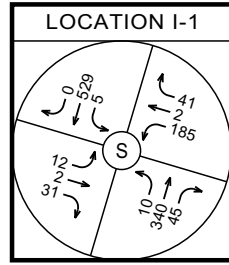
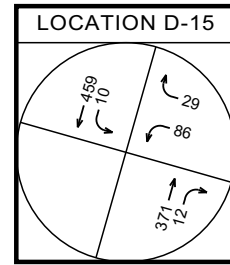
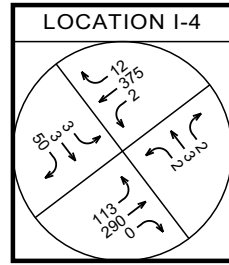
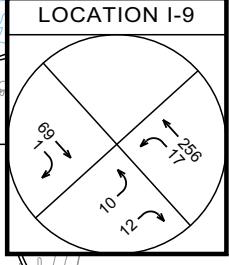
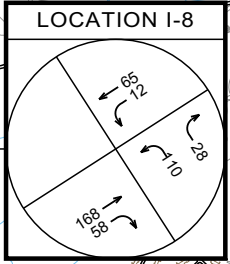
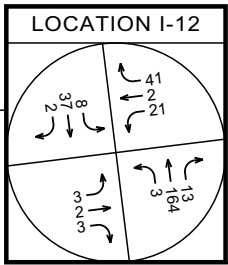
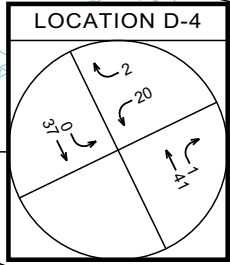
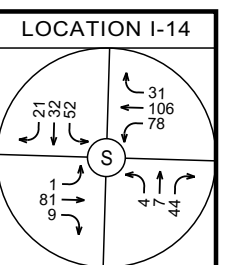
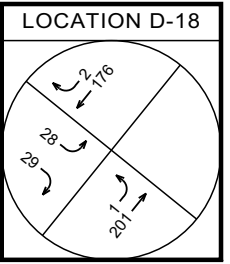
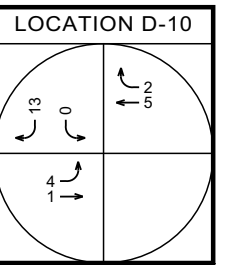
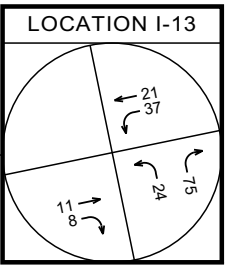
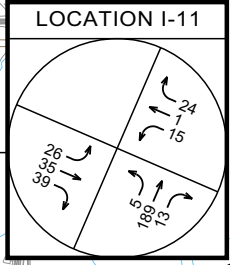
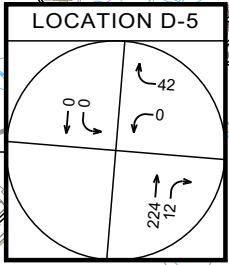
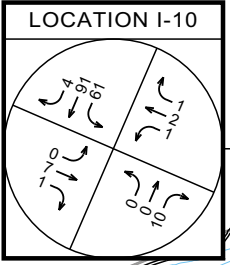
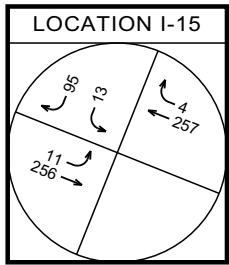
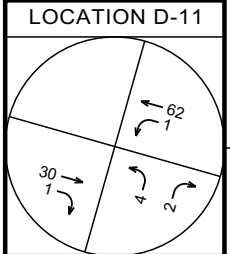
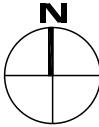
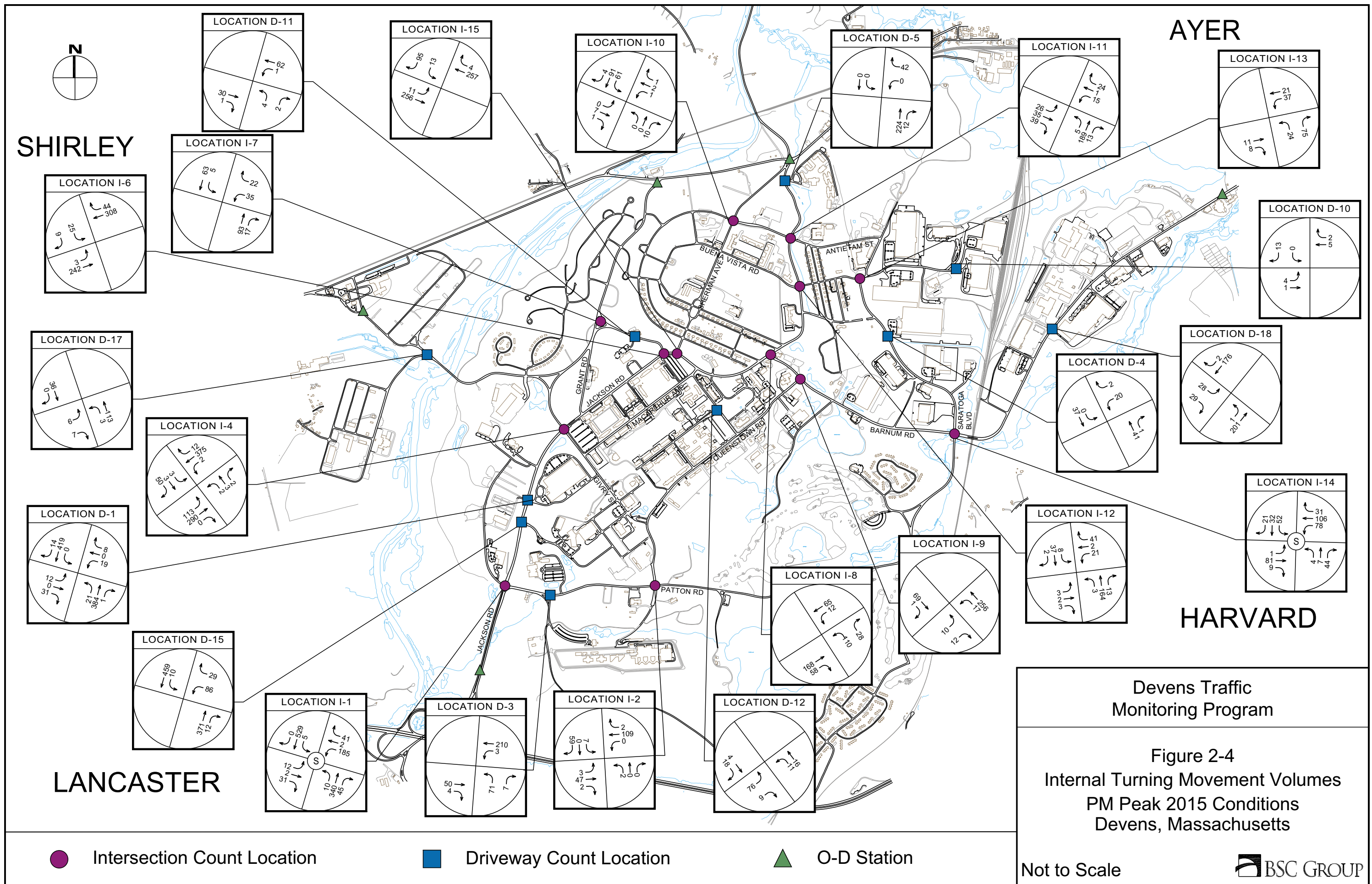
Driveway turning movement counts and vehicle classifications were conducted at ten businesses during the weekday morning (7-9AM) and weekday afternoon (4-6PM) peak hours on Wednesday April 29, 2015 and Tuesday May 5, 2015. The locations and count dates are listed below with corresponding intersection ID numbers, which will be used to identify the locations throughout this report. These volumes provide a snapshot of trip generation by Devens businesses. Peak hour driveway turning movement volumes are also included in Figures 2-3 and 2-4.

ID	Business Driveway	Date
D-1	American Superconductor – 64 Jackson Road	4/29/2015
D-2	<i>Eliminated</i>	
D-3	FBOP – Federal Medical Facility	4/29/2015
D-4	Quiet Logistics (formerly Gillette) – 66 Saratoga Boulevard	4/29/2015
D-5	Job Corps – 270 Jackson Road	5/5/2015
D-6	<i>Eliminated</i>	
D-7	<i>Eliminated</i>	
D-8	<i>Eliminated</i>	

D-9	<i>Eliminated</i>	
D-10	Southern Container – 51 Independence Boulevard	4/29/2015
D-11	Xinetics – 115 Jackson Road	5/5/2015
D-12	Army Enclave at Quebec Street and 10 th Mountain Division Road	5/5/2015
D-13	<i>Eliminated</i>	
D-14	<i>Eliminated</i>	
D-15	Bristol-Meyer Squibb – 38 Jackson Road	4/29/2015
D-16	<i>Eliminated</i>	
D-17	Army Enclave at Lovell Road	4/29/2015
D-18	Systems H ₂ O – 137 Barnum Road	4/29/2015

Driveway locations were eliminated because they were either vacant or determined to be duplicative due to other access points to the same properties.

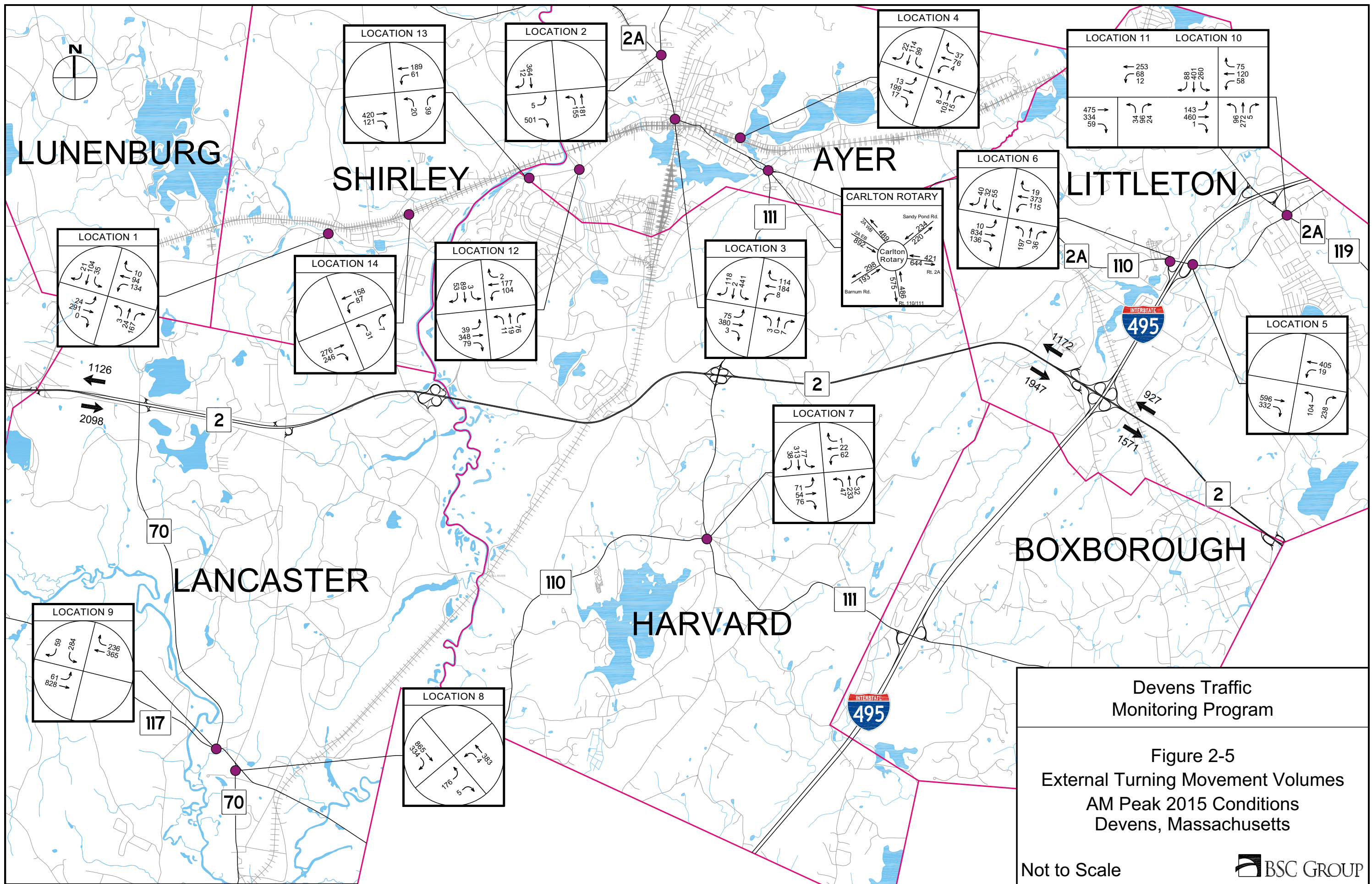




2.2.2 External Counts

Intersection turning movement counts and vehicle classifications were conducted at fourteen locations in towns surrounding Devens during the weekday morning (7-9AM) and weekday afternoon (4-6PM) peak hours on Tuesday April 28, 2015 and Wednesday April 29, 2015. These external locations and count dates are listed below with corresponding intersection ID numbers, which will be used to identify the locations throughout this report. Morning and afternoon peak hour turning movement counts at internal intersections are provided in Figures 2-5 and 2-6, respectively.

ID	Intersection	Town	Date
1	Front Street/ Lancaster Street/ Leominster Road/ Center Road	Shirley	4/28/2015
2	Park Street/ Fitchburg Road/ Groton School Road	Ayer	4/28/2015
3	Park Street/ Main Street/ West Main Street	Ayer	4/28/2015
4	Groton-Harvard Road/ Central Avenue	Ayer	4/28/2015
5	Route 2A-110/ I-495 Exit 30 Northbound (NB) Ramps	Littleton	4/28/2015
6	Route 2A-110/ I-495 Exit 30 Southbound (SB) Ramps	Littleton	4/28/2015
7	Route 110-111 (Ayer Road)/ Route 110 (Still River Road)/ Route 111	Harvard	4/29/2015
8	Route 70/ 117 (Seven Bridge Road)	Lancaster	4/28/2015
9	Route 70/ 117 (Lunenburg Road)	Lancaster	4/28/2015
10	Route 110 (King Street)/ Route 119/ Route 2A (Great Road)	Littleton Common	4/28/2015
11	Route 2A-110 (King Street)/ Goldsmith Street	Littleton Common	4/28/2015
12	Verbeck Gate/ MacPherson Road	Ayer	4/28/2015
13	Grant Road/ West Main Street	Ayer	4/28/2015
14	Hospital Road/ Front Street	Shirley	4/28/2015



LUNENBURG

SHIRLEY

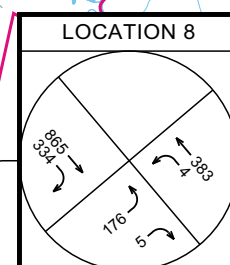
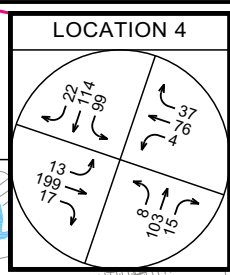
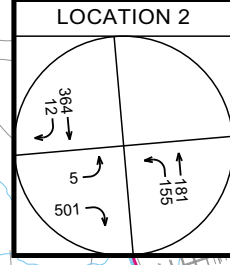
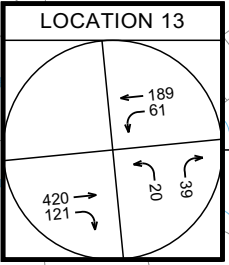
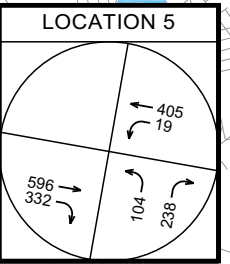
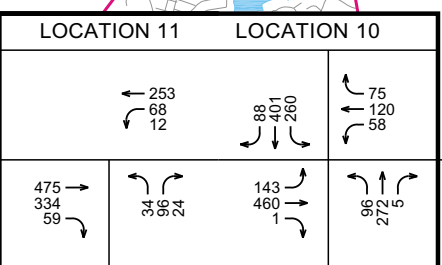
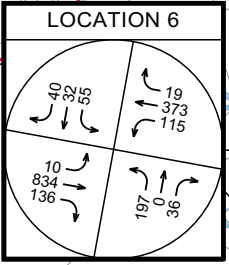
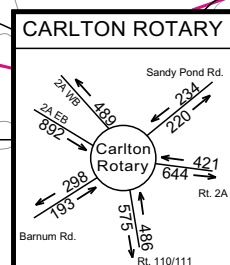
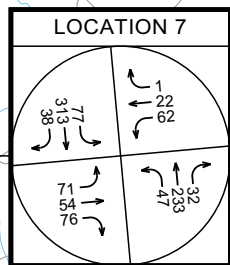
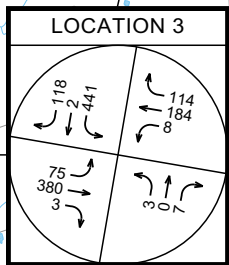
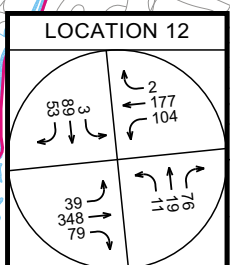
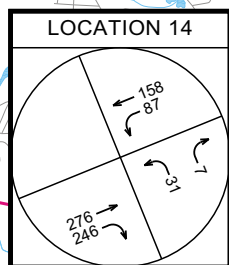
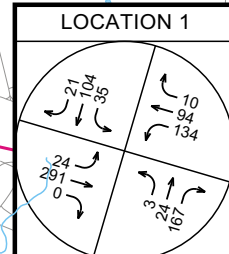
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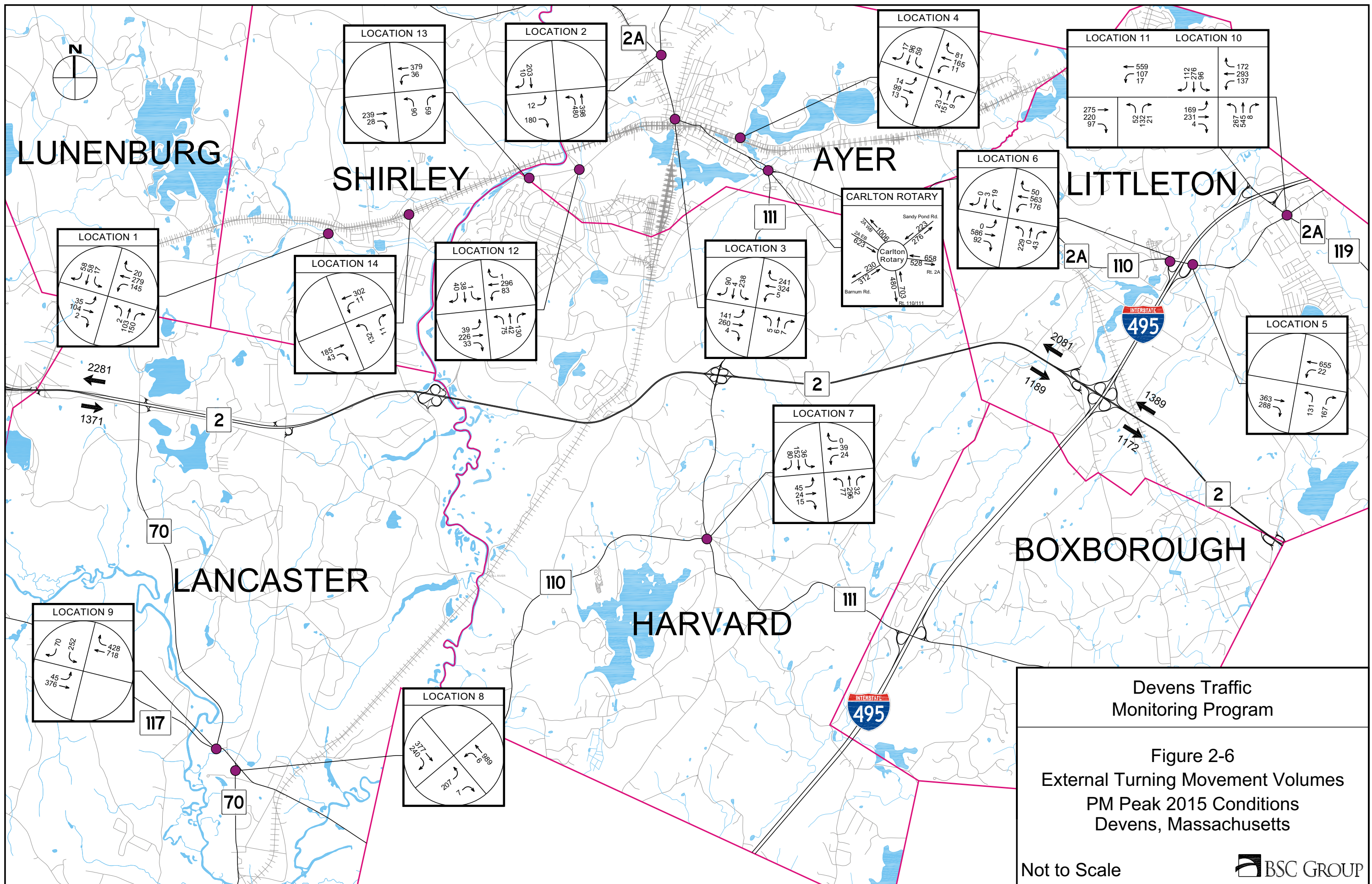
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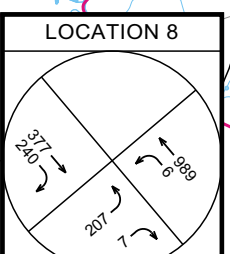
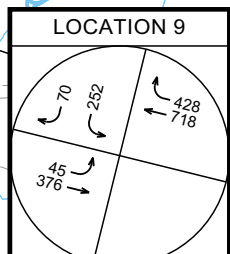
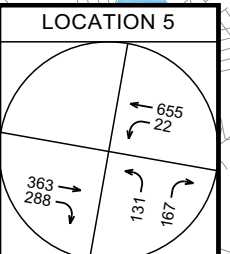
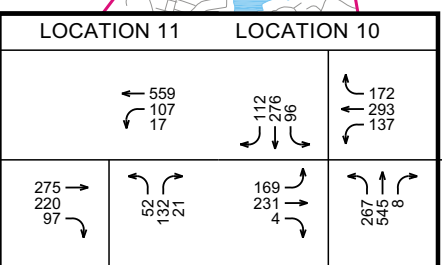
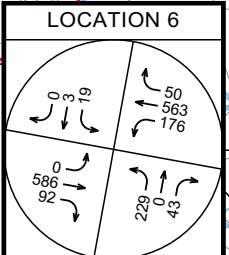
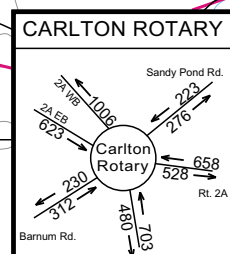
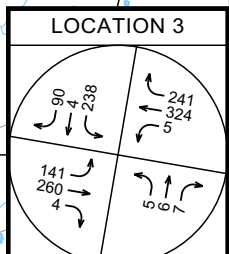
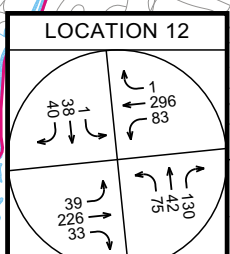
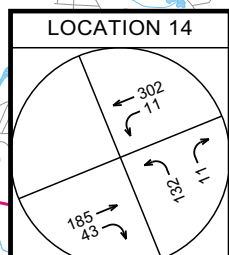
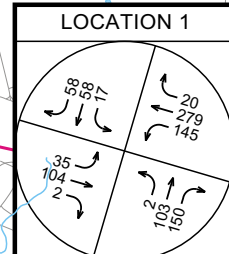
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2.3 Average Daily Traffic Counts

In addition to turning movement counts, automatic traffic recorders (ATRs) were placed at key locations consistent with previous reports to record 48-hour and 7-day traffic volume counts. Count dates and a summary of average weekday daily traffic (AWDT) volumes are provided in Table 2-1. Data recorded include:

- Weekday daily volumes
- AM and PM peak hour volumes
- Vehicle classification based on FHWA criteria: motorcycles, passenger cars, 4 Tire single unit, buses, 2 Axle 6 Tire, 3 Axle Single, 4 Axle Single, <5 Axle Double, 5 Axle Double, >6 Axle Double, <6 Axle Multi, 6 Axle Multi and >6 Axle Multi vehicles.

The data shows that Jackson Gate has the highest number of daily vehicle-trips in and out of Devens (13,420) followed by Barnum (5,651), Verbeck (5,435), and Grant (2,161). Shirley Gate recorded the fewest number of daily trips (1,693). Additional discussions of the traffic data trends are presented in Section 3.

Table 2-1: Average Weekday ATR Counts

Location Number	Location	Count Dates	AWDT 2015	AM Peak Hour 2015	PM Peak Hour 2015
48-Hour ATR Counts					
1	Route 111 at Boxborough /Harvard Town Line	5/6/2015-5/7/2015	5,251	592	558
2	Route 2A at Ayer/Shirley Town Line	5/6/2015-5/7/2015	7,458	666	681
3	Route 111 at Ayer/Groton Town Line	4/29/2015-4/30/2015	6,028	490	540
4	Sandy Pond Road east of Central Avenue, Ayer	4/29/2015-4/30/2015	6,503	514	629
5	Groton-Harvard Road at Ayer/Groton Town Line	4/29/2015-4/30/2015	4,440	392	399
6	Front Street west of Ayer Street, Shirley	4/29/2015-4/30/2015	5,806	515	526
7	Jackson Gate		13,420	1,319	1,225
	From Route 2 WB Off Ramp to Jackson Road NB	4/29/2015-4/30/2015	2323	328	152
	From Route 2 EB Off Ramp to Jackson Road NB	4/29/2015-4/30/2015	4,357	596	258
	From Jackson Road SB to Route 2 WB On Ramp	4/29/2015-4/30/2015	4,378	218	579
	From Jackson Road SB to Route 2 EB On Ramp	4/29/2015-4/30/2015	2,670	188	292
8	Verbeck Gate	5/6/2015-5/7/2015	5,435	534	457
9	Shirley Gate	5/6/2015-5/7/2015	1,693	181	175
10	Barnum Gate	5/6/2015-5/7/2015	5,651	462	510
11	Grant Road Gate	5/6/2015-5/7/2015	2,161	212	200
12	Poor Farm Road east of Route 110/111, Harvard	4/29/2015-4/30/2015	1,373	143	142
13	Carlton Rotary				
	Route 2A/110 east of rotary	4/29/2015-4/30/2015	14,177	1,059	1,148
	Sandy Pond Road north of rotary	4/29/2015-4/30/2015	5,611	450	486
	Route 2A/111 west of rotary (WB)	4/29/2015-4/30/2015	9,462	489	1,006
	Route 2A/111 west of rotary (EB)	4/29/2015-4/30/2015	8,947	878	587
	Barnum Road south of rotary	4/29/2015-4/30/2015	5,835	488	524
	Route 110/111 south of rotary	4/29/2015-4/30/2015	13,348	1,054	1,142
14	Route 110/111 south of Route 2, Harvard	4/29/2015-4/30/2015	8,457	824	834
7-Day ATR Counts					
1	Route 110-111 north of Route 2, Harvard	4/29/2015-5/5/2015	11,769	897	907
2	Route 2A-110 at Littleton/Ayer Town Line	4/29/2015-5/5/2015	12,657	865	1,014
3	Route 2 east of I-495, Littleton	4/27/2015-5-3-2015, 4/29/2015-5/5/2015	37,591	2,495	2,561
4	Route 2 west of I-495, Littleton	4/27/2015-5/3/2015	45,321	3,119	3,270
5	Route 2 west of Route 70, Lancaster	4/27/2015-5/3/2015	48,316	3,224	3,652
6	Route 2 west of I-190, Leominster	4/27/2015-5/3/2015	60,577	4,309	4,779

2.4 Origin-Destination Survey

An origin-destination study was conducted in order to determine the amount of traffic using Devens as a cut-through route. The last three alphanumeric characters of license plates were recorded as vehicles passed through each of the five Devens gates. These plate numbers were sorted according to the 15 minute interval in which they were recorded. License plate numbers of vehicles entering Devens at each of the five gates were then matched to those exiting the other four Devens gates. If a vehicle entered and exited Devens within 15 minutes, it was considered a cut-through trip. Results of the origin-destination survey as well as discussions on cut-through traffic are provided in Section 3.6.

2.5 Devens Resident and Business Employee Transportation Survey

Transportation surveys prepared by MassDevelopment were distributed to both residents and employees of businesses in Devens. The purpose of the survey was to collect information about commutes to and from Devens. The survey (see Appendix) posed the following questions:

- How do you travel to work?
- What time do you typically arrive to work and leave work Monday through Friday?
- Do you work within Devens or outside of Devens?
- Which gate/ entrance do you use most often to get to work?
- Which gate/ entrance do you use most often to return home from work?
- What are the primary route(s) you use to and from work?
- Where do you work?
- What town do you live in?

Results of the survey were received from 670 people (81 residents and 589 employees). The results are summarized in Figures 2-7, 2-8, and 2-9. In 2010, the results of this survey indicated that the majority of residents and employees (55%) used Jackson Gate for their commutes to and from work. Results of the survey in 2015 indicate that Jackson Gate continues to be the most utilized gate, used by 54% of those surveyed. This percentage excludes surveys taken by employees of Quiet Logistics (427 of 589 total business surveys), where 98% indicated that they use Barnum Gate to commute to work. Excluding Quiet Logistics, results of the survey are in line with traffic counts which indicate that approximately 50% of vehicles utilize Jackson Gate. Because the gates no longer physically exist, employees may have confused “Barnum Gate” with “Barnum Road.” It is suggested that in the future, the transportation surveys clarify “gate” locations. Due to this discrepancy, separate figures for results both including (Figure 2-7) and excluding (Figure 2-8) Quiet Logistics employees have been presented.

As expected, the majority of those surveyed (86%) drove to and from work by themselves (Figure 2-9). 12% carpooled in 2015, compared with 6% in 2010. It is noted that of the 92 who carpool, 88 work at Quiet Logistics.

Devens Residents and Business Employee Work Trips (by gate), Including Quiet Logistics

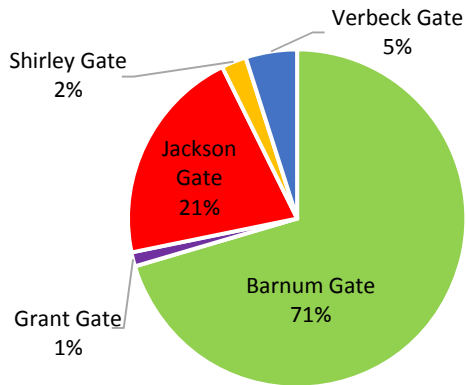


Figure 2-7: Devens Transportation Survey Results (by Gate), Including Quiet Logistics

Devens Residents and Business Employee Work Trips (by gate), Excluding Quiet Logistics

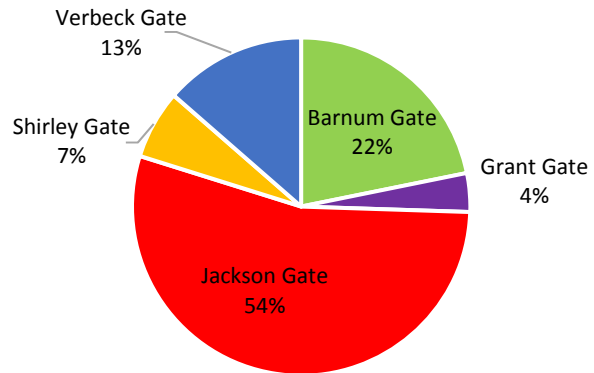


Figure 2-8: Devens Transportation Survey Results (by Gate), Excluding Quiet Logistics

Devens Residents and Business Employee Work Trips (by mode)

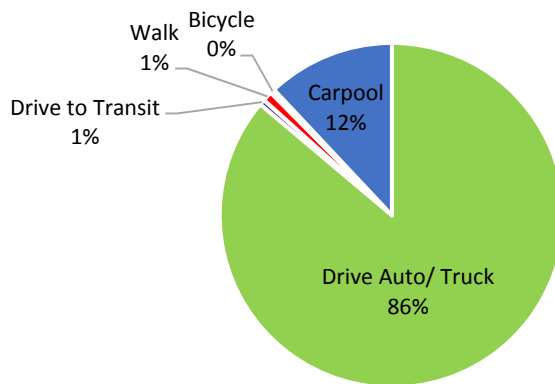


Figure 2-9: Devens Transportation Survey Results (by mode)

2.6 Transit Ridership

The Massachusetts Bay Transportation Authority (MBTA) Fitchburg commuter rail line services Devens and surrounding communities at four stations, Ayer, Shirley, North Leominster, and Fitchburg. Between 2009 and 2013, daily boardings have fluctuated each year (Table 2-2). Between 2009 and 2010, ridership decreased by 13%. It then increased by 26% in 2011, but fell by 11% in 2012. The latest MBTA data available (2013) shows an increase of 10% since 2012.

Boardings at Shirley Station have steadily increased and have more than doubled between 2009 and 2013. Ayer and North Leominster stations have decreased boardings, but Fitchburg shows a 12% increase. Overall, combined daily boardings at the four stations have increased by 8% from 2009 to 2013.

Table 2-2: MBTA Commuter Rail Daily Boardings at Devens Area Stations

Station	Feb -99	Feb -00	Feb -01	Feb -02	Feb -03	Feb -04	Feb-05	Apr-06	Jun-07	Feb-08	Feb-09	Nov-10	Nov-11	Nov-12	Apr-13	% Change 2/09 to 4/13
Ayer	186	190	228	194	209	245	292	336	327	427	490	304	419	405	435	-11%
Shirley	162	171	151	115	116	130	180	179	191	218	144	189	240	297	315	119%
North Leominster	217	200	208	185	176	186	311	321	357	408	366	348	481	318	313	-14%
Fitchburg	201	231	209	240	236	195	307	363	386	440	462	429	465	411	516	12%
Total	766	792	796	734	737	756	1090	1199	1261	1493	1462	1270	1605	1431	1579	8%

Source: Massachusetts Bay Transit Authority

Results of the transportation survey indicate that 4% of Devens residents use transit to get to and from work, while less than 1% of employees use this mode. Montachusett Area Regional Transit (MART) currently provides a shuttle from Littleton Station (which provides commuter rail service to North Station in Boston) to and from Devens businesses during morning and afternoon peak hours to encourage use of the commuter rail by those reverse commuting to and from the Boston area.

2.7 Background Traffic Growth

Background traffic growth is typically a function of future land development, increased economic activity, and changes in travel patterns. These developments are external to Devens. The MRPC was consulted to determine the appropriate annual growth rate for projecting future traffic volumes in the Devens area. MRPC indicated that the recent counts show a decrease in some communities or minimal increase in others. To be consistent with previous 5 year reports, however, an annual rate of 1.77% was used. This figure is based on a MRPC study that evaluated traffic from 1979 to 1999.

2.8 Regional Development

The ongoing construction projects on Route 2 at Crosby Corner, and Interstate 495 and Route 2 aimed at reducing regional congestion are two of the projects with regional significance. A number of projects on the MRPC Transportation Improvement Program within the study area had less of a regional focus.

Municipalities surrounding Devens as well as the MRPC were contacted in order to understand in progress, planned, and potential projects that may contribute to future traffic volumes in and around Devens. The following are the results of this correspondence:

- Ayer
 - New Family Dollar department store
 - Rail spur for Catania Spagna – expansion
 - New Habitat for Humanity duplex
 - New commuter rail parking lot at DCR Rail Trail site
 - Former fire station being renovated into apartments
- Boxborough
 - 5,000 SF Veterinary Dental Office Building (opening October 2015)
 - Jefferson at Beaver Brook – 244 unit Chapter 40B rental project (opening mid to late 2016)
 - 100 units of 55+ housing being proposed, no formal application filed
- Groton
 - Chamberlains Mill – nine lot residential subdivision
 - Bluestone Drive – seven unit, single-family condominiums
 - Reedy Meadow Estates – Ten unit, single-family condominiums
 - Academy Hill – 24 single and 2-family condominiums
 - Rocky Hill – 24 multifamily and 12 starter homes
 - Groton Inn – historic inn to be replaced
 - Two proposed restaurants – 4,600 SF and 2,000 SF
 - Pediatrics West – medical office building
- Harvard
 - 11,500 gpd sewage treatment system
 - 9-unit rental development
 - Trail Ridge development – 52 ownership units
 - Transformations off Stow Road – 24 condominiums
- Lancaster – no significant projects planned
- Littleton
 - Few small commercial developments
 - Wildflower Meadow/ Village Green Apartments – 190 new residential units
- Lunenburg
 - Highfield Village – 66 single family homes, 11 duplex, 22 units
 - Whalom Luxury Apartments – 5 buildings. 24 units each
 - Emerald Place – 238 units (nearing completion)
 - Stone Farm Estates – 58 condominium units (nearing completion)
 - Tri Town Landing – 4 buildings, 33 apartments per building (3 buildings completed)
- Shirley – no response received

Based on information received from the municipalities, Lunenburg is expected to have the most new development. Given the overall decrease or flat growth in traffic volumes in recent years, the application of the 1.77% per year annual growth rate would yield conservative estimates (i.e., higher than expected) and account for any specific regional background growth projects.



Chapter 3: Traffic Trends

Traffic data obtained in the 2015 traffic monitoring program were compared with data from previous years in order to identify changes in traffic over time. The following trends were analyzed:

- Devens driveway volumes
- Average weekday daily traffic counts at locations internal and external to Devens
- Peak external intersection volumes
- Average weekday daily traffic volumes at Devens gates
- Weekday truck traffic
- Cut-through traffic

For the purposes of this report, traffic trends are generally compared with the 2010 Five-Year Traffic Report. Data from previous five year traffic studies as well as biennial studies are included throughout this report.

3.1 Devens Driveway Volumes

Morning and evening peak hour turning movement volumes at nine driveways within Devens were compared to volumes from previous years (Table 3-1). Driveway D-18 located at Systems H₂O was added to this edition of the traffic monitoring report, and therefore has been excluded from any historical comparisons.

The most significant decreases since 2010 took place at the Federal Medical Facility and American Superconductor driveways, which experienced decreases of 48% (-78 vehicles) and 42% (-20 vehicles), respectively during the PM peak hour. The most significant increase during the PM peak hour occurred at the Army Enclave at Lovell Road, where traffic increased by 66% (+59 vehicles) during the PM peak hour since 2010.

Table 3-1: Devens Business Driveway Count Comparison (2000-2015)

Driveway Turning Movement Counts		AM Peak Hour					PM Peak Hour				
		2000	2005	2010	2015	Difference 2010-2015	2000	2005	2010	2015	Difference 2010-2015
D-1	American Superconductor - 64 Jackson Road	n/a	21	77	46	-31	n/a	23	48	28	-20
D-2	Aneheuser Busch – 235 Barnum Road	n/a	7	0	n/a	n/a	n/a	5	0	n/a	n/a
D-3	FBOP - Federal Medical Facility	195	164	195	175	-20	109	89	163	85	-78
D-4	Quiet Logistics (Gillette) - 66 Saratoga Boulevard	20	18	6	50	+44	17	34	17	23	+6
D-5	Job Corps - MacArthur Avenue	35	62	55	52	-3	55	72	62	54	-8
D-6	Netstal / Xinetics – 53 & 57 Jackson Road	27	15	20	n/a	n/a	24	15	15	n/a	n/a
D-7	Parker-Hannifin – 14 Robbins Pond Road	22	28	53	n/a	n/a	32	23	33	n/a	n/a
D-8	Ryerson – 45 Saratoga Boulevard	18	10	14	n/a	n/a	10	0	15	n/a	n/a
D-9	Sonoco – 18 Independence Boulevard	n/a	75	50	n/a	n/a	n/a	23	17	n/a	n/a
D-10	Southern Container - 51 Independence Boulevard	n/a	11	40	36	-4	n/a	11	19	19	0
D-11	Xinetics - 115 Jackson Road	n/a	20	2	7	+5	n/a	18	5	8	+3
D-12	Army Enclave at Quebec Street and 10th Mountain Division Road	n/a	n/a	265	123	-142	n/a	n/a	169	114	-55
D-13	Devens Common – Ryans Way	n/a	n/a	151	n/a	n/a	n/a	n/a	90	n/a	n/a
D-14	Devens Common – Andrews Parkway	n/a	n/a	347	n/a	n/a	n/a	n/a	195	n/a	n/a
D-15	Bristol-Meyer Squibb - 38 Jackson Road	n/a	n/a	173	115	-58	n/a	n/a	125	137	+12
D-16	Evergreen Solar – 112 Barnum Road	n/a	n/a	67	n/a	n/a	n/a	n/a	141	n/a	n/a
D-17	Army Enclave at Lovell Road	n/a	n/a	117	180	+63	n/a	n/a	90	149	+59
D-18	Systems H2O - 137 Barnum Road	n/a	n/a	n/a	61	n/a	n/a	n/a	n/a	60	n/a

The 2015 driveway count data was compared with trip generation rates provided by the Institute of Transportation Engineers (ITE), which will be discussed in Section 5.3.

3.2 Average Weekday Traffic – External Locations

Average weekday daily traffic counts from 2015 were compared to counts from previous years, as shown in Figures 3-1 and 3-2 and Tables 3-2 through 3-5. Collectively, the study roadways have experienced a 9% decrease in traffic volume since 2010. The annual traffic growth rate based on these data is -1.85%. The historical annual growth rate cited earlier in this report is 1.77%. Compared to this rate, towns surrounding Devens are experiencing no growth conditions.

Most roadways have not experienced significant changes in volume since 2010. The most significant increase in traffic occurred at Sandy Pond Road east of Central Avenue in Ayer, at which traffic volumes increased by 13% (+743 vehicles). Route 110-111 north of Route 2 in Harvard experienced the greatest decrease in traffic, with a net loss of 25% (-3,837 vehicles).

Four ATRs were placed along Route 2 in the vicinity of Devens. Collectively, weekday traffic volumes at these locations have decreased by 15% (-34,472 vehicles) since 2010. The largest decreases occurred west of Route 70 (-18% or -10,657 vehicles) and west of Interstate 190 (-15% or -10,643 vehicles). Traffic volumes at the I-495 northbound and southbound ramps have decreased by 14% (-13,172 vehicles) collectively. The decrease in traffic along Route 2 could be attributed to ongoing construction at Interstate 495 and Crosby Corner. This could also be reflective of a slowdown of economic and population growth in the region.

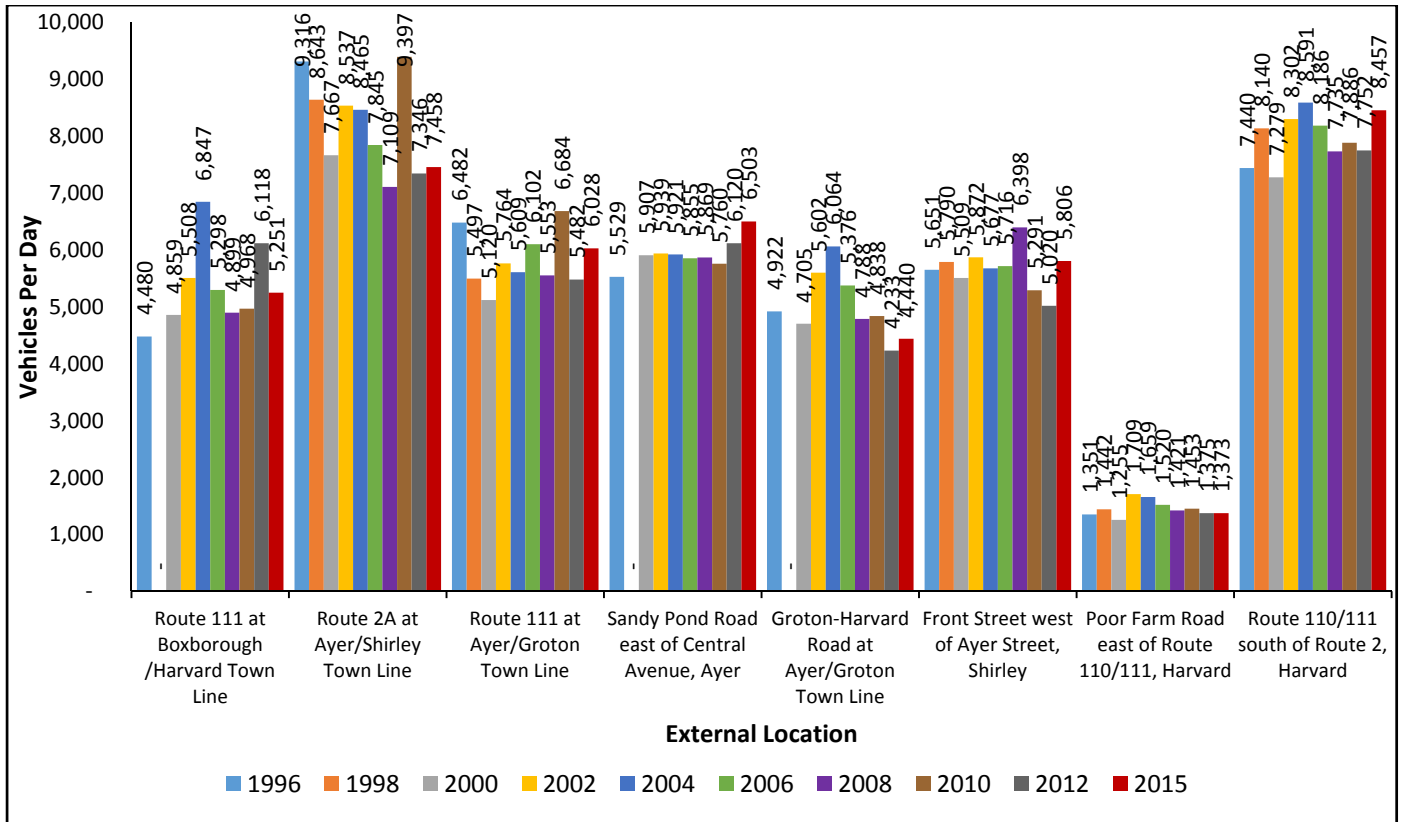


Figure 3-1: Average Weekday Daily Traffic – 48 Hour Count Locations

Table 3-2: Average Weekday Daily Traffic (AWDT) – External Locations (48 Hour Counts)

Location Number	Location	AWDT 1996	AWDT 1998	AWDT 2000	AWDT 2002	AWDT 2004	AWDT 2006	AWDT 2008	AWDT 2010	AWDT 2012	AWDT 2015
1	Route 111 at Boxborough /Harvard Town Line	4,480	n/a	4,859	5,508	6,847	5,298	4,899	4,968	6,118	5,251
2	Route 2A at Ayer/Shirley Town Line	9,316	8,643	7,667	8,537	8,465	7,845	7,109	9,397	7,346	7,458
3	Route 111 at Ayer/Groton Town Line	6,482	5,497	5,120	5,764	5,609	6,102	5,553	6,684	5,482	6,028
4	Sandy Pond Road east of Central Avenue, Ayer	5,529	n/a	5,907	5,939	5,921	5,855	5,869	5,760	6,120	6,503
5	Groton-Harvard Road at Ayer/Groton Town Line	4,922	n/a	4,705	5,602	6,064	5,376	4,788	4,838	4,233	4,440
6	Front Street west of Ayer Street, Shirley	5,651	5,790	5,509	5,872	5,677	5,716	6,398	5,291	5,020	5,806
7	Jackson Gate	3,578	4,854	6,398	7,405	8,508	9,552	12,394	12,205	11,324	13,420
	From Route 2 WB Off Ramp to Jackson Road							2,024	2,062	1,869	2,323
	From Route 2 EB Off Ramp to Jackson Road NB							4,296	4,505	3,821	4,357
	From Jackson Road SB to Route 2 WB On Ramp							4,285	4,299	3,812	4,378
	From Jackson Road SB to Route 2 EB On Ramp							1,784	2,110	1,822	2,670
8	Verbeck Gate	2,354	3,363	4,655	6,134	4,798	5,229	5,327	5,331	4,534	5,435
9	Shirley Gate	n/a	533	1,104	731	1,927	1,317	1,406	1,536	1,343	1,693
10	Barnum Gate	2,172	2,766	3,418	5,966	4,587	4,779	5,624	5,257	4,326	5,651
11	Grant Road Gate	n/a	n/a	n/a	n/a	638	936	2,233	1,574	1,514	2,161
12	Poor Farm Road east of Route 110/111, Harvard	1,351	1,442	1,255	1,709	1,659	1,520	1,421	1,453	1,375	1,373
13	Carlton Rotary										
	Route 2A/110 east of rotary	14,472	15,229	14,131	17,677	16,258	16,722	15,338	13,744	12,434	14,177
	Sandy Pond Road 0020north of rotary	4,701	6,505	3,798	4,301	5,030	5,178	5,022	5,236	5,183	5,611
	Route 2A/111 west of rotary (WB)	10,355	10,650	9,629	10,352	10,806	10,080	9,583	9,102	8,795	9,462
	Route 2A/111 west of rotary (EB)	9,951	10,394	9,483	9,796	10,101	9,370	9,152	8,670	8,624	8,947
	Barnum Road south of rotary	3,186	2,694	3,418	5,966	5,326	5,920	7,749	6,314	5,230	5,835
	Route 110/111 south of rotary	13,837	14,533	13,475	15,677	16,127	10,715	14,417	12,864	12,156	13,348
14	Route 110/111 south of Route 2, Harvard	7,440	8,140	7,279	8,302	8,591	8,186	7,735	7,886	7,752	8,457

Table 3-3: AM Peak Hour Traffic – External Locations (48 Hour Counts)

Location Number	Location	AM Peak Hour 1996	AM Peak Hour 1998	AM Peak Hour 2000	AM Peak Hour 2002	AM Peak Hour 2004	AM Peak Hour 2006	AM Peak Hour 2008	AM Peak Hour 2010	AM Peak Hour 2012	AM Peak Hour 2015
1	Route 111 at Boxborough /Harvard Town Line	448	n/a	540	552	715	516	550	526	686	592
2	Route 2A at Ayer/Shirley Town Line	852	740	723	743	816	728	697	788	680	666
3	Route 111 at Ayer/Groton Town Line	596	540	426	469	580	496	500	544	463	490
4	Sandy Pond Road east of Central Avenue, Ayer	445	n/a	502	498	471	481	519	482	507	514
5	Groton-Harvard Road at Ayer/Groton Town Line	473	n/a	546	549	500	552	482	440	393	392
6	Front Street west of Ayer Street, Shirley	412	403	429	495	441	456	541	416	505	515
7	Jackson Gate	324	462	812	770	836	951	1,236	1,469	1,302	1,319
	From Route 2 WB Off Ramp to Jackson Road NB							236	382	310	328
	From Route 2 EB Off Ramp to Jackson Road NB							689	693	632	596
	From Jackson Road SB to Route 2 WB On Ramp							203	204	188	218
	From Jackson Road SB to Route 2 EB On Ramp							120	190	172	188
8	Verbeck Gate	217	264	470	492	441	454	417	457	474	534
9	Shirley Gate	n/a	48	70	53	232	132	245	194	172	181
10	Barnum Gate	159	193	260	384	418	366	529	400	441	462
11	Grant Road Gate	n/a	n/a	n/a	n/a	67	97	249	190	173	212
12	Poor Farm Road east of Route 110/111, Harvard	129	162	132	180	168	154	146	147	131	143
13	Carlton Rotary										
	Route 2A/110 east of rotary	1,023	978	1,071	1,215	1,158	1,097	1,052	1,005	954	1,059
	Sandy Pond Road north of rotary	307	441	325	403	433	433	423	426	415	450
	Route 2A/111 west of rotary (WB)	537	459	519	488	622	546	513	495	468	489
	Route 2A/111 west of rotary (EB)	1,056	1,054	1,034	1,040	940	890	852	802	834	878
	Barnum Road south of rotary	220	181	260	384	401	403	575	518	449	488
	Route 110/111 south of rotary	1,075	1,148	1,121	1,202	1,346	796	1,254	1,000	993	1,054
14	Route 110/111 south of Route 2, Harvard	658	678	672	695	783	738	738	733	706	824

Table 3-4: PM Peak Hour Traffic – External Locations (48 Hour Counts)

Location Number	Location	PM Peak Hour 1996	PM Peak Hour 1998	PM Peak Hour 2000	PM Peak Hour 2002	PM Peak Hour 2004	PM Peak Hour 2006	PM Peak Hour 2008	PM Peak Hour 2010	PM Peak Hour 2012	PM Peak Hour 2015
1	Route 111 at Boxborough /Harvard Town Line	538	n/a	530	549	714	603	534	496	585	558
2	Route 2A at Ayer/Shirley Town Line	905	787	704	805	789	762	698	986	739	681
3	Route 111 at Ayer/Groton Town Line	554	541	406	483	554	529	490	578	502	540
4	Sandy Pond Road east of Central Avenue, Ayer	538	n/a	575	550	551	563	588	530	590	629
5	Groton-Harvard Road at Ayer/Groton Town Line	438	n/a	453	493	536	483	448	431	393	399
6	Front Street west of Ayer Street, Shirley	492	458	471	482	506	495	550	445	465	526
7	Jackson Gate	369	434	579	631	853	926	1,188	1,188	1,150	1,225
	From Route 2 WB Off Ramp to Jackson Road NB							220	147	134	152
	From Route 2 EB Off Ramp to Jackson Road NB							184	268	224	258
	From Jackson Road SB to Route 2 WB On Ramp							668	519	552	579
	From Jackson Road SB to Route 2 EB On Ramp							206	254	240	292
8	Verbeck Gate	206	252	380	506	421	488	512	462	432	457
9	Shirley Gate	n/a	53	122	36	179	138	150	160	162	175
10	Barnum Gate	172	224	367	430	454	462	470	430	423	510
11	Grant Road Gate	n/a	n/a	n/a	n/a	72	92	264	153	162	200
12	Poor Farm Road east of Route 110/111, Harvard	147	152	124	164	152	140	148	133	146	142
13	Carlton Rotary										
	Route 2A/110 east of rotary	1,248	1,257	1,133	1,326	1,324	1,414	1,281	1,093	976	1,148
	Sandy Pond Road north of rotary	456	558	320	363	449	494	440	484	450	486
	Route 2A/111 west of rotary (WB)	1,232	1,182	1,043	1,137	1,142	1,086	1,072	922	960	1,006
	Route 2A/111 west of rotary (EB)	611	555	581	507	636	604	572	574	538	587
	Barnum Road south of rotary	261	170	367	430	532	598	709	536	463	524
	Route 110/111 south of rotary	1,222	1,269	1,098	1,210	1,338	944	1,260	1,081	1,079	1,142
14	Route 110/111 south of Route 2, Harvard	760	766	600	640	736	764	735	696	745	834

Table 3-5: Average Weekday Daily Traffic (AWDT) -- External Locations (7 Day Counts)

Location Number	Location	ADT 1996	ADT 1998	ADT 2000	ADT 2002	ADT 2004	ADT 2006	ADT 2008	ADT 2010	ADT 2012	ADT 2015
1	Route 110-111 north of Route 2, Harvard	11,912	11,524	13,258	13,471	13,378	12,758	12,574 ^E	14,511	12,502	10,754
2	Route 2A-110 at Littleton/Ayer Town Line ^A	8,567	10,681	12,039	12,126	11,721	11,376	10,987	10,233	9,728	11,456
3	Route 2 east of I-495, Littleton	36,141	38,979	43,851	42,076	52,876	41,970	41,136	40,131	39,822	36,777
4	Route 2 west of I-495, Littleton ^B	41,510	44,620	42,485	51,083	60,066	52,484	48,340	49,552	47,237	44,169
5	Route 2 west of Route 70, Lancaster	41,441	41,981	n/a	n/a	51,628	53,198	51,902	54,266	48,960	46,072
6	Route 2 west of I-190, Leominster ^C	51,857	55,982	58,650	64,339	70,414	69,094	67,698	66,889	64,758	60,181
Location Number	Location	AM Peak Hour 1996	AM Peak Hour 1998	AM Peak Hour 2000	AM Peak Hour 2002	AM Peak Hour 2004	AM Peak Hour 2006	AM Peak Hour 2008	AM Peak Hour 2010	AM Peak Hour 2012	AM Peak Hour 2015
1	Route 110-111 north of Route 2, Harvard	1,083	969	1,201	1,252	1,156	1,150	1,227	1,303	1,141	897
2	Route 2A-110 at Littleton/Ayer Town Line ^A	799	890	1,030	1,054	1,004	958	947	902	866	859
3	Route 2 east of I-495, Littleton	3,886	3,896	4,374	4,064	5,430	4,217	4,230	3,774	3,916	2,495
4	Route 2 west of I-495, Littleton ^B	4,096	4,666	4,486	4,931	6,120	5,008	5,127	4,580	4,082	3,119
5	Route 2 west of Route 70, Lancaster	4,143	4,610	^D	^D	6,040	4,830	5,029	4,712	4,134	3,224
6	Route 2 west of I-190, Leominster ^C	4,701	5,417	5,556	5,567	6,150	5,998	6,050	5,213	5,017	4,309
Location Number	Location	Saturday 1996	Saturday 1998	Saturday 2000	Saturday 2002	Saturday 2004	Saturday 2006	Saturday 2008	Saturday 2010	Saturday 2012	Saturday 2015
1	Route 110-111 north of Route 2, Harvard	10,175	9,209	10,641	11,167	10,916	11,307	10,234	13,367	10,933	9,214
2	Route 2A-110 at Littleton/Ayer Town Line ^A	6,597	8,270	n/a	10,033	9,659	9,003	8,235	7,799	7,769	9,020
3	Route 2 east of I-495, Littleton	27,235	30,428	28,399	34,232	44,822	34,039	31,001	39,368	34,263	30,608
4	Route 2 west of I-495, Littleton ^B	30,194	37,623	33,015	38,747	40,606	42,099	38,749	41,038	44,249	39,015
5	Route 2 west of Route 70, Lancaster	35,527	35,321	^D	^D	30,552	45,817	39,025	46,279	44,817	42,586
6	Route 2 west of I-190, Leominster ^C	43,925	^D	43,368	53,238	62,260	62,440	58,145	60,836	62,857	55,794
Location Number	Location	Sunday 1996	Sunday 1998	Sunday 2000	Sunday 2002	Sunday 2004	Sunday 2006	Sunday 2008	Sunday 2010	Sunday 2012	Sunday 2015
1	Route 110-111 north of Route 2, Harvard	7,282	7,403	8,442	11,167	7,926	8,464	8,398	10,185	8,594	7,222
2	Route 2A-110 at Littleton/Ayer Town Line ^A	5,380	6,722	n/a	10,033	6,969	6,906	5,918	7,026	7,210	7,882
3	Route 2 east of I-495, Littleton	24,582	25,805	27,591	34,232	29,835	29,845	26,984	27,603	29,391	27,475
4	Route 2 west of I-495, Littleton ^B	29,775	29,340	30,834	38,747	44,132	38,089	34,701	39,340	41,301	36,773
5	Route 2 west of Route 70, Lancaster	32,387	30,644	^D	^D	40,889	39,248	37,459	38,713	32,984	36,098
6	Route 2 west of I-190, Leominster ^C	41,133	40,936	30,834	53,238	52,103	51,540	49,557	51,272	54,037	51,021

- A. 2 day count in 2000
- B. 5 day count in 2002
- C. 6 day count in 2002
- D. Data not available from MHD permanent count locations
- E. 6 day count in 2008
- F. 4 day count in 2008

Table 3-5: Average Weekday Daily Traffic (AWDT) -- External Locations (7 Day Counts) (continued)

Location Number	Location	ADT 1996	ADT 1998	ADT 2000	ADT 2002	ADT 2004	ADT 2006	ADT 2008	ADT 2010	ADT 2012	ADT 2015
1	Route 110-111 north of Route 2, Harvard	13,185	12,813	14,748	14,986	14,961	13,907	14,203 ^F	15,606	13,598	11,769
2	Route 2A-110 at Littleton/Ayer Town Line ^A	9,598	11,958	12,039	13,470	13,084	13,101	12,548	11,362	10,624	12,657
3	Route 2 east of I-495, Littleton	40,233	43,328	50,195	46,033	59,095	45,982	45,992	42,787	43,020	37,591
4	Route 2 west of I-495, Littleton ^B	44,720	49,076	46,707	58,944	67,145	57,240	54,148	53,297	49,022	45,321
5	Route 2 west of Route 70, Lancaster	43,940	45,581	43,870	n/a	57,989	57,464	57,367	58,973	52,983	48,316
6	Route 2 west of I-190, Leominster ^C	55,588	60,966	64,482	71,263	75,706	73,935	73,237	71,220	67,282	60,577
Location Number	Location	AM Peak Hour 1996	AM Peak Hour 1998	AM Peak Hour 2000	AM Peak Hour 2002	AM Peak Hour 2004	AM Peak Hour 2006	AM Peak Hour 2008	AM Peak Hour 2010	AM Peak Hour 2012	AM Peak Hour 2015
1	Route 110-111 north of Route 2, Harvard	1,169	1,092	1,237	1,222	1,230	1,185	1,268 ^F	1,285	1,157	907
2	Route 2A-110 at Littleton/Ayer Town Line ^A	725	911	940	1,003	1,111	1,060	1,017	1,019	932	1,014
3	Route 2 east of I-495, Littleton	3,872	3,964	5,133	3,962	4,860	4,025	4,055	3,688	3,726	2,561
4	Route 2 west of I-495, Littleton ^B	4,008	4,080	4,052	5,028	5,787	4,914	4,762	4,583	4,120	3,270
5	Route 2 west of Route 70, Lancaster	3,858	3,868	^D	n/a	4,443	4,966	4,693	4,788	4,457	3,652
6	Route 2 west of I-190, Leominster ^C	4,625	5,082	5,313	5,766	6,135	6,058	5,935	5,758	5,327	4,779
Location Number	Location	Saturday 1996	Saturday 1998	Saturday 2000	Saturday 2002	Saturday 2004	Saturday 2006	Saturday 2008	Saturday 2010	Saturday 2012	Saturday 2015
1	Route 110-111 north of Route 2, Harvard	880	764	875	933	958	1,000	896	1,133	933	790
2	Route 2A-110 at Littleton/Ayer Town Line ^A	553	653	n/a	814	776	704	681	606	581	635
3	Route 2 east of I-495, Littleton	2,047	2,240	2,227	2,454	3,294	2,595	2,396	2,918	2,333	1,879
4	Route 2 west of I-495, Littleton ^B	2,383	2,972	2,341	2,954	3,011	3,134	2,992	3,103	3,311	2,396
5	Route 2 west of Route 70, Lancaster	2,553	2,732	^D	^D	2,237	3,341	2,855	3,311	3,242	3,566
6	Route 2 west of I-190, Leominster ^C	3,174	^D	3,952	4,198	4,695	4,680	4,490	4,399	4,446	3,929
Location Number	Location	Sunday 1996	Sunday 1998	Sunday 2000	Sunday 2002	Sunday 2004	Sunday 2006	Sunday 2008	Sunday 2010	Sunday 2012	Sunday 2015
1	Route 110-111 north of Route 2, Harvard	628	587	828	933	815	800	769	909	857	639
2	Route 2A-110 at Littleton/Ayer Town Line ^A	491	532	n/a	814	625	652	532	625	678	642
3	Route 2 east of I-495, Littleton	1,989	2,149	2,436	2,454	2,583	2,758	2,320	2,411	2,500	1,679
4	Route 2 west of I-495, Littleton ^B	2,499	2,307	2,616	2,954	3,708	3,363	3,139	3,340	3,212	2,688
5	Route 2 west of Route 70, Lancaster	2,642	2,735	^D	^D	3,429	3,289	3,058	3,266	2,633	2,526
6	Route 2 west of I-190, Leominster ^C	3,310	3,391	3,592	4,198	4,227	4,454	4,428	4,445	4,151	4,247

- A. 2 day count in 2000
- B. 5 day count in 2002
- C. 6 day count in 2002
- D. Data not available from MHD permanent count locations
- E. 6 day count in 2008
- F. 4 day count in 2008

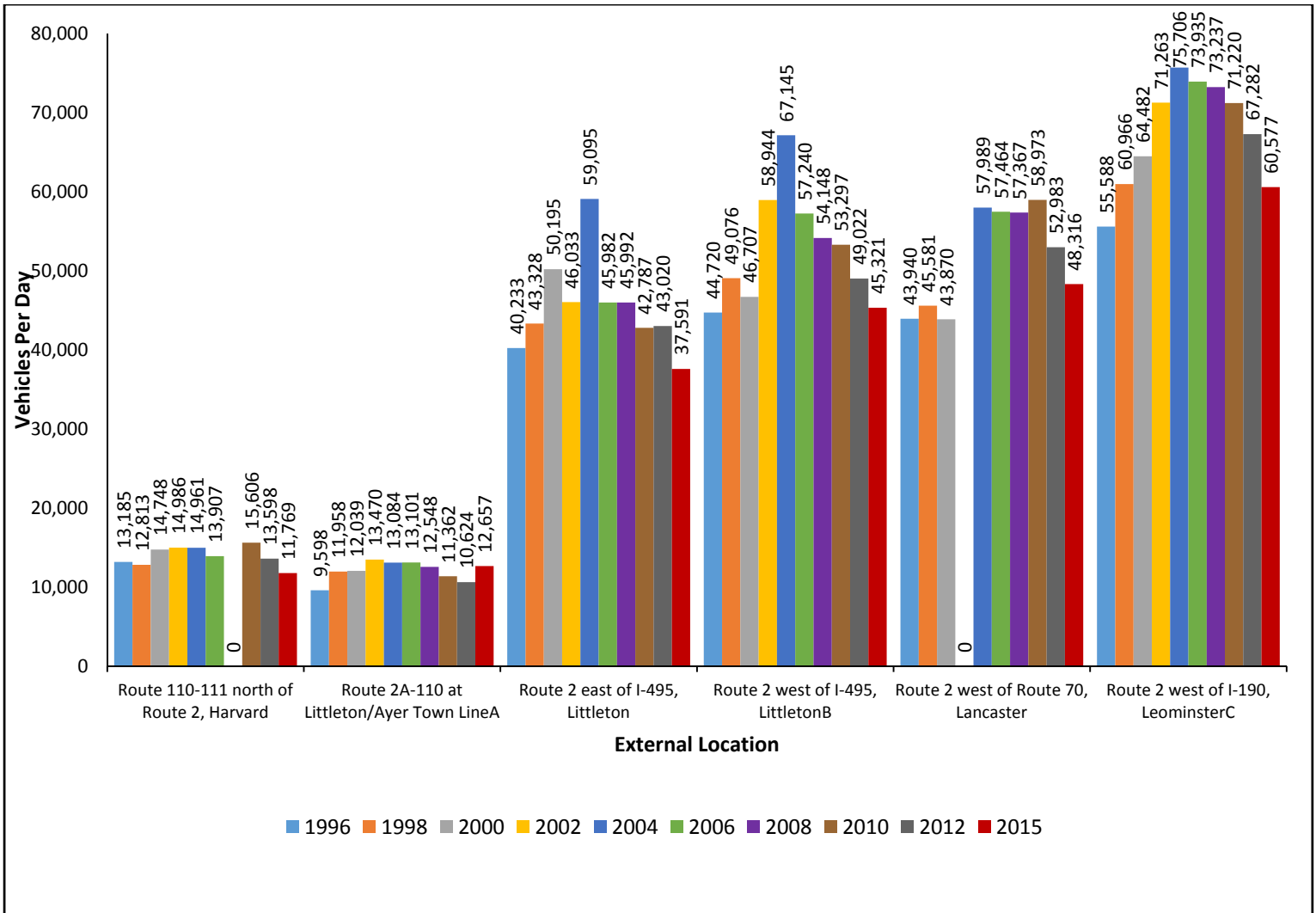


Figure 3-2: Average Weekday Daily Traffic – 7 Day Count Locations

Daily traffic volumes peaked in 2004 and have steadily declined since.

3.3 Total Intersection Volumes – External Locations

Tables 3-6 and 3-7 show the peak hour volumes for external intersections. Almost all peak hour intersection volumes have increased since 2010. Overall, traffic volumes during the AM peak hour have increased by 10% (+1,623 vehicles) between 2010 and 2015, and volumes during the PM peak hour have increased by 4% (+703 vehicles). Traffic volumes at external study intersections locations are increasing despite regional traffic volumes external to Devens generally decreasing.

Table 3-6: Total AM Peak Hour Intersection Volumes – External Locations

Intersection	1996 Baseline Pk. Hr. (vph)	1998 AM Pk. Hr. (vph)	2000 AM Pk. Hr. (vph)	2002 AM Pk. Hr. (vph)	2004 AM Pk. Hr. (vph)	2006 AM Pk. Hr. (vph)	2008 AM Pk. Hr. (vph)	2010 AM Pk. Hr. (vph)	2012 AM Pk. Hr. (vph)	2015 AM Pk. Hr. (vph)
1. Front St./Lancaster St./Leominster Rd./Center Rd., Shirley	802	861	803	738	761	815	838	841	867	907
2. Park St./Fitchburg Rd./Groton School Rd., Ayer	1210	1241	1157	1239	1146	1196	1238	1220	1223	1218
3. Park St./Main St./West Main St., Ayer	1492	1556	1361	1442	1372	1578	1504	1448	1470	1335
4. Groton-Harvard Rd./Central Ave., Ayer	864	941	880	990	869	782	801	737	703	707
5. Route 2A-110 (King St.)/I-495 Exit 30 NB Ramps, Littleton	1555	1703	1833	1941	1482	1462	1472	1559	1527	1694
6. Route 2A-110 (King St.)/I-495 Exit 30 SB Ramps, Littleton	1539	1714	1830	1782	1583	1657	1578	1631	1580	1847
7. Route 110-111 (Ayer Rd.)/Route 110/Route 111, Harvard	818	952	833	823	875	891	949	844	802	1026
8. Route 70/Route 117 (Seven Bridge Rd.), Lancaster	1452	1582	1616	1597	1564	1621	1760	1620	1666	1767
9. Route 70/Route 117 (Lunenburg Rd.), Lancaster	1471	1581	1652	1649	1608	1664	1818	1681	1733	1833
10. Route 110 (King St.)/Route 119/Route 2A, Littleton Common	2085	2196	2225	2382	2180	1873	1921	1825	2066	1979
11. Route 2A-110 (King St.)/Goldsmith St., Littleton Common	1469	1667	1674	1638	1449	1213	1319	1138	1401	1355
12. Verbeck Gate/Macpherson Rd., Ayer	774	710	888	1014	916	1094	1062	883	902	1000
13. Grant Rd./West Main St., Ayer	n/a	n/a	n/a	n/a	637	625	777	649	716	850
14. Hospital Rd./Front St., Shirley	n/a	n/a	n/a	n/a	668	553	671	624	648	805

Table 3-7: Total PM Peak Hour Intersection Volumes – External Locations

Intersection	1996 Baseline Pk. Hr. (vph)	1998 PM Pk. Hr. (vph)	2000 PM Pk. Hr. (vph)	2002 PM Pk. Hr. (vph)	2004 PM Pk. Hr. (vph)	2006 PM Pk. Hr. (vph)	2008 PM Pk. Hr. (vph)	2010 PM Pk. Hr. (vph)	2012 PM Pk. Hr. (vph)	2015 PM Pk. Hr. (vph)
1. Front St./Lancaster St./Leominster Rd./Center Rd., Shirley	953	779	847	782	850	776	889	815	899	973
2. Park St./Fitchburg Rd./Groton School Rd., Ayer	1353	1523	1447	1487	1482	1450	1414	1381	1478	1283
3. Park St./Main St./West Main St., Ayer	1721	1547	1698	1646	1699	1804	1754	1689	1685	1325
4. Groton-Harvard Rd./Central Ave., Ayer	841	956	904	960	854	796	765	693	718	738
5. Route 2A-110 (King St.)/I-495 Exit 30 NB Ramps, Littleton	1675	1711	1656	1927	1737	1893	1647	1514	1548	1626
6. Route 2A-110 (King St.)/I-495 Exit 30 SB Ramps, Littleton	1844	1705	1814	1981	1853	1959	1733	1655	1697	1761
7. Route 110-111 (Ayer Rd.)/Route 110/Route 111, Harvard	869	1135	668	642	710	609	822	592	793	820
8. Route 70/Route 117 (Seven Bridge Rd.), Lancaster	1614	1685	1657	1570	1636	1677	1793	1730	1877	1826
9. Route 70/Route 117 (Lunenburg Rd.), Lancaster	1578	1800	1679	1600	1650	1720	1825	1787	1910	1889
10. Route 110 (King St.)/Route 119/Route 2A, Littleton Common	2809	2880	2574	2871	2717	2450	2499	2304	2370	2310
11. Route 2A-110 (King St.)/Goldsmith St., Littleton Common	1758	1724	1588	1840	1683	1521	1600	1440	1443	1480
12. Verbeck Gate/Macpherson Rd., Ayer	726	669	926	959	936	1093	1010	924	884	1004
13. Grant Rd./West Main St., Ayer	n/a	n/a	n/a	n/a	662	617	890	713	714	831
14. Hospital Rd./Front St., Shirley	n/a	n/a	n/a	n/a	604	591	676	610	643	684

3.4 Average Weekday Traffic – Devens Gates

Weekday traffic volumes at the five Devens Gates have collectively increased by 11% since 2010 (Table 3-8 and Figure 3-3). Grant Road Gate experienced the largest increase in traffic volume, 587 vehicles per day, or 39%. Prior to 2010, traffic growth had been stabilizing.

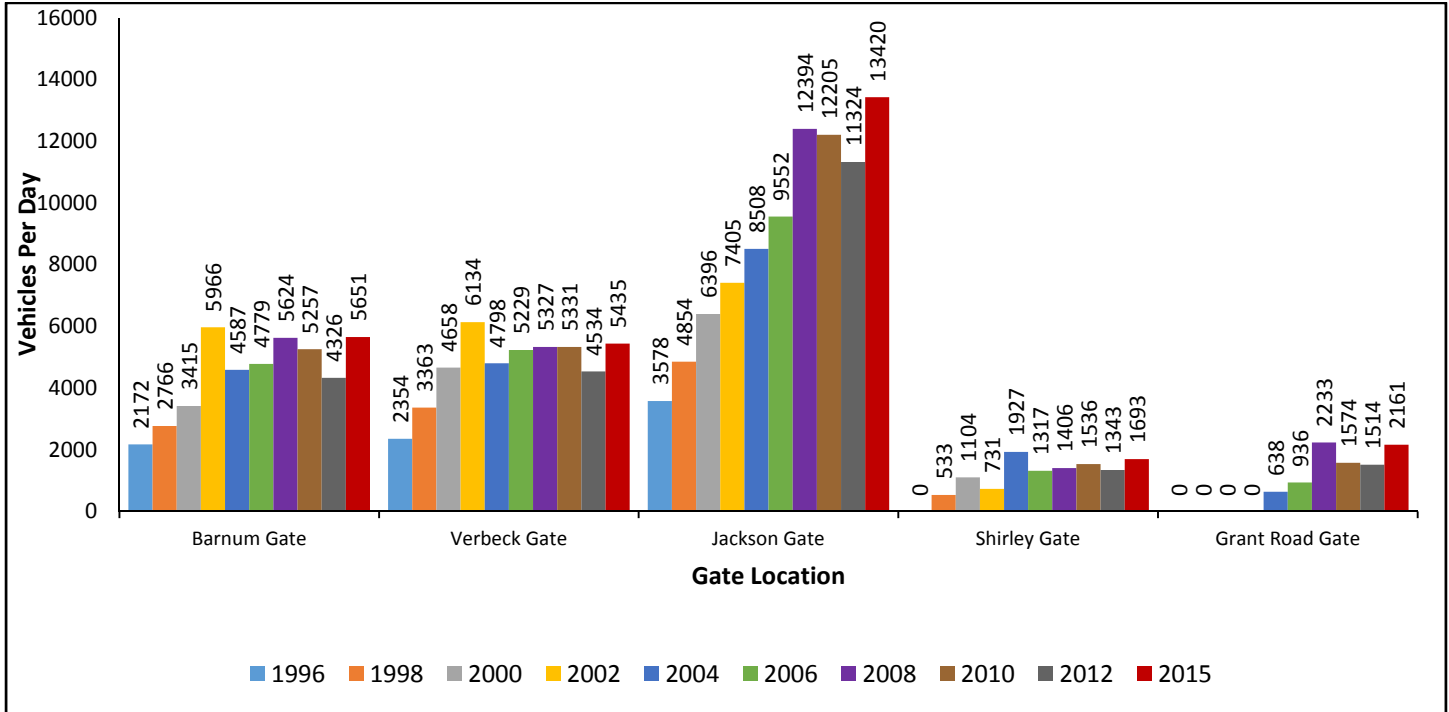


Figure 3-3: Average Weekday Daily Traffic by Gate

Table 3-8: Average Weekday Daily Traffic (AWDT) – Devens Gates

Location	1996 AWDT	1998 AWDT	2000 AWDT	2002 AWDT	2004 AWDT	2006 AWDT	2008 AWDT	2010 AWDT	2012 AWDT	2015 AWDT
Barnum Gate	2172	2766	3415	5966	4587	4779	5624	5257	4326	5651
Verbeck Gate	2354	3363	4658	6134	4798	5229	5327	5331	4534	5435
Jackson Gate	3578	4854	6396	7405	8508	9552	12394	12205	11324	13420
Shirley Gate	n/a	533	1104	731	1927	1317	1406	1536	1343	1693
Grant Road Gate	n/a	n/a	n/a	n/a	638	936	2233	1574	1514	2161
Total	8104	11516	15573	20236	20458	21813	26984	25903	23041	28360

On a daily basis, the distribution of traffic throughout the gates (which are used to access Devens) has remained constant. The largest changes in distribution were a 1.5% decrease in traffic at Verbeck Gate and a 1.5% increase in traffic at Grant Road Gate. Jackson Gate is used the most (47%), followed by Barnum (20%), Verbeck (19%), Grant (8%), and Shirley (6%).

Peak hour traffic at the gates has remained relatively stable since 2010 (Table 3-9). During the morning peak hour, traffic volumes have decreased by two vehicles, and in the evening, traffic volumes have increased by 7% (+174 vehicles).

Table 3-9: Peak Hour Traffic – Devens Gates

	1996		1998		2000		2002		2004		2006		2008		2010		2012		2015	
	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total	AM Peak	% Total
Barnum Gate	159	23%	193	20%	260	16%	384	23%	418	21%	366	18%	529	20%	400	15%	441	17%	462	17%
Verbeck Gate	217	31%	264	27%	470	29%	492	29%	441	22%	454	23%	417	16%	457	17%	474	19%	534	20%
Jackson Gate	324	46%	462	48%	812	50%	770	45%	836	42%	951	48%	1236	46%	1469	54%	1302	51%	1319	49%
Shirley Gate	n/a	n/a	48	5%	70	4%	53	3%	232	12%	132	7%	245	9%	194	7%	172	7%	181	7%
Grant Road Gate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	67	3%	97	5%	249	9%	190	7%	173	7%	212	8%
Total	700	100%	967	100%	1612	100%	1699	100%	1994	100%	2000	100%	2676	100%	2710	100%	2562	100%	2708	100%
	1996		1998		2000		2002		2004		2006		2008		2010		2012		2015	
	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total	PM Peak	% Total
Barnum Gate	172	23%	224	23%	367	25%	430	27%	454	23%	462	22%	470	18%	430	18%	423	18%	510	20%
Verbeck Gate	206	28%	252	26%	380	26%	506	32%	421	21%	488	23%	512	20%	462	19%	432	19%	457	18%
Jackson Gate	369	49%	434	45%	579	40%	631	39%	853	43%	926	44%	1188	46%	1188	50%	1150	49%	1225	48%
Shirley Gate	n/a	n/a	53	6%	122	8%	36	2%	179	9%	138	7%	150	6%	160	7%	162	7%	175	7%
Grant Road Gate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	72	4%	92	4%	264	10%	153	6%	162	7%	200	8%
Total	747	100%	963	100%	1448	100%	1603	100%	1979	100%	2106	100%	2584	100%	2393	100%	2329	100%	2567	100%

3.5 Average Weekday Daily Truck Traffic – Devens Gates

For the purposes of this report, the following FHWA vehicle classifications are considered trucks: buses, 2 Axle 6 Tire, 3 Axle Single, 4 Axle Single, <5 Axle Double, 5 Axle Double, >6 Axle Double, <6 Axle Multi, 6 Axle Multi and >6 Axle Multi vehicles. Truck traffic in Devens has increased at all gates with the exception of Verbeck Gate, which experienced a 51% decrease (-240 trucks) in truck volume since 2010. Grant and Jackson Gates experienced the most significant increases in truck traffic, having experienced increases of 123% (+73 trucks) and 121% (+967 trucks) respectively. Overall, average weekday daily truck traffic has increased by 55% (+1149 trucks) per day, since 2010 (Table 3-10 and Figure 3-4). 85% of truck traffic passes through Jackson Gate (55% or 1,768 trucks) and Barnum Gate (30% or 965 trucks).

Table 3-10: Average Weekday Daily Truck Traffic – Devens Gates

	1996	1998	2000	2004	2006	2008	2010	2012	2015
Barnum Gate	244	427	546	1245	1304	2003	661	918	965
Verbeck Gate	165	102	380	505	286	220	475	405	235
Jackson Gate	358	1253	862	1156	1705	2614	801	895	1768
Shirley Gate	n/a	n/a	n/a	117	30	136	79	102	125
Grant Road Gate	n/a	n/a	n/a	95	78	125	59	314	132
Total	767	1782	1788	3118	3403	5098	2075	2634	3224

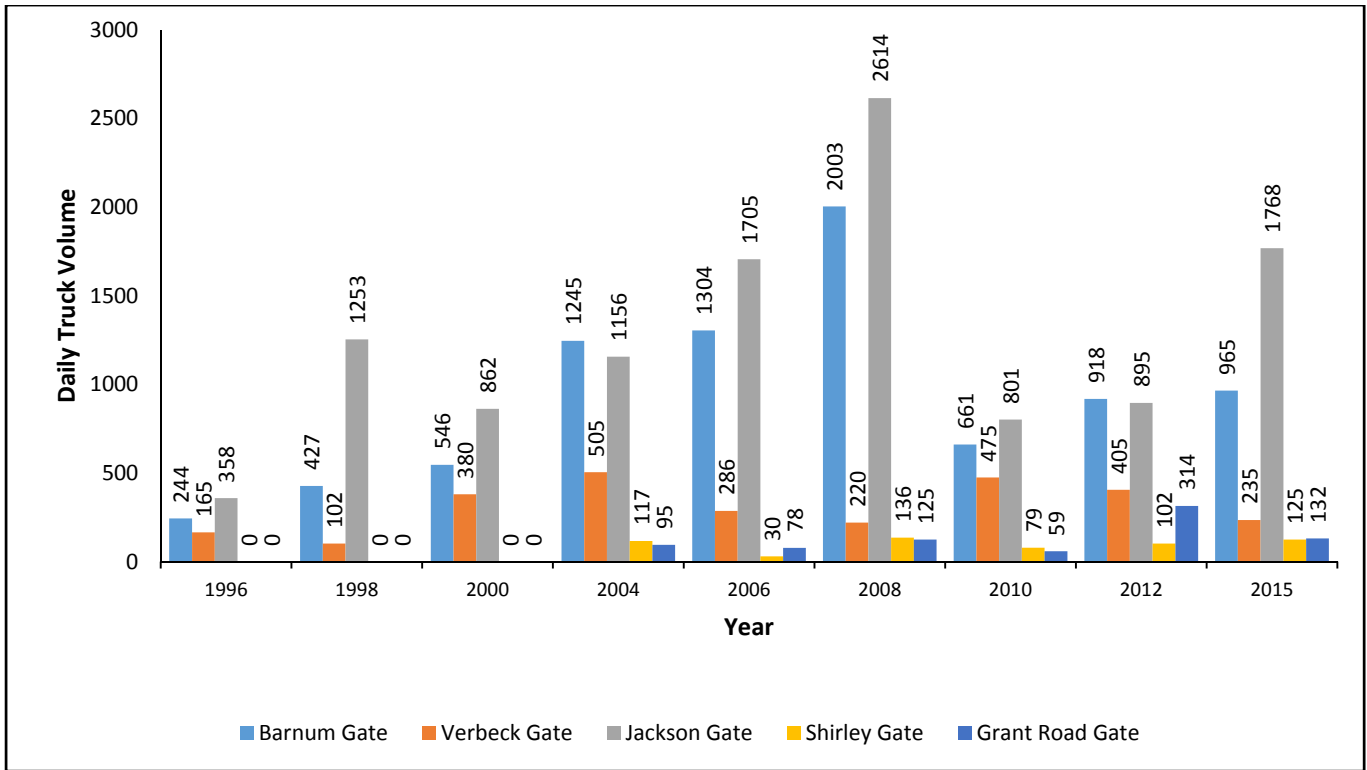


Figure 3-4: Average Weekday Daily Truck Distribution by Gate

Truck volumes were irregularly high in 2008 due to construction and army maneuvers.

3.6 Origin-Destination Survey

An origin-destination study was conducted to determine the amount of cut-through traffic in Devens. This was done by recording the last three alpha-numeric characters of license plates entering and exiting the five gates. The license plate numbers were then matched in order to quantify the amount of vehicles using Devens as a cut-through route. For this purpose, a cut-through is defined as a vehicle entering one gate and exiting another within a 15-minute interval. It is assumed that vehicles entering and exiting in this amount of time are using Devens as a means to reach a destination outside of Devens, and thus are not factored into trip generation calculations.

Table 3-11 shows cut-through traffic by hour. By comparing the total number of vehicles entering Devens gates and the number of vehicles using the gates as a cut-through, it was determined that 34% of trips through the gates between the hours of 6:00 AM and 6:00 PM are cut-through trips. The cut-through percentage steadily increased from 2000-2010, during which it increased by 14%. This percentage has now begun to stabilize, having only increased by 2% since 2010. The total number of cut-through trips decreased between the times of 9:00 AM and 2:00 PM, suggesting that fewer drivers are using Devens as a cut-through during non-peak hour times than in 2010. This shows that Devens is used as a cut-through mainly by commuters traveling to and from the regional highway network. The highest number of cut-throughs continues to occur during the afternoon peak hour.

Table 3-11: Cut-through Traffic by Hour

Start Time	End Time	Total Entering				Total Cut-Through				Cut-Through Percentage of Total Trips			
		2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
6:00 AM	7:00 AM	739	938	898	918	81	140	204	223	11%	15%	23%	24%
7:00 AM	8:00 AM	935	1176	1296	1221	160	223	254	306	17%	19%	20%	25%
8:00 AM	9:00 AM	787	1094	1218	1044	136	223	318	277	17%	20%	26%	27%
9:00 AM	10:00 AM	390	566	622	563	57	131	178	147	15%	23%	29%	26%
10:00 AM	11:00 AM	330	380	480	423	76	90	196	155	23%	24%	41%	37%
11:00 AM	12:00 PM	358	496	516	494	62	145	216	183	17%	29%	42%	37%
12:00 PM	1:00 PM	411	672	691	640	64	146	214	170	16%	22%	31%	27%
1:00 PM	2:00 PM	401	550	601	691	65	129	221	229	16%	23%	37%	33%
2:00 PM	3:00 PM	398	652	625	628	72	166	240	264	18%	25%	38%	42%
3:00 PM	4:00 PM	387	607	725	783	124	203	316	361	32%	33%	44%	46%
4:00 PM	5:00 PM	382	555	667	758	119	233	291	383	31%	42%	44%	51%
5:00 PM	6:00 PM	338	663	601	713	27	218	237	347	8%	33%	39%	49%
	Total	5856	8349	8940	8876	1043	2047	2885	3045	18%	25%	32%	34%

Table 3-12 shows the number of cut-through trips by gate. While the total percentage of cut-through trips has remained constant, the distribution of these trips has changed slightly. Cut-through trips between Jackson Gate and Verbeck Gate have decreased 7%, and cut-through trips between Jackson Gate and Verbeck Gate. This shows that a number drivers who regularly used Verbeck Gate have been using Grant Gate instead. Despite traffic migrating to Grant Gate, the cut-through route between Jackson Gate and Verbeck Gate is the second most popular route through Devens, making up 24% of total cut-through traffic. The most popular is the route between Jackson Gate and Barnum Gate, making up 26% of the total.

Table 3-12: Cut-through Traffic by Gate

Origin	Destination	2000 Total Number of Cut-Throughs	2005 Total Number of Cut-Throughs	2010 Total Number of Cut-Throughs	2015 Total Number of Cut-Throughs	2000 Percent Overall	2005 Percent Overall	2010 Percent Overall	2015 Percent Overall
Jackson Gate	Verbeck	270	479	367	305	26%	23%	17%	10%
	Shirley	66	170	154	212	6%	8%	7%	7%
	Barnum	93	176	260	298	9%	9%	12%	10%
	Grant Road	n/a	44	150	272	n/a	2%	7%	9%
Verbeck Gate	Jackson	287	327	299	423	28%	16%	14%	14%
	Shirley	15	24	22	14	1%	1%	1%	0%
	Barnum	49	63	81	67	5%	3%	4%	2%
	Grant Road	n/a	11	29	30	n/a	1%	1%	1%
Shirley Gate	Jackson	47	181	131	247	5%	9%	6%	8%
	Verbeck	14	35	28	25	1%	2%	1%	1%
	Barnum	15	33	41	56	1%	2%	2%	2%
	Grant Road	n/a	9	11	12	n/a	0%	1%	0%
Barnum Gate	Jackson	109	212	252	483	10%	10%	12%	16%
	Verbeck	51	117	87	83	5%	6%	4%	3%
	Shirley	27	47	37	54	3%	2%	2%	2%
	Grant Road	n/a	12	13	33	n/a	1%	1%	1%
Grant Road	Jackson	n/a	67	130	353	n/a	3%	6%	12%
	Verbeck	n/a	19	28	25	n/a	1%	1%	1%
	Shirley	n/a	7	17	13	n/a	0%	1%	0%
	Barnum	n/a	14	23	40	n/a	1%	1%	1%
	Total	1043	2047	2160	3045	100%	100%	100%	100%

3.7 Carlton Rotary

Traffic volumes were recorded entering and exiting each leg of the Carlton Rotary (Tables 3-13 through 3-15). These volumes were then balanced so that the total number of vehicles entering the rotary is equivalent to the total number of vehicles exiting the rotary.

Table 3-13: Carlton Rotary – Weekday Volumes – Entering/ Exiting (balanced)

	1996 Entering (vpd)	1998 Entering (vpd)	2000 Entering (vpd)	2002 Entering (vpd)	2004 Entering (vpd)	2006 Entering (vpd)	2008 Entering (vpd)	2010 Entering (vpd)	2012 Entering (vpd)	2015 Entering (vpd)
Route 2A-110, East of Rotary	7,200	7,500	6,994	8,844	8,512	8,248	8,070	7,068	6,487	7,388
Route 110-111, South of Rotary	7,400	7,200	6,775	7,920	8,571	6,194	7,775	6,960	6,479	7,089
Barnum Road	1,650	1,200	1,704	3,048	2,740	3,105	3,955	3,337	2,743	3,054
Route 2A-111 EB, West of Rotary	10,350	10,200	9,489	9,751	10,645	9,300	9,428	9,234	9,065	9,318
Route 2A-111 WB, West of Rotary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sandy Pond Road	2,650	3,900	2,003	2,337	2,190	2,082	2,203	2,242	2,088	2,423
Total	29,250	30,000	26,965	31,900	32,658	28,929	31,431	28,841	26,862	29,272
	1996 Exiting (vpd)	1998 Exiting (vpd)	2000 Exiting (vpd)	2002 Exiting (vpd)	2004 Exiting (vpd)	2006 Exiting (vpd)	2008 Exiting (vpd)	2010 Exiting (vpd)	2012 Exiting (vpd)	2015 Exiting (vpd)
Route 2A-110, East of Rotary	7,600	7,500	7,140	8,842	8,181	8,235	7,812	7,103	6,258	7,083
Route 110-111, South of Rotary	6,750	7,200	6,693	7,764	7,994	4,605	6,865	6,325	5,993	6,541
Barnum Road	1,550	1,500	1,713	2,921	2,726	2,693	4,100	3,179	2,623	2,902
Route 2A-111 EB, West of Rotary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Route 2A-111 WB, West of Rotary	10,350	11,100	9,625	10,409	10,806	10,318	9,737	9,104	8,795	9,462
Sandy Pond Road	3,000	2,700	1,794	1,964	2,952	3,079	2,917	3,130	3,194	3,284
Total	29,250	30,000	26,965	31,900	32,659	28,930	31,431	28,841	26,863	29,272
	1996 Total (vpd)	1998 Total (vpd)	2000 Total (vpd)	2002 Total (vpd)	2004 Total (vpd)	2006 Total (vpd)	2008 Total (vpd)	2010 Total (vpd)	2012 Total (vpd)	2015 Total (vpd)
Route 2A-110, East of Rotary	14,800	15,000	14,134	17,686	16,693	16,483	15,882	14,171	12,745	14,471
Route 110-111, South of Rotary	14,150	14,400	13,468	15,684	16,565	10,799	14,640	13,285	12,472	13,630
Barnum Road	3,200	2,700	3,417	5,969	5,466	5,798	8,055	6,516	5,366	5,956
Route 2A-111 EB, West of Rotary	10,350	10,200	9,489	9,751	10,645	9,300	9,428	9,234	9,065	9,318
Route 2A-111 WB, West of Rotary	10,350	11,100	9,625	10,409	10,806	10,318	9,737	9,104	8,795	9,462
Sandy Pond Road	5,650	6,600	3,797	4,301	5,142	5,161	5,120	5,372	5,282	5,707
Total	58,500	60,000	53,930	63,800	65,317	57,859	62,862	57,682	53,725	58,544

The overall balanced volumes decreased by 7% from 2010 to 2012, but increased by 9% from 2012 to 2015. The 2015 volumes are 1.5% greater than 2010 counts at the rotary. Traffic volumes have fluctuated between 1996 and 2015, peaking in 2004. It is noted that the total traffic volume recorded in the rotary in 2015 (58,544) is very similar to the total volume recorded in 1996 (58,500).

Table 3-14: Carlton Rotary – AM Peak Hour Volumes – Entering/ Exiting (balanced)

	1996 AM Peak Entering (vph)	1998 AM Peak Entering (vph)	2000 AM Peak Entering (vph)	2002 AM Peak Entering (vph)	2004 AM Peak Entering (vph)	2006 AM Peak Entering (vph)	2008 AM Peak Entering (vph)	2010 AM Peak Entering (vph)	2012 AM Peak Entering (vph)	2015 AM Peak Entering (vph)
Route 2A-110, East of Rotary	332	328	658	469	520	436	454	421	397	421
Route 110-111, South of Rotary	441	455	586	440	558	357	549	477	439	486
Barnum Road	86	85	252	170	205	197	304	200	170	193
Route 2A-111 EB, West of Rotary	1,143	1,122	518	999	997	842	862	873	825	892
Route 2A-111 WB, West of Rotary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sandy Pond Road	150	141	186	288	243	229	258	231	214	234
Total	2,152	2,131	2,200	2,366	2,522	2,061	2,427	2,202	2,045	2,226
	1996 AM Peak Exiting (vph)	1998 AM Peak Exiting (vph)	2000 AM Peak Exiting (vph)	2002 AM Peak Exiting (vph)	2004 AM Peak Exiting (vph)	2006 AM Peak Exiting (vph)	2008 AM Peak Exiting (vph)	2010 AM Peak Exiting (vph)	2012 AM Peak Exiting (vph)	2015 AM Peak Exiting (vph)
Route 2A-110, East of Rotary	716	639	413	758	668	643	611	603	552	644
Route 110-111, South of Rotary	651	661	515	775	820	426	720	546	549	575
Barnum Road	141	107	118	216	208	210	354	328	277	298
Route 2A-111 EB, West of Rotary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Route 2A-111 WB, West of Rotary	476	426	1,019	509	622	568	538	519	468	489
Sandy Pond Road	168	298	135	108	204	214	204	206	199	220
Total	2,152	2,131	2,200	2,366	2,522	2,061	2,427	2,202	2,045	2,226
	1996 AM Peak Total (vph)	1998 AM Peak Total (vph)	2000 AM Peak Total (vph)	2002 AM Peak Total (vph)	2004 AM Peak Total (vph)	2006 AM Peak Total (vph)	2008 AM Peak Total (vph)	2010 AM Peak Total (vph)	2012 AM Peak Total (vph)	2015 AM Peak Total (vph)
Route 2A-110, East of Rotary	1,048	967	1,071	1,227	1,188	1,079	1,065	1,024	949	1,065
Route 110-111, South of Rotary	1,092	1,116	1,101	1,215	1,378	783	1,269	1,023	988	1,061
Barnum Road	227	192	370	386	413	407	658	528	447	491
Route 2A-111 EB, West of Rotary	1,143	1,122	518	999	997	940	862	873	825	892
Route 2A-111 WB, West of Rotary	476	426	1,019	509	622	622	538	519	468	489
Sandy Pond Road	318	439	321	396	676	443	462	437	413	454
Total	4,304	4,262	4,400	4,732	5,044	4,122	4,854	4,404	4,090	4,452

Table 3-15: Carlton Rotary – PM Peak Hour Volumes – Entering/ Exiting (balanced)

	1996 PM Peak Entering (vph)	1998 PM Peak Entering (vph)	2000 PM Peak Entering (vph)	2002 PM Peak Entering (vph)	2004 PM Peak Entering (vph)	2006 PM Peak Entering (vph)	2008 PM Peak Entering (vph)	2010 PM Peak Entering (vph)	2012 PM Peak Entering (vph)	2015 AM Peak Entering (vph)
Route 2A-110, East of Rotary	820	817	359	762	778	828	797	649	648	658
Route 110-111, South of Rotary	809	789	438	776	874	632	822	638	661	703
Barnum Road	110	110	45	282	312	326	391	312	281	312
Route 2A-111 EB, West of Rotary	579	601	1,063	502	713	659	634	634	589	623
Route 2A-111 WB, West of Rotary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sandy Pond Road	169	177	228	175	188	204	218	225	206	223
Total	2,487	2,494	2,133	2,497	2,865	2,649	2,862	2,458	2,385	2,520
	1996 PM Peak Exiting (vph)	1998 PM Peak Exiting (vph)	2000 PM Peak Exiting (vph)	2002 PM Peak Exiting (vph)	2004 PM Peak Exiting (vph)	2006 PM Peak Exiting (vph)	2008 PM Peak Exiting (vph)	2010 PM Peak Exiting (vph)	2012 PM Peak Exiting (vph)	2015 PM Peak Exiting (vph)
Route 2A-110, East of Rotary	458	449	703	563	630	609	572	497	483	528
Route 110-111, South of Rotary	443	499	678	452	558	346	486	496	475	480
Barnum Road	61	75	210	146	254	302	414	250	206	230
Route 2A-111 EB, West of Rotary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Route 2A-111 WB, West of Rotary	1,232	1,222	443	1,148	1,142	1,099	1,085	937	960	1,006
Sandy Pond Road	293	249	99	188	281	293	305	278	262	276
Total	2,487	2,494	2,133	2,497	2,865	2,649	2,862	2,458	2,386	2,520
	1996 PM Peak Total (vph)	1998 PM Peak Total (vph)	2000 PM Peak Total (vph)	2002 PM Peak Total (vph)	2004 PM Peak Total (vph)	2006 PM Peak Total (vph)	2008 PM Peak Total (vph)	2010 PM Peak Total (vph)	2012 PM Peak Total (vph)	2015 PM Peak Total (vph)
Route 2A-110, East of Rotary	1,278	1,266	1,062	1,325	1,408	1,437	1,369	1,146	1,131	1,186
Route 110-111, South of Rotary	1,252	1,288	1,116	1,228	1,432	978	1,308	1,134	1,136	1,183
Barnum Road	171	185	255	428	566	628	805	562	487	542
Route 2A-111 EB, West of Rotary	579	601	1,063	502	713	659	634	634	589	623
Route 2A-111 WB, West of Rotary	1,232	1,222	443	1,148	1,142	1,099	1,085	937	960	1,006
Sandy Pond Road	462	426	327	363	469	497	523	503	468	499
Total	4,974	4,988	4,266	4,994	5,730	5,298	5,724	4,916	4,771	5,040



Chapter 4: Traffic Demand Management

The purpose of Transportation Demand Management (TDM) is to reduce the number of single occupancy vehicle-trips during morning and afternoon peak hours. As part of the FEIR for the redevelopment of Devens, a TDM program will be initiated once development reaches a critical mass. This program provides alternative transportation options throughout the community. The goal of this program is to reduce at least 15% of overall vehicle-trips in Devens. MassDevelopment is the agency in charge of initiating this program. It is noted that the results of the transportation survey show that approximately 12% of Devens employees and residents carpool to work.

The United States Environmental Protection Agency (EPA) requires that businesses with at least 250 employees file a TDM Plan with the Massachusetts Department of Environmental Protection (MassDEP). TDM strategies that could be implemented include:

- Carpooling, ridesharing, vanpools
- Shuttle bus service to and from public transit
- Public transportation (MBTA commuter rail)
- Parking management
- Park and ride lots
- Non-vehicle accommodations (bicycle racks, showering facilities, access to trail networks, etc.)
- Guaranteed ride home program
- Flexible work hours (to reduce peak hour traffic)
- Improved access to local services (dry cleaners, day care, bank etc.)

The MBTA has established a reverse commute schedule for trains between North Station and both Littleton and Fitchburg Stations in the morning and evening peak commuting periods. MART has also established a shuttle for reverse commuters from the Littleton and Fitchburg MBTA Stations to Mount Wachusett Community College and is planning a bus route through Devens that will connect the Shirley MBTA station, downtown Devens, and the Ayer MBTA station. The availability of this shuttle makes commuting from Boston to Devens via the commuter rail a viable transportation option.

Mass Development in conjunction with the Devens Enterprise Commission informs every applicant about TDM and requires them to incorporate trip reduction strategies to the extent reasonable and practical. In addition, each unfiled permit issued includes a requirement that at such time a transportation management association is created in Devens, they agree to join. Previous studies used a 7.5% target reduction in vehicle-trips as a result of TDM implementation to be conservative. This report will continue to use the 7.5% figure, although the transportation survey showed that 12% of Devens employees and residents carpool to and from work.



Chapter 5: Build-Out Analysis and Trip Generation/ Distribution

5.1 Overview

New development and redevelopment of existing facilities at Devens have continued over the past several years, including the construction of the New England Studios, redevelopment of the former Equity Industrial building into O'Reilly Automotive, and redevelopment of the former Gillette building into a Quiet Logistics distribution center. This section focuses on documenting current level of development, existing trip comparison with standard trip generation methodology, and future projection based on thresholds identified in the EIR and Final Environmental Impact Study (FEIS). It determines where development and traffic currently are and forecasts to determine future impacts based on current characteristics using standard methodology from the EIR. This year's traffic monitoring report also affords the opportunity to check projections made twenty years ago.

Devens Base Reuse Plan limited total development in Devens to 8.5 million square feet and a daily vehicle-trips threshold of 59,625 vehicle-trips per day was calculated based on projected development levels. In a 2008 Notice of Project Change (NPC) filing to MEPA, MassDevelopment received approval to discontinue using the building floor area as the basis for build-out limit; however, to be consistent with previous traffic monitoring reports, the build-out analysis in this report examines the same two future scenarios:

- Scenario 1: 59,625 daily vehicle-trips is reached.
- Scenario 2: 8.5 million square feet of development is reached.

5.2 Existing Build-Out

In order to develop a build-out analysis, all available data pertaining to existing and planned development was reviewed. The MassDevelopment Real Estate Office provided information related to existing, planned, and potential build-out in Devens. The following information was provided:

- Building owner
- Address
- Zoning District
- Building Size (SF)
- Projected Expansion Size (SF)
- Projected Number of Employees

Table 5-1 summarizes the build-out information provided by MassDevelopment.

Table 5-1: Devens Build-Out Summary

Category	Area (Building SF)
Existing Reuse (occupied)	534,954
New Construction (occupied)	4,173,145
<i>subtotal (occupied development)</i>	4,708,099
Existing Reuse	26,132
New Construction (unoccupied)	341,954
<i>subtotal (unoccupied development)</i>	368,086
Potential Expansions	1,666,147
Current Projects Under Construction	380,500
<i>subtotal (future development)</i>	2,046,647
Total Actual and Planned Buildout	7,122,832
Total Buildout Permitted Under Devens By-Laws	8,500,000
Potential Uncommitted Buildout	1,377,168

As of January 2015, approximately 4.71 million square feet of total build-out is occupied, 368,086 square feet is unoccupied, and 2.05 million square feet of build-out is under construction or has potential to be constructed. The total and actual planned build-out (7.12 million square feet) is 1.38 million square feet below the previously discussed 8.5 million square feet threshold. Since 2010, the total occupied build-out has increased by 1,045,341 square feet.

The 2010 Traffic Monitoring Report used an average build-out rate of 225,000 square feet per year. Based on conversations with MassDevelopment, this rate was retained for consistency.

5.3 Existing Trip Generation

Trip generation results quantify trips associated with any development. To estimate the trip generation characteristics for future development in Devens, the Institute of Transportation Engineers (ITE) Trip Generation manual (9th ed. 2011) was employed. The ITE Manual is widely used by traffic engineers for this application and provides vehicle-trip generation projections for a number of land uses. It incorporates data from all over the country and, as shown in previous Traffic Monitoring Reports, could be conservative compared to actual local data. The current traffic counts in Devens confirm this.

Based on the Devens real estate information provided by the MassDevelopment Real Estate Office, vehicle-trips were generated for each existing development. Trip generation information for existing uses is provided in the Appendix. As previously discussed, driveway turning movement counts were conducted at ten business driveways throughout Devens. The total entering and exiting volumes were calculated for both the morning and afternoon peak hours. These volumes were then compared with projections based on ITE trip generation rates and equations. Most of these rates and equations are based on building size in square feet; however others utilize variables such as number of hotel rooms or employees. Table 5-2 provides existing driveway counts in addition to projections based on rates and equations from the ITE Manual.

Table 5-2: Devens Driveway Trip Generation Comparison

Driveway Turning Movement Counts		AM Peak Hour			PM Peak Hour		
		Existing	ITE Projection	Difference	Existing	ITE Projection	Difference
D-1	American Superconductor - 64 Jackson Road	46	180	-134	28	241	-213
D-3	FBOP - Federal Medical Facility	175	218	-43	85	286	-201
D-4	Quiet Logistics - 66 Saratoga Boulevard	50	61	-11	23	70	-47
D-5	Job Corps - MacArthur Avenue	52	270	-218	54	251	-197
D-10	Southern Container - 51 Independence Boulevard	36	165	-129	19	159	-140
D-11	Xinetics - 115 Jackson Road	7	58	-51	8	62	-54
D-12	Army Enclave at Quebec Street and 10th Mountain Division Road	123	18	105	114	86	28
D-15	Bristol-Meyer Squibb - 38 Jackson Road	115	318	-203	137	299	-162
D-17	Army Enclave at Lovell Road	180	6	174	149	42	107
D-18	Systems H2O - 137 Barnum Road	61	36	25	60	41	19
Total		845	1493	-648	677	1765	-1088

The results of this comparison indicate that developments in Devens are generating traffic at rates lower than those published by ITE, which is consistent with previous 5-Year Traffic Monitoring Reports. For this study, trip generation rates for future expansions and planned developments will be based on rates provided in the ITE Manual.

5.4 Build-Out Projections

As previously discussed, the traffic conditions for two development scenarios are analyzed as part of this build-out analysis. These scenarios are based on development and traffic volumes. In order to evaluate conditions under these scenarios, potential development and traffic volumes were projected out to both the 8.5 million square feet threshold and the 59,625 daily vehicle-trip threshold (Figure 5-1 and Figure 5-2). It is noted that as of the most recent NPC, the 59,625 vehicle-trip limit has been removed; however, it has been included in this report for comparison with previous reports.

The Year 2015 total average weekday traffic (AWDT) at the Devens Gates is 28,360 vehicle-trips. To account for the fact that 34 percent of this traffic is made up of cut-through trips, this number was adjusted to 18,718 vehicle-trips in order to focus on only the traffic being generated by development within Devens. This volume serves as the baseline condition for projecting future weekday daily vehicle-trips.

Build-out projections are based on measured traffic volume data and the real estate data provided by MassDevelopment. Where insufficient information is available, the following assumptions were made:

1. Development will take place at a rate of 225,000 square feet per year, corresponding with a rate of 1,717 additional daily vehicle-trips per year.
2. Unplanned development will consist of similar land uses as current development.

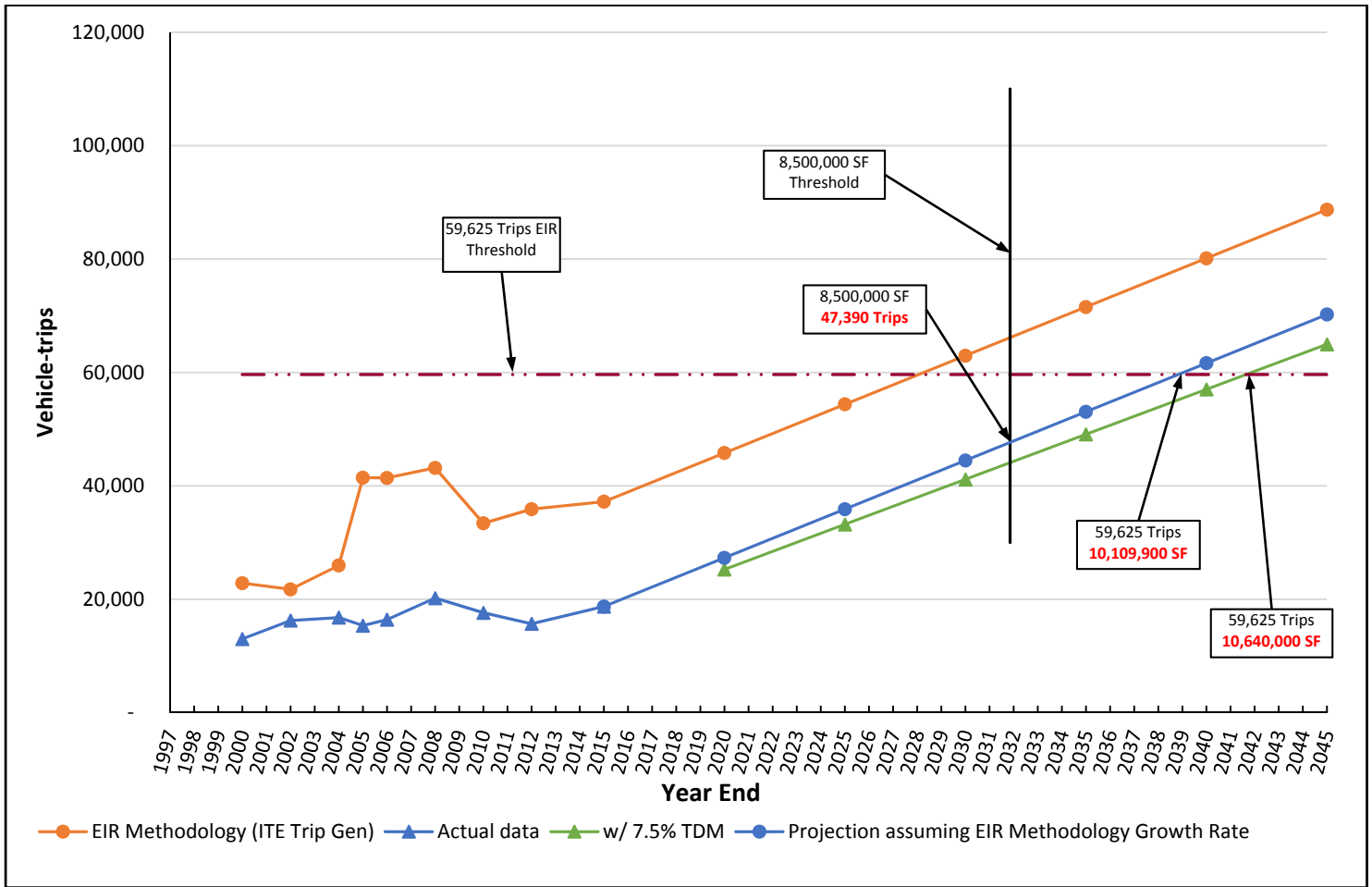


Figure 5-1: Devens Build-Out Summary by Year – Trips

Figure 5-1 projects development over time and forecasts when daily vehicle-trip and development thresholds will be reached. The trend labeled “EIR Methodology” represents historic and current trip estimates based on ITE trip generation rates and is projected in a linear fashion after 2015. The trend labeled “Actual data” represents traffic volume counts collected in 2015 as well as previous traffic studies with a linear projection for years after 2015. Using this projection, it is estimated that the 59,625 vehicle-trip threshold (Scenario 1) will not be reached until 2039, assuming 10,109,900 square feet of occupied development in Devens. The 2005 5-year Traffic Monitoring Report estimated that this threshold would be reached in 2014 with 7,360,854 square feet of development. This shows that Devens is currently generating significantly less traffic and being developed at a slower rate than projected. The Scenario 2 build-out limit of 8,500,000 square feet is projected to be reached in 2032, corresponding with an AWDT of 47,390 trips per day based on projections from actual data.

The trend labeled “w/ 7.5% TDM” represents the projection of vehicle-trips at a linear rate with the previously discussed TDM measures in place. Using this rate, the 59,625 daily vehicle-trip threshold would not be reached until 2042. At that time, it is projected that there would be 10,640,000 square feet of build-out assuming that development continues to take place at a rate of 225,000 square feet per year.

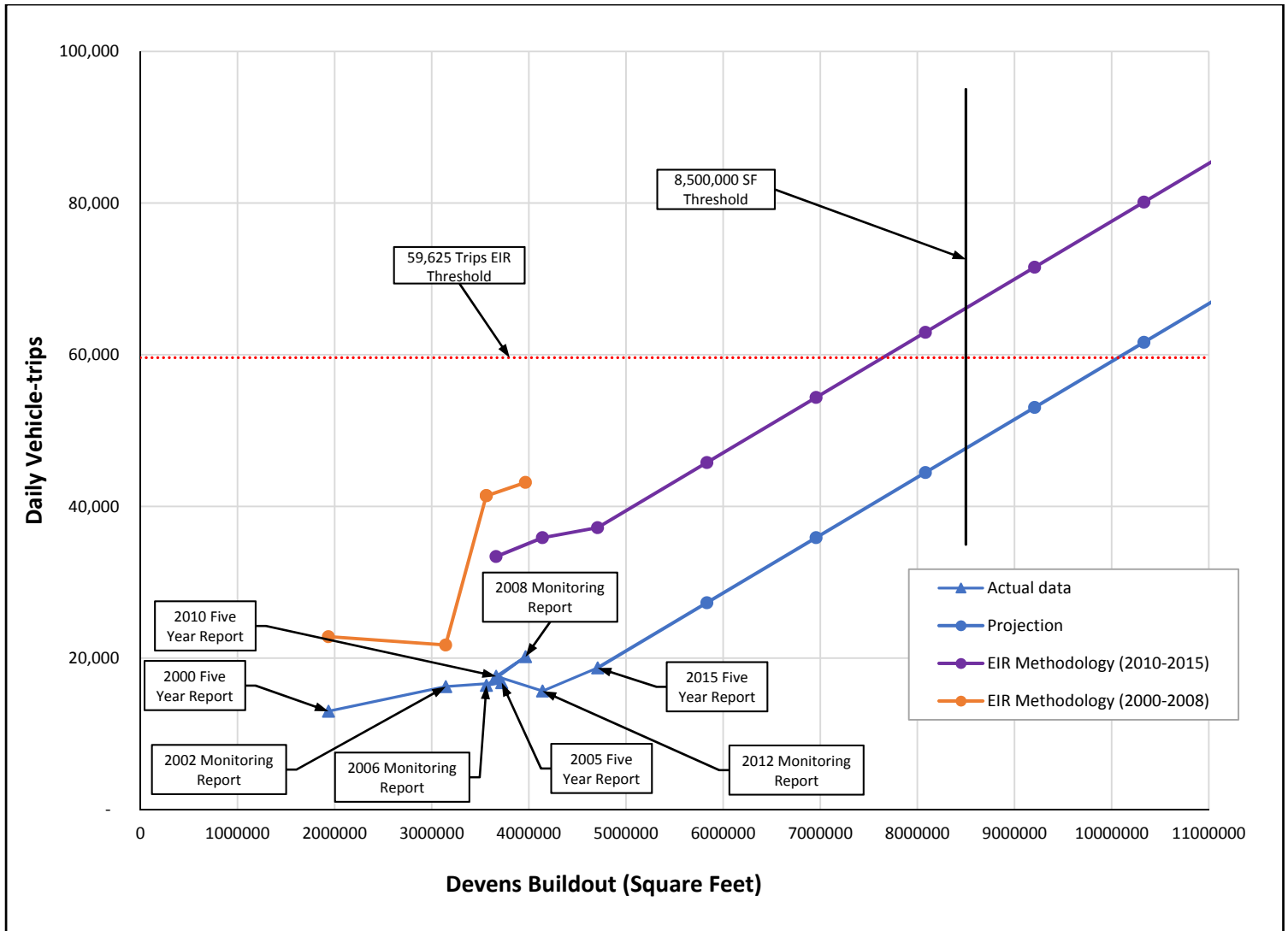


Figure 5-2: Devens Build-Out Summary by Square Feet – Trips

Figure 5-2 represents the relationship between square feet of occupied development in Devens and daily vehicle-trips. The trend labeled “EIR Methodology (2000-2008)” represents historic traffic volume estimates based on ITE trip generation rates during those years. The trend labeled “EIR Methodology (2010-2015)” represents traffic volume estimates based on ITE trip generation rates from the 2010 5-Year Traffic Monitoring Report forward. The reason for this discrepancy is that from 2000-2008, these estimates were based on more generic land uses. Starting with the 2010 report, trip generation was based on more specific land uses in order to produce a more accurate estimate. This accounts for the lower number of trips corresponding with equivalent build-out areas.

5.5 Traffic Analysis Zones

As part of the EIR, traffic analysis zones (TAZ) were established to analyze existing and future traffic conditions. These zones have been carried forward throughout all subsequent Traffic Monitoring Reports and will be utilized in this report for consistency and comparison purposes. Figure 5-3 depicts the boundaries of each TAZ. In order to establish a baseline condition, each existing development was assigned to a specific zone. Trip generation for each of the scenarios required assigning each planned development to a specific zone. Based on previously discussed build-out projections, future build-out

areas were established for each TAZ (Table 5-3). A detailed breakdown of land use and area for each TAZ is provided in the Appendix.

Table 5-3: Devens Build-Out by Scenario

	Existing SF	Buildout (SF)	
		Scenario 1	Scenario 2
Zone 1	852,445	1,042,851	955,576
Zone 2	1,895,706	2,847,086	2,743,521
Zone 3	257,475	1,080,945	640,882
Zone 4	11,615	921,433	432,508
Zone 5	0	-	-
Zone 6	0	-	-
Zone 7	1,133,090	2,852,468	2,659,753
Zone 8	557,768	1,160,423	973,066
Zone 9	0	240,694	94,694
Zone 10	0	-	-
Zone 11	0	-	-
Zone 12	0	-	-
Total	4,708,099	10,109,900	8,500,000

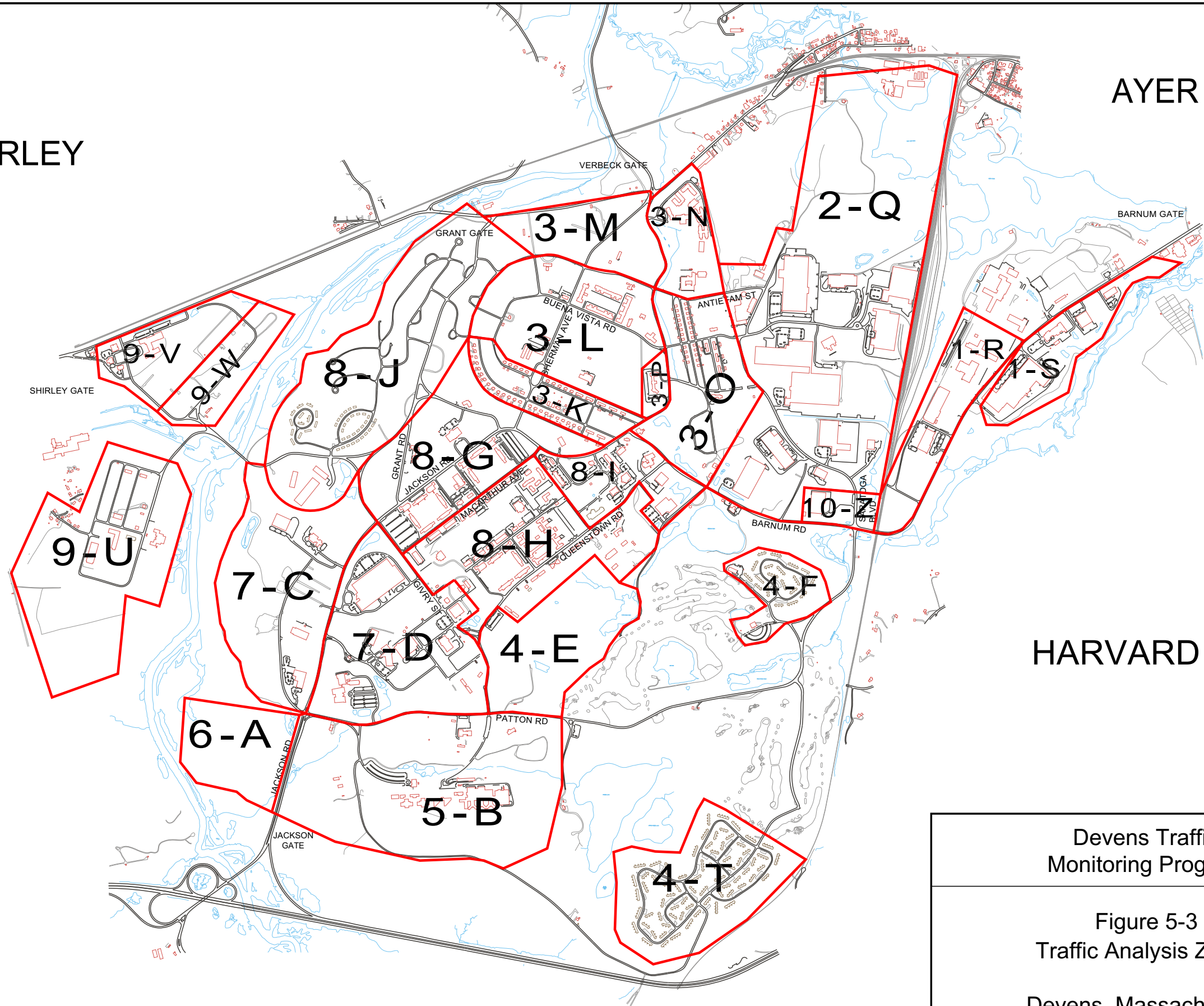
Utilizing the areas projected in Table 5-3, AM and PM peak hour trips as well as daily trips were projected for four different scenarios. These trips were calculated using ITE trip generation rates and traffic volume counts at Devens gates. The four scenarios are as follows:

1. Existing Trips – Existing Methodology: existing buildings and occupied new construction. Trips calculated using 2015 traffic volume data.
2. Existing Trips – EIR Methodology: existing buildings and occupied new construction. Trip generation rates based on ITE Manual.
3. Future Trips – Scenario 1: build-out condition where 59,625 daily vehicle-trip limit is reached. Trip generation rates based on 2015 traffic volume data and ITE Manual.



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Devens Traffic
Monitoring Program

Figure 5-3
Traffic Analysis Zones

Devens, Massachusetts

Not to Scale



4. Future Trips – Scenario 2: Build-Out condition where Devens By-Law development limit of 8.5 million square feet is reached. Trip generation based on 2015 traffic volume data and ITE Manual.

Table 5-4: Trip Generation Summary by Scenario

	Existing Trips - Existing Methodology					Existing Trips - EIR Methodology				
	AM in	AM out	PM in	PM out	Daily	AM in	AM out	PM in	PM out	Daily
Zone 1	257	87	142	281	1,901	512	173	282	558	3,779
Zone 2	344	102	159	308	3,089	684	202	317	612	6,141
Zone 3	286	165	203	348	3,275	569	329	403	692	6,509
Zone 4	14	13	14	18	323	28	25	28	36	643
Zone 5	68	42	39	105	528	135	83	77	209	1,050
Zone 6	0	0	0	0	0	0	0	0	0	0
Zone 7	352	133	190	324	2,647	699	265	378	645	5,261
Zone 8	451	230	274	498	6,469	896	458	544	990	12,859
Zone 9	45	39	37	37	485	89	78	74	73	965
Zone 10	0	0	0	0	0	0	0	0	0	0
Zone 11	0	0	0	0	0	0	0	0	0	0
127Zone	0	0	0	0	0	0	0	0	0	0
Total	1,817	811	1,058	1,920	18,718	3,612	1,613	2,102	3,816	37,207
	Future Trips - Scenario 1					Future Trips - Scenario 2				
	AM in	AM out	PM in	PM out	Daily	AM in	AM out	PM in	PM out	Daily
Zone 1	225	100	131	237	2,312	111	50	65	117	1,145
Zone 2	613	274	357	647	6,313	319	142	186	337	3,287
Zone 3	233	104	135	246	2,397	75	33	43	79	768
Zone 4	198	89	115	210	2,043	50	22	29	53	518
Zone 5	0	0	0	0	0	-	-	-	-	-
Zone 6	0	0	0	0	0	-	-	-	-	-
Zone 7	614	274	357	649	6,325	309	138	180	327	3,186
Zone 8	250	112	145	264	2,573	113	51	66	120	1,166
Zone 9	44	20	26	47	454	11	5	6	12	113
Zone 10	0	0	0	0	0	-	-	-	-	-
Zone 11	0	0	0	0	0	-	-	-	-	-
Zone 12	0	0	0	0	0	-	-	-	-	-
Total	2,177	972	1,267	2,299	22,418	989	441	575	1,044	10,183
				Cumulative	59,625				Cumulative	47,390

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5.6 Build-Out Analysis/Trip Generation Summary

Using ITE trip generation rates, it is estimated that existing Devens developments would generate 33,916 vehicle-trips on weekdays. After being adjusted for cut-through trips, the actual traffic counts at the gates indicate an average weekday daily traffic volume of 18,718 vehicle-trips in 2015. This means that Devens is currently generating traffic at a rate of 50% of what ITE projects a comparable development would generate. In 2010, results indicated that Devens was generating traffic at a rate of 53% of what a comparable development would generate. Table 5-5 shows an average trip generation rate of 3.98 trips/KSF in 2015 compared to 4.87 trips/KSF in 2010. ITE estimates that a comparable development would generate 7.90 trips/KSF when 4,708,099 square feet of build-out is occupied.

Table 5-5: Trip Generation Summary

	Year 2010	Year 2015	DIFFERENCE
Occupied Development	3,662,758 SF	4,708,099 SF	+1,045,341 SF
Total Daily Traffic Counts at Devens Gates	25,903 vehicle-trips	28,360 vehicle-trips	+2,457 vehicle-trips
Daily Gate Counts Adjusted for Cut-Thru Traffic	17,614 vehicle-trips	18,718 vehicle-trips	+1,104 vehicle-trips
Daily Vehicle-trips per 1,000 SF Development	4.81 trips/KSF	3.98 trips/KSF	-0.83 trips/KSF
ITE Estimated Daily Devens Trips	33,396 vehicle-trips	37,207 vehicle-trips	+3,811 vehicle-trips
ITE Estimated Daily Trips per 1,000 SF	9.12 trips/KSF	7.90 trips/KSF	-1.22 trips/KSF

5.7 Trip Distribution

After trip generation was established, forecasted trips generated within the study area were distributed to determine where people living and working in Devens travel to and from. Trip distribution patterns consist of trips leaving the region, trips entering the region, and trips that travel within the region. Separate distributions were produced for those who live in Devens and those who work in Devens.

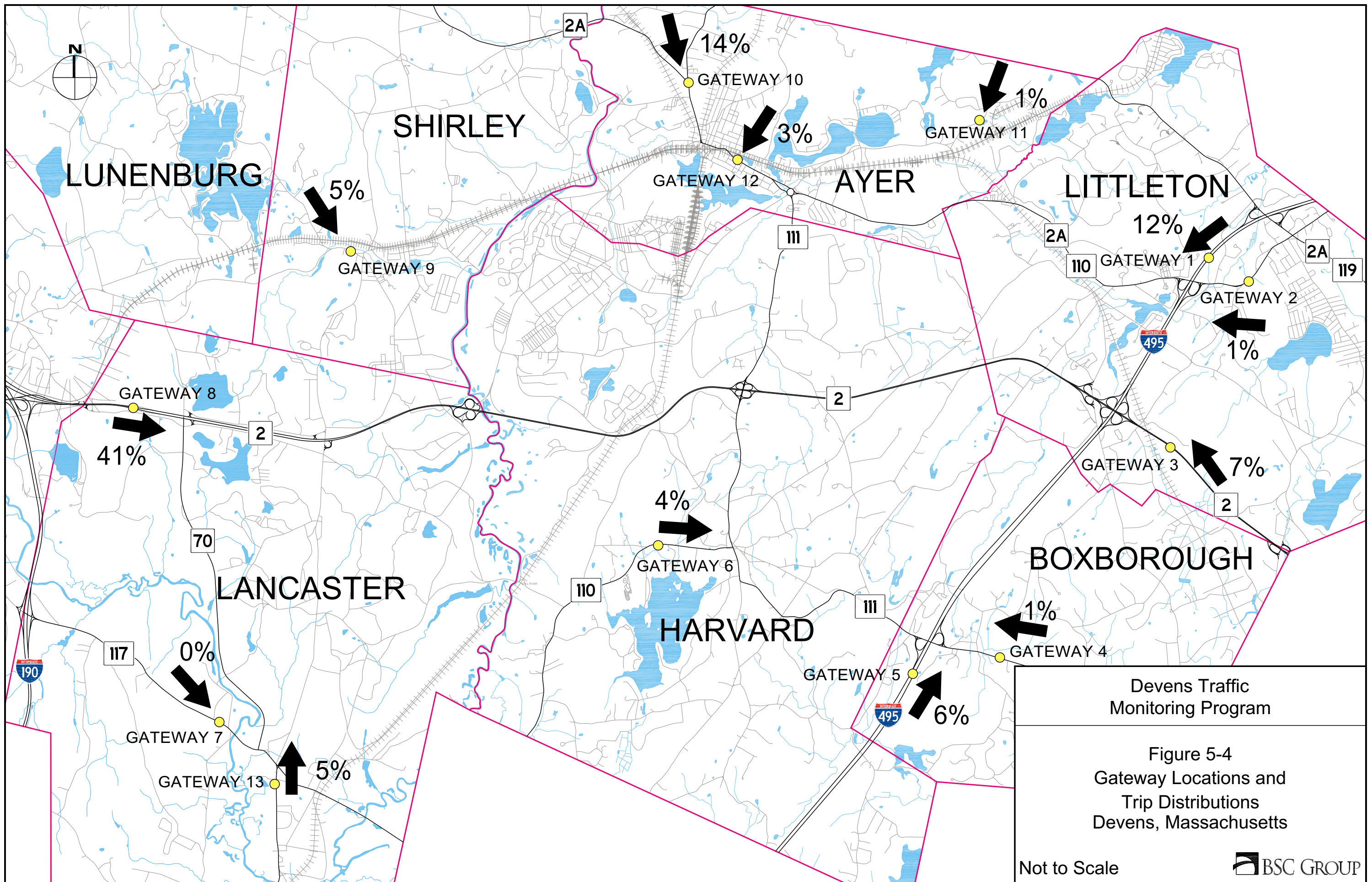
Devens employee trip distribution was developed from the following sources:

- 2015 Devens Business Employee Transportation Survey
- Year 2010 US Census Journey-to-Work Data

Devens resident trip distribution was developed from the following sources:

- 2015 Devens Resident Transportation Survey
- Year 2010 US Census Journey-to-Work Data

Figure 5-4 shows the distribution of Devens employment trips through thirteen external gateways around Devens. Previous reports placed these gateways in locations that must be passed through in order to enter any of the Devens gates. Using 2010 Journey-to-Work census data, trips from surrounding municipalities were assigned to the various gateways, and then these trips were aggregated in order to produce a percentage of trips traveling through each gateway. Gateway 8, Route 2 west of Route 70, continues to be the most utilized gateway, making up approximately 41% of total trips into Devens.



5.8 Comparison with 1995 Final Environmental Impact Report

The 1995 FEIR projected traffic volumes twenty years into the future (2015). Tables 5-6 through 5-8 show comparisons between 1990 baseline volumes, FEIR 2015 projections, and traffic volumes counted in 2015 for off-post roadways, Devens entrances, and Devens Roadways, respectively.

Off-post roadways on which traffic volumes were counted in 1990 are currently experiencing 43% of projected traffic volumes in the morning peak hour and 44% in the evening peak hour. Devens entrances are experiencing 29% of projected traffic volumes in the morning peak hour and 32% in the evening peak hour. Devens roadways are experiencing traffic volumes at rates of 26% and 15% of projections during the morning and evening peak hours, respectively.

Compared with measured 1990 baseline traffic volumes, off-post roadways are currently experiencing 19% (-1,842 vehicles) less traffic in the morning peak hour and 22% (-2,208 vehicles) in the evening peak hour. While traffic volumes at these external intersections are lower than they were in 1990, traffic volumes at Devens gates are higher. In the morning and evening peak hours, traffic counts are currently 35% (+474 vehicles) and 11% (+148 vehicles) higher, respectively, than they were 25 years ago. Because traffic counts were not performed at two of the three internal intersections in 1990, volumes at these intersections cannot be compared. This indicates that while Devens is generating more traffic in the morning and evening peak hours in 2015 than in 1990, external roadways are experiencing a decrease in traffic volumes. This could be an indication of a slowdown or negative growth in economic activity.

Table 5-6: Off-post Roadways FEIR Comparison

Location	Direction	1990 Baseline Volume	FEIR 2015 Projection	2015 Counted Volume	Difference
Off-post roadways					
Morning Peak Hour					
Route 2					
West of Jackson Road	EB	3,025	5,816	2,098	-3,718
East of Routes 110/111	EB	2,670	3,291	1,947	-1,344
Jackson Road Ramps					
From Route 2 West		440	2,956	328	-2,628
From Route 2 East		85	1,384	596	-788
Routes 110/111					
South of Carlton Rotary	NB	445	701	479	-222
South of Carlton Rotary	SB	730	859	575	-284
Routes 2A/110 East of Carlton Rotary	WB	660	805	415	-390
McPherson Road North of Verbeck Gate	SB	131	488	145	-343
Routes 111/2A					
Park St. North of Main St., Ayer	SB	592	1,115	561	-554
West of Carlton Rotary	EB	1,100	1,060	892	-168
Total		9,878	18,475	8,036	-10,439
Evening Peak Hour					
Route 2					
West of Jackson Road	WB	2,910	5,232	2,281	-2,951
East of Routes 110/111	WB	2,535	3,526	1,982	-1,544
Jackson Road Ramps					
From Route 2 West		430	2,502	152	-2,350
From Route 2 East		100	1,178	258	-920
Routes 110/111					
South of Carlton Rotary	NB	815	1,007	662	-345
South of Carlton Rotary	SB	450	666	480	-186
Routes 2A/110 East of Carlton Rotary	EB	815	896	528	-368
McPherson Road North of Verbeck Gate	NB	106	480	82	-398
Routes 111/2A					
Park St. North of Main St., Ayer	NB	621	1,070	388	-682
West of Carlton Rotary	WB	1,245	1,151	1,006	-145
Total		10,027	17,708	7,819	-9,889

Table 5-7: Fort Devens Entrances FEIR Comparison

Location	Direction	1990 Baseline	FEIR 2015 Projection	2015 Counted Volume	Difference
Fort Devens Entrances					
Morning Peak Hour					
Jackson Gate	NB	525	4,331	922	-3,409
Barnum Gate	SB	325	1,052	226	-826
Verbeck Gate	SB	495	815	378	-437
Shirley Gate	EB	n/a	84	137	n/a
Grant Gate	SB	n/a	n/a	156	n/a
Total		1,345	6,282	1,819	-4,463
Evening Peak Hour					
Jackson Gate	SB	530	3,267	794	-2,473
Barnum Gate	NB	265	777	258	-519
Verbeck Gate	NB	605	657	245	-412
Shirley Gate	WB	n/a	64	125	n/a
Grant Gate	SB	n/a	n/a	126	n/a
Total		1,400	4,765	1,548	-3,217

Table 5-8: Fort Devens Roadways FEIR Comparison

Location	Direction	1990 Baseline	FEIR 2015 Projection	2015 Counted Volume	Difference
Fort Devens Roadways					
Morning Peak Hour					
Jackson Road Ramps					
North of Patton Road	NB	n/a	2686	660	-2,026
Patton Road					
East of Jackson Road	EB	n/a	1699	361	-1,338
Barnum Road					
At Railroad Bridge	SB	253	524	242	-282
Total		253	4909	1263	-3,646
Evening Peak Hour					
Jackson Road					
North of Patton Road	SB	n/a	2217	382	-1,835
Patton Road					0
East of Jackson Road	WB	n/a	1525	81	-1,444
Barnum Road					0
At Railroad Bridge	NB	259	477	177	-300
Total		259	4219	640	-3,579



Chapter 6: Traffic Model

6.1 Overview

A Devens traffic model was created for 2015 conditions in order to obtain information about current conditions and forecast future traffic volumes. The model was created using PTV Vistro, a successor to the Traffix software used for analysis in the previous Traffic Monitoring Reports. It is made up of a network of study area roadways and intersections, traffic volumes, and TAZs. The model utilizes the four steps of the transportation planning process:

- Trip generation
- Trip distribution
- Mode Split
- Trip Assignment

The model includes 2015 morning and afternoon peak hour baseline traffic volumes, along with traffic volume projections for the following conditions as discussed in Section 5.4:

- No-Build (year 2032)
- Build Scenario 1 (year 2039)
- Build Scenario 2 (year 2032)

6.2 Traffic Model Development

A traffic model was created using PTV Vistro software to model current 2015 conditions. The 2015 traffic volumes were input in order to establish a baseline condition. Traffic generated from each build-out scenario, as discussed in Section 5, were input to forecast future traffic volumes. Along with current and future traffic volumes, trip distributions through each of the thirteen gateways were added to the model.

6.2.1 Intersection Volume Data

Data from turning movement counts collected in 2015 (see Section 2) were entered into the model to represent current 2015 traffic conditions. These data include traffic volumes, heavy vehicle percentages, and peak hour factors for both the morning and evening peak hours. Figures 6-1 through 6-4 show turning movement volumes for the morning and evening peak hours under the conditions of each build-out scenario.

6.2.2 Roadway Network

The model roadway network created in PTV Vistro is made up of roadways and intersections both internal and external to Devens. The network includes roadway geometry along with lane configurations.

6.2.3 Traffic Analysis Zones

The twelve TAZs established in previous reports and retained for consistency were created within the model. Each TAZ was defined by its geographical location and current and future traffic volumes. The TAZs reflect 2015 baseline volumes as well as the traffic volume projections discussed in Section 5.

6.2.4 Trip Distribution

The distribution entered into the model assumes that future travel patterns will be consistent with existing traffic patterns as established in Section 5. The thirteen gateway locations from previous 5-Year Traffic Monitoring Reports have been retained, but gateway utilization has been updated to reflect 2010 US Census Journey-to-Work data for employees working in Devens.

6.2.5 Background Traffic Growth

Background traffic growth is typically a function of future land development, increased economic activity, and changes in travel patterns external to Devens. Because of this, planned and proposed developments external to Devens were evaluated to determine any possible effects they may have on future traffic volumes. As discussed in Section 2, the annual traffic growth rate of 1.77% from previous reports was retained and used for the traffic model.

6.2.6 Project Traffic

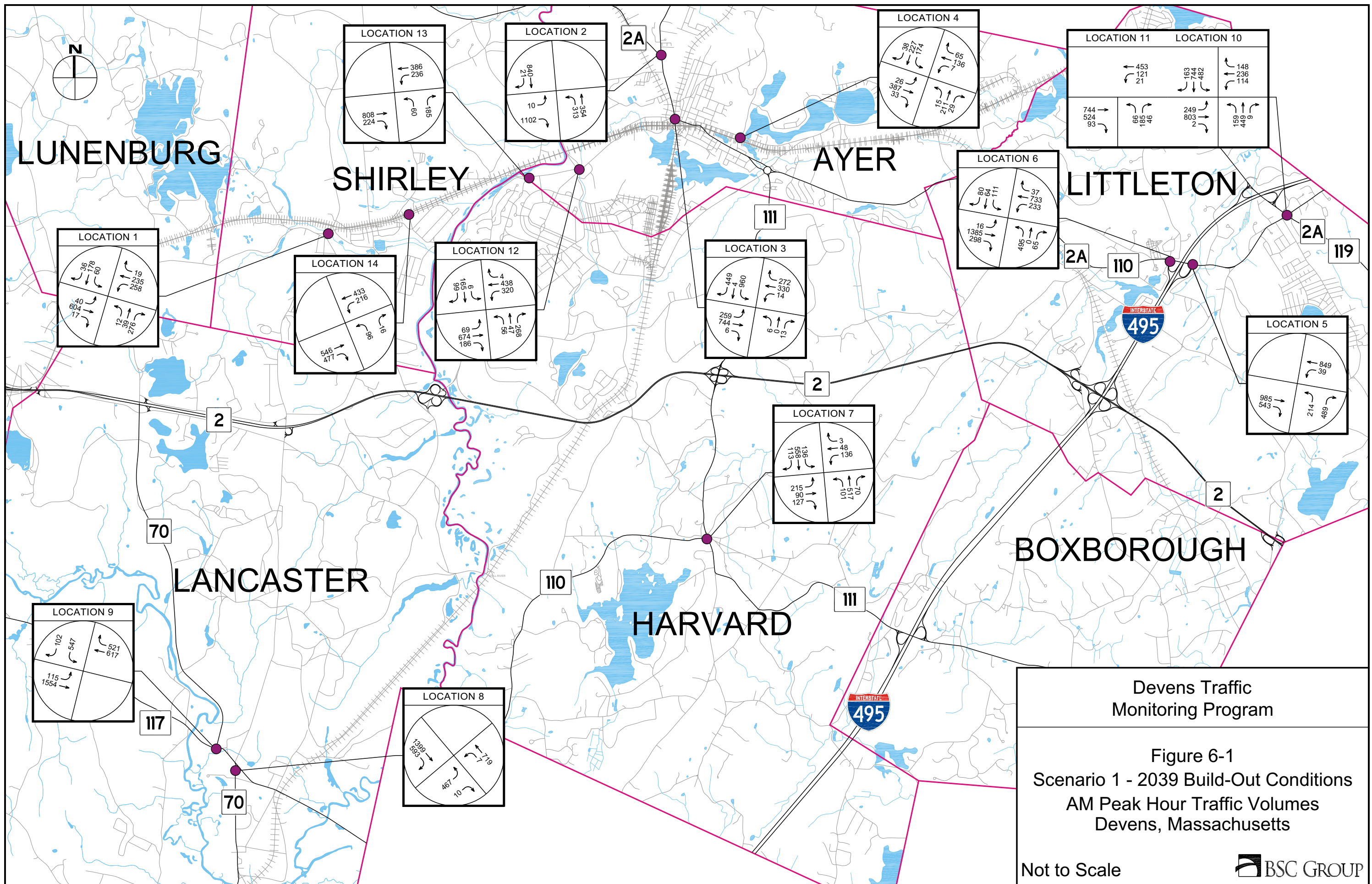
For this study, project traffic includes the additional trips generated by future developments internal to Devens. The additional trips generated in each TAZ due to projected Devens build-out (Section 5) were entered into the traffic model for the two future scenarios.

6.2.7 Traffic Assignment

Traffic generated by future Devens build-out was assigned routes through the roadway network based on the origin and destination of each of these trips, in addition to data from the Devens Resident and Employee Transportation Survey.

6.2.8 Transportation Mode Split

Modal split was determined by results of the transportation survey in addition to MBTA commuter rail ridership data. The transportation survey indicated that 86% of Devens residents and employees utilize automobiles to get to work. 12% of those surveyed carpool, 1% walk, 1% use transit, and less than 1% use bicycles. MBTA commuter rail data shows an 8% increase in boardings at Devens area stations between the years of 2009 and 2013. This suggests that more people are choosing to use transit to get to this area, which may be a result of TDM measures discussed in Section 4. For future traffic projections, all trips were considered to be made by vehicle in order to be conservative.

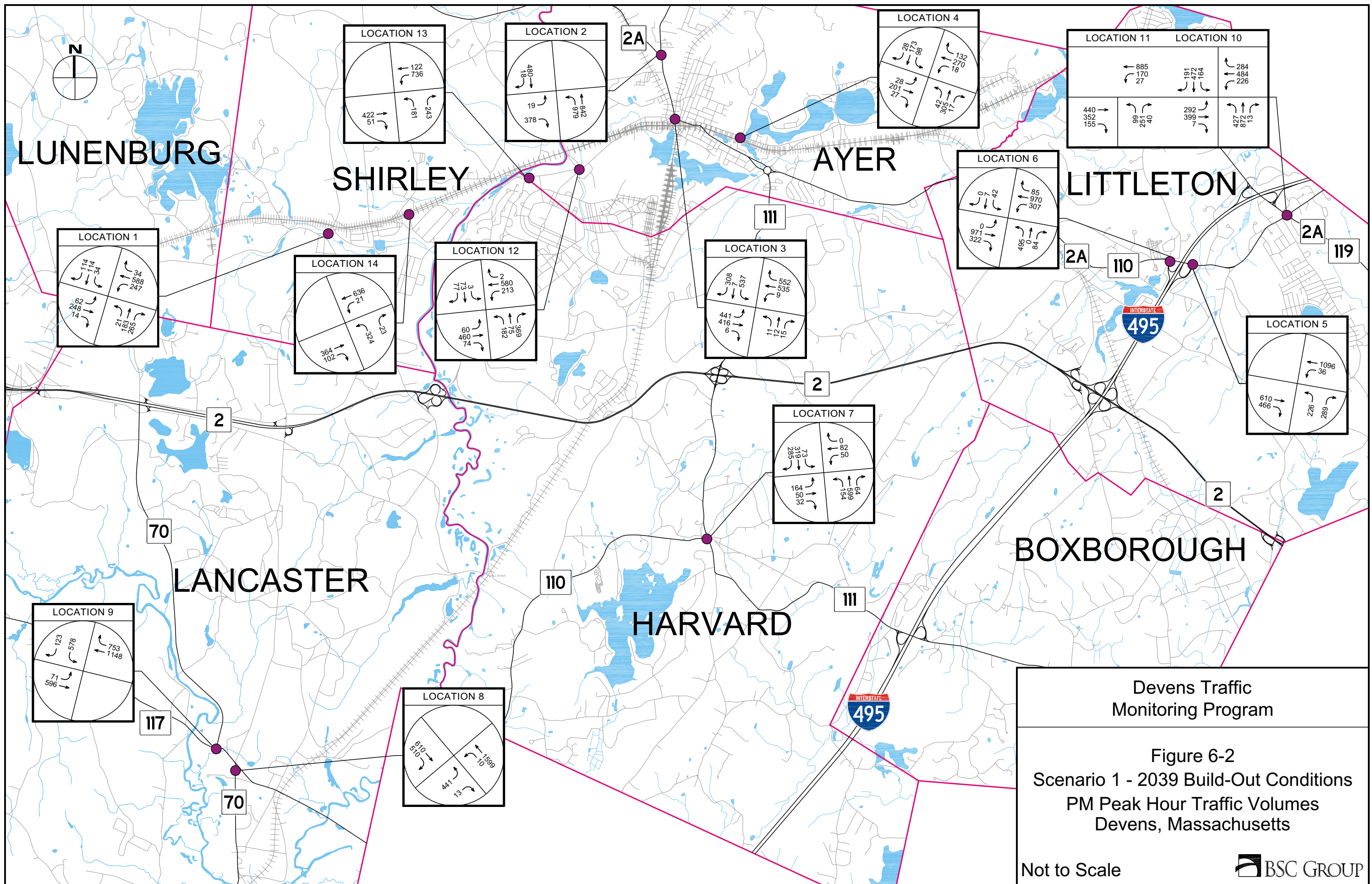


Devens Traffic Monitoring Program

Figure 6-1
Scenario 1 - 2039 Build-Out Conditions
AM Peak Hour Traffic Volumes
Devens, Massachusetts

Not to Scale

BSC GROUP

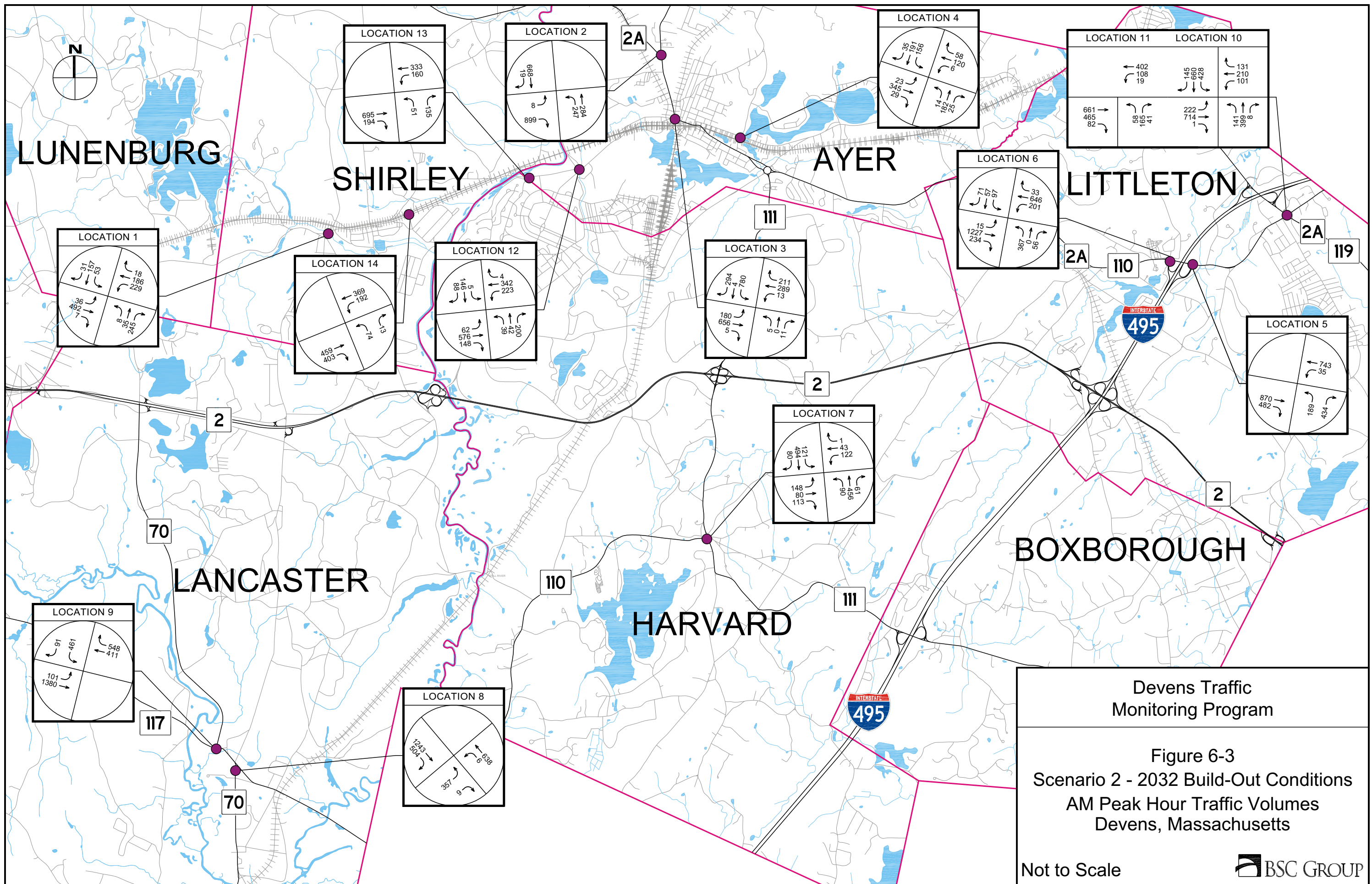


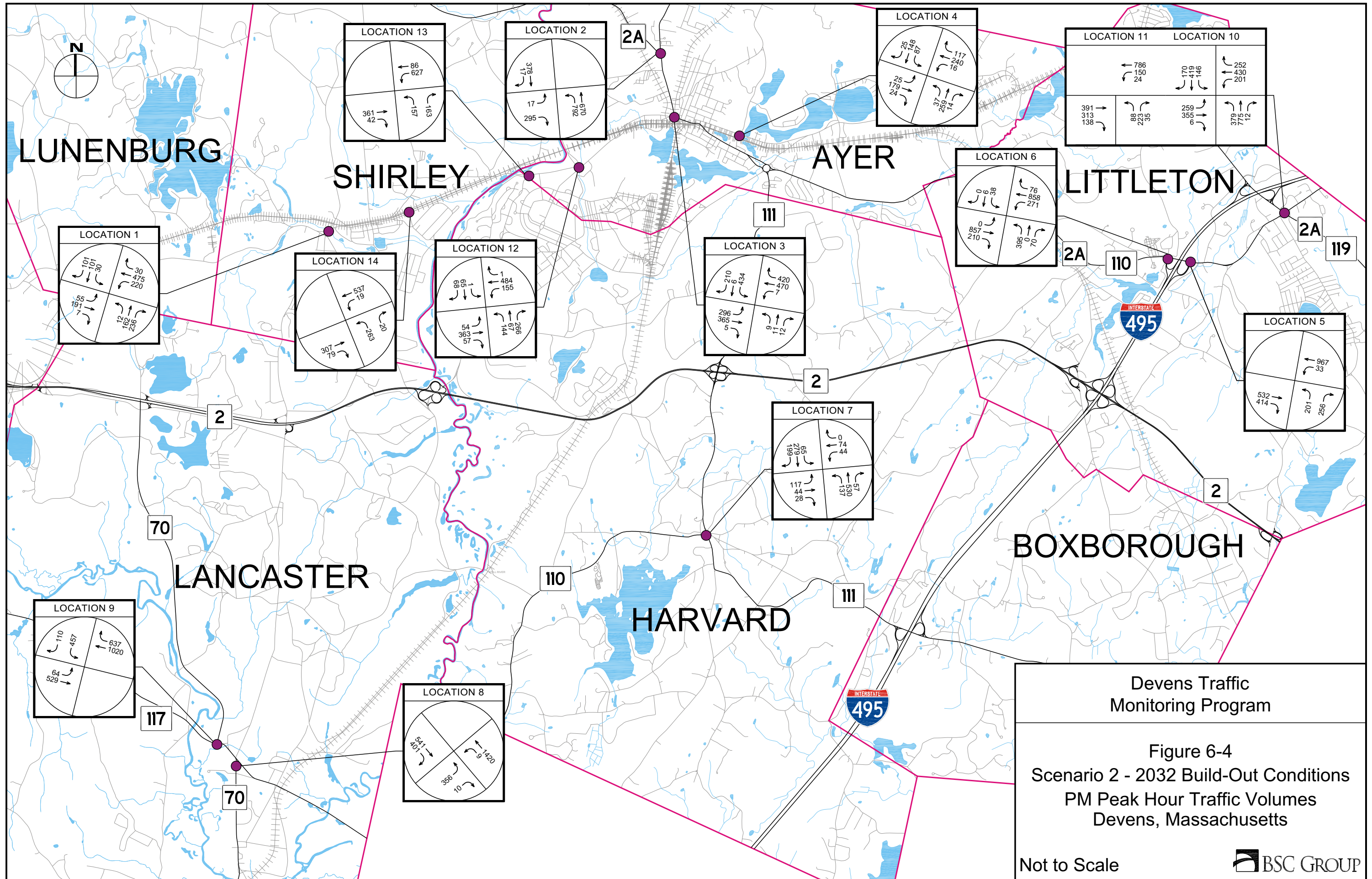
Devens Traffic Monitoring Program

Figure 6-2
Scenario 1 - 2039 Build-Out Conditions
PM Peak Hour Traffic Volumes
Devens, Massachusetts

Not to Scale

BSC GROUP





LUNENBURG

SHIRLEY

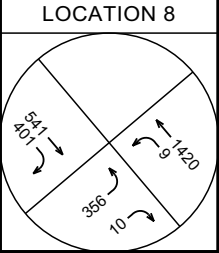
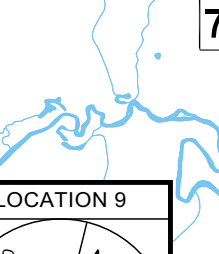
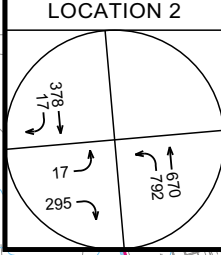
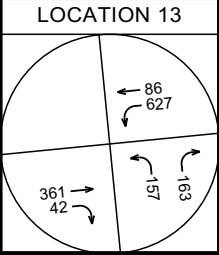
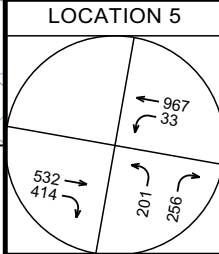
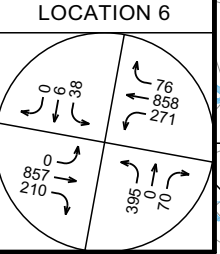
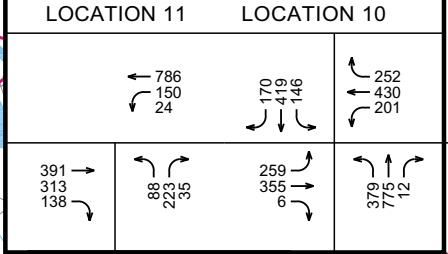
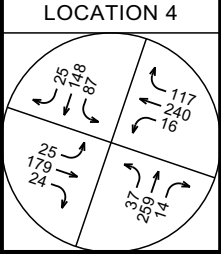
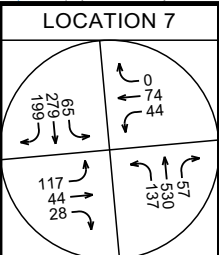
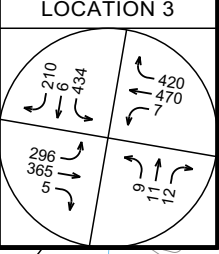
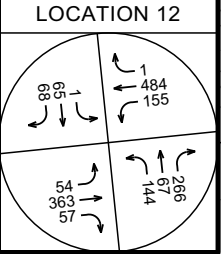
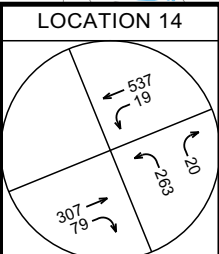
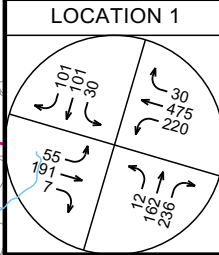
AYER

LITTLETON

LANCASTER

HARVARD

BOXBOROUGH





Chapter 7: Model Results Summary

7.1 Overview

Intersection capacity analysis has been performed to determine traffic operations under existing and future conditions for each scenario. Capacity analyses provide a standardized indication of the ability of an intersection to accommodate the traffic demands placed upon it. The primary results of capacity analyses are intersection delay (by approach and overall delay) and levels of service.

The concept of Level of Service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists. A Level of Service definition generally describes operational conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. In doing so, Level of Service provides an index to quality of traffic flow.

Six Levels of Service are defined for each type of facility. They are given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. Since the Level of Service of a traffic facility is a function of traffic flows placed upon it, an intersection may operate at a wide range of Levels of Service, depending on time of day, day of week, or period of year.

The average delay per vehicle approaching an intersection is used to quantify the Level of Service at a particular intersection. LOS designations for signalized and unsignalized intersections are defined in Table 7-1. Average delay measures the mean stopped delay experienced by vehicles entering an intersection during the design period. Average delay is measured for each individual turning movement that must yield the right of way, and for the intersection as a whole, if signalized (including through vehicles that experience no delay). The volume to capacity (v/c) ratio is also reported for each of the movements.

Table 7-1: Level of Service Designations for Unsignalized and Signalized Intersections

<u>Category</u>	<u>Unsignalized Intersection Delay (sec/veh)</u>	<u>Signalized Intersection Delay (sec/veh)</u>
LOS A	0.0 – 10.0	0.0 – 10.0
LOS B	10.1 – 15.0	10.1 – 20.0
LOS C	15.1 – 25.0	20.1 – 35.0
LOS D	25.1 – 35.0	35.1 – 55.0
LOS E	35.1 – 50.0	55.1 – 80.0
LOS F	50.1 +	80.1 +

Source: Transportation Research Board, Highway Capacity Manual, National Research Council, 2000.

7.2 Existing (2015) Conditions

Capacity analysis for existing 2015 conditions has been performed in order to serve as a baseline for this study (Tables 7-2 and 7-3). Generally, the 2015 levels of service are similar to those measured in the 2012 Traffic Monitoring Report. Notable levels of service changes since 2012 are as follows:

- Location 1 (Front Street/Lancaster Street/Leominster Road/Center Road): AM peak hour operations for the northbound approach (Lancaster Road) have improved due to a traffic volume reduction for the through and right turn movements.
- Location 3 (Park Street/Main Street/West Main Street): PM peak hour operations for the northbound approach (Park Street) have improved due to a traffic volume reduction on the westbound approach (Main Street).
- Location 5 (Route 2A-110/I-495 Exit 30 NB Ramps): AM peak hour operations for the northbound approach (exiting I-495 Ramps) have degraded due to an increase in eastbound and westbound (King Street) through traffic volumes.
- Location 10 (Route 110 (King Street)/ Route 119/ Route 2A (Great Road)): AM peak hour operations have improved despite an overall increase in traffic volume due to a new signal sequence plan. PM peak operations, however, have degraded.
- Location 11 (Route 2A-110 (King Street)/Goldsmith Street): Peak hour operations for the northbound approach (Goldsmith Street) have improved in the AM and degraded in the PM.
- Location 12 (Verbeck Gate/MacPherson Road/West Main Street): AM and PM peak hour operations for the northbound approach (MacPherson Road) have improved due to a reduction in traffic volumes for all northbound movements.
- Location 13 (Grant Road/West Main Street): PM peak hour operations for the northbound approach (Grant Road) have degraded due to increased traffic volumes on this approach.

Table 7-2: Intersection Capacity Analysis Level of Service Summary – 1996 to 2015 AM Peak Hour

	1996		1998		2000		2002		2004		2006		2008		2010		2012		2015	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections																				
Location 1 - Front/Lancaster/Leominster/Center																				
All movements from Lancaster Northbound	B	6	B	8	D	26	C	15	B	12	B	13	B	14	C	19	E	36	C	16
All movements from Center Southbound	B	10	C	20	E	48	D	29	C	19	C	23	C	24	F	52	F	>120	F	57
Left turn from Leominster Eastbound	A	2	A	2	A	8	A	7	A	7	A	7	A	7	A	8	A	8	A	8
Left turn from Front Street Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	9	A	8
Location 2 - Park/Fitchburg/Groton School																				
Left/Right from Groton School Southbound (stop control)	F	>120	F	>120	F	102	E	44	C	20	C	20	F	79	F	>120	F	>120	F	>120
Left turn from Fitchburg Road Eastbound	A	3	A	3	A	8	A	8	A	9	A	9	A	8	A	8	A	8	A	8
Location 3 - Park/Main/West Main																				
All movements from Park (Mill) Street Northbound	B	9	B	8	n/a	n/a	C	16	B	14	C	15	C	18	C	20	C	19	C	18
All movements from Park Street Southbound	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
Left turn from West Main Street Eastbound	A	4	A	5	A	9	A	9	A	9	A	9	A	9	A	9	A	9	A	8
Left turn from Main Street Westbound	A	3	A	3	n/a	n/a	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Location 4 - Groton-Harvard/Central																				
All movements from Groton-Harvard Northbound	B	8	C	12	C	18	C	18	B	14	B	13	C	21	F	55	C	23	C	15
All movements from Groton-Harvard Southbound	C	12	F	>120	F	80	F	118	D	26	C	20	B	13	C	18	C	16	C	24
Left turn from Central Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Central Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	7	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps																				
Left turn from Ramps Northbound	C	16	C	19	E	106	E	36	C	23	C	22	C	20	E	35	E	37	F	83
Right turn from Ramps Northbound	C	15	C	17	F	n/a	F	106	C	23	B	13	C	15	C	20	C	22	D	27
Left turn from Route 2A-110 Westbound	B	5	B	6	B	11	B	10	A	9	A	9	A	9	A	10	A	10	B	10
Location 6 - Route 2A-110/I-495 Southbound Ramps																				
Left turn from Ramps Northbound	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
Right turn from Ramps Northbound	B	6	B	8	C	21	C	18	B	13	B	14	B	14	C	15	C	15	C	18
All movements from Murray Park Southbound	E	35	F	>120	F	>120	F	>120	F	88	F	76	F	60	F	>120	F	107	F	>120
Left turn from Route 2A-110 Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Route 2A-110 Westbound	B	6	B	10	B	12	B	12	A	10	B	10	B	10	B	11	B	11	B	12
Location 7 - Route 110-111(Ayer Road)/Still River																				
All movements from Still River Road Eastbound	C	11	C	19	E	47	D	28	C	22	C	20	D	30	B	13	B	13	C	15
All movements from Still River Road Westbound	C	12	E	30	F	>120	D	31	D	27	D	27	C	23	B	12	B	12	B	13
Left turn from Ayer Road Northbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	C	17	C	16	D	27
Left turn from Ayer Road Southbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	C	22	D	27	D	34

Table 7-2: Intersection Capacity Analysis Level of Service Summary – 1996 to 2015 AM Peak Hour (continued)

	1996		1998		2000		2002		2004		2006		2008		2010		2012		2015	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections																				
Location 8 - Route 70/Route 117 (Seven Bridge Rd)																				
All movements from Seven Bridge Rd (Rt.117) Eastbound	F	88	A	3	A	< 8	n/a	n/a	n/a	n/a	n/a	n/a	A	8	A	3	A	8	A	0
All movements from Seven Bridge Road Westbound	B	10	B	8	B	11	B	11	B	11	B	11	B	12	B	11	B	13	B	12
All movements from Route 70 Northbound	B	7	F	>120	F	>120	F	>120	F	76	F	>120	F	>120	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	n/a	n/a	C	17	E	43	n/a	n/a	n/a	n/a	D	26	D	30	n/a	n/a	F	56	n/a	n/a
Location 9 - Route 70 (Lunenburg Road)/Route 117																				
All movements from Lunenburg Road Southbound	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
Left turn from Route 117 Eastbound	A	4	A	4	A	9	A	9	A	8	A	8	A	9	A	9	A	9	A	9
Location 11 - Route 2A-110/Goldsmith																				
All movements from Goldsmith Northbound	F	>120	F	489	F	117	F	69	D	30	C	20	C	22	C	20	F	60	D	34
Left turn from Route 2A-110 Westbound	B	9	B	10	B	12	B	12	B	10	A	10	A	10	A	9	B	11	B	10
Location 12 - Verbeck Gate/MacPherson/West Main																				
All movements from MacPherson Northbound	B	7	B	6	C	20	F	>120	C	19	E	36	D	27	D	31	E	48	D	32
All movements from MacPherson Southbound	B	6	B	9	A	< 5	F	62	C	20	D	35	D	33	E	40	E	39	E	44
All movements from West Main Eastbound			A	2	A	< 5	A	8	A	8	A	8	A	8	A	8	A	8	A	8
All movements from West Main Westbound	A	4	A	4	A	9	A	9	A	9	A	9	A	9	A	9	A	9	A	3
Location 13 - Grant/West Main																				
All movements from Grant Road Northbound									B	12	B	12	B	14	B	13	B	15	C	18
Left turn from Front Street (West Main St) Westbound									A	8	A	8	A	9	A	8	A	9	A	9
Location 14 - Hospital/Front																				
All movements from Hospital Road Northbound									B	13	B	12	B	13	C	16	C	16	C	25
Left turn from Front Street Westbound									A	8	A	8	A	8	A	9	A	9	A	9
Signalized Intersections																				
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) *																				
Left turn from King St Northbound (or Eastbound)	F	66	F	>120	F	>120	F	>120	F	>120	B	17	B	16	D	43	E	77	C	27
Through/Right from King St Northbound (or Eastbound)	C	17	D	37			F	>120	F	>120	B	16	B	16	D	43	E	77	C	27
Left turn from King St Southbound (or Westbound)	D	38	F	>120			E	77	D	48	B	14	B	14	C	33	C	32	D	36
Through/Right from King St Southbound (or Westbound)	B	13	C	19			C	24	E	62	B	15	B	15	C	33	C	32	B	18
Left turn from Great Road Westbound (or Northbound)	B	6	B	7			A	6	B	10	A	6	A	6	B	14	B	18	D	50
Through/Right from Great Road Westbound (or Northbound)	B	7	B	8			C	20	C	29	C	28	C	28	B	17	B	20	D	36
Left turn from Great Road Eastbound (or Southbound)	A	4	A	4			A	10	B	12	A	8	A	7	A	10	B	12	D	43

Note: (*) Location 10 was a signalized intersection as of 2006.

Table 7-3: Intersection Capacity Analysis Level of Service Summary – 1996 to 2015 PM Peak Hour

	1996		1998		2000		2002		2004		2006		2008		2010		2012		2015	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections																				
Location 1 - Front/Lancaster/Leominster/Center																				
All movements from Lancaster Northbound	B	9	B	7	C	23	C	17	C	18	C	16	C	18	C	24	C	23	D	30
All movements from Center Southbound	C	12	B	10	C	24	C	22	D	25	C	23	D	27	E	38	E	45	E	39
Left turn from Leominster Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Front Street Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Location 2 - Park/Fitchburg/Groton School																				
Left/Right from Groton School Southbound (stop control)	F	>120	F	>120	F	>120	F	>120	F	>120	F	54	F	101	F	>120	F	>120	F	70
Left turn from Fitchburg Road Eastbound	B	6	B	8	B	11	B	10	B	11	A	10	B	10	B	10	B	11	B	10
Location 3 - Park/Main/West Main																				
All movements from Park (Mill) Street Northbound	C	10	D	21			D	26	D	31	D	33	E	38	D	26	E	46	C	24
All movements from Park Street Southbound	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
Left turn from West Main Street Eastbound	B	8	C	11	B	10	B	11	B	12	B	13	B	13	B	11	B	12	A	9
Left turn from Main Street Westbound	A	3	A	3			A	8	A	8	A	8	A	8	A	8	A	8	A	7
Location 4 - Groton-Harvard/Central																				
All movements from Groton-Harvard Northbound	C	10	D	24	D	34	F	64	D	33	C	23	C	22	D	26	C	23	C	19
All movements from Groton-Harvard Southbound	B	10	D	25	D	34	F	67	C	21	C	24	C	21	C	18	C	21	C	19
Left turn from Central Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Left turn from Central Westbound	A	2	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps																				
Left turn from Ramps Northbound	F	73	F	>120	F	94	F	>120	F	162	F	>120	F	77	F	59	F	56	F	55
Right turn from Ramps Northbound	B	6	B	7	C	16	C	16	C	18	C	20	C	21	B	14	B	13	B	13
Left turn from Route 2A-110 Westbound	A	4	A	4	A	9	A	9	A	9	A	9	A	9	A	9	A	9	A	9
Location 6 - Route 2A-110/I-495 Southbound Ramps																				
Left turn from Ramps Northbound	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
Right turn from Ramps Northbound	B	5	B	6	B	14	B	14	B	14	B	13	B	14	B	12	B	13	B	13
All movements from Murray Park Southbound	F	49	E	41	F	78	F	85	F	93	F	>120	F	88	F	82	F	63	F	>120
Left turn from Route 2A-110 Eastbound	A	5	A	5	A	9	A	10	A	10	A	10	A	9	A	9	A	9	A	9
Left turn from Route 2A-110 Westbound	B	5	B	6	A	9	B	10	B	10	A	10	B	10	A	10	A	10	B	10
Location 7 - Route 110-111(Ayer Road)/Still River																				
All movements from Still River Road Eastbound	C	11	C	11	C	18	C	15	C	21	C	16	D	32	A	10	B	11	B	11
All movements from Still River Road Westbound	B	9	B	10	C	23	C	18	C	24	C	19	E	35	A	9	B	10	B	11
Left turn from Ayer Road Northbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	B	11	C	18	C	22
Left turn from Ayer Road Southbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	10	B	13	B	14

Table 7-3: Intersection Capacity Analysis Level of Service Summary – 1996 to 2015 PM Peak Hour (continued)

	1996		1998		2000		2002		2004		2006		2008		2010		2012		2015	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections																				
Location 8 - Route 70/Route 117 (Seven Bridge Rd)																				
All movements from Seven Bridge Rd (Rt.117) Eastbound	F	>120	B	6	A	10	n/a	n/a	n/a	n/a	A	10	B	10	A	3	A	3	A	0
All movements from Seven Bridge Road Westbound	C	14	A	4	A	9	C	22	A	9	A	9	A	9	A	9	A	9	A	9
All movements from Route 70 Northbound	A	4	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	B	5	D	22	E	36	n/a	n/a	n/a	n/a	E	37	E	41	n/a	n/a	F	51	n/a	n/a
Location 9 - Route 70 (Lunenburg Road)/Route 117																				
All movements from Lunenburg Road Southbound	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120	F	>120
Left turn from Route 117 Eastbound	B	7	B	9	B	11	B	11	B	11	B	11	B	12	B	12	B	13	B	12
Location 11 - Route 2A-110/Goldsmith																				
All movements from Goldsmith Northbound	F	>120	F	>120	F	58	F	>120	F	156	F	88	F	>120	C	22	D	33	F	54
Left turn from Route 2A-110 Westbound	B	7	B	7	A	9	B	11	B	10	A	10	B	10	A	9	A	10	A	9
Location 12 - Verbeck Gate/MacPherson/West Main																				
All movements from MacPherson Northbound	B	7	B	8	E	44	F	54	F	56	F	>120	F	>120	D	35	D	30	F	53
All movements from MacPherson Southbound	B	7	C	12	C	16	C	16	C	20	D	33	C	23	C	18	C	19	C	18
All movements from West Main Eastbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	8
All movements from West Main Westbound	A	3	A	3	A	8	A	8	A	8	A	8	A	8	A	8	A	8	A	2
Location 13 - Grant/West Main																				
All movements from Grant Road Northbound									B	13	B	12	C	20	C	16	C	18	F	101
Left turn from Front Street (West Main St) Westbound									A	8	A	8	A	8	A	8	A	8	A	9
Location 14 - Hospital/Front																				
All movements from Hospital Road Northbound									B	13	B	13	B	12	C	16	C	17	C	19
Left turn from Front Street Westbound									A	8	A	8	A	8	A	8	A	8	A	8
Signalized Intersections																				
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) *																				
Left turn from King St Northbound (or Eastbound)	F	>120	F	>120	F	>120	F	95	F	136	F	>120	F	107	C	28	C	32	F	>120
Through/Right from King St Northbound (or Eastbound)	B	7	B	9			B	15	B	16	B	16	C	19	C	28	C	32	C	23
Left turn from King St Southbound (or Westbound)	B	11	C	17			F	86	B	19	B	15	C	19	E	70	D	55	C	35
Through/Right from King St Southbound (or Westbound)	B	15	C	17			C	27	D	48	C	33	C	25	E	70	D	55	D	35
Left turn from Great Road Westbound (or Northbound)	E	60	E	59			F	15	A	10	A	9	A	9	B	19	B	17	D	46
Through/Right from Great Road Westbound (or Northbound)	D	39	D	37			F	15	F	>120	F	>120	F	>120	C	21	C	27	C	28
Left turn from Great Road Eastbound (or Southbound)	E	55	F	>120			C	24	A	8	A	7	A	8	C	22	C	22	D	49

Note: (*) Location 10 was a signalized intersection as of 2006.

Based on the above results, operations at study area intersection have changed to various degrees. When comparing existing levels of service to 1996 baseline conditions, these intersections can be classified as unaffected, minimally affected, or affected.

Unaffected intersections are those intersections where the 2015 levels of service have remained relatively unchanged from 1996. The unaffected intersections are as follows:

- Location 2 - Park Street/Fitchburg Road/Groton School Road
- Location 3 - Park Street/Main Street/West Main Street
- Location 4 - Groton-Harvard Road/Central Avenue
- Location 6 - Route 2A-110/I-495 Exit 30 SB Ramps
- Location 9 - Route 70/117 (Lunenburg Road)
- Location 11 - Route 2A-110 (King Street)/Goldsmith Street
- Location 13 - Grant Road/West Main Street
- Location 14 - Hospital Road/Front Street

Minimally affected intersections are those intersections where the 2015 levels of service have degraded only one level since 1996. The additional delay may be attributed to several factors, including regional traffic growth. The minimally affected intersections are as follows:

- Location 5 - Route 2A-110/I-495 Exit 30 NB Ramps
- Location 8 - Route 70/117 (Seven Bridge Road)
- Location 10 - Route 110 (King Street)/Route 119/Route 2A (Great Road)

Affected intersections are those intersections where the 2015 levels of service have degraded by more than one level since 1996. The additional delay may be attributed to several factors, including regional traffic growth. The affected intersections are as follows:

- Location 1 - Front Street/Lancaster Street/Leominster Road/Center Road
- Location 7 - Route 110-111 (Ayer Road)/Route 110 (Still River Road)/Route 111
- Location 12 - Verbeck Gate/ MacPherson Road/West Main Street

7.3 Future No-Build (2032)

In order to evaluate traffic impacts associated with future development, future No-Build Condition traffic volumes were examined to provide a baseline condition for comparison. The No-Build Condition traffic volumes were projected for the year 2032 based on baseline traffic volume data.

Future No-Build Condition traffic volume projections consist of general background growth. Typically, background growth is a function of changes in population, future land development, increased economic activity, and changes in travel patterns. As discussed previously, a regional growth rate of 1.77% was utilized in projecting traffic volumes. Compounding this rate over 16 years results in significant traffic growth, and therefore increased delay. This increase in delay often results in LOS F at study intersections (Table 7-4).

Table 7-4: Intersection Level of Service Comparison – Existing versus No-Build

	AM Peak Hour				PM Peak Hour			
	2015 Existing		2032 No-Build		2015 Existing		2032 No-Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections								
Location 1 – Front/Lancaster/Leominster/Center	F	67	F	100	F	62	F	>120
Location 2 – Park/Fitchburg/Groton School	F	>120	F	>120	F	70	F	>120
Location 3 – Park/Main/West Main	F	>120	F	>120	F	>120	F	>120
Location 4 – Groton-Harvard/Central	D	26	F	108	C	22	F	79
Location 5 – Route 2A-110/I-495 NB Ramps	F	83	F	>120	F	55	F	>120
Location 6 – Route 2A-110/I-495 SB Ramps	F	>120	F	>120	F	>120	F	>120
Location 7 – Route 110-111(Ayer Road)/Still River	D	26	F	>120	C	17	F	67
Location 8 – Route 70/Route 117 (Seven Bridge Road)	F	>120	F	>120	F	>120	F	>120
Location 9 – Route 70 (Lunenburg Road)/Route 117	F	>120	F	>120	F	>120	F	>120
Location 11 – Route 2A-110/Goldsmith	E	46	F	>120	F	71	F	>120
Location 12 – Verbeck Gate/MacPherson/West Main	F	63	F	>120	F	61	F	>120
Location 13 – Grant/West Main	C	23	E	46	F	110	F	>120
Location 14 – Hospital/Front	D	26	F	72	C	19	E	45
Signalized Intersection								
Location 10 – Rte 110 (King St)/Rte 119 (Great Road)	C	35	F	>120	D	46	F	>120

The following intersections are expected to deteriorate to LOS E or LOS F in the morning or evening peak hours as a result of regional background growth independent of additional development in Devens:

- Location 4 - Groton-Harvard Road/Central Avenue
- Location 7 - Route 110-111 (Ayer Road)/Route 110 (Still River Road)/Route 111
- Location 10 - Route 110 (King Street)/Route 119/Route 2A (Great Road)
- Location 13 - Grant Road/West Main Street
- Location 14 - Hospital Road/Front Street

7.4 Future Build (2032 and 2039) Scenarios 1 and 2

The two future Build scenarios include traffic generated by projected development in Devens in addition to regional traffic growth (Figures 6-1 through 6-4). It is projected that most study intersections will operate at LOS F in the future with or without further development in Devens. Tables 7-5 and 7-6 show comparisons between existing (2015), Scenario 1 Build (2039), and Scenario 2 Build (2032) levels of service and delays for study area intersections. The following intersections will continue to operate at LOS F when compared with the no-build conditions:

- Location 7 - Route 110-111 (Ayer Road)/Route 110 (Still River Road)/Route 111
- Location 14 - Hospital Road/Front Street
- Location 10 - Route 110 (King Street)/Route 119/Route 2A (Great Road)

**Table 7-5: Intersection Capacity Analysis Level of Service Summary
Existing versus Build AM Peak Hour**

	2015 Existing		2039 Build Scenario 1		2032 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections						
Location 1 - Front/Lancaster/Leominster/Center						
All movements from Lancaster Northbound	C	16	F	>120	F	>120
All movements from Center Southbound	F	57	F	>120	F	>120
Left turn from Leominster Eastbound	A	8	A	8	A	8
Left turn from Front Street Westbound	A	8	B	10	A	9
Location 2 - Park/Fitchburg/Groton School					F	>120
Left/Right from Groton School Southbound (stop control)	F	>120	F	>120	F	>120
Left turn from Fitchburg Road Eastbound	A	8	A	9	A	9
Location 3 - Park/Main/West Main						
All movements from Park (Mill) Street Northbound	C	18	F	>120	E	49
All movements from Park Street Southbound	F	>120	F	>120	F	>120
Left turn from West Main Street Eastbound	A	8	B	10	A	9
Left turn from Main Street Westbound	A	8	A	9	A	9
Location 4 - Groton-Harvard/Central						
All movements from Groton-Harvard Northbound	C	15	E	37	C	24
All movements from Groton-Harvard Southbound	C	24	F	>120	F	145
Left turn from Central Eastbound	A	8	A	8	A	8
Left turn from Central Westbound	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps						
Left turn from Ramps Northbound	F	83	F	>120	F	>120
Right turn from Ramps Northbound	D	27	F	>120	F	>120
Left turn from Route 2A-110 Westbound	B	10	B	14	B	12
Location 6 - Route 2A-110/I-495 Southbound Ramps						
Left turn from Ramps Northbound	F	>120	F	>120	F	>120
Right turn from Ramps Northbound	C	18	E	39	D	28
All movements from Murray St(HartwellAve) Southbound	F	>120	F	>120	F	>120
Left turn from Route 2A-110 Eastbound	A	8	A	9	A	9
Left turn from Route 2A-110 Westbound	B	12	D	29	C	19
Location 7 - Route 110-111(Ayer Road)/Still River						
All movements from Still River Road Eastbound	C	15	F	70	D	32
All movements from Still River Road Westbound	B	13	C	22	C	19
Left turn from Ayer Road Northbound	D	27	F	>120	F	>120
Left turn from Ayer Road Southbound	D	34	F	>120	F	>120

**Table 7-5: Intersection Capacity Analysis Level of Service Summary
Existing versus Build AM Peak Hour (continued)**

	2015 Existing		2039 Build Scenario 1		2032 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections						
Location 8 - Route 70/Route 117 (Seven Bridge Rd)						
All movements from Seven Bridge Rd (Rt.117) Eastbound	A	0	A	0	A	0
All movements from Seven Bridge Road Westbound	B	12	C	18	C	15
All movements from Route 70 Northbound	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	n/a	n/a	n/a	n/a	n/a	n/a
Location 9 - Route 70 (Lunenburg Road)/Route 117						
All movements from Lunenburg Road Southbound	F	>120	F	>120	F	>120
Left turn from Route 117 Eastbound	A	9	B	12	B	11
Location 11 - Route 2A-110/Goldsmith						
All movements from Goldsmith Northbound	D	34	F	>120	F	>120
Left turn from Route 2A-110 Westbound	B	10	B	15	B	13
Location 12 - Verbeck Gate/MacPherson/West Main						
All movements from MacPherson Northbound	D	32	F	>120	F	>120
All movements from MacPherson Southbound	E	44	F	>120	F	>120
All movements from West Main Eastbound	A	8	A	8	A	8
All movements from West Main Westbound	A	3	A	5	B	10
Location 13 - Grant/West Main						
All movements from Grant Road Northbound	C	18	F	>120	F	70
Left turn from Front Street (West Main St) Westbound	A	9	B	13	B	11
Location 14 - Hospital/Front						
All movements from Hospital Road Northbound	C	25	F	>120	F	80
Left turn from Front Street Westbound	A	9	B	13	B	11
Signalized Intersection						
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) (overall)	C	35	F	>120	F	>120
Left turn from King St Northbound (or Eastbound)	D	35	F	>120	F	>120
Through/Right from King St Northbound (or Eastbound)	C	33	F	>120	F	>120
Left turn from King St Southbound (or Westbound)	D	49	F	>120	F	>120
Through/Right from King St Southbound (or Westbound)	C	23	F	>120	D	51
Left turn from Great Road Westbound (or Northbound)	D	50	D	47	D	48
Through/Right from Great Road Westbound (or Northbound)	C	34	C	29	C	30
Left turn from Great Road Eastbound (or Southbound)	D	41	D	41	D	40
Through/Right from Great Road Eastbound (or Southbound)	C	34	D	39	D	36

**Table 7-6: Intersection Capacity Analysis Level of Service Summary
Existing versus Build PM Peak Hour**

	2015 Existing		2039 Build Scenario 1		2032 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections						
Location 1 - Front/Lancaster/Leominster/Center						
All movements from Lancaster Northbound	D	30	F	>120	F	>120
All movements from Center Southbound	E	39	F	>120	F	>120
Left turn from Leominster Eastbound	A	8	A	9	A	9
Left turn from Front Street Westbound	A	8	A	8	A	8
Location 2 - Park/Fitchburg/Groton School						
Left/Right from Groton School Southbound (stop control)	F	70	F	>120	F	>120
Left turn from Fitchburg Road Eastbound	B	10	C	17	B	13
Location 3 - Park/Main/West Main						
All movements from Park (Mill) Street Northbound	C	24	F	>120	F	>120
All movements from Park Street Southbound	F	>120	F	>120	F	>120
Left turn from West Main Street Eastbound	A	9	C	22	B	13
Left turn from Main Street Westbound	A	7	A	8	A	8
Location 4 - Groton-Harvard/Central						
All movements from Groton-Harvard Northbound	C	19	F	>120	E	48
All movements from Groton-Harvard Southbound	C	19	F	>120	F	84
Left turn from Central Eastbound	A	8	A	8	A	8
Left turn from Central Westbound	A	8	A	8	A	8
Location 5 - Route 2A-110/I-495 Northbound Ramps						
Left turn from Ramps Northbound	F	55	F	>120	F	>120
Right turn from Ramps Northbound	B	13	C	22	C	17
Left turn from Route 2A-110 Westbound	A	9	B	11	B	10
Location 6 - Route 2A-110/I-495 Southbound Ramps						
Left turn from Ramps Northbound	F	>120	F	>120	F	>120
Right turn from Ramps Northbound	B	13	C	21	C	18
All movements from Murray St(HartwellAve) Southbound	F	>120	F	>120	F	>120
Left turn from Route 2A-110 Eastbound	A	9	B	10	A	10
Left turn from Route 2A-110 Westbound	B	10	C	20	B	14
Location 7 - Route 110-111(Ayer Road)/Still River						
All movements from Still River Road Eastbound	B	11	C	20	C	15
All movements from Still River Road Westbound	B	11	C	15	B	14
Left turn from Ayer Road Northbound	C	22	F	>120	F	>120
Left turn from Ayer Road Southbound	B	14	F	>120	E	43

**Table 7-6: Intersection Capacity Analysis Level of Service Summary
Existing versus Build PM Peak Hour (continued)**

	2015 Existing		2039 Build Scenario 1		2032 Build Scenario 2	
	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections						
Location 8 - Route 70/Route 117 (Seven Bridge Rd)						
All movements from Seven Bridge Rd (Rt.117) Eastbound	A	0	A	0	A	0
All movements from Seven Bridge Road Westbound	A	9	B	11	B	10
All movements from Route 70 Northbound	F	>120	F	>120	F	>120
All movements from Route 70 Southbound	n/a	n/a	n/a	n/a	n/a	n/a
Location 9 - Route 70 (Lunenburg Road)/Route 117						
All movements from Lunenburg Road Southbound	F	>120	F	>120	F	>120
Left turn from Route 117 Eastbound	B	12	C	20	C	16
Location 11 - Route 2A-110/Goldsmith			F	>120	F	>120
All movements from Goldsmith Northbound	F	54	F	>120	F	>120
Left turn from Route 2A-110 Westbound	A	9	B	12	B	11
Location 12 - Verbeck Gate/MacPherson/West Main						
All movements from MacPherson Northbound	F	53	F	>120	F	>120
All movements from MacPherson Southbound	C	18	F	>120	F	57
All movements from West Main Eastbound	A	8	A	9	A	8
All movements from West Main Westbound	A	2	A	3	A	2
Location 13 - Grant/West Main						
All movements from Grant Road Northbound	F	101	F	>120	F	>120
Left turn from Front Street (West Main St) Westbound	A	9	C	15	B	12
Location 14 - Hospital/Front						
All movements from Hospital Road Northbound	C	19	F	>120	F	56
Left turn from Front Street Westbound	A	8	A	8	A	8
Signalized Intersection						
Location 10 – Rte 110 (King St)/Rte 119 (Great Rd) (overall)	D	46	F	>120	F	185
Left turn from King St Northbound (or Eastbound)	F	>120	F	>120	F	>120
Through/Right from King St Northbound (or Eastbound)	C	23	F	>120	D	51
Left turn from King St Southbound (or Westbound)	C	35	F	>120	F	>120
Through/Right from King St Southbound (or Westbound)	D	35	F	>120	F	>120
Left turn from Great Road Westbound (or Northbound)	D	46	E	56	D	52
Through/Right from Great Road Westbound (or Northbound)	C	28	C	26	C	26
Left turn from Great Road Eastbound (or Southbound)	D	49	D	46	D	47
Through/Right from Great Road Eastbound (or Southbound)	D	38	D	45	D	41



Chapter 8: Conclusions

This comprehensive traffic study indicates that regional traffic volumes in the vicinity of Devens are generally decreasing. Study area intersections external to Devens have collectively experienced a 9% decrease (-34,068 vehicles) in traffic volume since 2010. Total daily traffic volumes at Devens gates have increased since 2010, but peak hour traffic at the gates has remained relatively stable since 2010.

- During the morning peak hour, traffic volumes have remained constant, and in the afternoon, traffic volumes have increased by 7% (+174 vehicles).
- Average total weekday truck traffic volumes have increased at all gates since 2010, with the exception of Verbeck Gate (decreased by 51% or 240 vehicles).
- Cut through traffic includes vehicles entering Devens gates and passing through Devens without stopping. In 2010, the 32% of trips through Devens gates were classified as cut-through trips. This number has increased to 34% in 2015.

Devens Base Reuse Plan limits total development in Devens to 8.5 million square feet and a daily vehicle-trip threshold of 59,625 trips per day was calculated based on projected development levels. In a 2008 Notice of Project Change (NPC) filing to MEPA, MassDevelopment received approval to discontinue using the building floor area as the basis for build-out limit.

- As of January 2015, approximately 4.7 million square feet of total build-out was occupied, while 341,000 square feet of new construction is unoccupied and 1.67 million square feet of build-out is planned for potential new buildings or expansions of current buildings.
- The total square footage of occupied, unoccupied, and planned build-out (7.12 million square feet) is 1.38 million square feet less than the 8.5 million square feet previously permitted under Devens By-Laws.
- It is projected that the 59,625 daily vehicle-trip threshold will not be reached until 2039, with a corresponding with 10,109,900 square feet of occupied development in Devens.
- 8.5 million square feet of build-out is projected to be reached in 2032, corresponding with an average weekday daily traffic volume of 47,390 trips per day.

According to a review of the 1995 FEIR, the following intersections were identified as potential off-site locations that would require MassDevelopment to implement mitigation should congestion become a problem:

- Location 2 - Park Street/Fitchburg Road/Groton School Road in Ayer
- Location 5 - Route 2A-110/I-495 Exit 30 NB Ramps in Littleton
- Location 6 - Route 2A-110/I-495 Exit 30 SB Ramps in Littleton
- Location 3 - Park Street/Main Street/West Main Street in Ayer
- Carlton Rotary in Ayer

Level of service analyses of these locations show that, compared to 1996 baseline volumes, levels of service have either been unaffected or minimally affected. Considering the overall decrease in regional traffic volumes surrounding Devens, it is unlikely that traffic generated by Devens has adversely affected delay at these intersections.

Traffic volumes in 2015 are similar to pre-2000 volumes even with the redevelopment of Devens. As noted earlier, information from MRPC indicated that traffic in the region is stable, even declining in some communities. The findings in this study are similar to MRPC's observations. In areas where there are increases in traffic volumes, the magnitudes are not significant. Existing infrastructure is able to accommodate increased development in Devens; therefore, it is anticipated that the continued development at Devens will have negligible impact on the regional roadway network.

The 1995 Section 61 Finding required that MassDevelopment implement a "5-Year traffic reporting program to evaluate results of, and redirect as necessary, the traffic monitoring program." As noted in Chapter 3, regional traffic volumes at the external study locations have been fluctuating, and in some cases reduced. For example, traffic volumes along Route 2 have decreased since 2004 and traffic volumes at Carlton Rotary in Ayer have remained steady. Documented data including the 2015 results have shown that Devens development is generating significantly less traffic than anticipated. Although there is an increase in the area redeveloped in Devens, traffic operations at external intersections have not been significantly impacted due to the combined effect of reduction in regional traffic and lower Devens trip rates. In addition, cut-through traffic has increased steadily, almost doubling from 18% in 2000 to 34% in 2015. This is an indication that the redevelopment of Devens is having a positive impact on the area roadway network by diverting some traffic from local roadways through Devens.