3.3 ROADWAY MONITORING RESULTS

3.3.1 Arterial Roadways

3.3.1.1 Average Observed Travel Speeds

The average observed travel speeds along arterial roadway segments during the peak travel periods are summarized in Table 3.4. The data in this table reflect the most recent data for the CMS-monitored roadways. As explained earlier, observed travel speeds include the effect of delays from traffic signals and midsegment traffic impedances (such as left-turning vehicles, pedestrian crossings, and parked vehicles).

Overall, about 9 percent of the monitored Class III roadway miles in the region experience average travel speeds of 18 mph or less in the morning peak period. This number increases to 12 percent in the evening peak period. About one-half of these slow-travel miles are on the monitored roadways located in the Boston and inner suburbs subregion.

The difference in travel speeds between roadways in the Boston and inner suburbs subregion and roadways in the outer suburbs is strongly apparent. In the morning peak period, 20 percent of the monitored arterial roadways in the Boston and inner suburbs subregion have travel speeds of 18 mph or less, compared to 5 percent in the outer suburbs subregion. In the evening peak period, 28 percent of the monitored arterial roadways in the Boston and inner suburbs subregion have travel speeds of 18 mph or less, compared to 8 percent in the outer suburbs subregion. Furthermore, only a quarter of the arterial roadways in the Boston and inner suburbs subregion have average speeds above 30 mph in the evening, compared to nearly 70 percent for the roadways in the outer suburbs.

The Class I/II roadways exhibit a similar geographical and morning/evening breakdown. For the entire region, traffic on 13 percent of these roadways have travel speeds of 27 mph or less during the morning peak period, worsening to nearly 18 percent during the evening peak period.

Travel Speed Diagrams

A visual tool used to summarize and present the average observed travel speeds is the travel speed diagram. These diagrams illustrate the monitoring results using colored bands that represent average speeds for each roadway segment. Slow and fast segments can easily be identified. Figure 3.3 is an example of the travel speed diagram; the map illustrates the observed travel speeds on the monitored arterial roadways in one of the subregions of the Boston metropolitan region.[5] Appendix B contains diagrams for all the subregions of the Boston metropolitan region.

Comparison between 1996–1999 Data and 2001–2003 Data

Tables 3.5 and 3.6 present a comparison of average travel speeds from the 1996–1999 CMS roadway data collection and from the most recent CMS monitoring period (2001–2003), for both the morning and evening peak periods. Only roadways common to the two monitoring periods are included in this comparison (please refer to Figure 3.1). All of these roadways are classified as Class III urban arterial roadways.

Average observed travel speeds on these roadways in the morning peak period appear to have decreased in the most recent data-collection years. In general, the percent of roadway miles with traffic traveling at *average travel speeds greater than 30 mph* has decreased between the two

[5] The Boston metropolitan region is subdivided into eight subregions as defined by the Metropolitan Area Planning Council. For purposes of showing CMS-related measures, the Inner Core subregion is further divided into three areas.

monitoring periods, while the percent of roads with *average speeds at 18 mph or less* increased. The percent of roads with average speeds at 18 mph or less increased by 3 percent regionwide, and 4 percent fewer roads now have average travel speeds greater than 30 mph.

For the 2001–2003 data collection period, 8 percent of the roadways in the subregion made up of Boston and its inner suburbs had average observed morning-peak-period speeds of 14 mph or less, an increase of 4 percent from the 1996–1999 period. The data indicate that this subregion also experienced a decrease between the two periods in the percent of arterial roadways with average travel speeds greater than 30 mph; the decrease was from 40 percent to 33 percent. However, looking at the monitored roadways in the region as a whole, or at the roadways in the outer suburbs subregion, the trend of declining speeds in the morning peak period is not as pronounced.

In the evening peak period, the average speeds do not seem to have significantly changed since the earlier data collection period. The percent of roads with average speeds of 18 mph or less increased from 7 percent to 10 percent regionwide. Approximately 24 percent of the monitored arterial roadway segments in the subregion made up of Boston and its inner suburbs had an average observed travel speed of 18 mph or less in the evening, according to 2001–2003 data, compared to 20 percent of the roadways in the earlier data collection period. Similarly, an increase from 5 percent to 8 percent is observed between the two monitoring periods for the roadways in the outer suburbs.

CMS calculations using the measures of speed index and delay also indicate increases in congestion between the two monitoring periods. Details are provided in the next two sections.

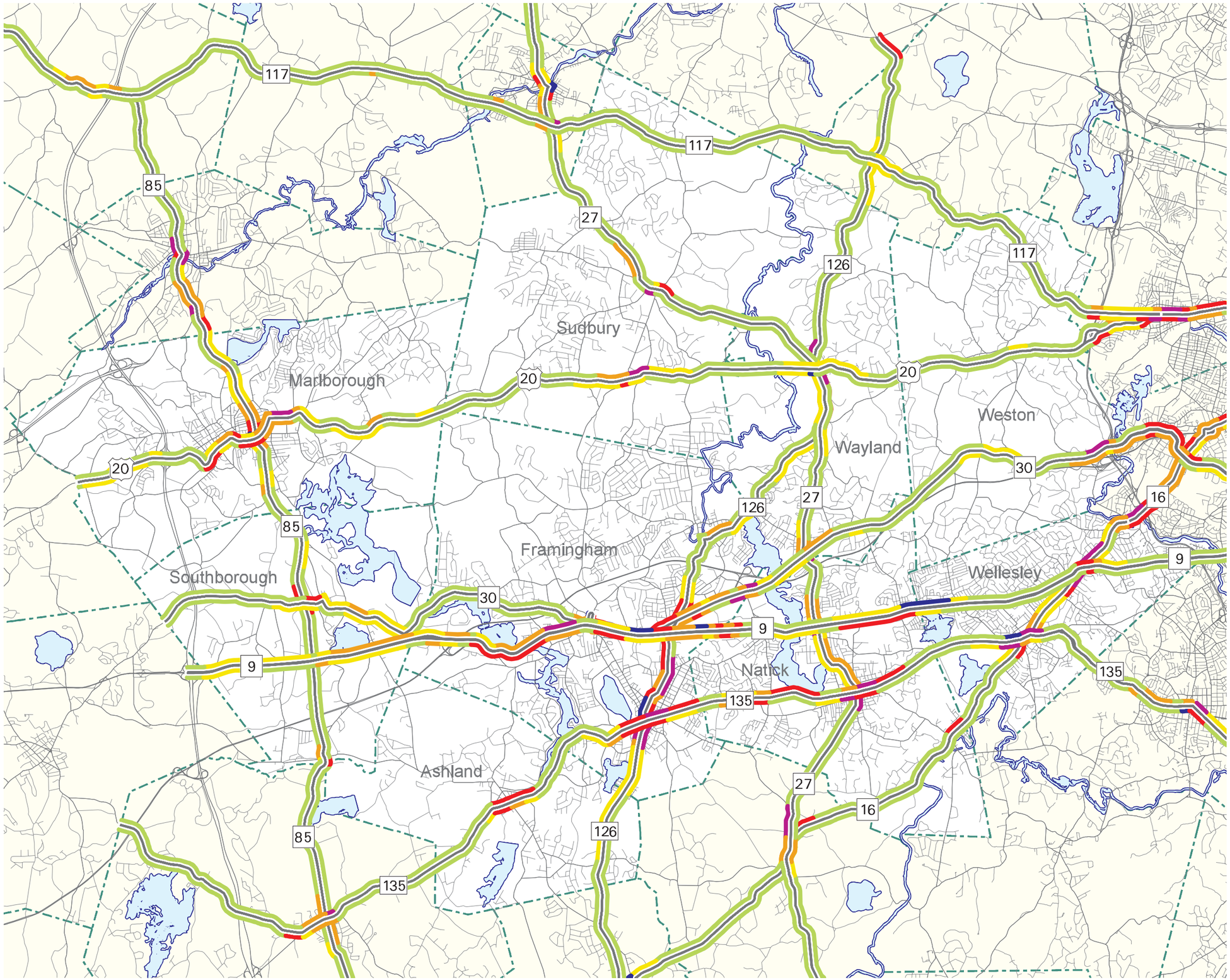

FIGURE 3.3

AVERAGE TRAVEL SPEEDS

PM Peak Period
MetroWest Growth Management Committee (MetroWest)
Arterial Roadways

URBAN ARTERIAL CLASS I & II

Routes Monitored	Year
Route 9	2002-2003

Average Speed (mph)

- 1 - 16
- 17 - 21
- 22 - 27
- 28 - 34
- 35 - 42
- 43+

URBAN ARTERIAL CLASS III

Routes Monitored	Year
Route 16	2001
Route 20	2002
Route 27	2003
Route 30	2002
Route 85	2002
Route 117	2002
Route 126	2001
Route 135	2002

Average Speed (mph)

- 1 - 10
- 11 - 14
- 15 - 18
- 19 - 24
- 25 - 30
- 31+

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Table 3.4. Summary of Average Observed Travel Speeds: Arterial Roadways, 2001–2003

Class III Arterial Roadways

		LOS E–F	LOS D	LOS C	LOS B	LOS A	Total Miles [1]
		Percent of Miles Monitored with Avg. Observed Speeds in the Following Ranges					
		1–14 mph	>14–18 mph	>18–24 mph	>24–30 mph	>30 mph	
Morning Peak	**Boston and Inner Suburbs** [2]	9	11	24	28	27	*397*
	Outer Suburbs	2	3	8	16	71	*1,298*
	MPO Region	4	5	12	19	61	*1,695*
Evening Peak	**Boston and Inner Suburbs**	13	15	27	21	25	*398*
	Outer Suburbs	3	5	9	14	69	*1,298*
	MPO Region	5	7	13	16	59	*1,695*

Class I/II Arterial Roadways

		LOS E–F	LOS D	LOS C	LOS B	LOS A	Total Miles [1]
		Percent of Miles Monitored with Avg. Observed Speeds in the Following Ranges					
		1–21 mph	>21–27 mph	>27–34 mph	>34–42 mph	>42 mph	
Morning Peak	**Boston and Inner Suburbs**	7	9	15	18	51	*28*
	Outer Suburbs	7	5	12	25	52	*96*
	MPO Region	7	6	13	23	51	*124*
Evening Peak	**Boston and Inner Suburbs**	15	8	16	18	43	*28*
	Outer Suburbs	7	9	14	20	50	*97*
	MPO Region	9	9	15	20	49	*124*

Percentages are rounded to the nearest whole number.

1. *Total miles* is the combined length of the roadway's two directions of travel. Due to sample size limitations, total miles may not be equal for the AM and PM peak periods.

2. *Boston and Inner Suburbs* consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

Table 3.5. Average Travel Speeds on Arterial Roadways (Urban Street Class III) in the Morning Peak Period: A Comparison between 1996–1999 Data and 2001–2003 Data

Earlier CMS Monitoring: 1996–1999

	LOS E–F	LOS D	LOS C	LOS B	LOS A	Total
	1–14 mph	>14–18 mph	>18–24 mph	>24–30 mph	>30 mph	Miles[1]
	Percent of Miles Monitored					
Boston and Inner Suburbs [2]	4	7	25	24	40	*173*
Outer Suburbs	1	2	7	14	76	*753*
MPO Region	2	3	11	16	69	*926*

Latest CMS Monitoring: 2001–2003

	LOS E–F	LOS D	LOS C	LOS B	LOS A	Total
	1–14 mph	>14–18 mph	>18–24 mph	>24–30 mph	>30 mph	Miles
	Percent of Miles Monitored					
Boston and Inner Suburbs	8	13	22	25	33	*174*
Outer Suburbs	2	3	8	15	72	*756*
MPO Region	3	5	10	17	65	*930*

Percentages are rounded to the nearest whole number.

1. *Total miles* is the combined length of the roadway's two directions of travel. Due to sample size limitations, total miles may not be equal for the AM and PM peak periods.

2. *Boston and Inner Suburbs* consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

Percent of Class III Arterial Roadway Miles by LOS Category, Morning Peak Period

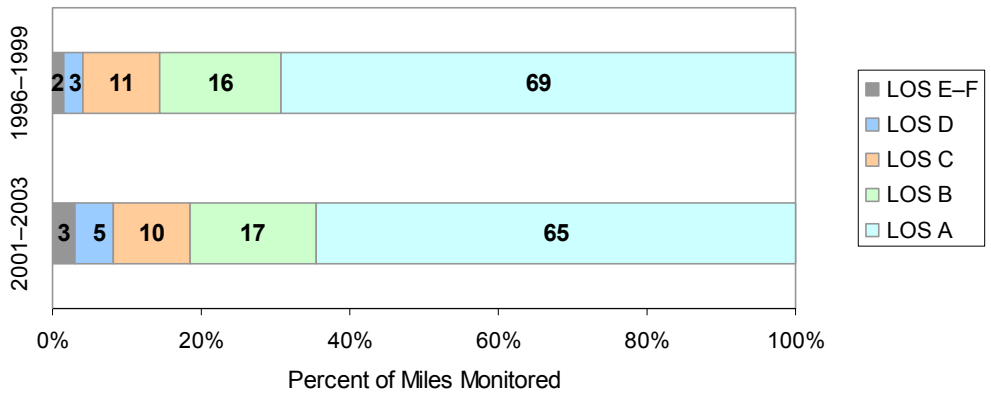


Table 3.6. Average Travel Speeds on Arterial Roadways (Urban Street Class III) in the Evening Peak Period: A Comparison between 1996–1999 Data and 2001–2003 Data

Earlier CMS Monitoring: 1996–1999

	LOS E–F	LOS D	LOS C	LOS B	LOS A	Total
	1–14 mph	>14–18 mph	>18–24 mph	>24–30 mph	>30 mph	Miles[1]
	Percent of Miles Monitored					
Boston and Inner Suburbs [2]	9	11	21	28	31	*173*
Outer Suburbs	2	3	10	16	70	*737*
MPO Region	3	4	12	18	62	*910*

Latest CMS Monitoring: 2001–2003

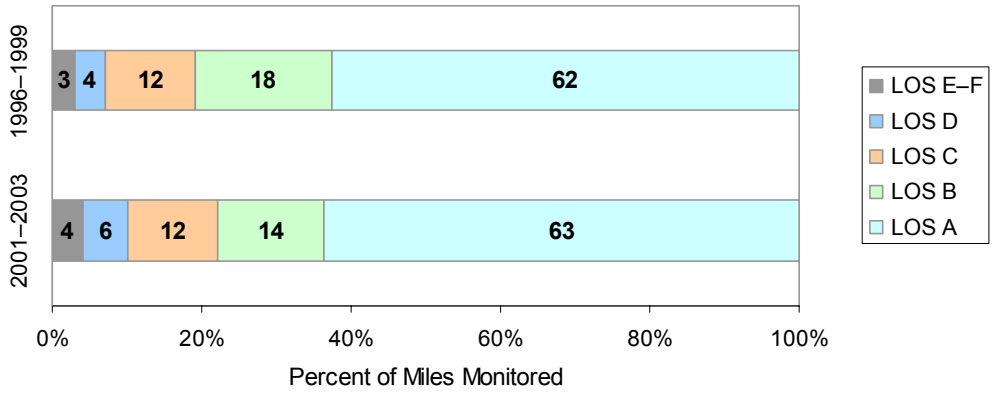
	LOS E–F	LOS D	LOS C	LOS B	LOS A	Total
	1–14 mph	>14–18 mph	>18–24 mph	>24–30 mph	>30 mph	Miles
	Percent of Miles Monitored					
Boston and Inner Suburbs	10	14	26	22	29	*174*
Outer Suburbs	3	5	9	13	71	*741*
MPO Region	4	6	12	14	63	*916*

Percentages are rounded to the nearest whole number.

1. *Total miles* is the combined length of the roadway's two directions of travel. Due to sample size limitations, total miles may not be equal for the AM and PM peak periods.

2. *Boston and Inner Suburbs* consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

Percent of Class III Arterial Roadway Miles by LOS Category, Evening Peak Period



3.3.1.2 Speed Index

Table 3.7 provides the breakdown of arterial roadway miles by average observed traffic speeds relative to the roadway's posted speed limit—the speed index.

Regionwide, about 16 percent of the monitored Class III arterial roadways have *average observed speeds that are less than 70 percent of the speed limit* for the morning peak period; in the evening peak period, this figure is 19 percent. In terms of *average observed speeds near or above the posted speed limit*, 62 percent of the roadways in the morning peak period were observed in this range; in the evening, this number drops to 55 percent. Of the CMS roadways in the Boston and inner suburbs subregion, slightly less than a third had observed average speeds in the evening peak period near or above the posted speed limit.

The Class III roadways in Boston and its inner suburbs show a great difference in the speed index between the morning and evening peak periods: 31 percent of roadways in the morning have average observed speeds that are less than 70 percent of the speed limit, as compared to about 40 percent of roadways in evening period.

For Class I/II arterial roadways, the speed index between the morning and the evening peak periods shows a different congestion picture. Fewer of these major arterials with some limited access have average observed speeds that are less than 70 percent of the posted speed limit in the evening peak period: 21 percent, compared to nearly 25 percent of these roadways in the morning peak period.

An example of a travel speed index diagram is provided in Figure 3.4, featuring a subregion of the MPO region. Colored bands along the CMS-monitored routes represent the speed index range for each roadway segment. Diagrams illustrating the observed speed index on arterial roadway segments for all the subregions can be found in Appendix B.

Comparison between 1996–1999 Data and 2001–2003 Data

Tables 3.8 and 3.9 present a comparison of the travel speed index for monitored roadways from the 1996–1999 CMS data collection and from the most recent monitoring period (2001–2003), for both the morning and evening peak periods. Only roadways common to the two monitoring periods are included in this comparison (please refer to Figure 3.1). All of these roadways in this comparison are classified as Class III urban arterial roadways.

Based on the speed index measure, the data show that there was a decrease in free-flow speeds in both peak periods for roadways in the MPO region. The roadways in the subregion defined by Boston and its inner suburbs appear to have had the largest decrease in free-flow speeds, particularly in the morning: 51 percent of roadways in 1996–1999 had traffic traveling near or above the speed limit on average, compared to 39 percent in 2001–2003.

As would be expected, the data also show an increase in the percent of roadways with traffic traveling below 70 percent of the speed limit, in both peak periods. All areas of the MPO region exhibit this increase in slower travel.

The changes in both the free-flow and congested speed index categories are more evident in the morning peak period than in the evening.

FIGURE 3.4

SPEED INDEX

PM Peak Period
Minuteman Advisory Group on Interlocal Coordination (MAGIC)
Arterial Roadways

URBAN ARTERIALS

Routes Monitored	Year
Middlesex Tpk.	2002
Route 2A	2002
Route 4	2002
Route 27	2003
Route 62	2001
Route 85	2002
Route 117	2002
Route 119	2002
Route 126	2001

Speed Index*

- < 40%
- 40%-50%
- 50%-70%
- 70%-90%
- > 90%

* The speed index is the ratio of the observed speed to the posted speed. By "normalizing" the travel speed to the posted speed limit, the speed index complements travel speed as an indicator of congestion.

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Table 3.7. Summary of Speed Index: Arterial Roadways, 2001–2003

Class III Arterial Roadways

		Speed Index			Total Miles [1]
		< 0.7	0.7 to < 0.9	0.9 or more	
		Percent of Miles Monitored with Avg. Speed Index in the Ranges Above			
Morning Peak	**Boston and Inner Suburbs** [2]	31	30	39	*397*
	Outer Suburbs	12	19	69	*1,297*
	MPO Region	16	22	62	*1,694*
Evening Peak	**Boston and Inner Suburbs**	40	29	31	*397*
	Outer Suburbs	13	24	63	*1,298*
	MPO Region	19	25	55	*1,695*

Class I/II Arterial Roadways

		Speed Index			Total Miles [1]
		< 0.7	0.7 to < 0.9	0.9 or more	
		Percent of Miles Monitored with Avg. Speed Index in the Ranges Above			
Morning Peak	**Boston and Inner Suburbs** [2]	34	17	49	*24*
	Outer Suburbs	22	24	54	*101*
	MPO Region	25	22	53	*125*
Evening Peak	**Boston and Inner Suburbs**	21	17	63	*24*
	Outer Suburbs	21	24	54	*103*
	MPO Region	21	23	56	*127*

Percentages are rounded to the nearest whole number.

1. *Total miles* is the combined length of the roadway's two directions of travel. Due to sample size limitations, total miles may not be equal for the AM and PM peak periods.

2. *Boston and Inner Suburbs* consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

Table 3.8. Speed Index on Arterial Roadways (Urban Street Class III) in the Morning Peak Period: A Comparison between 1996–1999 Data and 2001–2003 Data

Earlier CMS Monitoring: 1996–1999

	Speed Index			Total Miles [1]
	< 0.7	**0.7 to < 0.9**	**0.9 or more**	
	Percent of Miles Monitored with Avg. Speed Index in the Ranges Above			
Boston and Inner Suburbs [2]	19	30	51	*173*
Outer Suburbs	7	22	71	*753*
MPO Region	9	23	68	*926*

Latest CMS Monitoring: 2001–2003

	Speed Index			Total Miles [1]
	< 0.7	**0.7 to < 0.9**	**0.9 or more**	
	Percent of Miles Monitored with Avg. Speed Index in the Ranges Above			
Boston and Inner Suburbs	30	31	39	*174*
Outer Suburbs	10	24	66	*756*
MPO Region	14	25	61	*930*

Percentages are rounded to the nearest whole number.

1. *Total miles* is the combined length of the roadway's two directions of travel. Due to sample size limitations, total miles may not be equal for the AM and PM peak periods.

2. *Boston and Inner Suburbs* consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

Table 3.9. Speed Index on Arterial Roadways (Urban Street Class III) in the Evening Peak Period: A Comparison between 1996–1999 Data and 2001–2003 Data

Earlier CMS Monitoring: 1996–1999

	Speed Index			Total Miles [1]
	< 0.7	0.7 to < 0.9	0.9 or more	
	Percent of Miles Monitored with Avg. Speed Index in the Ranges Above			
Boston and Inner Suburbs[2]	29	32	40	*173*
Outer Suburbs	10	25	65	*737*
MPO Region	14	26	60	*910*

Latest CMS Monitoring: 2001–2003

	Speed Index			Total Miles [1]
	< 0.7	0.7 to < 0.9	0.9 or more	
	Percent of Miles Monitored with Avg. Speed Index in the Ranges Above			
Boston and Inner Suburbs	36	31	33	*174*
Outer Suburbs	14	23	63	*741*
MPO Region	18	24	57	*916*

Percentages are rounded to the nearest whole number.

1. *Total miles* is the combined length of the roadway's two directions of travel. Due to sample size limitations, total miles may not be equal for the AM and PM peak periods.

2. *Boston and Inner Suburbs* consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

3.3.1.3 Delay per Mile

Between the 1996–1999 and the 2001–2003 monitoring periods, *average vehicle peak-period delay* in the region increased on a delay-per-mile basis by 13 seconds (76 percent) in the morning peak period and by 14 seconds (67 percent) in the evening peak period. Table 3.10 presents a comparison of 1996–1999 and 2001–2003 delay data.

Table 3.10. Average Delay per Mile on Arterial Roadways (Urban Street Class III): A Comparison between 1996–1999 Data and 2001–2003 Data

Morning Peak Period

	Average Delay per Mile (seconds/mile)		Change	Percent Change
	1996–1999	2001–2003		
Boston and Inner Suburbs*	37	70	32	**87**
Outer Suburbs	12	21	8	**69**
MPO Region	17	30	13	**76**

Evening Peak Period

	Average Delay per Mile (seconds/mile)		Change	Percent Change
	1996–1999	2001–2003		
Boston and Inner Suburbs*	45	75	30	**67**
Outer Suburbs	15	25	10	**66**
MPO Region	21	35	14	**67**

Numbers are rounded to the nearest integer.

* Boston and Inner Suburbs consists of the municipalities of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Holbrook, Lynn, Malden, Medford, Melrose, Milton, Nahant, Newton, Quincy, Randolph, Revere, Saugus, Somerville, Waltham, Watertown, and Winthrop.

3.3.1.4 Delay at Intersections

As it was assumed that a segment's delay can be considered an intersection approach delay, a list of signalized intersections was compiled for the CMS that have high levels of approach delay (on those approaches that were monitored for the CMS). This list is presented in Tables 3.11 and 3.12, which give, respectively, the morning and evening travel conditions for these intersections. The intersections are sorted by the magnitude of the average delay on the "worst" approach—the more congested of the two approaches of the monitored intersection. The delay measure represents the average time a vehicle is expected to spend in a queue on the approach to the intersection. Please note that the list is not an exhaustive inventory of the intersections along the Boston region's roadways: even though most of the numbered roadways and major arterials are monitored, collectors and most minor arterial roadways are not.

As expected, observed delay was greater in the evening peak period than in the morning peak period. During the morning peak period, there are 42 intersections on the CMS network with *average approach delays* higher than 80 seconds per vehicle; in the evening peak period, 78 intersections on the CMS network have approaches with average delays higher than 80 seconds per vehicle, nearly twice the morning peak period's number.

Most of the high-delay intersections are located in the Boston and inner suburbs subregion. The appendix features maps of the signalized intersections that have high levels of approach delay, by peak period. Figure 3.5 is an example of this type of map, featuring a subregion of the MPO region.

This summary of roadway performance data is only one way of identifying problem intersections. In order to have a complete evaluation of an intersection's level of service, traffic data for all of that intersection's approaches are required. Therefore, while the list does show the segments (of those which were monitored) with the worst levels of delay, it does not necessarily capture all of the metropolitan region's worst segments and intersections. Plus, to appropriately quantify the "worst" intersections, the delays need to be associated with roadway volumes, which provide a sense of how many motorists are affected. The analysis described later in Section 3.3.1.7 ties delay to roadway volumes along the CMS roadway corridors.

Table 3.11. Delay at Signalized Intersections, Morning Peak Period: Approaches with Delays of 80 Seconds or More
(page 1 of 2)

Monitored Route	At (Cross Street Name)	Worst Approach[1]		Combined Total Avg. AM Delay (sec.)[2]	City/Town
		Avg. AM Delay (sec.)	Direction of Travel		
Route 126	Route 20	221	NB	286	Wayland
Route 129	Redington Street	187	WB	215	Swampscott
Route 1A	Revere Street	160	SB	191	Revere
Route 16	Route 2/Concord Turnpike (WB access lane)	154	WB	193	Cambridge
Route 126	Hartford Street	148	NB	157	Framingham
Route 16	Huron Avenue at Fresh Pond Parkway	144	WB	165	Cambridge
Route 28	Malcolm X Boulevard (New Dudley Street)/ Tremont Street	144	NB	162	Boston
Route 129	Autumn Street/Basset Street	141	WB	153	Lynn
Route 126	Route 140/Mendon Street	124	NB	144	Bellingham
Route 16	Massachusetts Avenue/Route 2A	124	WB	165	Cambridge
Route 3/3A	Mystic Street (Route 60) (at Mass. Ave.)	122	SB	189	Arlington
Route 126	Route 135/Waverly Street	119	NB	218	Framingham
Route 99	Dexter Street	119	SB	137	Everett
Route 129	Route 28/Main Street	116	WB	146	Reading
Route 135	Route 27/Main Street	103	EB	128	Natick
Route 99	Second Street	103	SB	128	Everett
Route 16	Main Street/Route 20	102	WB	166	Watertown
Route 28	East Street/Cambridge Street	102	SB	157	Cambridge
Route 16	Route 30/Commonwealth Avenue	101	EB	142	Newton
Route 60	Massachusetts Avenue	101	WB	138	Arlington
Route 135	Kendall Lane/West Natick commuter rail station	98	EB	109	Natick

1. "Worst approach" refers to the more congested of the two approaches of the monitored roadway. (Unmonitored cross streets may actually have higher levels of delay.)

2. "Combined total" delay is the sum of the average delay of both opposing approaches.

LT = left turn
RT = right turn

Table 3.11. Delay at Signalized Intersections, Morning Peak Period: Approaches with Delays of 80 Seconds or More
(page 2 of 2)

Monitored Route	At (Cross Street Name)	Worst Approach[1]		Combined Total Avg. AM Delay (sec.)[2]	City/Town
		Avg. AM Delay (sec.)	Direction of Travel		
Route 99	Church Street	95	NB	138	Everett
Route 3/3A	Alewife Brook Parkway (Route 16) *(SB data only)*	95	SB	95	Cambridge
Route 99	Bowdoin Street	94	SB	95	Everett
Route 27	Route 109/Main Street	94	NB	152	Medfield
Route 129	Route 62/Church Street/Burlington Avenue	93	EB	115	Wilmington
Route 2	Route 62/Main Street	92	EB	97	Concord
Route 139	Route 37/Franklin Street	90	WB	120	Holbrook
Route 28	Melnea Cass Boulevard	90	SB	170	Boston
Route 28	Ruggles Street	87	SB	93	Boston
Route 16	Forest Street/Rockland Street	87	EB	98	Wellesley
Route 38	Shore Drive	86	SB	93	Somerville
Route 53	Route 228/Main Street/Pond Street	86	NB	115	Hingham
Route 203	Route 28/Blue Hill Avenue	86	WB	122	Boston
Route 60	Fellsway West/Route 28	86	EB	148	Medford
Route 60	Washington Avenue/Wesley Street	85	EB	106	Malden
Route 16	Beacon Street	83	EB	98	Newton
Route 28	Pond/Reed Street	83	NB	104	Randolph
Route 3A	Evans Street	82	NB	87	Weymouth
Route 60	Mystic Street (Route 3) LT/Chestnut Street RT	82	WB	87	Arlington
Route 126	Gorman Road/Anzio Road	82	NB	93	Framingham
VFW Parkway	Spring Street/Route 109	81	SB	144	Boston

1. "Worst approach" refers to the more congested of the two approaches of the monitored roadway. (Unmonitored cross streets may actually have higher levels of delay.)

2. "Combined total" delay is the sum of the average delay of both opposing approaches.

LT = left turn
RT = right turn

Table 3.12. Delay at Signalized Intersections, Evening Peak Period: Approaches with Delays of 80 Seconds or More
(page 1 of 4)

Monitored Route	At (Cross Street Name)	Worst Approach[1]		Combined Total Avg. AM Delay (sec.)[2]	City/Town
		Avg. PM Delay (sec.)	Direction of Travel		
Route 1A	Beach Street	317	SB	332	Revere
Route 126	Route 20	254	NB	297	Wayland
Route 60	Main Street/Forest Street	228	EB	255	Medford
Route 16	Route 85/Cedar Street	177	WB	200	Milford
Route 129	Route 1 and Salem Street	172	EB	265	Lynnfield
Route 109	South Street	164	WB	170	Medfield
Route 16	Route 9/Worcester WB	162	WB	174	Wellesley
Route 126	Route 140/Mendon Street	157	SB	208	Bellingham
Route 1A	Mahoney (Bell) Circle (junction of Route 60 & 16) (SB 1st signal)	155	SB	155	Revere
Route 109	Westwood Glen	150	WB	173	Westwood
Route 16	Main Street/Route 20	148	WB	218	Watertown
Route 126	Hartford Street	148	NB	201	Framingham
Route 129	Route 107/Western Avenue	146	WB	270	Lynn
Route 129	New Ocean/Route 129A & Eastern Avenue	145	EB	190	Lynn
Route 99	Second Street	144	NB	256	Everett
Route 60	Fellsway West/Route 28	141	EB	234	Medford
Route 60	Massachusetts Avenue	138	EB	203	Arlington
Route 107	Burns–Albion/Minot Street	136	NB	171	Lynn
Route 60	Irving Street	134	EB	154	Arlington
Route 28	Land Boulevard	133	SB	180	Cambridge
Route 3A	Beach Street/Beale Street	132	SB	177	Quincy

1. "Worst approach" refers to the more congested of the two approaches of the monitored roadway. (Unmonitored cı actually have higher levels of delay.)

2. "Combined total" delay is the sum of the average delay of both opposing approaches.

LT = left turn
RT = right turn

Table 3.12. Delay at Signalized Intersections, Evening Peak Period: Approaches with Delays of 80 Seconds or More
(page 2 of 4)

Monitored Route	At (Cross Street Name)	Worst Approach[1]		Combined Total Avg. AM Delay (sec.)[2]	City/Town
		Avg. PM Delay (sec.)	Direction of Travel		
Route 139	Route 37/Franklin Street	130	EB	163	Holbrook
Route 129A	Chatham Street	126	WB	152	Lynn
Route 62	Broad/Manning Street	125	EB	176	Hudson
Route 28	Talbot Avenue/Harvard Street	125	SB	171	Boston
Route 28	Melnea Cass Boulevard	124	NB	217	Boston
Route 126	Route 135/Waverly Street	124	SB	220	Framingham
Providence Hwy.	Eastern Avenue	123	SB	172	Dedham
Route 28	Malcolm X Boulevard (New Dudley Street)–Tremont Street	123	SB	157	Boston
Route 27	Route 109/Main Street	122	SB	169	Medfield
Washington	Corinth/Poplar Street	115	NB	161	Boston
Route 129	Route 38/Main Street at Richmond Street	115	WB	121	Wilmington
Route 3A	Route 53/Southern Artery–Washington Street	114	SB	126	Quincy
Route 2A	Baker Avenue Extension/Elm Street LT	114	WB	167	Concord
Route 16	Route 135/Central Street	113	WB	148	Wellesley
Route 1A	Boardman Street	112	NB	134	Boston
Route 135	Speen Street	110	WB	130	Natick
Route 18	Park Avenue	106	SB	124	Weymouth
Route 16	Massachusetts Avenue/Route 2A	106	EB	160	Cambridge
Route 9	Hammond Street	105	WB	163	Brookline
Route 99	Church Street	105	NB	144	Everett
Route 1A	Revere Street	105	SB	202	Revere

1. "Worst approach" refers to the more congested of the two approaches of the monitored roadway. (Unmonitored cross streets may actually have higher levels of delay.)

2. "Combined total" delay is the sum of the average delay of both opposing approaches.

LT = left turn
RT = right turn

Table 3.12. Delay at Signalized Intersections, Evening Peak Period: Approaches with Delays of 80 Seconds or More
(page 3 of 4)

Monitored Route	At (Cross Street Name)	Worst Approach[1]		Combined Total Avg. AM Delay (sec.)[2]	City/Town
		Avg. PM Delay (sec.)	Direction of Travel		
Route 38	Route 62/Church Street/Burlington Street	103	NB	139	Wilmington
Route 1A	Route 114/Lafayette Street-Loring Avenue	103	SB	137	Salem
Route 16	Route 126/Concord Street	103	WB	113	Holliston
Route 126	Highland Street	103	SB	107	Holliston
Route 27	Washington Street	102	NB/EB	175	Walpole
Route 99	Ferry Street	102	NB	134	Everett
Route 129A	Chestnut Street–Route 107/Western Avenue	100	WB	119	Lynn
Providence Hwy.	Washington Street	100	SB	130	Dedham
Route 109	Route 27/Spring Street/N. Meadows Road	100	EB	197	Medfield
Route 203	Route 28/Blue Hill Avenue	97	EB	148	Boston
Route 129	West Street	97	EB	104	Wilmington
Route 16	Highland Avenue	97	WB	106	Holliston
Route 16	N. Bow/Winter Street	96	WB	120	Milford
Route 62	Springs Road/South Road	96	WB	113	Bedford
Route 129	Parkland Avenue at Broadway	96	WB	157	Lynn
Route 28	Medford Street/Central Street	96	NB	111	Medford
Route 4	Hartwell Avenue	96	NB	109	Lexington
Route 126	Union Avenue	94	SB	147	Framingham
Route 16	Route 9/Worcester EB	93	WB	130	Wellesley
Route 126	Route 2/Concord Turnpike (NB only)	93	NB	93	Concord
Route 16	Broadway	89	EB	122	Somerville

1. "Worst approach" refers to the more congested of the two approaches of the monitored roadway. (Unmonitored cross streets may actually have higher levels of delay.)

2. "Combined total" delay is the sum of the average delay of both opposing approaches.

LT = left turn
RT = right turn

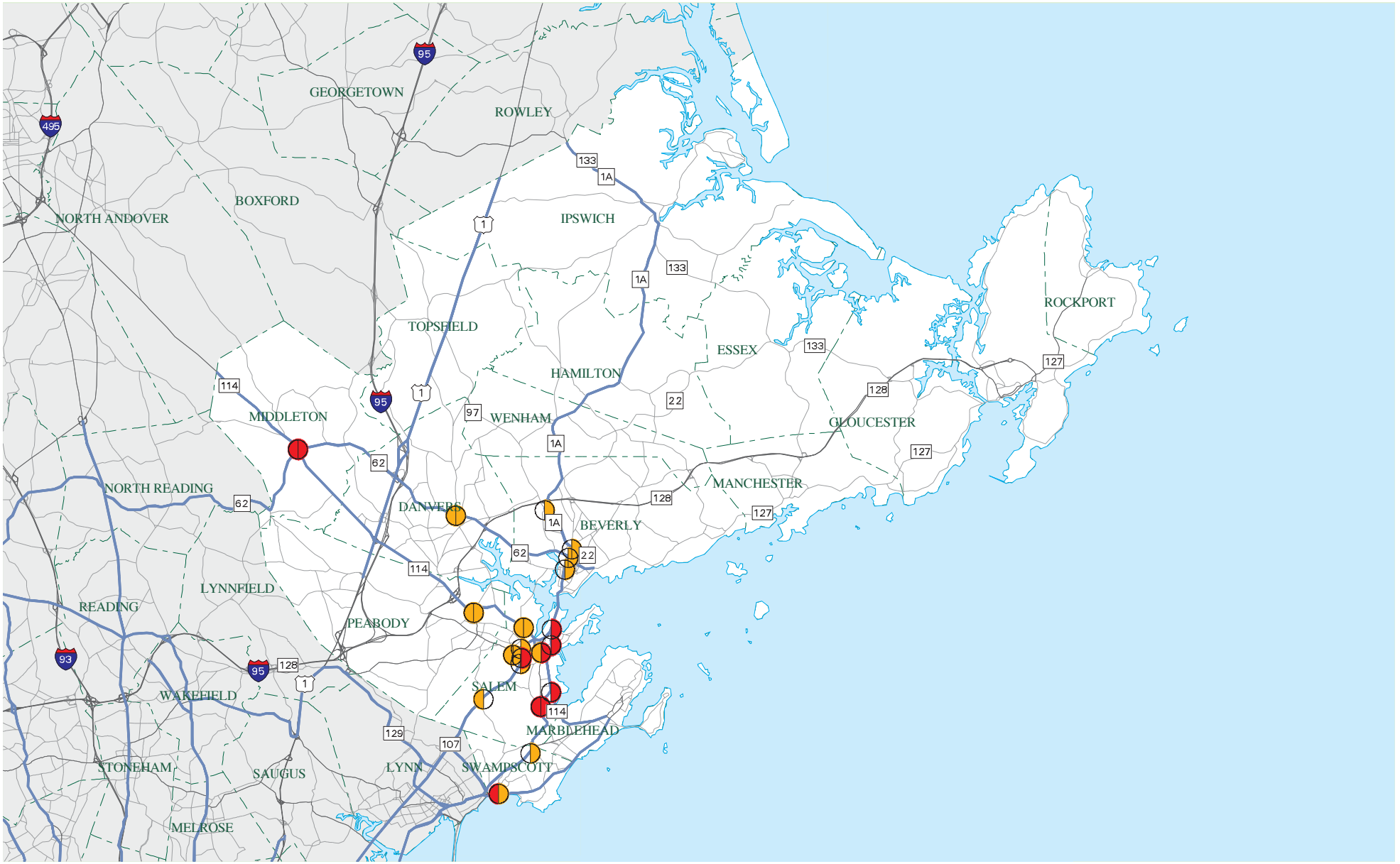
Table 3.12. Delay at Signalized Intersections, Evening Peak Period: Approaches with Delays of 80 Seconds or More
(page 4 of 4)

Monitored Route	At (Cross Street Name)	Worst Approach[1]		Combined Total Avg. AM Delay (sec.)[2]	City/Town
		Avg. PM Delay (sec.)	Direction of Travel		
Route 2A	Waltham Street	88	EB	105	Lexington
Route 107	School/Cushman Street	88	NB	110	Revere
Route 3/3A	Mystic Street (Route 60) (at Mass. Ave.)	85	NB	169	Arlington
Route 60	Charger Street	85	WB	89	Revere
Route 203	Norfolk Street	83	EB	134	Boston
Route 129	Water Street and Main Street	83	EB	141	Wakefield
Route 28	River Street	82	SB	101	Boston
Mass. Ave.	Albany Street	82	SB	94	Boston
Route 16	Highland Street	82	WB	122	Newton
Route 16	Route 27/N. Main Street	82	WB	83	Sherborn
Route 129	Route 62/Church Street/Burlington Avenue	82	WB	119	Wilmington
Route 16	Mount Auburn RT (WB traffic) / Aberdeen LT (EB	82	EB	111	Cambridge
Route 114	Norman Street at Washington Street	81	WB	89	Salem
Route 28	Route 203/Morton Street	80	SB	112	Boston

1. "Worst approach" refers to the more congested of the two approaches of the monitored roadway. (Unmonitored cross streets may actually have higher levels of delay.)

2. "Combined total" delay is the sum of the average delay of both opposing approaches.

LT = left turn
RT = right turn



BOSTON MPO
Congestion Management System
CTPS

AM Level of Service
- F (80 seconds or more)
- E (55–79 seconds)
- A–D (less than 55 seconds)

PM Level of Service
- F (80 seconds or more)
- E (55–79 seconds)
- A–D (less than 55 seconds)

FIGURE 3.5
CMS Network Signalized Intersections with Worst Average Approach Delay
NSTF Subregion

3.3.1.5 Traffic Volumes

Traffic volumes are a measure of how many vehicles use a particular roadway. This measure is usually presented in the form of either average daily traffic (ADT) or average weekday traffic (AWDT), and it complements the roadway performance measures discussed earlier. Traffic volumes are an indication of how many users of the roadway system are affected by poor performance and how many users would benefit from an improvement.

Traffic counts are collected regularly in our region. MassHighway does the bulk of this data collection, through three methods and programs: permanent, continuous-counting stations; a three-year coverage and classification count program; and special counts for specific studies or needs.[6] Other traffic counts are collected by private firms for the purpose of traffic impact studies for MEPA review of proposed land developments and for other purposes.[7]

A selection of traffic counts collected during the past six years is presented in Appendix B.

3.3.1.6 Roadway Safety

Roadway crash data are collected, entered, and stored by the Registry of Motor Vehicles (RMV). The Central Transportation Planning Staff (CTPS) then uses GIS to geocode the RMV data and subsequently identify the top crash locations, which are summarized in MassHighway's statewide *Top 1000 High Crash Locations Report* (August 2002). MassHighway uses the report and the crash data to develop a list of possible safety improvement projects. A three-year crash history is used—a standard industry practice for analyzing crash locations; the most current data are for the years 1997 through 1999.

MassHighway uses a weighted scoring system to rank the crash locations. The following weights are assigned to crash incidents according to crash severity:

- Property Damage Only = 1
- Personal Injury = 5
- Fatality = 10

The weighted score highlights the locations that tend to have more serious crashes, rather than simply ranking by the number of crashes.

Table 3.13 lists the top 60 traffic-related crash locations on the region's arterial roadways. The locations are sorted by number of crashes, and the weighted rating of each location is also provided. Most of the locations found at the top of the list are at intersections of high-volume roadways.

Maps illustrating high-crash locations are provided in Appendix B; Figure 3.6 is an example of this type of map, featuring one of the subregions of the MPO region. The crash-locations maps show the locations on the entire roadway network that experienced 15 or more crashes in the three-year period of 1997–1999. The 2,031 crash locations are grouped in four categories by the total number of crashes occurring at a given location: the top 5 percent (which have totals of between 106 and 678 crashes), the next 10 percent (55 to 105 crashes), the next 35 percent (25 to 54 crashes), and the final 50 percent (15 to 24 crashes).

[6] For more information on the MassHighway Traffic Data Collection program, please visit www.state.ma.us/mhd/trafficc/traffic.htm.

[7] MEPA review is a public process that involves evaluation of the potentially harmful environmental impacts of certain projects pursuant to the Massachusetts Environmental Policy Act regulations. The daily implementation and administration of the MEPA review process is done by the MEPA Office, which is the staff of the Secretary of the Executive Office of Environmental Affairs.

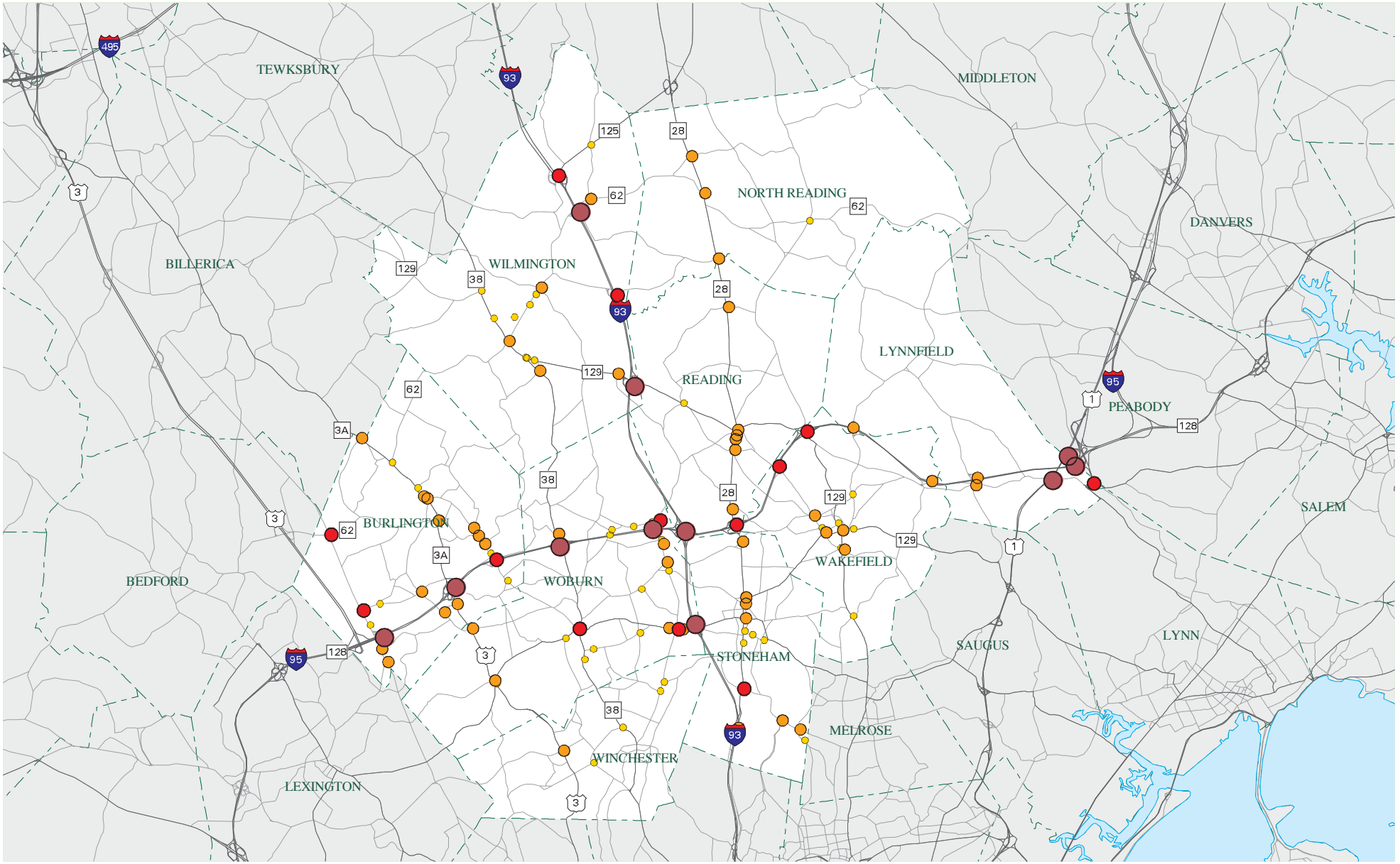
Table 3.13. Top 60 Crash Locations on Arterial Roadways in the Boston MPO Region (1997–1999) (page 1 of 2)

Rank	City/Town	Roadway		Intersecting Street		Crashes	
		Rte. No.	Street Name	Rte. No.	Street Name	Total No.	Weighted Score
1	Medford	16	Mystic Valley Parkway	28	Fellsway	343	815
2	Boston		Airport Road		Airport Road	286	590
3	Natick	27	North Main Street	9	Worcester Street	285	593
4	Boston		Charles Circle	28	Embankment Road	279	615
5	Natick	9	Worcester Street		Speen Street	278	574
6	Newton		Centre Street		Washington Street	252	536
7	Wellesley	16	Washington Street	9	Worcester Street	246	527
8	Revere	1A	Mahoney (Bell) Circle	1A	Mahoney (Bell) Circle	243	695
9	Somerville	28	McGrath Highway		Washington Street	235	587
10	Boston	203	Gallivan Boulevard	3A	Neponset Avenue	204	504
11	Concord	2	Reformatory Circle	2	Lincoln Turnpike	197	385
12	Everett	16	Revere Beach Parkway	99	Sweetser Circle	186	510
13	Framingham	30	Main Street	9	Worcester Road	179	411
14	Revere	107	Broadway	60	Albert J. Brown Circle	176	448
15	Cambridge	2A	Massachusetts Avenue		Peabody Street	172	416
16	Boston		Brookline Avenue		Riverway	159	403
17	Boston		Cambridge Street		Soldiers Field Road	159	371
18	Boston		Freeport Street		William T. Morrissey Boulevard	150	426
19	Everett	16	Santilli Circle	16	Revere Beach Parkway	148	372
20	Natick		Oak Street	9	Worcester Street	146	330
21	Boston		Kosciuszko Circle		William T. Morrissey Boulevard	143	368
22	Framingham	30	Cochituate Road	9	Worcester Road	143	331
23	Cambridge	2A	Massachusetts Avenue	3	Memorial Drive	141	369
24	Framingham	126	Concord Street	135	Waverley Street	134	266
25	Boston		Atlantic Avenue		New Northern Avenue	126	270
26	Peabody		Andover Street		Prospect Street	123	247
27	Boston		American Legion Highway		Cummins Highway	118	403
28	Stoughton		Central Street	138	Washington Street	116	264
29	Salem		Canal Street	114	Washington Street	114	230
30	Boston	30	Commonwealth Avenue		Harvard Avenue	112	240

Table 3.13. Top 60 Crash Locations on Arterial Roadways in the Boston MPO Region (1997–1999) (page 2 of 2)

Rank	City/Town	Roadway		Intersecting Street		Crashes	
		Rte. No.	Street Name	Rte. No.	Street Name	Total No.	Weighted Score
31	Framingham	30	Concord Street	9	Worcester Road	111	263
32	Cambridge	3	Memorial Drive		River Street	110	246
33	Boston		Adams Street	203	Gallivan Boulevard	108	292
34	Somerville		Somerville Avenue		Washington Street	107	267
35	Boston		Causeway Street		North Washington Street	106	246
36	Reading	28	Main Street		South Street	104	232
37	Boston		North Harvard Street		Soldiers Field Road	103	251
38	Quincy		Honorable T. S. Burgin Parkway		Granite Street	102	250
39	Everett		Everett Avenue	16	Revere Beach Parkway	101	293
40	Weymouth	18	Main Street		Middle Street	101	233
41	Randolph	28	North Main Street	28	South Main Street	100	216
42	Weymouth	18	Main Street		Park Avenue	97	221
43	Boston	28	Columbus Avenue	28	Tremont Street	96	300
44	Boston		Charlesgate West	2	Commonwealth Avenue	96	256
45	Newton		Centre Street	9	Boylston Street	95	247
46	Weymouth	18	Main Street		Pond Street	93	265
47	Chelsea	16	Revere Beach Parkway		Webster Avenue	93	241
48	Cambridge	3	Memorial Drive		Western Avenue	93	217
49	Newton		Chestnut Street	9	Boylston Street	92	232
50	Framingham	9	Worcester Road		Temple Street	87	223
51	Danvers		Garden Street	114	Andover Street	85	237
52	Weymouth	18	Main Street		Winter Street	85	225
53	Boston		Soldiers Field Road		Western Avenue	84	220
54	Brookline		Chestnut Hill Avenue	9	Boylston Street	82	250
55	Lynn		Commercial Street	1A	Lynnway	82	226
56	Boston		Columbia Road		Massachusetts Avenue	82	218
57	Chelsea		Everett Avenue		Spruce Street	81	237
58	Boston	28	Blue Hill Avenue	203	Morton Street	79	247
59	Salem	107	Bridge Street	114	North Street	79	216
60	Boston	28	Blue Hill Avenue		Talbot Avenue	78	302

Source: CTPS and the Massachusetts Highway Department—Traffic Operations and Safety Unit, *Top 1000 High Crash Locations Report (1997–1999)*, August 2002.



BOSTON MPO
Congestion Management System
CTPS

Number of crashes
- 15–24
- 25–54
- 55–105
- 106–678

FIGURE 3.6
Locations with 15 or More Crashes, 1997–99
NSPC Subregion

3.3.1.7 Mobility Along CMS Arterial Roadways

Table 3.14 lists the congested routes based on the CMS delay measure and other indicators of congestion. Routes on the CMS arterial roadway network that (1) experience high average delays per mile, (2) carry high traffic volumes (expressed in ADT), (3) have crowded or late MBTA buses traveling along them, or (4) experience many crashes, are candidates for planning studies that explore operational improvements along the roadway. The roadways are sorted by ADT and then by the sum of the morning and evening peak-direction average delay per mile. In addition, the CMS performed a cursory assessment to identify whether or not a segment has potential for signal coordination; candidate segments are noted in the table. The measures and indicators of congestion are described below.

The roadways in Table 3.14 are categorized into four groups:

- Those with more than 45,000 ADT at their peak-volume location
- Those with 30,001 to 45,000 ADT at their peak-volume location
- Those with 15,001 to 30,000 ADT at their peak-volume location
- Those with 15,000 or less ADT at their peak-volume location

Average daily traffic (ADT) is the highest volume count for the roadway. Not all sections of the roadway handle this amount of traffic. The main source for ADTs is MassHighway's traffic count database, as published in their annual document.

Delay per mile is calculated by taking the average observed delay and dividing that value by the segment length. As noted earlier in this chapter, delay is measured as the time a vehicle travels less than 5 mph on a roadway segment (including stopped time), as long as the speed has been less than 5 mph for at least three consecutive seconds.

Bus routes that are crowded and/or late during either of the peak periods and that travel along any of the CMS monitored roadways are also noted in this table. Crowding and late arrivals can often be attributed to delay experienced on the roadway and therefore are indicators of possible roadway congestion. (The CMS criteria used for identifying buses as "crowded" or "late" are explained in Chapter 4.)

Total crashes and crashes per mile can be indicators of congestion, poor roadway design or condition, or both. The crash totals were compiled from the RMV's database of crashes for the three-year period 1997–1999.

Potential traffic signal coordination recommendations are made based on signal delay and spacing. Signals that experience a high level of delay and also are less than half a mile apart on the same route are considered candidates for signal coordination. Coordination between signals may reduce the delay experienced by vehicles at signals, thereby reducing the overall delay along the route.

The table indicates that, in general, the amount of delay increases with the number of users. High-volume roadways, as a group, have higher delays per mile than medium-volume roadways, which, in turn, experience higher delays per mile than low-volume roadways. The average delay on low-volume roadways is less than or equal to 20 seconds per mile for each peak period; none of these routes have buses with crowded or late service.

The four roadways in the CMS network with the highest delay for both peak periods are high-volume roads that are located within the Boston and inner suburbs subregion. These roadways—Route 99, Route 16 (east of I-95/Route 128), Route 28 (South), and Route 60—experience an average peak-

period delay per mile of approximately 80 seconds or greater. The high average delays are especially significant along these high-volume roadways because they carry more than 45,000 vehicles a day at certain locations—an indication that many roadway users are affected by these conditions. Three of the four routes carry transit buses that experience crowded and/or late service. Furthermore, all four of these routes are identified as having signal coordination potential.

Of the medium-high-volume arterial roadways (those carrying 30,000 to 45,000 vehicles a day in some locations), Massachusetts Avenue, Route 4, Route 38, and Route 126 are found to experience notable congestion problems. In addition, congestion on Massachusetts Avenue could be contributing to schedule adherence problems on MBTA buses.

Serious delays are also encountered on many medium-volume roadways (those carrying between 15,000 and 30,000 vehicles a day at some locations). In particular, traffic on routes in the lower North Shore communities, such as Route 107, Route 1A, and Route 129/Route 129A, was observed to have high average delays per mile along the roadway. In all of these cases, MBTA bus service experiences schedule adherence problems.

Potential planning studies should focus on corridors with medium to high average delays, high ADTs, crowded and/or late bus service, and a relatively high rate of crashes per mile. Additionally, any study should contain an analysis of signal coordination potential and implementation strategy.

Table 3.14. Mobility Characteristics of CMS Arterial Roadway Corridors* (page 1 of 5)

Route	Definition of Segment	Average Delay per Mile (sec./mile) *Peak Direction*		Crowded and/or Late Bus Service on This Roadway?		Crashes per Mile	Traffic Signal Coordination Potential?
		AM	PM	AM	PM		
Roadways with ADTs Higher than 45,000							
Route 99	Rutherford Ave. at Sullivan Square, Boston, to Route 1, Saugus	140	132	Yes	No	355	Yes
Route 16 (East)	Concord St., Newton, to Route 1A, Revere	102	102	No	No	317	Yes
Route 60	Route 20/Main Street, Waltham, to Route 1A/60 rotary (Mahoney/Bell Circle), Revere	79	109	Yes	No	292	Yes
Route 28 (South)	Arlington St. at Columbus Ave., Boston, to Randolph/Avon TL	80	90	Yes	Yes	286	Yes
Route 203/ Jamaicaway	I-93/Neponset Circle, Boston, to Route 9, Boston	76	73	No	Yes	389	Yes
Route 28 (North)	North Reading/Andover TL to Leverett Circle signal, Boston	70	57	No	No	258	Yes
VFW Pkwy./ Providence Hwy.	Arborway/Centre St., Boston, to Enterprise Dr., Dedham	41	80	No	No	128	No
Route 3A (South)	I-93 at Neponset Circle, Boston, to Route 3, Exit 10, Duxbury	27	30	Yes	Yes	103	Yes
Route 9 (East)	Natick/Wellesley TL to Brookline Ave., Brookline	29	39	No	No	293	Yes
Route 138	Easton/Stoughton TL to Route 28, Milton	22	25	N/A		124	No
Route 9 (West)	I-495, Southborough, to Natick/Wellesley TL	19	24	N/A		232	No

** Within each of the table's subsections, the corridors are in order by combined AM and PM average delay per mile.*
N/A = MBTA bus service does not operate on the corridor.
TL = town line

Table 3.14. Mobility Characteristics of CMS Arterial Roadway Corridors (page 2 of 5)

Route	Definition of Segment	Average Delay per Mile (sec./mile) *Peak Direction*		Crowded and/or Late Bus Service on This Roadway?		Crashes per Mile	Traffic Signal Coordination Potential?
		AM	PM	AM	PM		
Route 1 (South)	I-495, Wrentham/Plainville, to Enterprise Dr., Dedham	17	20	N/A		79	No
Route 1 (North)	Lowell St., Peabody, to Ipswich/ Rowley TL	5	3	No	No	245	No
Roadways with ADTs between 30,000 and 45,000							
Mass. Ave.	Wood St., Lexington, to Melnea Cass Blvd., Boston	50	76	Yes	Yes	80	No
Route 4/225	Billerica/Bedford TL to Route 2, Lexington	24	72	No	No	149	Yes
Route 38	Lowell TL to Route 28, Somerville	42	46	No	No	177	Yes
Route 126	Route 2, Concord, to MA/RI State Line, Bellingham	45	43	N/A		130	Yes
Route 20	Marlborough/Northborough TL to Kenmore Square, Boston	34	36	Yes	Yes	204	Yes
Route 114	North Andover/Middleton TL to Ocean Avenue, Marblehead	29	32	No	Yes	264	Yes
Route 37 & Furnace Brook Pkwy.	Route 28, Brockton, to Quincy Shore Drive, Quincy	27	32	No	Yes	162	Yes
Middlesex Tpk. & Lowell St.	Billerica/Bedford TL to Route 2A at Lowell Street, Lexington	25	28	No	No	150	Yes
Route 140	Hopedale/Milford TL to Foxborough/Mansfield TL	16	16	N/A		59	Yes

** Within each of the table's subsections, the corridors are in order by combined AM and PM average delay per mile.*
N/A = MBTA bus service does not operate on the corridor.
TL = town line

Table 3.14. Mobility Characteristics of CMS Arterial Roadway Corridors (page 3 of 5)

Route	Definition of Segment	Average Delay per Mile (sec./mile) *Peak Direction*		Crowded and/or Late Bus Service on This Roadway?		Crashes per Mile	Traffic Signal Coordination Potential?
		AM	PM	AM	PM		
Roadways with ADTs between 15,000 and 30,000							
Route 107	Route 16, Revere, to Route 1A/Winter Street, Salem	62	108	Yes	Yes	289	Yes
Route 1A (North, southern portion)	Route 16, Revere, to Route 62 (Elliot St.), Beverly	59	97	Yes	Yes	239	Yes
Route 129/129A	Billerica/Wilmington TL to Ocean Ave., Marblehead	66	85	Yes	Yes	162	Yes
Washington Street	Mass. Ave., Boston, to Rt 1A (Elm St.), Dedham	58	71	Yes	No	357	Yes
Route 16 (West)	Hopedale/Milford TL to Concord St., Newton	56	68	N/A		126	Yes
Route 109	VFW Parkway at Boston/Dedham TL to Millis/Medfield TL	37	83	No	No	171	Yes
Main Streets	Main Street Everett-Malden-Melrose-Wakefield: Rt. 99 to I-95	46	65	Yes	Yes	295	No
Route 3/3A (North)	Billerica/Burlington TL to Alewife Brook Parkway, Cambridge	64	47	Yes	No	184	Yes
Route 18	Route 53, Weymouth, to Abington/Weymouth TL	51	55	No	No	373	Yes
Beacon Street	Washington Street, Newton, to Arlington Street, Boston	38	55	N/A		23	No
Route 30 (East)	Route 20 (Packard's Corner), Boston, to Route 9, Framingham	40	46	No	No	194	Yes
Route 62 (West)	I-495, Berlin, to Bedford/Burlington TL	32	46	N/A		125	Yes

** Within each of the table's subsections, the corridors are in order by combined AM and PM average delay per mile.*
N/A = MBTA bus service does not operate on the corridor.
TL = town line

Table 3.14. Mobility Characteristics of CMS Arterial Roadway Corridors (page 4 of 5)

Route	Definition of Segment	Average Delay per Mile (sec./mile) *Peak Direction*		Crowded and/or Late Bus Service on This Roadway?		Crashes per Mile	Traffic Signal Coordination Potential?
		AM	PM	AM	PM		
Route 135	Westborough/Hopkinton TL to I-95, Exit 17, Dedham	34	33	N/A		104	Yes
Route 139 (West)	Route 138, Stoughton, to Weymouth/Abington TL	28	38	N/A		192	Yes
Route 53	Route 3A/Washington Street, Quincy, to Route 3A, Kingston	25	23	No	No	118	Yes
Route 62 (East)	Route 127/Lothrop St., Beverly, to Burlington/Bedford TL	19	21	N/A		77	Yes
Route 30 (West)	Westborough/Southborough TL to Route 9 merge, Framingham	21	18	N/A		77	No
Route 2A (West)	Littleton/Groton TL to Route 2, Lincoln	19	20	N/A		73	No
Route 85	Route 117, Bolton, to Route 16, Milford	17	19	N/A		73	Yes
Route 27	Route 24, Brockton, to Route 225, Westford	17	19	N/A		100	Yes
Route 1A (South)	Enterprise Dr., Dedham, to Wrentham/Plainville TL	13	17	N/A		85	Yes
Route 139 (East)	Abington/ Rockland TL to Route 3 overpass, Duxbury	10	14	N/A		89	Yes
Route 1A (North, northern portion)	Route 62 (Elliot St.), Beverly, to Ipswich/Rowley TL	11	11	N/A		78	No
Route 117	Lancaster/Bolton TL to Route 20, Waltham	10	6	N/A		60	Yes

** Within each of the table's subsections, the corridors are in order by combined AM and PM average delay per mile.*
N/A = MBTA bus service does not operate on the corridor.
TL = town line

Table 3.14. Mobility Characteristics of CMS Arterial Roadway Corridors (page 5 of 5)

Route	Definition of Segment	Average Delay per Mile (sec./mile) *Peak Direction*		Crowded and/or Late Bus Service on This Roadway?		Crashes per Mile	Traffic Signal Coordination Potential?
		AM	PM	AM	PM		
Roadways with ADTs of 15,000 or Less							
Route 2A (East)	Route 2, Lincoln, to Route 3/3A, Arlington	21	12	No	No	73	No
Route 119	Groton/Littleton TL to Route 2A/ Route 110/King St., Littleton	15	13	N/A		82	No
Route 123	Abington/Rockland TL to Route 3A, Scituate	9	12	N/A		52	No
Route 115	Route 27, Sherborn, to Route 1A, Norfolk	9	11	N/A		6	No
Route 228	Route 3, Rockland, to Nantasket Beach, Hull	8	9	N/A		20	No
Route 14	Route 3A, Duxbury, to Pembroke/Hanson TL	5	7	N/A		18	No

** Within each of the table's subsections, the corridors are in order by combined AM and PM average delay per mile.*
N/A = MBTA bus service does not operate on the corridor.
TL = town line