

# Performance Measure Summary - Richmond VA

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2017. There is no single performance measure that experts agree "says it all". A few key points should be recognized by users of the Urban Mobility Scorecard data.

**Use the trends** - The multi-year performance measures are better indicators, in most cases, than any single year. 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. (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 atop several 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. It is calculated as the ratio of travel time in the peak period to travel time in free-flow. A value of 1.30 indicates that a 20-minute free-flow trip takes 26 minutes in the peak.

**Planning Time Index** - A travel time reliability measure that represents the total travel time that should be planned for a trip. Computed with the 95th percentile travel time it represents the amount of time that should be planned for a commute trip to be late for only 1 day a month. If it is computed with the 80th percentile travel time it represents the amount of time that should be planned for a trip to be late for only 1 day a week. A PTI of 2.00 means that for a 20-minute trip in light traffic, 40 minutes should be planned.

**Peak Commuters** - Number of travelers who begin a trip during the morning or evening peak travel periods (6 to 10 a.m. and 3 to 7 p.m.). "Commuters" are private vehicle users unless specifically noted.

**Annual Delay per Commuter** - A yearly sum of all the per-trip delays for those persons who travel in the peak period (6 to 10 a.m. and 3 to 7 p.m.). This measure illustrates the effect of traffic slowdowns as well as the length of each trip.

**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** - These values are derived from time periods with lighter traffic volumes in the INRIX speed database. They are used as the national comparison thresholds. Other speed thresholds may be appropriate for urban project evaluations or sub-region studies.

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

**Congestion Cost** - Value of travel delay for 2017 (estimated at \$18.29 per hour of person travel and \$59.94 per hour of truck time) and excess fuel consumption estimated using state average cost per gallon.

**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), so increases include both new growth and development that was previously in areas designated as rural.

**Number of Rush Hours** - Time when the road system might have congestion.

# Mobility Data for Richmond VA

Inventory Measures	2017	2016	2015	2014	2013	2012
<b>Urban Area Information</b>						
Population (1000s)	1,015	1,010	1,005	1,000	995	985
Rank	46	45	45	45	45	45
Commuters (1000s)	512	509	506	503	510	505
<b>Daily Vehicle-Miles of Travel (1000s)</b>						
Freeway	13,280	12,918	12,480	11,805	11,638	11,660
Arterial Streets	10,264	10,405	10,024	9,980	9,578	9,875
<b>Cost Components</b>						
Value of Time (\$/hour)	18.12	17.91	17.69	17.67	17.39	17.14
Commercial Cost (\$/hour)	52.14	50.20	46.87	44.82	41.23	39.66
Gasoline (\$/gallon)	2.15	2.01	2.09	3.09	3.37	3.39
Diesel (\$/gallon)	2.39	2.16	2.43	3.48	3.77	3.78
System Performance	2017	2016	2015	2014	2013	2012
<b>Congested Travel (% of peak VMT)</b>	11.0	--	--	--	--	--
<b>Congested System (% of lane-miles)</b>	7.3	--	--	--	--	--
<b>Congested Time (number of "Rush Hours")</b>	0.8	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	8,496	8,373	8,317	8,207	8,154	7,935
Rank	60	60	60	60	60	60
Fuel per Peak Auto Commuter (gallons)	17	16	15	15	14	14
Rank	68	76	83	81	85	82
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	24,461	23,678	23,120	22,416	21,878	21,100
Rank	55	55	55	55	55	55
Delay per Auto Commuter (pers-hrs)	35	33	31	29	28	28
Rank	90	91	91	92	92	90
<b>Travel Time Index</b>						
Rank	1.12	1.12	1.12	1.13	1.13	1.12
Rank	93	93	92	86	87	91
<b>Commuter Stress Index</b>						
Rank	1.13	--	--	--	--	--
Rank	92	--	--	--	--	--
<b>Freeway Planning Time Index (95th Pctile)</b>						
Rank	1.20	--	--	--	--	--
Rank	92	--	--	--	--	--
<b>Congestion Cost</b>						
Total Cost (\$ millions)	490	467	450	442	426	405
Rank	55	55	55	55	55	55
Cost per Auto Commuter (\$)	641	625	605	584	575	563
Rank	88	89	89	89	88	89
<b>Truck Congestion</b>						
Annual Person-Hours of Delay (000)	1,027	994	971	941	919	886
Rank	55	55	55	55	55	55
Annual Gallons of Wasted Fuel (000)	1,801	1,775	1,763	1,740	1,729	1,682
Rank	60	60	60	60	60	60
Annual Congestion Cost (\$ million)	51	48	44	43	40	37
Rank	55	55	55	56	55	56

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

# Mobility Data for Richmond VA

Inventory Measures	2011	2010	2009	2008	2007	2006
<b>Urban Area Information</b>						
Population (1000s)	975	970	955	945	935	925
Rank	46	46	46	46	46	46
Commuters (1000s)	499	494	485	478	471	463
<b>Daily Vehicle-Miles of Travel (1000s)</b>						
Freeway	11,843	11,758	11,600	11,560	11,960	11,860
Arterial Streets	9,982	9,910	9,939	10,080	9,925	10,030
<b>Cost Components</b>						
Value of Time (\$/hour)	16.79	16.28	16.01	16.07	15.47	15.06
Commercial Cost (\$/hour)	44.62	42.50	41.83	40.77	39.30	37.88
Gasoline (\$/gallon)	3.29	2.63	2.18	3.35	2.88	2.57
Diesel (\$/gallon)	3.60	2.88	2.50	4.08	3.27	2.74
System Performance	2011	2010	2009	2008	2007	2006
<b>Congested Travel (% of peak VMT)</b>	--	--	--	--	--	--
<b>Congested System (% of lane-miles)</b>	--	--	--	--	--	--
<b>Congested Time (number of "Rush Hours")</b>	--	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	7,843	7,816	7,608	7,814	7,423	7,157
Rank	60	60	59	58	61	61
Fuel per Peak Auto Commuter (gallons)	13	13	13	14	13	13
Rank	84	84	80	80	85	81
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	20,474	20,216	19,309	18,889	17,942	17,301
Rank	55	54	55	55	56	56
Delay per Auto Commuter (pers-hrs)	28	28	27	27	27	26
Rank	88	88	88	86	88	90
<b>Travel Time Index</b>						
Rank	1.12	1.12	1.12	1.13	1.12	1.12
Rank	91	89	89	86	90	88
<b>Commuter Stress Index</b>						
Rank	--	--	--	--	--	--
Rank	--	--	--	--	--	--
<b>Freeway Planning Time Index (95th Pctile)</b>						
Rank	--	--	--	--	--	--
Rank	--	--	--	--	--	--
<b>Congestion Cost</b>						
Total Cost (\$ millions)	389	368	343	347	314	292
Rank	55	54	56	56	56	57
Cost per Auto Commuter (\$)	563	575	558	541	534	529
Rank	86	84	84	85	88	89
<b>Truck Congestion</b>						
Annual Person-Hours of Delay (000)	860	849	811	793	754	727
Rank	55	54	55	55	56	56
Annual Gallons of Wasted Fuel (000)	1,663	1,657	1,613	1,657	1,574	1,517
Rank	60	60	59	58	61	61
Annual Congestion Cost (\$ million)	40	36	34	35	31	28
Rank	55	55	56	56	57	58

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

# Mobility Data for Richmond VA

Inventory Measures	2005	2004	2003	2002	2001	2000
<b>Urban Area Information</b>						
Population (1000s)	920	920	915	870	830	790
Rank	47	47	46	48	48	50
Commuters (1000s)	457	455	450	423	398	374
<b>Daily Vehicle-Miles of Travel (1000s)</b>						
Freeway	11,680	11,510	10,830	9,965	9,425	9,290
Arterial Streets	9,760	9,730	9,895	9,350	8,840	8,335
<b>Cost Components</b>						
Value of Time (\$/hour)	14.58	14.10	13.73	13.43	13.22	12.85
Commercial Cost (\$/hour)	36.51	35.19	33.92	32.69	31.51	30.38
Gasoline (\$/gallon)	2.24	1.85	1.46	1.32	1.47	1.49
Diesel (\$/gallon)	2.41	1.89	1.49	1.31	1.46	1.45
System Performance	2005	2004	2003	2002	2001	2000
<b>Congested Travel (% of peak VMT)</b>	--	--	--	--	--	--
<b>Congested System (% of lane-miles)</b>	--	--	--	--	--	--
<b>Congested Time (number of "Rush Hours")</b>	--	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	6,700	6,355	5,764	5,043	4,651	4,243
Rank	61	65	70	72	72	73
Fuel per Peak Auto Commuter (gallons)	13	12	11	10	9	7
Rank	81	83	86	87	89	91
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	16,196	15,360	13,934	12,190	11,242	10,256
Rank	57	57	59	61	67	68
Delay per Auto Commuter (pers-hrs)	26	25	25	24	24	23
Rank	88	88	89	90	90	89
<b>Travel Time Index</b>						
Rank	1.11	1.11	1.10	1.09	1.09	1.09
Rank	92	91	91	96	94	92
<b>Commuter Stress Index</b>						
Rank	--	--	--	--	--	--
Rank	--	--	--	--	--	--
<b>Freeway Planning Time Index (95th Pctile)</b>						
Rank	--	--	--	--	--	--
Rank	--	--	--	--	--	--
<b>Congestion Cost</b>						
Total Cost (\$ millions)	263	239	209	178	162	144
Rank	57	57	60	61	67	68
Cost per Auto Commuter (\$)	512	502	466	419	391	365
Rank	89	90	90	91	90	92
<b>Truck Congestion</b>						
Annual Person-Hours of Delay (000)	680	645	585	512	472	431
Rank	57	57	59	61	67	68
Annual Gallons of Wasted Fuel (000)	1,420	1,347	1,222	1,069	986	900
Rank	61	65	70	72	72	73
Annual Congestion Cost (\$ million)	25	22	19	16	14	13
Rank	58	58	60	61	67	67

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

# Mobility Data for Richmond VA

Inventory Measures	1999	1998	1997	1996	1995	1994
<b>Urban Area Information</b>						
Population (1000s)	755	740	730	720	715	705
Rank	50	49	48	48	48	48
Commuters (1000s)	353	342	333	324	318	310
<b>Daily Vehicle-Miles of Travel (1000s)</b>						
Freeway	8,960	9,175	9,270	9,315	9,020	8,315
Arterial Streets	8,025	7,540	7,030	6,715	6,320	6,015
<b>Cost Components</b>						
Value of Time (\$/hour)	12.43	12.17	11.98	11.71	11.37	11.06
Commercial Cost (\$/hour)	29.28	28.89	28.50	28.12	27.75	27.38
Gasoline (\$/gallon)	1.05	1.02	1.13	1.21	1.15	1.03
Diesel (\$/gallon)	1.06	1.09	1.18	1.29	1.22	1.09
System Performance	1999	1998	1997	1996	1995	1994
<b>Congested Travel (% of peak VMT)</b>	--	--	--	--	--	--
<b>Congested System (% of lane-miles)</b>	--	--	--	--	--	--
<b>Congested Time (number of "Rush Hours")</b>	--	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	3,966	3,843	3,745	3,718	3,707	3,490
Rank	73	73	73	70	68	67
Fuel per Peak Auto Commuter (gallons)	7	7	6	6	6	7
Rank	90	87	88	85	85	73
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	9,587	9,289	9,053	8,987	8,960	8,435
Rank	68	67	64	63	61	61
Delay per Auto Commuter (pers-hrs)	23	23	23	23	23	22
Rank	87	83	77	74	73	72
<b>Travel Time Index</b>						
Rank	87	84	88	79	77	80
<b>Commuter Stress Index</b>						
Rank	--	--	--	--	--	--
<b>Freeway Planning Time Index (95th Pctile)</b>						
Rank	--	--	--	--	--	--
<b>Congestion Cost</b>						
Total Cost (\$ millions)	129	122	118	115	111	102
Rank	68	68	64	63	61	60
Cost per Auto Commuter (\$)	354	352	348	354	362	351
Rank	92	90	88	83	81	80
<b>Truck Congestion</b>						
Annual Person-Hours of Delay (000)	403	390	380	377	376	354
Rank	68	67	64	63	61	61
Annual Gallons of Wasted Fuel (000)	841	815	794	788	786	740
Rank	73	73	73	70	68	67
Annual Congestion Cost (\$ million)	11	11	10	10	10	9
Rank	68	66	66	63	61	60

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

# Mobility Data for Richmond VA

Inventory Measures	1993	1992	1991	1990	1989	1988
<b>Urban Area Information</b>						
Population (1000s)	700	690	685	680	665	650
Rank	48	48	48	47	46	47
Commuters (1000s)	304	295	290	284	275	267
<b>Daily Vehicle-Miles of Travel (1000s)</b>						
Freeway	7,500	7,100	6,700	6,300	5,800	5,025
Arterial Streets	5,610	5,300	5,000	4,985	4,905	4,790
<b>Cost Components</b>						
Value of Time (\$/hour)	10.78	10.47	10.17	9.75	9.25	8.83
Commercial Cost (\$/hour)	27.02	26.66	26.30	25.95	25.60	25.26
Gasoline (\$/gallon)	1.07	1.08	1.08	1.06	1.10	1.02
Diesel (\$/gallon)	1.13	1.17	1.21	1.08	1.02	0.94
System Performance	1993	1992	1991	1990	1989	1988
<b>Congested Travel (% of peak VMT)</b>	--	--	--	--	--	--
<b>Congested System (% of lane-miles)</b>	--	--	--	--	--	--
<b>Congested Time (number of "Rush Hours")</b>	--	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	3,066	2,887	2,662	2,304	2,034	1,801
Rank	69	66	66	68	68	69
Fuel per Peak Auto Commuter (gallons)	5	5	6	5	3	3
Rank	82	82	67	72	85	81
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	7,410	6,978	6,435	5,569	4,916	4,354
Rank	61	60	60	63	63	64
Delay per Auto Commuter (pers-hrs)	20	19	18	16	14	13
Rank	74	74	72	81	80	80
<b>Travel Time Index</b>						
Rank	83	82	81	86	87	84
<b>Commuter Stress Index</b>						
Rank	--	--	--	--	--	--
<b>Freeway Planning Time Index (95th Pctile)</b>						
Rank	--	--	--	--	--	--
<b>Congestion Cost</b>						
Total Cost (\$ millions)	87	80	72	60	50	43
Rank	61	60	60	63	63	64
Cost per Auto Commuter (\$)	316	309	291	267	245	228
Rank	82	82	82	84	85	85
<b>Truck Congestion</b>						
Annual Person-Hours of Delay (000)	311	293	270	234	206	183
Rank	61	60	60	63	63	64
Annual Gallons of Wasted Fuel (000)	650	612	564	488	431	382
Rank	69	66	66	68	68	69
Annual Congestion Cost (\$ million)	8	8	7	6	5	4
Rank	61	58	58	59	60	64

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

# Mobility Data for Richmond VA

Inventory Measures	1987	1986	1985	1984	1983	1982
<b>Urban Area Information</b>						
Population (1000s)	635	630	620	615	610	600
Rank	46	46	46	46	47	47
Commuters (1000s)	259	255	249	245	241	234
<b>Daily Vehicle-Miles of Travel (1000s)</b>						
Freeway	4,645	4,415	3,520	3,365	3,215	3,000
Arterial Streets	4,720	4,520	4,120	3,900	3,810	3,760
<b>Cost Components</b>						
Value of Time (\$/hour)	8.48	8.18	8.03	7.75	7.43	7.20
Commercial Cost (\$/hour)	24.93	24.60	24.27	23.94	23.63	23.31
Gasoline (\$/gallon)	1.02	0.99	1.30	1.31	1.34	1.41
Diesel (\$/gallon)	0.94	0.92	1.20	1.22	1.24	1.30
System Performance	1987	1986	1985	1984	1983	1982
<b>Congested Travel (% of peak VMT)</b>	--	--	--	--	--	--
<b>Congested System (% of lane-miles)</b>	--	--	--	--	--	--
<b>Congested Time (number of "Rush Hours")</b>	--	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	1,665	1,551	1,465	1,331	1,203	1,078
Rank	70	69	68	68	66	67
Fuel per Peak Auto Commuter (gallons)	3	3	3	2	2	2
Rank	80	74	66	79	69	55
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	4,026	3,750	3,542	3,218	2,908	2,607
Rank	66	64	64	63	63	64
Delay per Auto Commuter (pers-hrs)	12	12	11	10	10	9
Rank	79	74	72	70	64	65
<b>Travel Time Index</b>						
Rank	79	85	81	75	68	76
<b>Commuter Stress Index</b>						
Rank	--	--	--	--	--	--
<b>Freeway Planning Time Index (95th Pctile)</b>						
Rank	--	--	--	--	--	--
<b>Congestion Cost</b>						
Total Cost (\$ millions)	38	34	32	28	25	22
Rank	65	64	64	63	62	64
Cost per Auto Commuter (\$)	224	215	207	191	186	175
Rank	84	81	81	81	78	80
<b>Truck Congestion</b>						
Annual Person-Hours of Delay (000)	169	157	149	135	122	109
Rank	66	64	64	63	63	64
Annual Gallons of Wasted Fuel (000)	353	329	311	282	255	229
Rank	70	69	68	68	66	66
Annual Congestion Cost (\$ million)	4	4	4	3	3	3
Rank	63	58	55	61	55	52

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