

Performance Measure Summary

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2005. 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 aspects. 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).*

Comparison of Several Key Mobility Performance Measures Very Large Group – over 3 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
New York-Newark, NY-NJ-CT	L	0	H+	0	F+
Los Angeles-Long Beach-Santa Ana, CA	H+	H+	H+	S	F+
Chicago, IL-IN	L	H+	H	0	F+
Miami, FL	L	0	L	0	0
Philadelphia, PA-NJ-DE-MD	L-	L-	L-	S-	S-
Dallas-Fort Worth-Arlington, TX	H	L	L	F+	F
Washington, DC-VA-MD	H	0	L	F+	S-
Atlanta, GA	H	L	L	0	S-
San Francisco-Oakland, CA	H	H	L	F	S-
Boston, MA-NH-RI	L	L-	L-	0	S-
Detroit, MI	0	L-	L-	S	S-
Houston, TX	H	0	L-	S	S-
Phoenix, AZ	L	L	L-	S-	S-
Seattle, WA	L-	L-	L-	0	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

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 2005 (estimated at \$14.60 per hour of person travel and \$77.10 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

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	
	Above 1M Population	Below 1M Population
2005 Values Delay per Traveler - Travel Time Index - Total Delay -	5 Hours 5 Index Points 5 Hours x Average Population	3 Hours 3 Index Points 3 Hours x Average Population
1982 to 2005 Trends Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

The Mobility Data for Philadelphia, PA-NJ-DE-MD

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	5,300	5,300	5,285	5,200	5,125	5,040
Rank	5	4	4	4	4	4
Urban Area (square miles)	2,280	2,275	2,270	2,200	2,100	2,000
Popn Density (persons/sq mile)	2,325	2,330	2,328	2,364	2,440	2,520
Peak Travelers (1000s)	2,920	2,910	2,886	2,824	2,716	2,611
Freeway						
Daily Vehicle-Miles of Travel (1000s)	35,325	34,440	33,875	30,770	30,050	28,930
Lane Miles	2,305	2,305	2,300	2,085	2,070	2,065
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	48,235	47,910	47,245	45,070	42,050	40,015
Lane Miles	8,240	8,215	8,040	7,720	7,435	7,120
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,631	1,589	1,507	1,460	1,480	1,540
Annual Unlinked Psgr Trips (millions)	353	351	338	331	337	337
Cost Components						
Value of Time (\$/hour)	14.60	14.10	13.75	13.45	13.25	12.85
Commercial Cost (\$/hour)	77.10	74.60	72.65	71.05	69.95	68.00
Fuel Cost (\$/gallon)	2.28	1.94	1.51	1.36	1.54	1.51
System Performance						
Congested Travel (% of peak VMT)	63	63	63	63	59	55
Congested System (% of lane-miles)	52	52	52	52	51	46
Congested Time (number of "Rush Hours")	7.2	7.2	7.0	7.0	6.8	6.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	413	439	469	357	317	236
Transit Riders or Carpoolers (millions)	114	119	128	96	83	61
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	70,902	68,142	65,811	62,327	57,139	49,469
Rank	12	12	11	11	11	11
Fuel per Peak Traveler (gallons)	24	23	23	22	21	19
Rank	34	35	34	34	33	36
Annual Delay						
Total Delay (1000s of person-hours)	111,704	107,309	104,132	99,045	90,265	79,121
Rank	11	11	11	11	11	11
Delay per Peak Traveler (person-hrs)	38	37	36	35	33	30
Rank	33	32	30	28	31	36
Delay due to Incidents (percent)	59	59	58	58	59	58
Travel Time Index						
Rank	1.28	1.27	1.26	1.27	1.26	1.23
Rank	23	23	23	17	20	23
Congestion Cost						
Total Cost (\$ millions)	2,076	1,901	1,776	1,642	1,485	1,259
Rank	11	11	11	11	11	11
Cost per Peak Traveler (\$)	711	653	616	582	547	482
Rank	31	32	31	31	33	37

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Philadelphia, PA-NJ-DE-MD, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	4,950	4,875	4,800	4,725	4,670	4,640
Rank	4	4	4	4	4	4
Urban Area (square miles)	1,900	1,800	1,700	1,600	1,500	1,475
Popn Density (persons/sq mile)	2,605	2,708	2,824	2,953	3,113	3,146
Peak Travelers (1000s)	2,500	2,408	2,314	2,225	2,148	2,083
Freeway						
Daily Vehicle-Miles of Travel (1000s)	28,625	27,860	26,930	25,445	25,185	24,045
Lane Miles	2,065	2,060	2,050	2,050	2,050	2,045
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	38,500	37,105	36,515	35,755	35,560	36,300
Lane Miles	6,850	6,655	6,575	6,565	6,520	6,435
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,488	1,366	1,415	1,408	1,405	1,440
Annual Unlinked Psgr Trips (millions)	328	292	316	329	339	343
Cost Components						
Value of Time (\$/hour)	12.40	12.15	12.00	11.70	11.40	11.05
Commercial Cost (\$/hour)	65.80	64.35	63.40	61.95	60.20	58.50
Fuel Cost (\$/gallon)	1.11	1.06	1.19	1.26	1.19	1.04
System Performance						
Congested Travel (% of peak VMT)	55	53	51	46	44	44
Congested System (% of lane-miles)	46	46	45	45	44	44
Congested Time (number of "Rush Hours")	6.4	6.2	6.0	5.6	5.6	5.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	191	163	153	180	171	171
Transit Riders or Carpoolers (millions)	50	42	39	44	42	42
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	50,207	48,246	41,935	37,352	34,698	32,781
Rank	11	12	12	12	13	13
Fuel per Peak Traveler (gallons)	20	20	18	17	16	16
Rank	36	37	39	39	40	38
Annual Delay						
Total Delay (1000s of person-hours)	80,949	76,947	67,109	59,688	57,205	54,063
Rank	11	11	12	12	11	11
Delay per Peak Traveler (person-hrs)	32	32	29	27	27	26
Rank	34	34	38	38	37	34
Delay due to Incidents (percent)	58	58	57	57	57	56
Travel Time Index						
Rank	22	19	24	27	28	27
Congestion Cost						
Total Cost (\$ millions)	1,230	1,142	990	865	802	727
Rank	11	10	12	11	11	12
Cost per Peak Traveler (\$)	492	474	428	388	374	349
Rank	36	35	38	38	38	35

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Philadelphia, PA-NJ-DE-MD, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	4,625	4,610	4,590	4,580	4,565	4,550
Rank	4	4	4	4	4	4
Urban Area (square miles)	1,460	1,445	1,435	1,420	1,400	1,370
Popn Density (persons/sq mile)	3,168	3,190	3,199	3,225	3,261	3,321
Peak Travelers (1000s)	2,026	1,973	1,919	1,869	1,844	1,825
Freeway						
Daily Vehicle-Miles of Travel (1000s)	23,395	22,530	22,080	21,210	21,170	19,450
Lane Miles	2,040	1,905	1,835	1,730	1,700	1,630
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	35,825	35,580	33,105	33,845	33,440	34,105
Lane Miles	6,410	6,385	6,350	6,310	6,280	6,265
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,367	1,392	1,457	1,495	1,542	1,535
Annual Unlinked Psgr Trips (millions)	341	337	360	373	389	385
Cost Components						
Value of Time (\$/hour)	10.75	10.50	10.25	10.00	9.25	8.80
Commercial Cost (\$/hour)	57.05	55.40	53.80	51.60	48.95	46.70
Fuel Cost (\$/gallon)	1.09	1.14	1.16	1.30	1.06	0.98
System Performance						
Congested Travel (% of peak VMT)	43	42	41	43	43	43
Congested System (% of lane-miles)	44	43	43	39	39	39
Congested Time (number of "Rush Hours")	5.4	5.6	5.4	5.6	5.6	5.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	171	183	196	308	310	301
Transit Riders or Carpoolers (millions)	42	45	46	73	74	71
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	31,031	31,923	28,949	28,543	28,273	27,444
Rank	14	12	13	12	11	9
Fuel per Peak Traveler (gallons)	15	16	15	15	15	15
Rank	36	29	30	29	22	21
Annual Delay						
Total Delay (1000s of person-hours)	50,816	53,859	48,885	46,910	46,291	46,049
Rank	12	8	9	9	9	9
Delay per Peak Traveler (person-hrs)	25	27	25	25	25	25
Rank	34	27	25	27	21	19
Delay due to Incidents (percent)	56	56	56	55	55	54
Travel Time Index						
Rank	27	23	22	21	19	18
Congestion Cost						
Total Cost (\$ millions)	666	692	615	577	526	495
Rank	12	9	9	10	10	9
Cost per Peak Traveler (\$)	329	351	320	309	285	271
Rank	35	27	28	28	24	20

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Philadelphia, PA-NJ-DE-MD, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	4,500	4,480	4,470	4,465	4,460	4,450
Rank	4	4	4	4	4	4
Urban Area (square miles)	1,350	1,330	1,300	1,275	1,135	1,090
Popn Density (persons/sq mile)	3,333	3,368	3,438	3,502	3,930	4,083
Peak Travelers (1000s)	1,787	1,761	1,743	1,723	1,708	1,687
Freeway						
Daily Vehicle-Miles of Travel (1000s)	17,790	16,000	15,585	15,980	15,705	14,110
Lane Miles	1,575	1,560	1,550	1,540	1,520	1,465
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	34,295	33,030	30,015	29,145	28,715	28,425
Lane Miles	6,115	5,950	5,810	5,705	5,625	5,585
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,400	1,426	1,444	1,540	1,540	1,540
Annual Unlinked Psgr Trips (millions)	368	365	401	414	414	414
Cost Components						
Value of Time (\$/hour)	8.50	8.20	8.00	7.75	7.45	7.20
Commercial Cost (\$/hour)	44.85	43.30	42.50	41.05	39.35	38.10
Fuel Cost (\$/gallon)	0.98	0.96	1.25	1.27	1.30	1.35
System Performance						
Congested Travel (% of peak VMT)	42	39	35	34	34	32
Congested System (% of lane-miles)	38	38	38	38	38	38
Congested Time (number of "Rush Hours")	5.4	5.0	4.4	4.4	4.4	4.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	318	--	--	--	--	--
Transit Riders or Carpoolers (millions)	75	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	26,346	23,913	19,888	17,833	17,381	16,268
Rank	9	8	8	8	7	7
Fuel per Peak Traveler (gallons)	15	14	11	10	10	10
Rank	18	18	24	24	18	16
Annual Delay						
Total Delay (1000s of person-hours)	44,389	40,701	33,909	29,865	29,042	27,458
Rank	8	8	8	8	7	7
Delay per Peak Traveler (person-hrs)	25	23	19	17	17	16
Rank	16	15	20	22	17	14
Delay due to Incidents (percent)	54	55	54	54	55	55
Travel Time Index						
	1.16	1.15	1.13	1.12	1.12	1.12
Rank	13	12	13	16	13	10
Congestion Cost						
Total Cost (\$ millions)	462	409	338	289	271	249
Rank	8	8	8	8	7	7
Cost per Peak Traveler (\$)	259	232	194	168	159	148
Rank	17	15	20	23	17	16

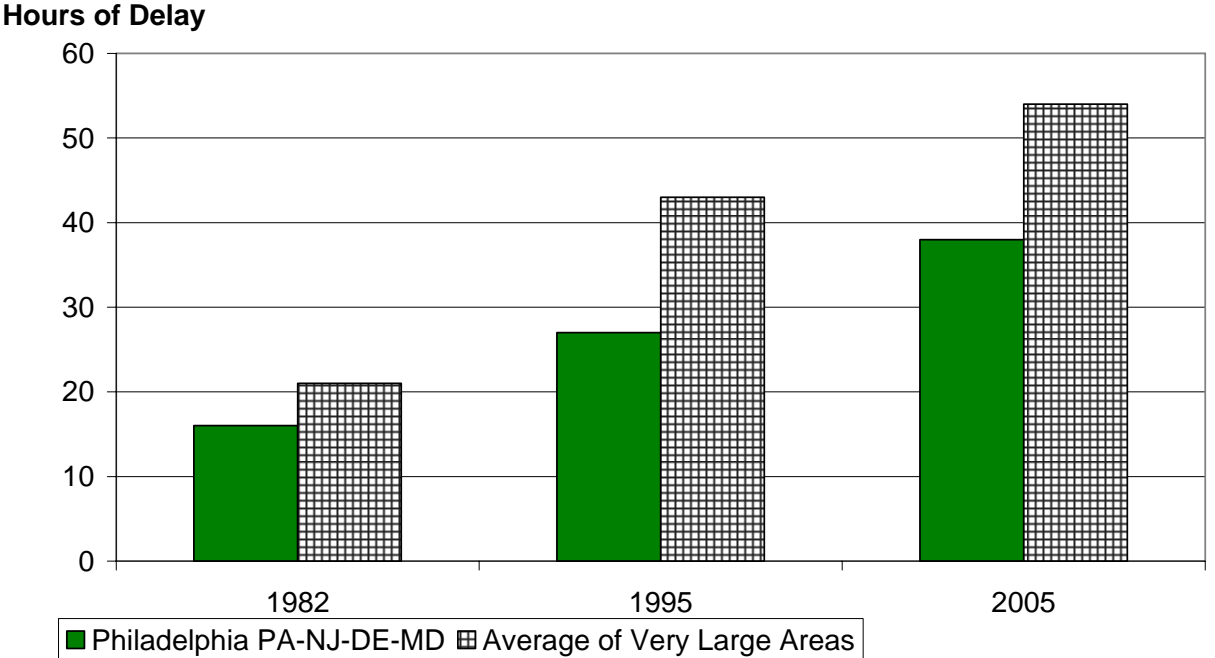
Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

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Benefits From Public Transportation Service and Operations Strategies for Philadelphia, PA-NJ-DE-MD

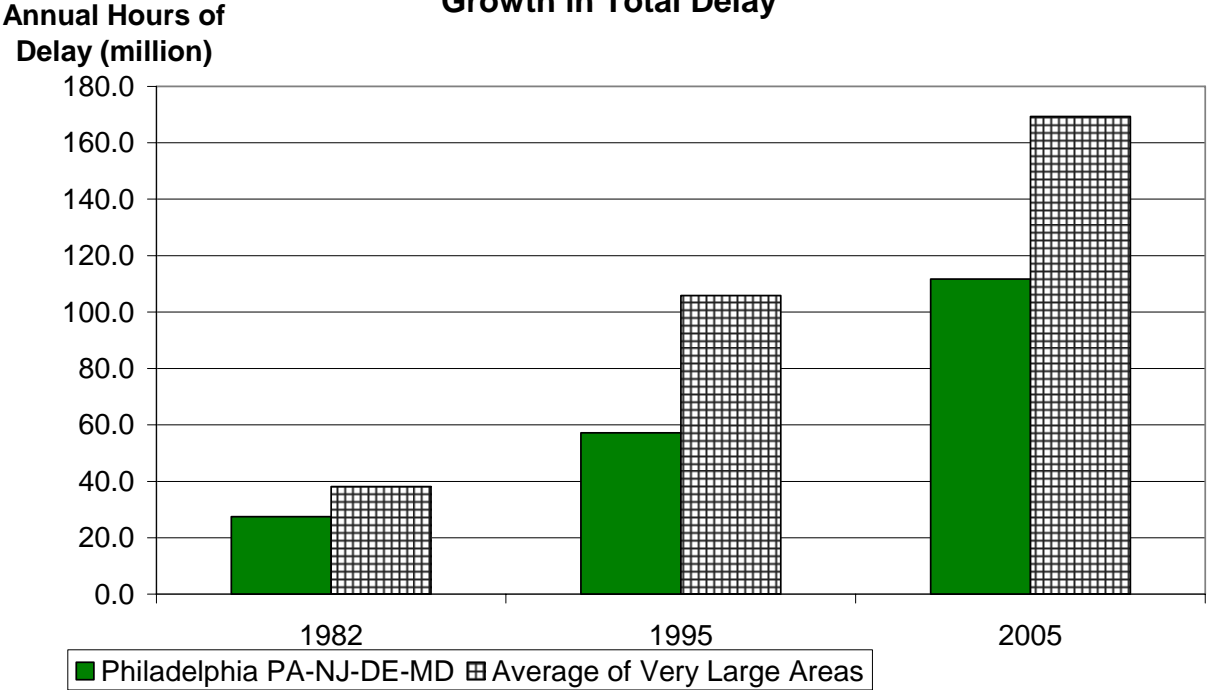
Operations Strategies	2005	2004	2003	2002	2001	2000
Freeway Ramp Metering						
Percent of Roadway Miles	4	4	4	4	4	4
Annual Delay Reduction (1000 hours)	150	126	168	168	101	72
Freeway Incident Management						
Cameras						
Percent of Roadway Miles	32	32	32	35	28	18
Service Patrols						
Percent of Roadway Miles	70	70	59	65	75	83
Annual Delay Reduction (1000 hours)	4,446	3,945	3,151	3,172	3,341	2,817
Arterial Signal Coordination						
Percent of Roadway Miles	40	39	37	32	31	28
Annual Delay Reduction (1000 hours)	446	413	418	420	326	309
Arterial Access Management						
Percent of Roadway Miles	15	16	16	13	11	7
Annual Delay Reduction (1000 hours)	1,351	1,334	1,395	1,104	1,131	826
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	6,393	5,817	5,131	4,864	4,899	4,023
Annual Delay Saved per Peak Traveler (hours)	2	2	2	2	2	2
Annual Congestion Cost Savings (\$million)	120.1	104.4	88.7	82.2	81.9	65.6
Travel Time Index with Strategies	1.278	1.270	1.264	1.268	1.257	1.231
Travel Time Index (Base)	1.291	1.283	1.275	1.279	1.269	1.241
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	1,631	1,589	1,507	1,460	1,480	1,540
Unlinked Passenger Trips (million)	353	351	338	331	337	337
Travel Time Index (combined road and transit)	1.256	1.249	1.244	1.247	1.237	1.212
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.323	1.314	1.305	1.312	1.312	1.287
Annual Delay Increase (1000 hours)	19,155	17,931	16,564	16,912	21,362	21,146
Annual Delay Increase per Peak Traveler (hours)	7	6	6	6	8	8
Annual Congestion Cost Increase (\$million)	359.7	321.6	286.7	285.2	356.0	341.4

Growth in Delay per Peak Traveler



Very Large areas have populations over 3 million

Growth in Total Delay



Very Large areas have populations over 3 million