### **Performance Measure Summary - Houston TX**

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2020. 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 2020 (estimated at \$20.17 per hour of person travel and \$55.24 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.

Annual Greenhouse Gases (CO2) Produced -Tons of CO2 produced from all vehicle travel.

Excess Greenhouse Gases (CO2) Produced due to Congestion-Tons of CO2 produced due to congested portion of travel. The excess CO2 is a subset of the total CO2 produced.

Inventory Measures	2020	2019	2018	2017	2016	2015
Urban Area Information						
Population (1000s)	5,425	5,425	5,300	5,180	5,120	5,060
Rank	7	7	7	7	7	7
Commuters (1000s)	2,616	2,616	2,556	2,498	2,467	2,437
Daily Vehicle-Miles of Travel (1000s)						
Freeway	53,242	61,837	60,766	59,793	62,507	59,378
Arterial Streets	44,249	51,392	50,359	48,044	47,127	42,565
Cost Components						
Value of Time (\$/hour)	20.17	19.14	18.71	18.12	17.91	17.69
Commercial Cost (\$/hour)	55.24	49.49	54.71	52.14	50.20	46.87
Gasoline (\$/gallon)	2.05	2.37	2.63	2.17	1.97	2.11
Diesel (\$/gallon)	2.51	2.73	2.99	2.31	2.10	2.36
System Performance	2020	2019	2018	2017	2016	2015
Congested Travel (% of peak VMT)				38.4		
Congested System (% of lane-miles)				24.6		
Congested Time (number of "Rush Hours")				5.1		
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	68,295	105,899	100,084	95,940	95,528	94,823
Rank	4	6	6	6	6	6
Fuel per Peak Auto Commuter (gallons)	21	33	32	31	30	30
Rank	2	7	7	7	9	7
Annual Delay						
Total Delay (1000s of person-hours)	169,765	263,239	255,304	247,440	242,869	236,989
Rank	4	5	5	7	6	6
Delay per Auto Commuter (pers-hrs)	49	76	76	75	73	72
Rank	3	9	9	9	9	8
Travel Time Index	1.15	1.34	1.34	1.34	1.34	1.33
Rank	4	10	10	11	11	11
Commuter Stress Index	1.16	1.44	1.42	1.39		
Rank	6	10	11	12		
Freeway Planning Time Index (95th Pctile)		1.84	1.83	1.92		
Rank		24	23	19		
Congestion Cost						
Total Cost (\$ millions)	3,795	5,656	5,543	5,255	5,071	4,884
Rank	1,007	1 (25	1 (40	7	7	1.525
Cost per Auto Commuter (\$)  Rank	1,097	1,635	1,640	1,591 10	1,572	1,525
	J	9	9	10	10	10
Truck Congestion  Annual Person-Hours of Delay (000)	7.050	12,015	11 402	10.202	10.200	9,954
Rank	7,950	12,013	11,403	10,392	10,200	9,934
Annual Gallons of Wasted Fuel (000)	14,010	21,173	20,876	20,339	20,252	20,102
Rank	14,010	5	20,870	20,339	4	20,102
Annual Congestion Cost (\$ million)	420	586	628	551	519	482
Rank	4	5 5	5	6	6	6
Annual Greenhouse Gases (CO2) Produced	·		-	<u> </u>	-	
Excess Due to Congestion (tons)	681,232	1,056,323				
Rank	4	6				
	16,082,796	24,938,081				
Due to All Travel (tons)	1 / / / /					
Due to All Travel (tons) Rank	4	6				
Rank	4	0				
Rank Truck Annual Greenhouse Gases (CO2) Produced	193,607	-				
Rank		292,600		 		
Rank  Truck Annual Greenhouse Gases (CO2) Produced  Excess Due to Truck Congestion (tons)	193,607	292,600		  		  

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	2014	2013	2012	2011	2010	2009
Urban Area Information						
Population (1000s)	5,000	4,950	4,900	4,830	4,750	4,700
Rank	7	7	7	7	7	7
Commuters (1000s)	2,408	2,384	2,404	2,370	2,373	2,348
Daily Vehicle-Miles of Travel (1000s)						
Freeway	53,673	51,518	53,620	54,700	54,300	54,290
Arterial Streets	39,211	38,480	40,705	40,768	39,587	39,195
Cost Components						
Value of Time (\$/hour)	17.67	17.39	17.14	16.79	16.28	16.01
Commercial Cost (\$/hour)	44.82	41.23	39.66	44.62	42.50	41.83
Gasoline (\$/gallon)	3.12	3.37	3.33	3.29	2.56	2.13
Diesel (\$/gallon)	3.47	3.76	3.75	3.56	2.83	2.43
System Performance	2014	2013	2012	2011	2010	2009
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	94,299	92,053	87,701	80,314	76,689	76,047
Rank	6	6	6	8	8	8
Fuel per Peak Auto Commuter (gallons)	30	29	29	25	23	23
Rank	5	6	5	12	14	10
Annual Delay						
Total Delay (1000s of person-hours)	231,617	222,132	209,742	188,614	176,796	172,039
Rank	6	7	7	8	8	8
Delay per Auto Commuter (pers-hrs)	70	68	64	59	55	54
Rank	8	8	8	10	11	11
Travel Time Index	1.33	1.33	1.31	1.29	1.28	1.28
Rank	11	9	13	15	16	15
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	4,857	4,595	4,272	3,811	3,412	3,239
Rank	6	7	7	8	8	8
Cost per Auto Commuter (\$)	1,482	1,435	1,372	1,272	1,231	1,219
Rank	10	10	11	11	13	12
Truck Congestion						
Annual Person-Hours of Delay (000)	9,728	9,330	8,809	7,922	7,425	7,226
Rank	6	7	8	8	8	8
Annual Gallons of Wasted Fuel (000)	19,991	19,515	18,593	17,027	16,258	16,122
Rank	4	4	5	5	5	5
Annual Congestion Cost (\$ million)	477	433	397	391	341	321
Rank	6	6	6	8	8	8
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Excess Due to Truck Congestion (tons)						
Rank						
Due to Truck Travel (tons)						
Rank					l l	

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	2008	2007	2006	2005	2004	2003
Urban Area Information						
Population (1000s)	4,590	4,475	4,400	4,325	4,240	4,165
Rank	7	7	7	7	8	8
Commuters (1000s)	2,313	2,275	2,237	2,218	2,182	2,133
Daily Vehicle-Miles of Travel (1000s)						
Freeway	54,020	55,000	53,500	52,600	51,000	49,800
Arterial Streets	39,000	41,500	41,000	39,355	39,330	39,540
Cost Components						
Value of Time (\$/hour)	16.07	15.47	15.06	14.58	14.10	13.73
Commercial Cost (\$/hour)	40.77	39.30	37.88	36.51	35.19	33.92
Gasoline (\$/gallon)	3.36	2.92	2.55	2.23	1.83	1.45
Diesel (\$/gallon)	4.07	3.30	2.73	2.40	1.85	1.43
System Performance	2008	2007	2006	2005	2004	2003
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	76,060	75,323	74,594	71,388	67,121	65,066
Rank	8	9	9	8	10	10
Fuel per Peak Auto Commuter (gallons)	23	23	24	23	21	21
Rank	13	13	10	13	14	13
Annual Delay						
Total Delay (1000s of person-hours)	163,876	162,288	160,717	153,810	144,616	140,189
Rank	9	9	9	9	10	10
Delay per Auto Commuter (pers-hrs)	52	53	53	52	49	49
Rank	13	12	12	12	14	13
Travel Time Index	1.28	1.29	1.29	1.28	1.27	1.27
Rank	16	14	13	14	17	14
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	3,202	3,023	2,886	2,655	2,388	2,229
Rank	9	9	9	9	10	10
Cost per Auto Commuter (\$)	1,150	1,184	1,204	1,192	1,159	1,153
Rank	13	16	16	16	15	14
Truck Congestion						
Annual Person-Hours of Delay (000)	6,883	6,816	6,750	6,460	6,074	5,888
Rank	9	9	9	9	10	10
Annual Gallons of Wasted Fuel (000)	16,125	15,969	15,814	15,134	14,230	13,794
Rank	6	7	7	7	8	8
Annual Congestion Cost (\$ million)	329	303	282	257	226	206
Rank	9	9	9	9	10	10
Annual Greenhouse Gases (CO2) Produced					1	
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Excess Due to Truck Congestion (tons)						
Rank						
Due to Truck Travel (tons) Rank						

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	2002	2001	2000	1999	1998	1997
Urban Area Information						
Population (1000s)	4,100	3,970	3,800	3,685	3,515	3,385
Rank	8	9	10	11	11	11
Commuters (1000s)	2,085	2,008	1,912	1,841	1,746	1,673
Daily Vehicle-Miles of Travel (1000s)						
Freeway	48,900	47,000	45,000	43,200	42,000	40,500
Arterial Streets	39,980	39,210	37,085	35,770	33,665	31,965
Cost Components						
Value of Time (\$/hour)	13.43	13.22	12.85	12.43	12.17	11.98
Commercial Cost (\$/hour)	32.69	31.51	30.38	29.28	28.89	28.50
Gasoline (\$/gallon)	1.32	1.46	1.47	1.07	1.01	1.12
Diesel (\$/gallon)	1.29	1.48	1.42	1.07	1.10	1.19
System Performance	2002	2001	2000	1999	1998	1997
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	61,135	57,333	51,616	48,815	46,100	44,101
Rank	11	11	12	12	12	11
Fuel per Peak Auto Commuter (gallons)	19	19	17	16	15	14
Rank	18	13	24	27	25	26
Annual Delay						
Total Delay (1000s of person-hours)	131,719	123,527	111,210	105,174	99,325	95,017
Rank	12	11	12	11	11	11
Delay per Auto Commuter (pers-hrs)	47	46	43	42	42	42
Rank	15	15	19	17	15	14
Travel Time Index	1.25	1.25	1.23	1.23	1.23	1.23
Rank	17	17	22	21	18	13
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	2,040	1,890	1,655	1,496	1,383	1,308
Rank	12	11	12	11	11	11
Cost per Auto Commuter (\$)	1,108	1,052	974	953	920	893
Rank	14	17	19	19	19	19
Truck Congestion	5 530	£ 100	4 671	4 417	4 170	2.001
Annual Person-Hours of Delay (000)	5,532	5,188	4,671	4,417	4,172	3,991
Rank Annual Gallons of Wasted Fuel (000)	10 12,961	10 12 155	11 10,943	11 10,349	9,773	9,349
Rank	12,961	12,155 8	10,943	10,349	9,7/3	9,349
Annual Congestion Cost (\$ million)	185	8 170	148	131	10	117
Rank	10	10	148	11	123	117
Annual Greenhouse Gases (CO2) Produced	10	10	11	11	11	11
Excess Due to Congestion (tons)				1		
Rank				<u></u>		
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Excess Due to Truck Congestion (tons)						_
Rank		<u></u>		<u></u>		
Due to Truck Travel (tons)						
Rank						
TAMILL					-2	

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	1996	1995	1994	1993	1992	1991
Urban Area Information						
Population (1000s)	3,275	3,150	3,045	2,930	2,850	2,775
Rank	12	12	12	12	12	12
Commuters (1000s)	1,610	1,540	1,478	1,414	1,368	1,324
Daily Vehicle-Miles of Travel (1000s)						
Freeway	39,000	37,500	35,900	34,000	32,800	31,600
Arterial Streets	28,345	26,785	25,805	25,260	23,565	23,675
Cost Components						
Value of Time (\$/hour)	11.71	11.37	11.06	10.78	10.47	10.17
Commercial Cost (\$/hour)	28.12	27.75	27.38	27.02	26.66	26.30
Gasoline (\$/gallon)	1.21	1.14	1.03	1.10	1.09	1.12
Diesel (\$/gallon)	1.29	1.21	1.09	1.17	1.17	1.20
System Performance	1996	1995	1994	1993	1992	1991
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	41,778	39,786	37,432	35,792	34,557	33,873
Rank	11	11	11	11	11	11
Fuel per Peak Auto Commuter (gallons)	14	13	12	11	10	10
Rank	18	19	21	22	24	19
Annual Delay						
Total Delay (1000s of person-hours)	90,012	85,720	80,649	77,116	74,455	72,981
Rank	11	11	11	11	11	10
Delay per Auto Commuter (pers-hrs)	41	41	40	40	40	40
Rank	12	12	12	12	11	11
Travel Time Index	1.22	1.22	1.22	1.22	1.22	1.22
Rank	15	13	10	6	6	6
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost			4 000	0.60		0.6
Total Cost (\$ millions)	1,218	1,126	1,028	963	905	865
Rank	11	11	11	11	11	10
Cost per Auto Commuter (\$)  Rank	866 19	850 20	825 19	809 19	805 18	813 16
	19	20	19	19	18	10
Truck Congestion	2 701	2 (00	2 207	2 220	2 127	2.065
Annual Person-Hours of Delay (000)	3,781	3,600	3,387	3,239	3,127	3,065
Rank Annual Gallons of Wasted Fuel (000)	8,857	8,435	7,936	7,588	7,326	11 7,181
Rank	10	8,433	10	7,388	8	7,181
Annual Congestion Cost (\$ million)	110	103	95	90	86	84
Rank	110	103	11	11	11	10
Annual Greenhouse Gases (CO2) Produced	11	10	11	11	11	10
Excess Due to Congestion (tons)						
Rank				<u></u>		 
Due to All Travel (tons)	 					
Rank						
Truck Annual Greenhouse Gases (CO2) Produced		-	1			
Excess Due to Truck Congestion (tons)						
Rank	 					
Due to Truck Travel (tons)	 					
Rank	 			 		
ALWANA		-	-	-	-	

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	1990	1989	1988	1987	1986	1985
Urban Area Information						
Population (1000s)	2,700	2,650	2,600	2,550	2,525	2,475
Rank	12	12	12	12	12	12
Commuters (1000s)	1,281	1,248	1,213	1,181	1,160	1,128
Daily Vehicle-Miles of Travel (1000s)						
Freeway	30,000	28,310	27,280	25,635	24,680	23,135
Arterial Streets	22,480	22,255	21,535	20,285	20,370	20,690
Cost Components						
Value of Time (\$/hour)	9.75	9.25	8.83	8.48	8.18	8.03
Commercial Cost (\$/hour)	25.95	25.60	25.26	24.93	24.60	24.27
Gasoline (\$/gallon)	1.04	1.07	0.99	0.99	0.97	1.27
Diesel (\$/gallon)	1.07	1.05	0.97	0.97	0.95	1.24
System Performance	1990	1989	1988	1987	1986	1985
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	32,558	31,834	31,096	31,482	32,577	33,355
Rank	11	10	10	10	6	6
Fuel per Peak Auto Commuter (gallons)	10	10	9	10	10	10
Rank	14	11	13	10	9	8
Annual Delay						
Total Delay (1000s of person-hours)	70,147	68,588	66,999	67,829	70,188	71,865
Rank	10	10	10	9	6	6
Delay per Auto Commuter (pers-hrs)	40	40	40	41	43	46
Rank	9	8	7	4	4	3
Travel Time Index	1.22	1.22	1.22	1.22	1.24	1.25
Rank	5	4	4	4	3	3
Commuter Stress Index				· 		
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	798	745	696	680	680	695
Rank	10	10	10	9	6	6
Cost per Auto Commuter (\$)	819	845	868	918	985	1,027
Rank	16	13	12	9	9	8
Truck Congestion						
Annual Person-Hours of Delay (000)	2,946	2,881	2,814	2,849	2,948	3,018
Rank	10	10	10	8	6	6
Annual Gallons of Wasted Fuel (000)	6,902	6,749	6,592	6,674	6,906	7,071
Rank	7	6	6	6	6	6
Annual Congestion Cost (\$ million)	79	76	73	73	74	77
Rank	10	10	9	7	6	6
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Excess Due to Truck Congestion (tons)						
Rank						
Due to Truck Travel (tons)		 				
Rank						
= INGUIN						

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	1984	1983	1982
Urban Area Information			
Population (1000s)	2,450	2,420	2,400
Rank	11	11	11
Commuters (1000s)	1,106	1,084	1,066
Daily Vehicle-Miles of Travel (1000s)			
Freeway	23,280	21,930	20,000
Arterial Streets	20,705	19,870	19,335
Cost Components			
Value of Time (\$/hour)	7.75	7.43	7.20
Commercial Cost (\$/hour)	23.94	23.63	23.31
Gasoline (\$/gallon)	1.28	1.31	1.37
Diesel (\$/gallon)	1.25	1.28	1.34
System Performance	1984	1983	1982
Congested Travel (% of peak VMT)			
Congested System (% of lane-miles)			
Congested Time (number of "Rush Hours")			
Annual Excess Fuel Consumed			
Total Fuel (1000 gallons)	33,684	30,867	29,123
Rank	6	6	6
Fuel per Peak Auto Commuter (gallons)	11	10	9
Rank	5	4	7
Annual Delay			
Total Delay (1000s of person-hours)	72,573	66,505	62,747
Rank	6	6	6
Delay per Auto Commuter (pers-hrs)	47	44	42
Rank	3	3	3
Travel Time Index	1.25	1.24	1.23
Rank	3	3	3
Commuter Stress Index			
Rank			
Freeway Planning Time Index (95th Pctile)			
Rank			
Congestion Cost			
Total Cost (\$ millions)	681	603	555
Rank	6	6	6
Cost per Auto Commuter (\$)	1,076	1,031	1,005
Rank	8	9	7
Truck Congestion			
Annual Person-Hours of Delay (000)	3,048	2,793	2,635
Rank	6	6	6
Annual Gallons of Wasted Fuel (000)	7,141	6,544	6,174
Rank	6	6	6
Annual Congestion Cost (\$ million)	77	70	66
Rank	6	6	6
Annual Greenhouse Gases (CO2) Produced			
Excess Due to Congestion (tons)			
Rank			
Due to All Travel (tons)			
Rank			
Truck Annual Greenhouse Gases (CO2) Produced			
Excess Due to Truck Congestion (tons)			
Rank Due to Truck Travel (tons)			
Due to Truck Travel (tons)  Rank			
IXGIIK			

<sup>\*</sup> Note: Zeroes in the table reflect values less than 0.5.