### Performance Measure Summary - Tucson AZ

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)	880	880	880	875	870	865
Rank	52	52	52	52	52	52
Commuters (1000s)	433	433	433	431	428	426
Daily Vehicle-Miles of Travel (1000s)						
Freeway	3,676	4,177	4,021	3,972	4,221	4,067
Arterial Streets	8,584	9,754	10,217	10,272	11,832	12,280
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)	2.72	2.86	2.92	2.23	2.15	2.42
Diesel (\$/gallon)	2.93	3.01	3.18	2.42	2.20	2.41
System Performance	2020	2019	2018	2017	2016	2015
Congested Travel (% of peak VMT)				14.5		
Congested System (% of lane-miles)				1.6		
Congested Time (number of "Rush Hours")				1.0		
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	5,725	13,696	13,842	14,004	13,848	13,616
Rank	53	48	47	46	46	46
Fuel per Peak Auto Commuter (gallons)	8	19	20	20	20	20
Rank	82	62	47	47	47	42
Annual Delay						
Total Delay (1000s of person-hours)	13,189	31,552	31,784	32,305	31,661	30,850
Rank	57	47	46	46	46	46
Delay per Auto Commuter (pers-hrs)	21	50	51	52	50	49
Rank	77	41	34	32	33	33
Travel Time Index	1.07	1.20	1.20	1.21	1.21	1.21
Rank	57	38	37	36	36	36
Commuter Stress Index	1.07	1.21	1.22	1.22		
Rank	75	44	43	40		
Freeway Planning Time Index (95th Pctile)		1.44	1.31	1.25		
Rank		48	65	84		
Congestion Cost						
Total Cost (\$ millions)	306	697	708	699	675	650
Rank	56	47	46	46	46	46
Cost per Auto Commuter (\$)	381	869	882	877	864	836
Rank	83	58	56	52	50	50
Truck Congestion						
Annual Person-Hours of Delay (000)	840	1,867	1,742	1,659	1,626	1,584
Rank	49	2 410	45	45	45	2.007
Annual Gallons of Wasted Fuel (000)	1,538	3,419	3,227	2,989	2,936	2,887
Rank	45	42	44	43	43	42
Annual Congestion Cost (\$ million)	45	92	97	88	82 45	76 42
Rank	49	44	45	45	45	43
Annual Greenhouse Gases (CO2) Produced	57,022	120.252			I	
Excess Due to Congestion (tons)	57,833	138,353				
Rank Due to All Travel (tons)	52	48 2 156 219				
Due to All Travel (tons)	1,319,327	3,156,218				
Rank	71	57				
Truck Annual Greenhouse Gases (CO2) Produced	16.046	27.666			ı	
Excess Due to Truck Congestion (tons)	16,946	37,666				
Rank	45	42				
Due to Truck Travel (tons)	371,135	824,950				
Rank	66	52				

<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)	865	850	840	825	810	790
Rank	52	52	52	52	52	52
Commuters (1000s)	426	426	414	406	397	386
Daily Vehicle-Miles of Travel (1000s)						
Freeway	3,775	3,784	3,755	3,793	3,761	3,632
Arterial Streets	11,760	11,308	10,680	10,832	10,741	11,100
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)	3.23	3.47	3.34	3.19	2.70	2.32
Diesel (\$/gallon)	3.55	3.77	3.94	3.68	2.99	2.59
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)	13,418	13,274	13,149	12,858	12,826	12,327
Rank	46	46	46	46	45	46
Fuel per Peak Auto Commuter (gallons)	20	19	19	19	20	17
Rank	38	45	42	40	29	43
Annual Delay						
Total Delay (1000s of person-hours)	30,124	29,528	28,979	28,072	27,738	26,661
Rank	46	46	46	46	45	45
Delay per Auto Commuter (pers-hrs)	47	46	44	44	43	43
Rank	34	34	38	35	34	31
Travel Time Index	1.20	1.20	1.20	1.20	1.20	1.21
Rank	36	36	37	37	36	33
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	643	621	600	576	545	511
Rank	46	46	46	46	46	45
Cost per Auto Commuter (\$)	814	805	802	801	816	797
Rank	50	48	48	48	47	47
Truck Congestion			4			
Annual Person-Hours of Delay (000)	1,547	1,516	1,488	1,441	1,424	1,369
Rank	43	43	2 799	2 726	2 710	42
Annual Gallons of Wasted Fuel (000)	2,845	2,814	2,788	2,726	2,719	2,613
Rank	43	43	43	43	42	42
Annual Congestion Cost (\$ million)  Rank	75 43	69 43	66 43	70 43	65 43	60 42
	43	43	43	43	43	42
Annual Greenhouse Gases (CO2) Produced				ı	I	
Excess Due to Congestion (tons)  Rank						
Nank Due to All Travel (tons)						
Rank						 -
Truck Annual Greenhouse Gases (CO2) Produced				ı	I	
Excess Due to Truck Congestion (tons)  Rank						
Nank Due to Truck Travel (tons)						
Rank				 	 	
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<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)	775	760	740	720	700	685
Rank	52	52	53	54	55	56
Commuters (1000s)	377	368	356	344	333	324
Daily Vehicle-Miles of Travel (1000s)						
Freeway	3,550	3,510	3,650	3,540	3,425	3,285
Arterial Streets	11,260	11,205	11,235	11,100	10,320	10,105
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	3.03	2.63	2.42	2.04	1.59
Diesel (\$/gallon)	4.09	3.55	2.97	2.69	2.12	1.61
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)	13,385	12,522	11,779	11,074	10,129	9,810
Rank	44	46	47	48	49	50
Fuel per Peak Auto Commuter (gallons)	21	20	19	19	17	16
Rank	24	28	36	34	46	49
Annual Delay						
Total Delay (1000s of person-hours)	27,569	25,792	24,262	22,810	20,862	20,206
Rank	45	45	45	46	46	46
Delay per Auto Commuter (pers-hrs)	42	41	41	41	40	40
Rank	34	36	34	34	37	32
Travel Time Index	1.21	1.22	1.22	1.21	1.20	1.20
Rank	36	34	34	35	35	35
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	546	489	443	401	351	327
Rank	45	45	46	46	46	46
Cost per Auto Commuter (\$)	817	792	767	746	705	704
Rank	42	48	50	55	63	61
Truck Congestion						
Annual Person-Hours of Delay (000)	1,416	1,324	1,246	1,171	1,071	1,038
Rank	41	42	43	43	43	43
Annual Gallons of Wasted Fuel (000)	2,838	2,655	2,497	2,348	2,147	2,080
Rank	41	42	42	42	44	44
Annual Congestion Cost (\$ million)	66	58	51	46	40	36
Rank	41	42	42	43	43	43
Annual Greenhouse Gases (CO2) Produced				ı	ı	
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced				ı	I	
Excess Due to Truck Congestion (tons)						
Rank Due to Travel (Travel (tons)						
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)	665	655	645	640	635	625
Rank	56	59	59	58	58	58
Commuters (1000s)	311	302	293	288	282	274
Daily Vehicle-Miles of Travel (1000s)						
Freeway	3,000	2,750	2,420	2,100	1,955	1,775
Arterial Streets	9,620	9,610	9,355	9,265	9,135	8,985
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)	1.47	1.62	1.52	1.38	1.19	1.32
Diesel (\$/gallon)	1.46	1.66	1.57	1.39	1.31	1.34
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)	9,342	9,064	8,848	8,362	7,830	7,376
Rank	50	48	47	46	45	45
Fuel per Peak Auto Commuter (gallons)	14	14	15	14	13	13
Rank	61	54	40	42	42	38
Annual Delay						
Total Delay (1000s of person-hours)	19,242	18,669	18,225	17,223	16,128	15,193
Rank	48	47	46	47	47	46
Delay per Auto Commuter (pers-hrs)	40	40	40	39	38	36
Rank	30	29	28	27	26	28
Travel Time Index	1.20	1.20	1.20	1.19	1.18	1.17
Rank	35	32	29	30	30	32
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	303	290	275	250	229	213
Rank	46	46	46	46	46	46
Cost per Auto Commuter (\$)	684	672	673	657	631	604
Rank	63	59	57	58	60	59
Truck Congestion						
Annual Person-Hours of Delay (000)	988	958	935	884	828	780
Rank	43	43	42	42	42	42
Annual Gallons of Wasted Fuel (000)	1,980	1,921	1,876	1,773	1,660	1,564
Rank	45	44	43	43	43	43
Annual Congestion Cost (\$ million)	33	31	29	27	24	23
Rank	42	42	42	41	42	42
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Truck Annual Greenhouse Gases (CO2) Produced Excess Due to Truck Congestion (tons)						
Excess Due to Truck Congestion (tons) Rank	 	 	 	 		 
Excess Due to Truck Congestion (tons)		  		  		  

<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)	625	620	605	590	560	550
Rank	57	56	56	56	59	59
Commuters (1000s)	271	265	256	246	231	224
Daily Vehicle-Miles of Travel (1000s)						
Freeway	1,670	1,475	1,365	1,330	1,280	1,250
Arterial Streets	8,250	8,000	7,725	7,675	7,500	7,320
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)	1.26	1.20	1.19	1.18	1.22	1.06
Diesel (\$/gallon)	1.29	1.22	1.21	1.20	1.26	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)	6,913	6,586	6,065	5,774	5,436	5,089
Rank	47	45	44	44	44	43
Fuel per Peak Auto Commuter (gallons)	12	12	11	11	10	9
Rank	38	35	37	22	24	27
Annual Delay						
Total Delay (1000s of person-hours)	14,239	13,565	12,492	11,894	11,198	10,482
Rank	46	46	47	46	44	43
Delay per Auto Commuter (pers-hrs)	34	33	31	31	31	30
Rank	33	31	31	26	22	20
Travel Time Index	1.16	1.16	1.15	1.15	1.15	1.14
Rank	34	32	35	31	27	29
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	195	181	162	151	139	126
Rank	46	45	45	45	43	42
Cost per Auto Commuter (\$)	578	567	538	524	512	494
Rank	57	51	53	49	48	46
Truck Congestion						
Annual Person-Hours of Delay (000)	731	697	642	611	575	538
Rank	41	39	39	38	37	37
Annual Gallons of Wasted Fuel (000)	1,466	1,396	1,286	1,224	1,153	1,079
Rank	44	42	42	41	41	41
Annual Congestion Cost (\$ million)	21	20	18	17	16	14
Rank	42	38	38	37	37	38
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced				<del></del>		
Truck Annual Greenhouse Gases (CO2) Produced  Excess Due to Truck Congestion (tons)  Rank		  		 		
Truck Annual Greenhouse Gases (CO2) Produced Excess Due to Truck Congestion (tons)		  		   		  

<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)	530	510	500	490	480	470
Rank	59	61	61	61	61	61
Commuters (1000s)	213	203	198	192	187	182
Daily Vehicle-Miles of Travel (1000s)						
Freeway	1,275	1,200	1,070	1,130	1,040	970
Arterial Streets	7,190	7,110	7,050	6,980	6,940	6,910
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)	1.07	1.11	1.02	1.03	1.00	1.31
Diesel (\$/gallon)	1.18	1.20	1.10	1.11	1.08	1.42
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)	4,658	4,194	3,910	3,490	3,302	2,926
Rank	42	42	41	41	41	42
Fuel per Peak Auto Commuter (gallons)	9	8	7	6	6	6
Rank	23	26	27	32	28	22
Annual Delay						
Total Delay (1000s of person-hours)	9,594	8,638	8,053	7,188	6,801	6,027
Rank	43	42	41	43	43	43
Delay per Auto Commuter (pers-hrs)	28	27	25	23	22	20
Rank	21	21	24	25	24	25
Travel Time Index	1.14	1.13	1.12	1.11	1.11	1.10
Rank	26	28	28	30	27	27
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	111	95	85	73	67	59
Rank	42	41	41	42	42	43
Cost per Auto Commuter (\$)	470	450	441	410	402	366
Rank	46	48	48	51	45	46
Truck Congestion						
Annual Person-Hours of Delay (000)	493	444	413	369	350	309
Rank	38	38	38	38	36	37
Annual Gallons of Wasted Fuel (000)	987	889	829	740	700	620
Rank	40	41	40	40	38	40
Annual Congestion Cost (\$ million)	13	12	11	9	9	8
Rank	38	35	36	37	34	36
Annual Greenhouse Gases (CO2) Produced				1	1	
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced				ı		
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	1984	1983	1982
Urban Area Information			
Population (1000s)	455	450	450
Rank	61	61	60
Commuters (1000s)	174	171	169
Daily Vehicle-Miles of Travel (1000s)			
Freeway	950	810	750
Arterial Streets	6,885	6,800	6,750
Cost Components			
Value of Time (\$/hour)	7.75	7.43	7.20
Commercial Cost (\$/hour)	23.94	23.63	23.31
Gasoline (\$/gallon)	1.33	1.36	1.42
Diesel (\$/gallon)	1.43	1.46	1.53
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)	2,620	2,430	2,357
Rank	43	42	41
Fuel per Peak Auto Commuter (gallons)	4	4	3
Rank	41	35	34
Annual Delay			
Total Delay (1000s of person-hours)	5,396	5,006	4,854
Rank	44	43	42
Delay per Auto Commuter (pers-hrs)	19	18	17
Rank	27	25	24
Travel Time Index	1.09	1.09	1.08
Rank	30	28	29
Commuter Stress Index			
Rank			
Freeway Planning Time Index (95th Pctile)			
Rank			
Congestion Cost			
Total Cost (\$ millions)	52	46	44
Rank	44	43	41
Cost per Auto Commuter (\$)	335	327	328
Rank	46	46	43
Truck Congestion			
Annual Person-Hours of Delay (000)	278	257	249
Rank	38	37	35
Annual Gallons of Wasted Fuel (000)	555	515	500
Rank	40	40	38
Annual Congestion Cost (\$ million)	7	6	6
Rank	35	37	35
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			

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