

## 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 Large Group – 1 million to 3 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
San Diego, CA	H+	H+	H+	F+	F+
Minneapolis-St. Paul, MN	H	0	H+	F+	F+
Baltimore, MD	H	H	H+	F	F+
Tampa-St. Petersburg, FL	H+	H	H+	S	F+
St. Louis, MO-IL	L	L-	0	S	0
Denver-Aurora, CO	H+	H+	H+	F+	F+
Pittsburgh, PA	L-	L-	L-	S-	S-
Riverside-San Bernardino, CA	H+	H+	H+	F+	F+
Cleveland, OH	L-	L-	L-	S-	S-
Sacramento, CA	H	H+	H	0	F+
Portland, OR-WA	0	H	0	0	0
San Jose, CA	H+	H+	H+	F	F+
<b>Cincinnati, OH-KY-IN</b>	<b>L-</b>	<b>L</b>	<b>L</b>	<b>S</b>	<b>S-</b>
Virginia Beach, VA	L	L	L	S-	S-
Kansas City, MO-KS	L-	L-	L-	S-	S-
Milwaukee, WI	L-	L-	L-	S-	S-
Las Vegas, NV	0	H	L	F	0
Orlando, FL	H+	H	H	F+	F+
San Antonio, TX	0	0	L	F	S
Providence, RI-MA	L-	L-	L-	0	S-
Columbus, OH	L	L	L	F	S-
Buffalo, NY	L-	L-	L-	S-	S-
New Orleans, LA	L-	L-	L-	S-	S-
Indianapolis, IN	H	0	L	0	S-
Memphis, TN-MS-AR	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
<b>2005 Values</b> 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
<b>1982 to 2005 Trends</b> Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

### The Mobility Data for Cincinnati, OH-KY-IN

Inventory Measures	2005	2004	2003	2002	2001	2000
<b>Urban Area Information</b>						
Population (1000s)	1,620	1,610	1,605	1,570	1,540	1,500
Rank	27	27	27	26	25	25
Urban Area (square miles)	885	885	880	850	820	790
Popn Density (persons/sq mile)	1,831	1,819	1,824	1,847	1,878	1,899
Peak Travelers (1000s)	914	905	899	864	833	798
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	18,560	17,790	17,635	16,900	16,200	16,000
Lane Miles	1,200	1,185	1,160	1,100	1,080	1,030
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	12,030	12,270	12,200	11,200	11,000	10,700
Lane Miles	2,745	2,730	2,600	2,525	2,450	2,400
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	163	156	152	160	176	170
Annual Unlinked Psgr Trips (millions)	30	27	28	29	29	30
<b>Cost Components</b>						
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)	2.24	1.81	1.52	1.38	1.30	1.55
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	51	51	52	52	51	53
<b>Congested System</b> (% of lane-miles)	36	40	40	40	40	40
<b>Congested Time</b> (number of "Rush Hours")	6.8	6.4	6.6	6.6	6.4	6.8
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	109	122	129	99	124	137
Transit Riders or Carpoolers (millions)	29	32	36	27	33	37
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	17,447	17,341	17,717	16,547	15,842	16,125
Rank	28	28	27	29	28	28
Fuel per Peak Traveler (gallons)	19	19	20	19	19	20
Rank	42	42	41	42	41	34
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	24,378	24,411	25,080	23,563	22,511	22,885
Rank	29	30	29	30	30	29
Delay per Peak Traveler (person-hrs)	27	27	28	27	27	29
Rank	45	46	43	43	44	40
Delay due to Incidents (percent)	55	54	53	53	54	54
<b>Travel Time Index</b>						
Rank	39	39	36	34	34	34
<b>Congestion Cost</b>						
Total Cost (\$ millions)	459	436	432	396	370	370
Rank	30	30	28	29	30	28
Cost per Peak Traveler (\$)	502	482	481	458	444	463
Rank	45	46	43	43	44	40

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 Cincinnati, OH-KY-IN, Continued**

<b>Inventory Measures</b>	<b>1999</b>	<b>1998</b>	<b>1997</b>	<b>1996</b>	<b>1995</b>	<b>1994</b>
<b>Urban Area Information</b>						
Population (1000s)	1,470	1,425	1,390	1,350	1,300	1,255
Rank	26	26	26	26	28	28
Urban Area (square miles)	760	730	710	695	675	655
Popn Density (persons/sq mile)	1,934	1,952	1,958	1,942	1,926	1,916
Peak Travelers (1000s)	769	732	702	671	634	602
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	15,500	15,195	14,930	13,870	13,425	13,415
Lane Miles	1,000	975	960	945	945	945
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	10,300	10,000	9,640	9,020	8,510	7,990
Lane Miles	2,350	2,300	2,245	2,205	2,150	2,110
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	161	171	154	139	144	133
Annual Unlinked Psgr Trips (millions)	30	33	30	30	28	29
<b>Cost Components</b>						
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)	1.14	1.11	1.13	1.28	1.12	1.08
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	53	53	50	47	46	46
<b>Congested System</b> (% of lane-miles)	39	39	38	38	42	42
<b>Congested Time</b> (number of "Rush Hours")	6.8	6.8	6.8	6.2	5.8	5.8
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	127	154	183	160	151	171
Transit Riders or Carpoolers (millions)	34	41	49	40	37	42
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	15,150	15,232	14,621	12,308	11,411	11,097
Rank	28	28	27	28	28	27
Fuel per Peak Traveler (gallons)	20	21	21	18	18	18
Rank	38	35	32	35	34	31
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	21,610	21,657	21,017	17,679	16,316	16,015
Rank	29	28	27	29	29	27
Delay per Peak Traveler (person-hrs)	28	30	30	26	26	27
Rank	43	37	37	39	40	33
Delay due to Incidents (percent)	54	54	54	54	54	54
<b>Travel Time Index</b>						
Rank	38	33	30	36	32	32
<b>Congestion Cost</b>						
Total Cost (\$ millions)	331	324	311	257	229	218
Rank	29	28	28	29	29	27
Cost per Peak Traveler (\$)	430	443	443	383	361	361
Rank	42	38	37	40	39	34

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 Cincinnati, OH-KY-IN, Continued**

<b>Inventory Measures</b>	<b>1993</b>	<b>1992</b>	<b>1991</b>	<b>1990</b>	<b>1989</b>	<b>1988</b>
<b>Urban Area Information</b>						
Population (1000s)	1,250	1,220	1,200	1,140	1,140	1,130
Rank	28	28	28	30	29	29
Urban Area (square miles)	640	630	590	570	565	560
Popn Density (persons/sq mile)	1,953	1,937	2,034	2,000	2,018	2,018
Peak Travelers (1000s)	590	566	547	511	506	497
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	12,560	11,610	11,360	11,260	10,800	9,750
Lane Miles	935	910	890	870	860	840
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	7,485	7,015	6,525	6,025	5,490	5,010
Lane Miles	2,050	1,990	1,945	1,895	1,850	1,810
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	148	162	150	170	144	135
Annual Unlinked Psgr Trips (millions)	30	32	33	35	31	28
<b>Cost Components</b>						
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	1.11	1.13	1.06	1.08	1.00
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	43	40	38	37	32	26
<b>Congested System</b> (% of lane-miles)	42	42	38	37	32	30
<b>Congested Time</b> (number of "Rush Hours")	5.2	4.8	4.8	4.8	4.4	3.6
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	188	165	168	144	143	91
Transit Riders or Carpoolers (millions)	44	37	37	31	30	18
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	9,203	7,798	6,698	6,214	4,836	3,482
Rank	27	28	30	30	33	37
Fuel per Peak Traveler (gallons)	16	14	12	12	10	7
Rank	34	38	41	40	43	53
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	12,862	10,951	9,351	8,721	6,736	4,887
Rank	29	31	33	32	35	38
Delay per Peak Traveler (person-hrs)	22	19	17	17	13	10
Rank	41	42	45	45	50	61
Delay due to Incidents (percent)	54	53	53	53	53	53
<b>Travel Time Index</b>						
Rank	33	36	38	37	43	48
<b>Congestion Cost</b>						
Total Cost (\$ millions)	170	141	118	107	77	53
Rank	29	32	33	32	35	39
Cost per Peak Traveler (\$)	288	249	216	209	152	107
Rank	41	42	45	43	50	60

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 Cincinnati, OH-KY-IN, Continued**

<b>Inventory Measures</b>	<b>1987</b>	<b>1986</b>	<b>1985</b>	<b>1984</b>	<b>1983</b>	<b>1982</b>
<b>Urban Area Information</b>						
Population (1000s)	1,130	1,130	1,130	1,130	1,130	1,130
Rank	28	28	27	27	25	25
Urban Area (square miles)	560	560	560	560	560	560
Popn Density (persons/sq mile)	2,018	2,018	2,018	2,018	2,018	2,018
Peak Travelers (1000s)	493	488	484	479	475	471
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	9,415	8,775	8,840	8,255	8,310	7,460
Lane Miles	835	815	815	815	810	780
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	4,700	4,650	4,565	4,345	4,150	3,930
Lane Miles	1,755	1,700	1,650	1,600	1,550	1,500
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	151	143	126	22	22	22
Annual Unlinked Psgr Trips (millions)	33	33	33	7	7	7
<b>Cost Components</b>						
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)	1.00	0.98	1.28	1.29	1.32	1.38
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	23	19	19	18	18	15
<b>Congested System</b> (% of lane-miles)	30	25	25	25	25	23
<b>Congested Time</b> (number of "Rush Hours")	3.2	3.0	3.0	2.9	2.9	2.7
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	114	--	--	--	--	--
Transit Riders or Carpoolers (millions)	21	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	2,974	2,330	2,472	2,072	1,916	1,431
Rank	37	40	38	40	38	38
Fuel per Peak Traveler (gallons)	6	5	5	4	4	3
Rank	56	60	54	56	55	60
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	4,241	3,386	3,583	3,031	2,790	2,189
Rank	39	42	40	41	39	39
Delay per Peak Traveler (person-hrs)	9	7	7	6	6	5
Rank	60	65	59	61	60	64
Delay due to Incidents (percent)	53	52	52	52	52	52
<b>Travel Time Index</b>						
Rank	1.06	1.05	1.06	1.05	1.05	1.04
Rank	50	53	48	50	49	54
<b>Congestion Cost</b>						
Total Cost (\$ millions)	44	34	36	30	26	20
Rank	38	42	39	40	37	39
Cost per Peak Traveler (\$)	90	70	75	62	55	42
Rank	59	65	58	62	59	64

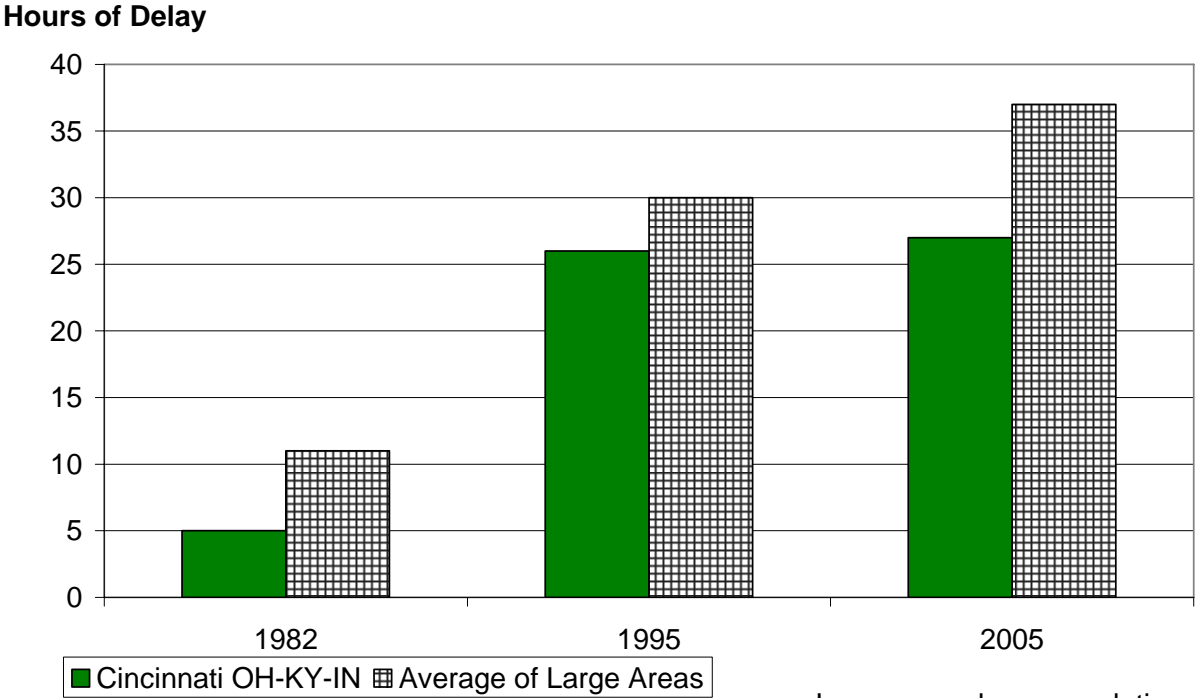
Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

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

## Benefits From Public Transportation Service and Operations Strategies for Cincinnati, OH-KY-IN

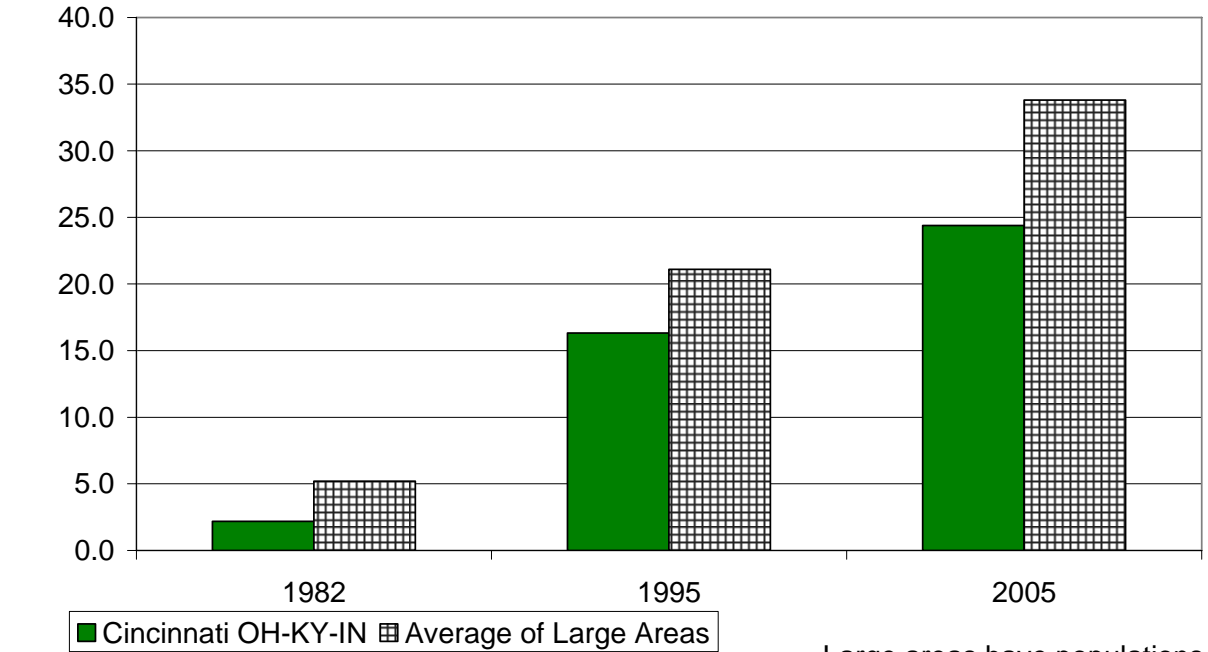
<b>Operations Strategies</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Freeway Ramp Metering</b>						
Percent of Roadway Miles	2	2	--	--	--	--
Annual Delay Reduction (1000 hours)	17	14	--	--	--	--
<b>Freeway Incident Management</b>						
<b>Cameras</b>						
Percent of Roadway Miles	50	51	46	49	50	52
<b>Service Patrols</b>						
Percent of Roadway Miles	44	44	45	48	49	51
Annual Delay Reduction (1000 hours)	593	541	541	533	538	554
<b>Arterial Signal Coordination</b>						
Percent of Roadway Miles	51	48	38	36	34	35
Annual Delay Reduction (1000 hours)	108	111	99	126	95	121
<b>Arterial Access Management</b>						
Percent of Roadway Miles	7	7	7	8	8	8
Annual Delay Reduction (1000 hours)	72	37	50	41	44	67
<b>HOV Lanes</b>						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
<b>Total Effect of Operations Treatments</b>						
Annual Delay Reduction (1000 hours)	790	702	689	700	677	741
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1	1	1
Annual Congestion Cost Savings (\$million)	15.0	12.8	12.1	11.9	11.3	12.1
Travel Time Index with Strategies	1.181	1.183	1.189	1.187	1.185	1.192
Travel Time Index (Base)	1.186	1.188	1.193	1.192	1.190	1.198
<b>Public Transportation Service</b>						
<b>Existing Service</b>						
Annual Passenger-miles of Travel (million)	163	156	152	160	176	170
Unlinked Passenger Trips (million)	30	27	28	29	29	30
Travel Time Index (combined road and transit)	1.178	1.180	1.185	1.183	1.180	1.187
<b>Condition if Public Transportation Service were Discontinued</b>						
Travel Time Index	1.197	1.198	1.203	1.205	1.204	1.212
Annual Delay Increase (1000 hours)	1,909	1,676	1,698	2,018	2,144	2,132
Annual Delay Increase per Peak Traveler (hours)	2	2	2	2	3	3
Annual Congestion Cost Increase (\$million)	36.2	30.3	29.6	34.2	35.6	34.8

### Growth in Delay per Peak Traveler



Large areas have populations between 1 and 3 million

### Growth in Total Delay



Large areas have populations between 1 and 3 million