Performance Measure Summary – Springfield, MA-CT

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2007. There is no single performance measure that experts agree "says it all." The best comparison of congestion levels and trends is done between regions of similar size, over several years, and with a few measures of congestion. Examining a few measures over many years reduces the chance that data variations or the estimating procedures may have caused a "spike" in any single year. A few key points should be recognized by users of the Urban Mobility Report data.

Use the Trends – The multi-year performance measures are better indicators, in most cases, than any single year. (*5 years is 5 times better than 1 year*).

Use several measures – Each performance measure illustrates a different element of congestion. (*The view is more interesting from the top of a few measures*).

Compare to similar regions – Congestion analyses that compare areas with similar characteristics (for example population, growth rate, road and public transportation system design) are usually more insightful than comparisons of different regions. (*Los Angeles is not Peoria*).

Compare ranking changes and performance measure values – In some performance measures a small change in the value may cause a significant change in rank from one year to the next. This is the case when there are several regions with nearly the same value. (*15 hours is only 1 hour more than 14 hours*).

Consider the scope of improvement options – Any improvement project in a corridor within most of the regions will only have a modest effect on the regional congestion level. (*To have an effect on areawide congestion, there must be significant change in the system or service*).

Performance Measures and Definition of Terms

Travel Time Index – A measure of congestion that focuses on each trip and each mile of travel. The ratio of travel time in the peak period to travel time in free-flow. A value of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak.

Peak Travelers – Number of travelers (using any travel mode) who begin a trip during the morning or evening peak travel periods (6 to 9 a.m. and 4 to 7 p.m.).

Annual Delay per Traveler – A yearly sum of all the per-trip delays. This measure illustrates the effect of the per-mile congestion as well as the length of each trip. The extra time required to travel in the peak period is divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.).

Total Delay – The overall size of the congestion problem. Measured by the total travel time above that needed to complete a trip at free-flow speeds. The ranking of total delay usually follows the population ranking (larger regions usually have more delay).

Free-Flow Speeds (60 mph on freeways and 35 mph on arterials) – These values are used as the national comparison thresholds. Other speed values may be appropriate for urban areas or sub-regions.

Excess Fuel Consumed – Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.

Public Transportation – Regular route service from all public transportation providers in an urban area.

Operations Treatments – Freeway incident management, freeway ramp metering, arterial street signal coordination and arterial street access management.

Congestion Cost – Value of travel delay for 2007 (estimated at $15.47 per hour of person travel and $102.12 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

Annual Increase Needed to Maintain Constant Congestion Level – Number of lane-miles that must be added to the road system each year – or – the number of new transit riders or carpoolers that must be added to keep congestion levels the same as the previous year.

Urban Area – The developed area (population density more than 1,000 persons per square mile) within a metropolitan region. The urban area boundaries change frequently (every year for most growing areas). The annual change in miles traveled, therefore, includes both new travel due to growth and travel that previously occurred in areas designated as rural.

Number of Rush Hours – Time when system might have congestion.

The Mobility Data for Springfield MA-CT

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	660	660	660	660	655	650
Rank	61	60	59	58	58	58
Urban Area (square miles)	475	470	470	470	460	460
Population Density (persons/sq mile)	1,389	1,404	1,404	1,404	1,424	1,413
Peak Travelers (1000s)	363	361	358	356	352	345
Freeway						
Daily Vehicle-Miles of Travel (1000s)	5,380	5,400	5,450	5,310	5,030	4,805
Lane-Miles	460	460	460	455	445	430
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,965	5,990	5,960	5,960	6,020	6,095
Lane-Miles	1,485	1,485	1,485	1,475	1,460	1,440
Public Transportation						
Annual Psgr-Miles of Travel (millions)	36.8	30.8	33.8	40.7	39.4	34.4
Annual Unlinked Psgr Trips (millions)	10.5	9.9	10.1	11.1	10.9	10.8
Cost Components						
Value of Time ($/hour)	15.47	15.06	14.58	14.10	13.73	13.43
Commercial Cost ($/hour)	102.12	98.77	94.06	86.24	82.38	79.96
Fuel Cost ($/gallon)	2.98	2.67	2.28	2.02	1.53	1.40
System Performance	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Congested Travel (% of peak VMT)	21	22	22	20	20	20
Congested System (% of lane-miles)	23	23	23	23	23	23
Congested Time (number of "Rush Hours")	4.2	4.2	4.2	4.2	4.0	4.0
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	16	50	46	47	52	61
Transit Riders or Carpoolers (millions)	3	10	9	10	11	12
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,422	2,567	2,460	2,235	2,141	2,171
Rank	76	76	73	76	75	72
Fuel per Peak Traveler (gallons)	7	7	7	6	6	6
Rank	77	81	79	81	80	78
Annual Delay						
Total Delay (1000s of person-hours)	3,989	4,203	4,030	3,725	3,637	3,732
Rank	76	75	73	73	73	71
Delay per Peak Traveler (person-hours)	11	12	11	10	10	11
Rank	79	78	80	83	80	77
Delay due to Incidents (percent)	55	55	55	54	54	53
Travel Time Index	1.06	1.07	1.06	1.06	1.06	1.06
Rank	85	83	84	85	83	82
Congestion Cost						
Total Cost ($ millions)	77	78	72	63	59	59
Rank	77	76	75	75	74	74
Cost per Peak Traveler ($)	212	217	201	178	168	171
Rank	82	83	82	84	84	81

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Springfield MA-CT, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	630	615	605	600	600
Rank	58	59	58	58	58
Urban Area (square miles)	455	450	445	440	435
Population Density (persons/sq mile)	1,385	1,367	1,360	1,364	1,379
Peak Travelers (1000s)	330	318	309	303	299
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,215	4,250	4,140	3,980	3,845
Lane-Miles	400	395	390	390	390
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,825	5,890	5,835	5,675	5,430
Lane-Miles	1,410	1,405	1,385	1,340	1,305
Public Transportation					
Annual Psgr-Miles of Travel (millions)	33.0	37.7	33.1	35.5	34.1
Annual Unlinked Psgr Trips (millions)	11.2	12.2	11.5	12.9	12.7
Cost Components					
Value of Time ($/hour)	13.22	12.85	12.43	12.17	11.98
Commercial Cost ($/hour)	80.88	80.75	74.23	72.61	74.32
Fuel Cost ($/gallon)	1.70	1.58	1.13	1.08	1.28
System Performance	**2001**	**2000**	**1999**	**1998**	**1997**
Congested Travel (% of peak VMT)	19	20	19	18	17
Congested System (% of lane-miles)	26	26	26	24	24
Congested Time (number of "Rush Hours")	3.4	3.6	3.6	3.4	3.0
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	33	37	37	28	21
Transit Riders or Carpoolers (millions)	7	7	7	6	4
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,986	2,108	2,072	1,909	1,723
Rank	71	70	70	70	71
Fuel per Peak Traveler (gallons)	6	7	7	6	6
Rank	78	77	76	77	77
Annual Delay					
Total Delay (1000s of person-hours)	3,473	3,689	3,597	3,391	3,025
Rank	71	69	70	70	71
Delay per Peak Traveler (person-hours)	11	12	12	11	10
Rank	77	76	76	76	75
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.06	1.06	1.06	1.06	1.05
Rank	82	79	77	76	79
Congestion Cost					
Total Cost ($ millions)	55	56	52	48	43
Rank	72	70	70	71	72
Cost per Peak Traveler ($)	166	178	169	158	143
Rank	82	78	79	78	78

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Springfield MA-CT, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	595	595	590	590	580
Rank	58	57	56	55	55
Urban Area (square miles)	430	425	425	420	400
Population Density (persons/sq mile)	1,384	1,400	1,388	1,405	1,450
Peak Travelers (1000s)	293	289	283	280	271
Freeway					
Daily Vehicle-Miles of Travel (1000s)	3,720	3,715	3,660	3,530	3,455
Lane-Miles	390	385	385	380	380
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,435	5,425	5,325	5,365	5,265
Lane-Miles	1,295	1,280	1,275	1,250	1,235
Public Transportation					
Annual Psgr-Miles of Travel (millions)	34.5	31.9	29.3	34.1	32.7
Annual Unlinked Psgr Trips (millions)	12.9	11.4	10.9	12.0	11.1
Cost Components					
Value of Time ($/hour)	11.71	11.37	11.06	10.78	10.47
Commercial Cost ($/hour)	74.17	71.54	69.53	67.77	66.19
Fuel Cost ($/gallon)	1.31	1.22	1.07	1.15	1.14
System Performance	**1996**	**1995**	**1994**	**1993**	**1992**
Congested Travel (% of peak VMT)	17	17	16	17	16
Congested System (% of lane-miles)	24	24	24	24	24
Congested Time (number of "Rush Hours")	3.0	3.0	3.0	3.0	3.0
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	29	39	34	40	43
Transit Riders or Carpoolers (millions)	5	7	6	8	8
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,664	1,712	1,635	1,669	1,638
Rank	70	69	68	65	65
Fuel per Peak Traveler (gallons)	6	6	6	6	6
Rank	76	74	75	72	68
Annual Delay					
Total Delay (1000s of person-hours)	2,913	3,024	2,878	2,955	2,872
Rank	69	66	65	64	64
Delay per Peak Traveler (person-hours)	10	10	10	11	11
Rank	75	74	76	69	65
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.05	1.06	1.05	1.06	1.06
Rank	78	73	77	68	66
Congestion Cost					
Total Cost ($ millions)	41	41	38	38	36
Rank	69	68	69	64	64
Cost per Peak Traveler ($)	139	141	133	135	132
Rank	77	75	77	73	69

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Springfield MA-CT, Continued

Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	575	560	560	560	555
Rank	53	54	53	53	53
Urban Area (square miles)	385	380	375	365	360
Population Density (persons/sq mile)	1,494	1,474	1,493	1,534	1,542
Peak Travelers (1000s)	266	255	253	251	247
Freeway					
Daily Vehicle-Miles of Travel (1000s)	3,330	3,335	3,465	3,330	3,130
Lane-Miles	375	375	370	370	365
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,080	4,810	4,650	4,545	4,525
Lane-Miles	1,220	1,215	1,210	1,210	1,205
Public Transportation					
Annual Psgr-Miles of Travel (millions)	35.7	32.4	39.4	37.4	30.0
Annual Unlinked Psgr Trips (millions)	10.8	10.0	15.0	11.8	11.3
Cost Components					
Value of Time ($/hour)	10.17	9.75	9.25	8.83	8.48
Commercial Cost ($/hour)	64.55	62.47	59.16	56.03	54.62
Fuel Cost ($/gallon)	1.23	1.04	1.06	0.98	0.98
System Performance	**1991**	**1990**	**1989**	**1988**	**1987**
Congested Travel (% of peak VMT)	15	14	14	14	13
Congested System (% of lane-miles)	20	20	20	20	20
Congested Time (number of "Rush Hours")	2.9	2.8	2.9	2.8	2.7
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	42	35	35	36	30
Transit Riders or Carpoolers (millions)	8	6	6	6	5
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,384	1,305	1,298	1,200	1,138
Rank	65	65	64	64	63
Fuel per Peak Traveler (gallons)	5	5	5	5	5
Rank	71	67	68	67	63
Annual Delay					
Total Delay (1000s of person-hours)	2,422	2,277	2,248	2,094	1,988
Rank	64	65	64	64	63
Delay per Peak Traveler (person-hours)	9	9	9	8	8
Rank	67	66	65	68	65
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.05	1.05	1.05	1.04	1.04
Rank	71	65	63	68	65
Congestion Cost					
Total Cost ($ millions)	30	27	25	22	20
Rank	64	65	64	64	63
Cost per Peak Traveler ($)	111	104	99	88	82
Rank	69	69	69	69	66

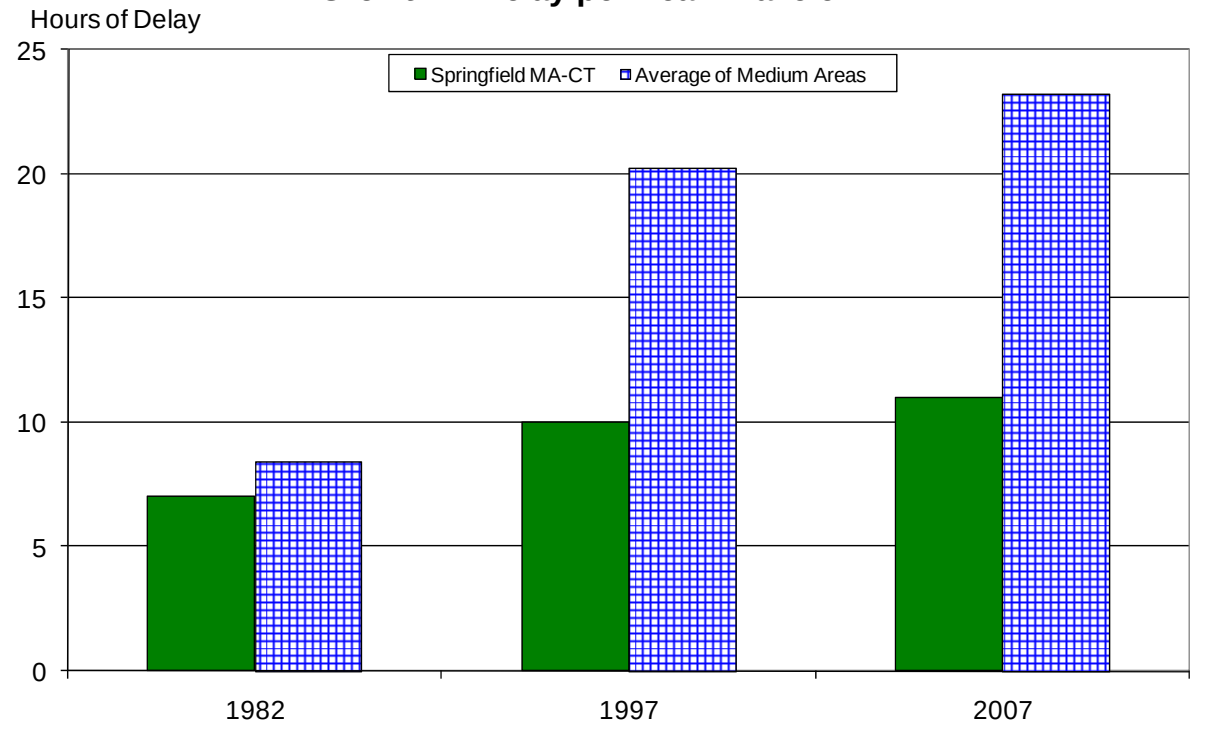
Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Springfield MA-CT, Continued

Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	550	545	540	535	530
Rank	52	52	51	50	50
Urban Area (square miles)	355	350	340	335	330
Population Density (persons/sq mile)	1,549	1,557	1,588	1,597	1,606
Peak Travelers (1000s)	243	239	235	231	226
Freeway					
Daily Vehicle-Miles of Travel (1000s)	2,985	2,795	2,815	2,605	2,625
Lane-Miles	360	360	360	360	360
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	4,390	4,490	4,465	4,425	4,340
Lane-Miles	1,200	1,190	1,190	1,185	1,180
Public Transportation					
Annual Psgr-Miles of Travel (millions)	30.0	30.0	33.4	33.4	33.4
Annual Unlinked Psgr Trips (millions)	12.0	12.0	11.8	11.8	11.8
Cost Components					
Value of Time ($/hour)	8.18	8.03	7.75	7.43	7.20
Commercial Cost ($/hour)	52.63	55.80	54.65	52.70	52.13
Fuel Cost ($/gallon)	0.96	1.25	1.27	1.30	1.35
System Performance	**1986**	**1985**	**1984**	**1983**	**1982**
Congested Travel (% of peak VMT)	13	13	13	13	13
Congested System (% of lane-miles)	20	20	20	20	20
Congested Time (number of "Rush Hours")	2.7	2.6	2.6	2.6	2.6
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	- -	- -	- -	- -	- -
Transit Riders or Carpoolers (millions)	- -	- -	- -	- -	- -
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,051	1,033	1,029	967	931
Rank	63	61	59	58	55
Fuel per Peak Traveler (gallons)	4	4	4	4	4
Rank	65	60	58	55	53
Annual Delay					
Total Delay (1000s of person-hours)	1,820	1,810	1,800	1,692	1,601
Rank	62	60	56	55	54
Delay per Peak Traveler (person-hours)	7	8	8	7	7
Rank	64	58	54	55	53
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.04	1.04	1.04	1.04	1.04
Rank	65	59	55	53	50
Congestion Cost					
Total Cost ($ millions)	18	18	17	16	15
Rank	62	59	57	55	52
Cost per Peak Traveler ($)	74	75	74	68	64
Rank	65	63	59	57	54

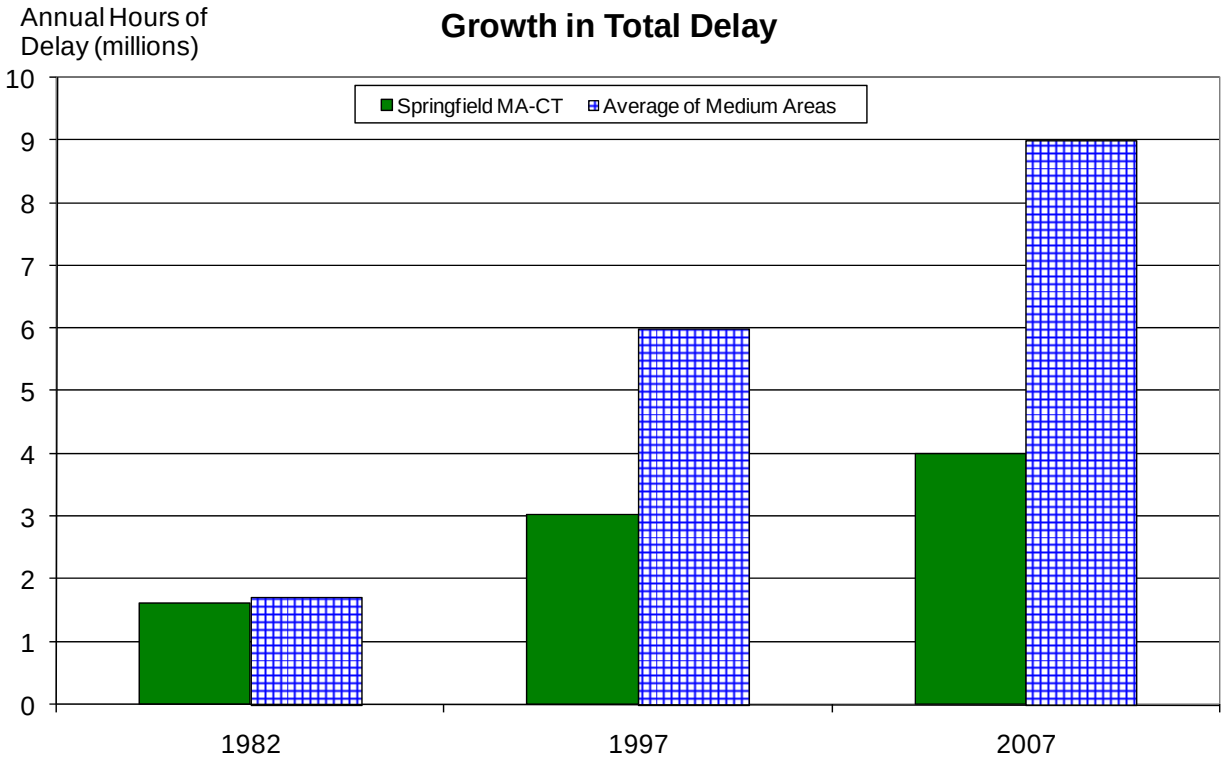
Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

Growth in Delay per Peak Traveler



Note: Medium areas have populations between 0.5 and 1 million

Growth in Total Delay



Note: Medium areas have populations between 0.5 and 1 million

Benefits from Public Transportation Service and Operations Strategies in Springfield MA-CT

Operations Strategies	2007	2006	2005	2004
Freeway Ramp Metering				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--
Freeway Incident Management				
Cameras				
Percent of Roadway Miles	13	13	13	14
Service Patrols				
Percent of Roadway Miles	37	37	37	35
Annual Delay Reduction (1000 hours)	27	31	27	17
Arterial Signal Coordination				
Percent of Roadway Miles	46	46	46	42
Annual Delay Reduction (1000 hours)	17	19	18	20
Arterial Access Management				
Percent of Roadway Miles	6	5	5	5
Annual Delay Reduction (1000 hours)	21	15	12	19
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	64	66	57	55
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings ($million)	1.3	1.3	1.1	1.0
Travel Time Index with Strategies	1.064	1.068	1.065	1.059
Travel Time Index (Base)	1.065	1.069	1.066	1.060
Public Transportation Service	**2007**	**2006**	**2005**	**2004**
Existing Service				
Annual Passenger-miles of travel (million)	36.8	30.8	33.8	40.7
Unlinked Passenger Trips (million)	10.5	9.9	10.1	11.1
Travel Time Index (combined road and transit)	1.064	1.068	1.065	1.060
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.066	1.071	1.067	1.061
Annual Increase				
Delay (1000 hours)	119	168	128	89
Delay per Peak Traveler (hours)	0	0	0	0
Congestion Cost ($million)	2.3	3.1	2.3	1.5

Benefits from Public Transportation Service and Operations Strategies in Springfield MA-CT, Continued

Operations Strategies	2003	2002	2001	2000
Freeway Ramp Metering				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--
Freeway Incident Management				
Cameras				
Percent of Roadway Miles	14	14	16	16
Service Patrols				
Percent of Roadway Miles	36	37	40	41
Annual Delay Reduction (1000 hours)	12	10	6	7
Arterial Signal Coordination				
Percent of Roadway Miles	41	40	41	39
Annual Delay Reduction (1000 hours)	17	17	18	11
Arterial Access Management				
Percent of Roadway Miles	3	3	4	4
Annual Delay Reduction (1000 hours)	13	18	18	20
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	42	45	41	38
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings ($million)	0.7	0.7	0.7	0.6
Travel Time Index with Strategies	1.058	1.059	1.059	1.062
Travel Time Index (Base)	1.059	1.060	1.060	1.063
Public Transportation Service	**2003**	**2002**	**2001**	**2000**
Existing Service				
Annual Passenger-miles of travel (million)	39.4	34.4	33.0	37.7
Unlinked Passenger Trips (million)	10.9	10.8	11.2	12.2
Travel Time Index (combined road and transit)	1.058	1.060	1.059	1.062
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.060	1.061	1.060	1.064
Annual Increase				
Delay (1000 hours)	119	108	82	148
Delay per Peak Traveler (hours)	0	0	0	0
Congestion Cost ($million)	1.9	1.7	1.3	2.3

Comparison of Several Key Mobility Performance Measures
Medium Group – 500,000 to 1 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2007	
				Delay per Traveler	Total Delay
Nashville-Davidson, TN	H+	0	H+	F	F+
Salt Lake City, UT	H	H+	H+	F	F+
Richmond ,VA	L	L-	H	0	F+
Louisville, KY-IN	H+	H+	H+	F+	F+
Hartford, CT	L	L	H	F	F+
Bridgeport-Stamford, CT-NY	H+	H+	H+	F+	F+
Oklahoma City, OK	H	L	H+	F+	F+
Tulsa, OK	0	L	0	0	F
Tucson, AZ	H+	H+	H+	F	F+
Dayton, OH	L-	L-	L-	S-	S-
Rochester, NY	L-	L-	L-	S-	S-
Birmingham, AL	H+	0	H+	F+	F+
Lancaster-Palmdale, CA	L-	L	L-	S-	S-
Honolulu, HI	H	H+	H	S	S
El Paso, TX-NM	L	L	L	0	S
Oxnard-Ventura, CA	H+	H+	H+	F+	F+
Sarasota-Bradenton ,FL	H	H+	0	S-	0
Springfield, MA-CT	L-	L-	L-	S-	S-
Omaha, NE-IA	H	H	0	F+	F
Fresno, CA	L	0	L	S-	S-
Allentown-Bethlehem, PA-NJ	0	0	L	S	S-
Akron, OH	L-	L-	L-	S-	S-
Grand Rapids, MI	0	L	L	0	S
Albany-Schenectady, NY	L	L	L	0	S-
Albuquerque, NM	H+	H	H	F+	F+
New Haven, CT	L	L	L-	0	S-
Indio-Cathedral City-Palm Springs, CA	L-	0	L-	S-	S-
Toledo, OH-MI	L-	L-	L-	S	S-
Poughkeepsie-Newburgh, NY	L-	L-	L-	S-	S-
Bakersfield, CA	L-	L-	L-	S-	S-
Colorado Springs, CO	0	0	L	F	S-

0 – Average congestion levels or average congestion growth
H Higher congestion; H+ Much higher congestion; F Faster congestion growth; F+ Much faster growth
L Lower congestion; L- Much lower congestion; S Slower congestion growth; S- Much slower growth

Key Mobility Performance Measure Labels

Note: Designation of an urban area congestion problem as “Much higher”, “Much faster growth”, etc. is determined using a general indicator of the accuracy of the congestion estimates. For regions with the same indicator label, there may be no difference in congestion levels. Different values are used for the indicators in regions over 1 million population and below 1 million population.

Measures	Differences Within These Values May Not Indicate a Difference in Congestion Level	
2007 Values	**Above 1M Population**	**Below 1M Population**
Delay per Traveler -	5 Hours	3 Hours
Travel Time Index -	5 Index Points	3 Index Points
Total Delay -	5 Hours x Average Population	3 Hours x Average Population
1982 to 2007 Trends		
Delay per Traveler -	5 Hours	3 Hours
Total Delay -	5 Hours x Average Population	3 Hours x Average Population