Performance Measure Summary – Nashville-Davidson, TN

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 Nashville-Davidson TN

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	995	990	990	965	940	900
Rank	44	44	42	42	42	44
Urban Area (square miles)	755	755	755	755	750	735
Population Density (persons/sq mile)	1,318	1,311	1,311	1,278	1,253	1,224
Peak Travelers (1000s)	547	542	538	521	505	478
Freeway						
Daily Vehicle-Miles of Travel (1000s)	14,150	13,575	13,300	13,100	13,085	12,200
Lane-Miles	1,060	1,010	975	960	955	910
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	11,900	11,915	11,750	11,700	11,445	10,140
Lane-Miles	2,130	2,125	2,105	2,045	2,040	1,900
Public Transportation						
Annual Psgr-Miles of Travel (millions)	39.9	38.2	33.3	27.7	33.8	32.4
Annual Unlinked Psgr Trips (millions)	8.9	7.9	7.5	6.4	6.8	7.1
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 ($/gallon)	2.98	2.54	2.24	1.86	1.46	1.32
System Performance	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Congested Travel (% of peak VMT)	41	41	44	44	44	44
Congested System (% of lane-miles)	43	44	44	44	40	42
Congested Time (number of "Rush Hours")	6.0	6.0	6.2	6.2	6.2	6.0
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	99	127	158	181	195	145
Transit Riders or Carpoolers (millions)	28	36	45	52	56	40
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	12,487	12,721	13,556	13,476	13,152	11,892
Rank	38	36	36	36	35	35
Fuel per Peak Traveler (gallons)	23	23	25	26	26	25
Rank	35	35	33	27	24	24
Annual Delay						
Total Delay (1000s of person-hours)	20,215	20,754	21,822	21,156	20,419	18,360
Rank	35	35	33	34	31	33
Delay per Peak Traveler (person-hours)	37	38	41	41	40	38
Rank	34	30	27	24	19	22
Delay due to Incidents (percent)	56	56	56	56	57	57
Travel Time Index	1.15	1.16	1.17	1.17	1.17	1.17
Rank	48	45	42	42	41	41
Congestion Cost						
Total Cost ($ millions)	426	418	420	386	355	310
Rank	34	35	34	34	31	35
Cost per Peak Traveler ($)	778	771	782	741	703	649
Rank	33	29	28	25	23	22

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 Nashville-Davidson TN, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	850	815	780	740	700
Rank	46	46	48	49	51
Urban Area (square miles)	720	705	695	680	655
Population Density (persons/sq mile)	1,181	1,156	1,122	1,088	1,069
Peak Travelers (1000s)	445	421	399	374	349
Freeway					
Daily Vehicle-Miles of Travel (1000s)	11,600	11,000	10,250	9,750	9,350
Lane-Miles	870	830	800	775	735
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	9,325	8,505	8,265	8,135	8,030
Lane-Miles	1,800	1,750	1,700	1,655	1,605
Public Transportation					
Annual Psgr-Miles of Travel (millions)	35.6	30.2	30.6	32.1	28.8
Annual Unlinked Psgr Trips (millions)	7.1	6.9	7.0	6.0	6.9
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 ($/gallon)	1.45	1.47	1.07	1.03	1.13
System Performance	**2001**	**2000**	**1999**	**1998**	**1997**
Congested Travel (% of peak VMT)	44	40	39	37	40
Congested System (% of lane-miles)	42	42	42	40	42
Congested Time (number of "Rush Hours")	5.8	5.6	5.4	5.2	5.4
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	123	93	78	98	105
Transit Riders or Carpoolers (millions)	33	24	20	25	27
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	10,368	9,551	8,571	7,675	8,049
Rank	36	40	40	40	39
Fuel per Peak Traveler (gallons)	23	23	22	21	23
Rank	28	25	29	28	21
Annual Delay					
Total Delay (1000s of person-hours)	15,942	14,818	13,243	11,916	12,579
Rank	35	38	39	39	39
Delay per Peak Traveler (person-hours)	36	35	33	32	36
Rank	22	24	28	29	18
Delay due to Incidents (percent)	56	57	57	56	57
Travel Time Index	1.16	1.15	1.14	1.13	1.14
Rank	42	44	47	45	43
Congestion Cost					
Total Cost ($ millions)	265	243	204	178	189
Rank	35	36	39	39	38
Cost per Peak Traveler ($)	595	577	512	477	541
Rank	27	27	29	32	20

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 Nashville-Davidson TN, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	665	640	615	605	590
Rank	52	53	54	54	54
Urban Area (square miles)	630	600	575	570	550
Population Density (persons/sq mile)	1,056	1,067	1,070	1,061	1,073
Peak Travelers (1000s)	327	311	295	287	276
Freeway					
Daily Vehicle-Miles of Travel (1000s)	8,880	8,640	8,450	7,810	7,265
Lane-Miles	720	700	700	690	635
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	7,835	7,720	7,410	6,875	6,705
Lane-Miles	1,545	1,485	1,450	1,435	1,400
Public Transportation					
Annual Psgr-Miles of Travel (millions)	37.1	24.7	29.3	41.8	36.2
Annual Unlinked Psgr Trips (millions)	8.0	6.7	7.1	6.6	8.4
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 ($/gallon)	1.24	1.11	1.03	1.07	1.08
System Performance	**1996**	**1995**	**1994**	**1993**	**1992**
Congested Travel (% of peak VMT)	37	37	36	29	30
Congested System (% of lane-miles)	40	40	40	35	35
Congested Time (number of "Rush Hours")	5.2	5.2	5.2	4.4	4.4
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	107	107	99	82	98
Transit Riders or Carpoolers (millions)	28	28	25	20	23
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	7,062	6,790	6,166	4,546	4,358
Rank	40	38	39	44	41
Fuel per Peak Traveler (gallons)	22	22	21	16	16
Rank	23	19	17	30	29
Annual Delay					
Total Delay (1000s of person-hours)	11,183	10,729	9,563	7,194	6,791
Rank	40	38	39	42	40
Delay per Peak Traveler (person-hours)	34	34	32	25	25
Rank	22	16	19	30	30
Delay due to Incidents (percent)	56	56	56	56	55
Travel Time Index	1.13	1.13	1.12	1.09	1.09
Rank	45	43	44	52	50
Congestion Cost					
Total Cost ($ millions)	164	152	131	96	88
Rank	40	38	39	43	41
Cost per Peak Traveler ($)	503	487	445	335	317
Rank	22	21	21	35	33

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 Nashville-Davidson TN, Continued

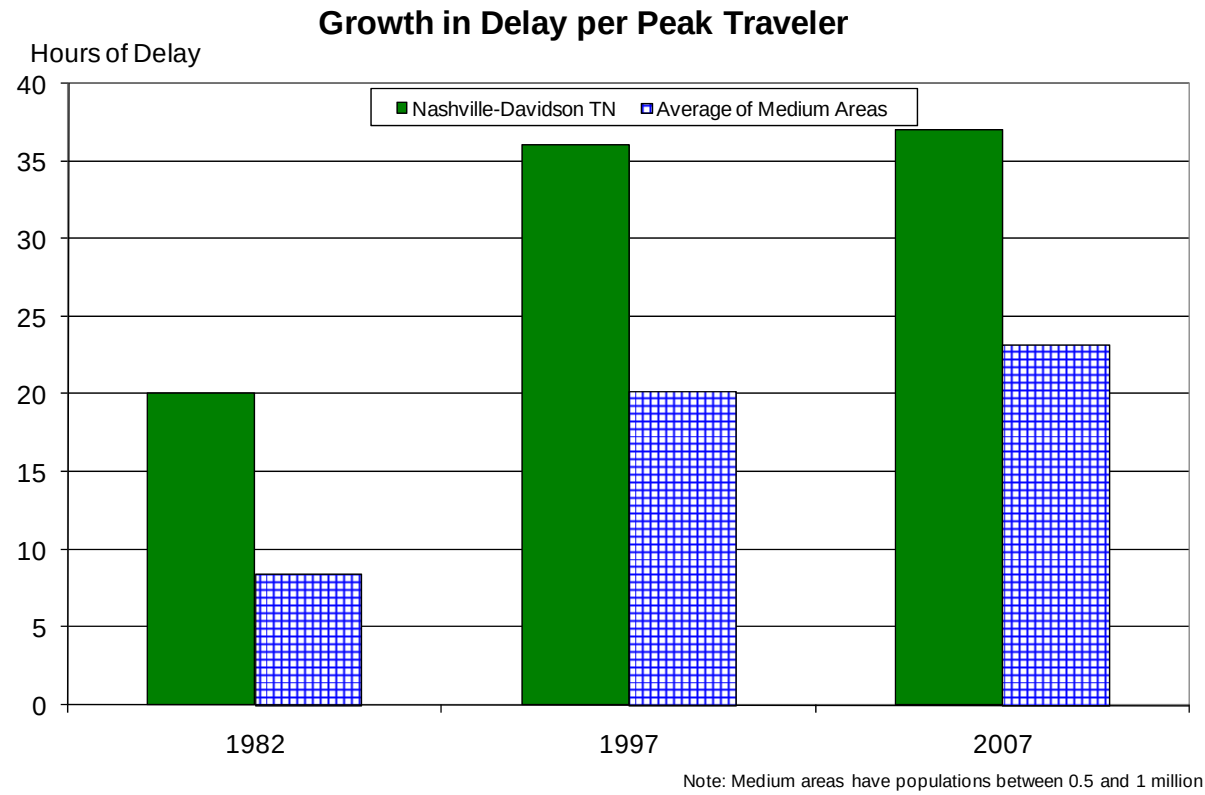
Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	575	565	550	540	540
Rank	53	53	54	54	54
Urban Area (square miles)	530	500	495	485	470
Population Density (persons/sq mile)	1,085	1,130	1,111	1,113	1,149
Peak Travelers (1000s)	266	258	249	242	240
Freeway					
Daily Vehicle-Miles of Travel (1000s)	6,600	6,265	6,065	5,545	4,975
Lane-Miles	590	560	520	470	440
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	6,655	6,620	6,600	6,605	6,070
Lane-Miles	1,385	1,355	1,305	1,280	1,235
Public Transportation					
Annual Psgr-Miles of Travel (millions)	35.4	42.5	35.9	39.0	38.0
Annual Unlinked Psgr Trips (millions)	8.2	8.8	8.9	8.6	8.2
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 ($/gallon)	1.11	1.08	1.12	1.03	1.04
System Performance	**1991**	**1990**	**1989**	**1988**	**1987**
Congested Travel (% of peak VMT)	31	32	34	36	33
Congested System (% of lane-miles)	39	39	39	40	40
Congested Time (number of "Rush Hours")	4.4	4.4	4.8	5.0	4.6
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	98	117	117	111	77
Transit Riders or Carpoolers (millions)	23	27	28	27	18
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	4,422	4,594	4,861	5,049	4,164
Rank	39	36	32	30	33
Fuel per Peak Traveler (gallons)	17	18	20	21	17
Rank	21	19	12	11	13
Annual Delay					
Total Delay (1000s of person-hours)	7,147	7,559	7,914	8,348	6,883
Rank	38	34	32	29	31
Delay per Peak Traveler (person-hours)	27	29	32	34	29
Rank	20	18	12	10	12
Delay due to Incidents (percent)	55	55	55	55	55
Travel Time Index	1.10	1.11	1.12	1.13	1.12
Rank	41	36	25	21	22
Congestion Cost					
Total Cost ($ millions)	89	90	90	91	72
Rank	37	34	32	30	32
Cost per Peak Traveler ($)	334	350	361	373	301
Rank	26	19	15	10	12

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.

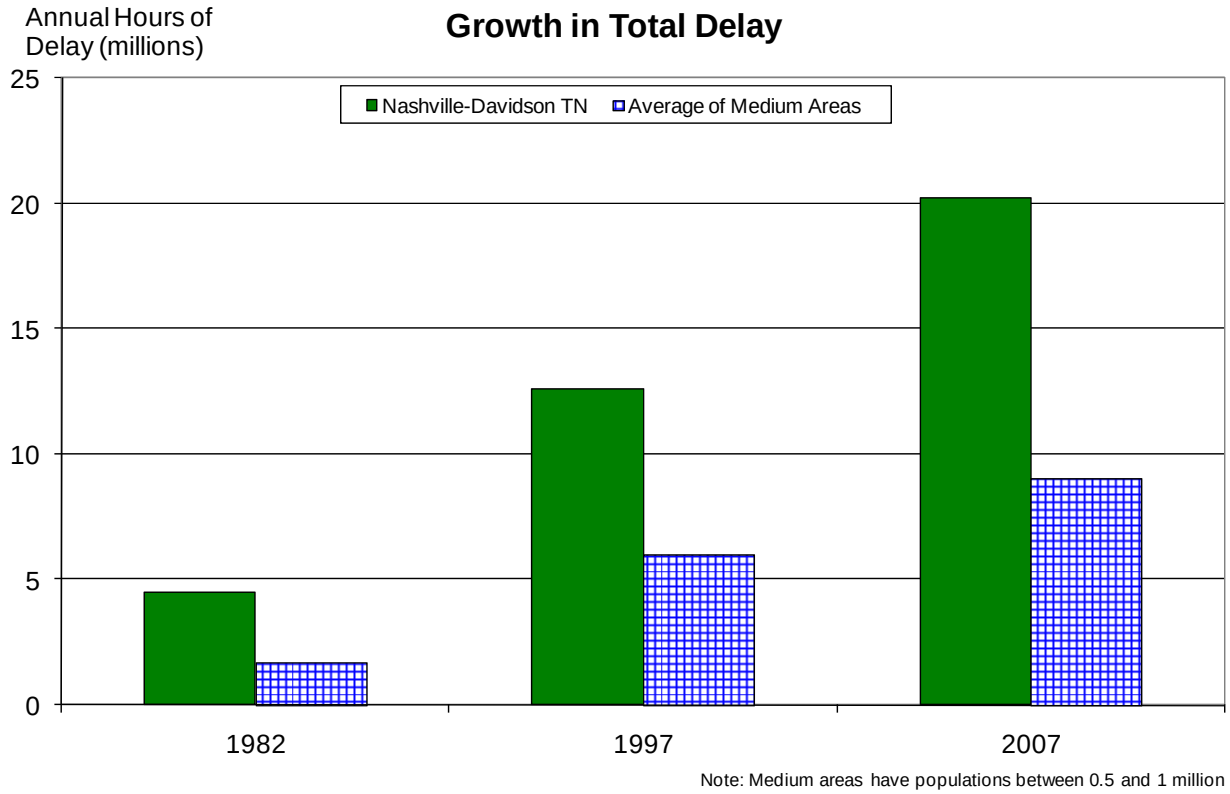
The Mobility Data for Nashville-Davidson TN, Continued

Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	535	530	530	525	525
Rank	53	53	52	51	51
Urban Area (square miles)	455	440	430	410	380
Population Density (persons/sq mile)	1,176	1,205	1,233	1,280	1,382
Peak Travelers (1000s)	236	233	231	227	224
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,440	4,115	3,965	3,700	3,655
Lane-Miles	420	400	375	345	340
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,955	5,470	5,305	5,250	5,175
Lane-Miles	1,210	1,175	1,150	1,130	1,110
Public Transportation					
Annual Psgr-Miles of Travel (millions)	36.9	42.3	38.0	38.0	38.0
Annual Unlinked Psgr Trips (millions)	9.0	9.5	9.1	9.1	9.1
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 ($/gallon)	1.01	1.32	1.34	1.37	1.43
System Performance	**1986**	**1985**	**1984**	**1983**	**1982**
Congested Travel (% of peak VMT)	29	27	27	27	27
Congested System (% of lane-miles)	35	35	35	34	34
Congested Time (number of "Rush Hours")	4.2	3.8	3.8	4.0	4.0
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	- -	- -	- -	- -	- -
Transit Riders or Carpoolers (millions)	- -	- -	- -	- -	- -
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	3,324	2,751	2,776	2,715	2,681
Rank	35	35	31	31	28
Fuel per Peak Traveler (gallons)	14	12	12	12	12
Rank	13	17	16	9	9
Annual Delay					
Total Delay (1000s of person-hours)	5,570	4,541	4,595	4,558	4,472
Rank	33	34	32	32	30
Delay per Peak Traveler (person-hours)	24	20	20	20	20
Rank	11	17	15	11	9
Delay due to Incidents (percent)	55	55	55	54	54
Travel Time Index	1.10	1.09	1.09	1.09	1.09
Rank	24	30	23	20	20
Congestion Cost					
Total Cost ($ millions)	56	46	46	43	42
Rank	33	34	32	32	30
Cost per Peak Traveler ($)	236	200	198	192	186
Rank	16	20	17	15	11

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.



Note: Medium areas have populations between 0.5 and 1 million



Note: Medium areas have populations between 0.5 and 1 million

Benefits from Public Transportation Service and Operations Strategies in Nashville-Davidson TN

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	48	50	49	47
Service Patrols				
Percent of Roadway Miles	48	50	50	49
Annual Delay Reduction (1000 hours)	628	678	547	499
Arterial Signal Coordination				
Percent of Roadway Miles	59	49	47	49
Annual Delay Reduction (1000 hours)	74	62	75	66
Arterial Access Management				
Percent of Roadway Miles	12	12	13	13
Annual Delay Reduction (1000 hours)	192	291	218	200
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	893	1,031	840	764
Annual Delay Saved per Peak Traveler (hours)	2	2	2	1
Annual Congestion Cost Savings ($million)	19.6	21.4	16.7	14.5
Travel Time Index with Strategies	1.150	1.156	1.170	1.171
Travel Time Index (Base)	1.155	1.162	1.176	1.176
Public Transportation Service	**2007**	**2006**	**2005**	**2004**
Existing Service				
Annual Passenger-miles of travel (million)	39.9	38.2	33.3	27.7
Unlinked Passenger Trips (million)	8.9	7.9	7.5	6.4
Travel Time Index (combined road and transit)	1.154	1.162	1.175	1.176
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.157	1.163	1.176	1.177
Annual Increase				
Delay (1000 hours)	407	229	217	259
Delay per Peak Traveler (hours)	1	0	0	0
Congestion Cost ($million)	8.6	4.6	4.2	4.7

Benefits from Public Transportation Service and Operations Strategies in Nashville-Davidson TN, 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	49	28	--	--
Service Patrols				
Percent of Roadway Miles	51	54	57	60
Annual Delay Reduction (1000 hours)	494	446	315	353
Arterial Signal Coordination				
Percent of Roadway Miles	44	42	37	38
Annual Delay Reduction (1000 hours)	69	96	55	35
Arterial Access Management				
Percent of Roadway Miles	11	9	8	7
Annual Delay Reduction (1000 hours)	185	86	52	96
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	749	627	422	484
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1
Annual Congestion Cost Savings ($million)	13.6	11.1	7.5	8.4
Travel Time Index with Strategies	1.169	1.167	1.155	1.153
Travel Time Index (Base)	1.174	1.172	1.159	1.158
Public Transportation Service	**2003**	**2002**	**2001**	**2000**
Existing Service				
Annual Passenger-miles of travel (million)	33.8	32.4	35.6	30.2
Unlinked Passenger Trips (million)	6.8	7.1	7.1	6.9
Travel Time Index (combined road and transit)	1.173	1.172	1.158	1.157
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.176	1.175	1.162	1.160
Annual Increase				
Delay (1000 hours)	386	363	378	317
Delay per Peak Traveler (hours)	1	1	1	1
Congestion Cost ($million)	6.8	6.2	6.4	5.3

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