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16. Abstract

This research report represents the sixth year of a ten-year research effort focused on quantifying urban mobility. This study contains the facility information for 50 urban areas throughout the country. The database used for this research contains information on vehicle travel, system length, and urban area characteristics from 1982 to 1991. Various federal, state, and local agencies provided the information used to update and verify the primary database. The primary database and original source of most of the information is the Federal Highway Administration's Highway Performance Monitoring System (HPMS).

Vehicle travel and system length data were combined to develop Roadway Congestion Index (RCI) values for 50 urban areas including the seven largest in Texas. The RCI values provide an indicator of the relative mobility level within an urban area.

An analysis of the cost of congestion was also performed using travel delay and increased fuel consumption as estimated quantities. The impact of congestion was also estimated by the amount of additional facility capacity required to provide urban mobility. Congestion costs were estimated on an areawide, per registered vehicle, and per capita basis

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TRENDS IN URBAN ROADWAY CONGESTION - 1982 TO 1991
VOLUME 2: METHODOLOGY AND URBANIZED AREA DATA

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IMPLEMENTATION STATEMENT

To determine future highway needs and assist the Texas Department of Transportation in planning, it is desirable to measure and monitor the severity of congestion in the large Texas metropolitan areas. This report quantifies those congestion levels and the economic impact of congestion on urban motorists. The report also presents data on other large metropolitan areas throughout the country to assist in determining nationwide mobility trends and the performance of Texas' roadway networks relative to those of other areas. Information in this report should be of value in identifying transportation trends and prioritizing needs for the future.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation. In addition, this report is not intended for construction, bidding, or permit purposes. David L. Schrank, Shawn M. Turner, and Timothy J. Lomax (Texas Professional Engineer certification number 54597) prepared this research report.

TABLE OF CONTENTS

VOLUME 2		Page
LIST OF FIGURES		x
LIST OF TABLES		xi
SUMMARY		xvii
INTRODUCTION		1
APPENDIX A:	ENGLISH UNIT EQUIVALENT TABLES	3
APPENDIX B:	DEVELOPMENT OF THE URBAN AREAWIDE CONGESTION MEASUREMENT METHODOLOGY	41
APPENDIX C:	CONGESTION CLASSIFICATION AND COST ESTIMATES	55
APPENDIX D:	FREEWAY AND PRINCIPAL ARTERIAL STREET TRAVEL AND SYSTEM LENGTH STATISTICS 1982 TO 1991	85
APPENDIX E:	URBAN AREA MOBILITY AND CONGESTION STATISTICS	109
REFERENCES		161

LIST OF FIGURES

VOLUME 2

Figure		Page
B-1	Freeway Capacity and Travel in Houston, 1950 to 1986	47
B-2	Delay by Segments for Houston Freeways, P.M. Peak Period	48
B-3	Percent of Freeway Lane-kilometers with more than 15,000 ADT for Harris County (Houston), 1970 to 1985	50

LIST OF TABLES

VOLUME 2

Table		Page
S-1	1991 Roadway Congestion Levels	xviii
S-2	Fastest Congestion Growth Areas	xviii
S-3	Slowest Congestion Growth Areas	xix
S-4	Roadway Necessary to Maintain Constant Congestion Levels	xx
S-5	Component and Total Congestion Costs By Urban Area for 1991	xx
S-6	1991 Congestion Cost per Registered Vehicle	xxi
S-7	1991 Congestion Cost per Capita	xxi
S-8	Annual Vehicle Hours of Delay for 1991 Grouped by Population	xxii
A-1	1991 Freeway Mileage and Travel Volume	5
A-2	1991 Principal Arterial Street Mileage and Travel Volume	6
A-3	1991 Roadway Congestion Index Value	7
A-4	Roadway Congestion Index Values, 1982 to 1991	8
A-5	1991 Urban Area Travel by Facility Type	9
A-6	Illustration of Annual Capacity Increase Required to Prevent Congestion Growth	10
A-7	Speed Relationships with Average Daily Traffic (ADT) per Lane Volumes	11
A-8	Freeway and Expressway Recurring and Incident Hours of Daily Delay for 1991	12
A-9	Principal Arterial Street Recurring and Incident Hours of Daily Delay for 1991	13
A-10	Daily Vehicle Hours of Delay for 1991	14
A-11	Annual Excess Fuel Consumed due to Traffic Congestion	15
A-12	Change in Daily Delay in 1991	16
A-13	Annual Wasted Fuel due to Congestion	17
A-14	Component and Total Congestion Costs By Urban Area for 1991	18
A-15	Estimated Unit Costs of Congestion in 1991	19
A-16	1991 Rankings of Urban Area by Estimated Impact of Congestion	20

LIST OF TABLES, Continued

VOLUME 2

Table		Page
A-17	1991 Congestion Index Values	21
A-18	Component and Total Congestion Costs By Urban Area for 1986	22
A-19	Estimated Impact of Congestion in 1986	23
A-20	Component and Total Congestion Costs By Urban Area for 1987	24
A-21	Estimated Impact of Congestion in 1987	25
A-22	Component and Total Congestion Costs By Urban Area for 1988	26
A-23	Estimated Impact of Congestion in 1988	27
A-24	Component and Total Congestion Costs By Urban Area for 1989	28
A-25	Estimated Impact of Congestion in 1989	29
A-26	Component and Total Congestion Costs By Urban Area for 1990	30
A-27	Estimated Impact of Congestion in 1990	31
A-28	Component and Total Congestion Costs By Urban Area for 1991	32
A-29	Estimated Impact of Congestion in 1991	33
A-30	Urban Area Grouping by Population Size	34
A-31	1991 Freeway Travel Volume and Roadway Supply Grouped by Population	35
A-32	1991 Principal Arterial Street Travel Volume and Roadway Supply Grouped by Population	35
A-33	1991 Roadway Congestion Index Values Grouped by Population	35
A-34	Roadway Congestion Index Values Grouped by Population, 1982 to 1991	35
A-35	Daily Vehicle Hours of Delay for 1991 Grouped by Population	36
A-36	1991 Component and Total Congestion Costs Grouped by Population	36
A-37	Urban Area Grouping by Population Density	37
A-38	1991 Freeway Travel Volume and Roadway Supply Grouped by Population Density	38
A-39	1991 Principal Arterial Street Travel Volume and Roadway Supply Grouped by Population Density	38

LIST OF TABLES, Continued

VOLUME 2

Table		Page
A-40	1991 Roadway Congestion Index Values Grouped by Population Density	38
A-41	Roadway Congestion Index Values Grouped by Population Density, 1982 to 1991	38
A-42	Daily Vehicle-Hours of Delay for 1991 Grouped by Population Density	39
A-43	1991 Component and Total Congestion Costs Grouped by Population Density	39
B-1	City of Houston Growth Trends, 1950 to 1985	46
B-2	Average Evening Peak-Period Delay by Freeway Segment Per Major Radial Freeway	48
C-1	Summary of Freeway Travel Frequency and Urban Population Statistics for 1991	58
C-2	Principal Arterial Street Travel Frequency and Population Density Statistics for 1991	59
C-3	Percent of Congested DVKT by AADT Congestion Ranges for 1982	60
C-4	Percent of Congested DVKT by AADT Congestion Ranges for 1983	61
C-5	Percent of Congested DVKT by AADT Congestion Ranges for 1984	62
C-6	Percent of Congested DVKT by AADT Congestion Ranges for 1985	63
C-7	Percent of Congested DVKT by AADT Congestion Ranges for 1986	64
C-8	Percent of Congested DVKT by AADT Congestion Ranges for 1987	65
C-9	Percent of Congested DVKT by AADT Congestion Ranges for 1988	66
C-10	Percent of Congested DVKT by AADT Congestion Ranges for 1989	67
C-11	Percent of Congested DVKT by AADT Congestion Ranges for 1990	68
C-12	Percent of Congested DVKT by AADT Congestion Ranges for 1991	69
C-13	Congested Daily Vehicle-Kilometers of Travel by Average Annual Daily Traffic per Lane Volumes	70
C-14	1991 Congestion Cost Estimate Variables	72
C-15	1991 Congested Daily Vehicle-Kilometers of Travel	75

LIST OF TABLES, Continued

VOLUME 2

Table		Page
C-16	Recurring and Incident Delay Relationships for 1991	76
C-17	Component and Total Congestion Costs By Urban Area for 1991	80
C-18	Estimated Impact of Congestion in 1991	82
C-19	1991 Rankings of Urban Area by Estimated Impact of Congestion	83
D-1	Summary of Normalized Freeway Travel and Distance Statistics for 1991	87
D-2	Summary of Normalized Principal Arterial Street Travel and System Length Statistics for 1991	88
D-3	Summary of 1982 Relative Mobility Values for Freeways and Expressways	89
D-4	Summary of 1982 Relative Mobility Values for Principal Arterial Streets	90
D-5	Summary of 1983 Relative Mobility Values for Freeways and Expressways	91
D-6	Summary of 1983 Relative Mobility Values for Principal Arterial Streets	92
D-7	Summary of 1984 Relative Mobility Values for Freeways and Expressways	93
D-8	Summary of 1984 Relative Mobility Values for Principal Arterial Streets	94
D-9	Summary of 1985 Relative Mobility Values for Freeways and Expressways	95
D-10	Summary of 1985 Relative Mobility Values for Principal Arterial Streets	96
D-11	Summary of 1986 Relative Mobility Values for Freeways and Expressways	97
D-12	Summary of 1986 Relative Mobility Values for Principal Arterial Streets	98
D-13	Summary of 1987 Relative Mobility Values for Freeways and Expressways	99
D-14	Summary of 1987 Relative Mobility Values for Principal Arterial Streets	100
D-15	Summary of 1988 Relative Mobility Values for Freeways and Expressways	101
D-16	Summary of 1988 Relative Mobility Values for Principal Arterial Streets	102
D-17	Summary of 1989 Relative Mobility Values for Freeways and Expressways	103
D-18	Summary of 1989 Relative Mobility Values for Principal Arterial Streets	104
D-19	Summary of 1990 Relative Mobility Values for Freeways and Expressways	105
D-20	Summary of 1990 Relative Mobility Values for Principal Arterial Streets	106
D-21	Summary of 1991 Relative Mobility Values for Freeways and Expressways	107

LIST OF TABLES, Continued

VOLUME 2

Table		Page
D-22	Summary of 1991 Relative Mobility Values for Principal Arterial Streets	108
E-1	Mobility and Congestion Variables in Albuquerque NM	111
E-2	Mobility and Congestion Variables in Atlanta GA	112
E-3	Mobility and Congestion Variables in Austin TX	113
E-4	Mobility and Congestion Variables in Baltimore MD	114
E-5	Mobility and Congestion Variables in Boston MA	115
E-6	Mobility and Congestion Variables in Charlotte NC	116
E-7	Mobility and Congestion Variables in Chicago IL	117
E-8	Mobility and Congestion Variables in Cincinnati OH	118
E-9	Mobility and Congestion Variables in Cleveland OH	119
E-10	Mobility and Congestion Variables in Columbus OH	120
E-11	Mobility and Congestion Variables in Corpus Christi TX	121
E-12	Mobility and Congestion Variables in Dallas TX	122
E-13	Mobility and Congestion Variables in Denver CO	123
E-14	Mobility and Congestion Variables in Detroit MI	124
E-15	Mobility and Congestion Variables in El Paso TX	125
E-16	Mobility and Congestion Variables in Fort Worth TX	126
E-17	Mobility and Congestion Variables in Ft. Lauderdale FL	127
E-18	Mobility and Congestion Variables in Hartford CT	128
E-19	Mobility and Congestion Variables in Honolulu HI	129
E-20	Mobility and Congestion Variables in Houston TX	130
E-21	Mobility and Congestion Variables in Indianapolis IN	131
E-22	Mobility and Congestion Variables in Jacksonville FL	132
E-23	Mobility and Congestion Variables in Kansas City MO	133
E-24	Mobility and Congestion Variables in Los Angeles CA	134
E-25	Mobility and Congestion Variables in Louisville KY	135

LIST OF TABLES, Continued

VOLUME 2

Table		Page
E-26	Mobility and Congestion Variables in Memphis TN	136
E-27	Mobility and Congestion Variables in Miami FL	137
E-28	Mobility and Congestion Variables in Milwaukee WI	138
E-29	Mobility and Congestion Variables in Minn-St. Paul MN	139
E-30	Mobility and Congestion Variables in Nashville TN	140
E-31	Mobility and Congestion Variables in New Orleans LA	141
E-32	Mobility and Congestion Variables in New York NY	142
E-33	Mobility and Congestion Variables in Norfolk VA	143
E-34	Mobility and Congestion Variables in Oklahoma City OK	144
E-35	Mobility and Congestion Variables in Orlando FL	145
E-36	Mobility and Congestion Variables in Philadelphia PA	146
E-37	Mobility and Congestion Variables in Phoenix AZ	147
E-38	Mobility and Congestion Variables in Pittsburgh PA	148
E-39	Mobility and Congestion Variables in Portland OR	149
E-40	Mobility and Congestion Variables in Sacramento CA	150
E-41	Mobility and Congestion Variables in Salt Lake City UT	151
E-42	Mobility and Congestion Variables in San Antonio TX	152
E-43	Mobility and Congestion Variables in San Bernardino-Riv CA	153
E-44	Mobility and Congestion Variables in San Diego CA	154
E-45	Mobility and Congestion Variables in San Fran-Oak CA	155
E-46	Mobility and Congestion Variables in San Jose CA	156
E-47	Mobility and Congestion Variables in Seattle-Everett WA	157
E-48	Mobility and Congestion Variables in St. Louis MO	158
E-49	Mobility and Congestion Variables in Tampa FL	159
E-50	Mobility and Congestion Variables in Washington DC	160

SUMMARY

This report represents the sixth year of a planned ten-year study to measure and monitor urban mobility in 50 urbanized areas throughout the United States. This research study estimates the level of congestion in the seven largest Texas urban areas and 43 other areas representing a cross-section of urban areas throughout the country. Quantitative estimates of mobility levels allow comparisons of transportation systems in the various urbanized areas and assist the transportation community in analyzing urban mobility.

The level of congestion in an urban area was estimated using procedures developed in previous research (1-7). The Roadway Congestion Index (RCI) combines the daily vehicle-kilometers of travel (DVKT) per lane-kilometer for freeways and principal arterial street systems in a ratio comparing the existing value to values identified with congested conditions. Equation S-1 illustrates how the areawide and congested level travel per lane values are combined into the RCI values for each urban area.

Eq. S-1

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln.-Km.}}{13{,}000} \times \frac{\text{Freeway VKT}}{\text{Freeway VKT}} + \frac{\text{Prin Art Str VKT/Ln.-Km.}}{5{,}000} \times \frac{\text{Prin Art Str VKT}}{\text{Prin Art Str VKT}}$$

An RCI value of 1.0 or greater indicates that congested conditions exist areawide. It should be noted that urban areas with areawide values less than 1.0 may have sections of roadway that experience periods of heavy congestion, but the average mobility level within the urban area could be defined as uncongested. The RCI analyses presented in this report are intended to evaluate entire urban areas and not specific locations. The nature of the RCI equation (Eq. S-1) is to underestimate point or specific facility congestion if the overall system has "good" operational characteristics.

AREAWIDE MOBILITY

Table S-1 combines the freeway and principal arterial street system DVKT and DVKT per lane-kilometer into the 1991 estimated Roadway Congestion Index (RCI). The ten most congested

urban areas in the study are displayed. The RCI values range from 1.56 (Los Angeles) to 1.14 (Atlanta and New York). All of these urban areas have surpassed the RCI value at which undesirable levels of congestion occur (1.0).

Table S-1. 1991 Roadway Congestion Levels

Urban Area	Freeway / Expressway DVKT[1] (1000)	Freeway / Expressway DVKT/[2] Ln-Kilometer	Principal Arterial Street DVKT[1] (1000)	Principal Arterial Street DVKT/[2] Ln-Kilometer	Roadway[3] Congestion Index	Rank
Los Angeles CA	177,550	21,110	131550	6,590	1.56	1
Washington DC	41,470	16,830	31,640	8,470	1.39	2
San Fran-Oak CA	67,620	17,570	22,590	6,100	1.34	3
Chicago IL	62,760	16,010	49,160	7,180	1.28	4
Miami FL	14,140	14,280	25,760	7,690	1.28	4
San Diego CA	44,600	16,060	15,300	5,490	1.22	6
San Bernardino-Riv CA	24,100	16,540	17,150	4,660	1.20	7
Seattle-Everett WA	30,590	15,570	15,810	6,140	1.20	7
Atlanta GA	40,200	14,520	15,920	6,280	1.14	9
New York NY	133,650	14,020	85,360	6,960	1.14	9

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer
[3] See Equation S-1

See Table 3 for complete listing of urban areas.
Source: TTI Analysis

The eleven urban areas which have experienced the greatest growth in congestion between 1982 and 1991 are displayed in Table S-2. The RCI values reflect the level of congestion occurring in the urban areas. San Diego experienced a 56 percent increase in congestion during the ten year period. The congestion increase rate in all cities in the top eleven exceeded two percent per year.

Table S-2. Fastest Congestion Growth Areas

Urban Area	Year 1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Percent Change 1982 to 1991
San Jose CA	0.85	0.87	0.90	0.94	0.96	0.98	0.99	1.02	1.04	1.07	26
Dallas TX	0.84	0.89	0.94	0.98	1.04	1.02	1.02	1.02	1.05	1.06	26
Seattle-Everett WA	0.95	0.99	1.02	1.05	1.09	1.14	1.17	1.21	1.20	1.20	26
Minn-St. Paul MN	0.74	0.79	0.81	0.83	0.87	0.87	0.88	0.90	0.93	0.94	27
Los Angeles CA	1.22	1.27	1.32	1.36	1.42	1.47	1.52	1.54	1.55	1.56	28
Atlanta GA	0.89	0.94	0.97	1.02	1.09	1.11	1.14	1.14	1.11	1.14	28
Washington DC	1.07	1.09	1.12	1.20	1.28	1.30	1.32	1.36	1.37	1.39	30
Sacramento CA	0.80	0.84	0.88	0.92	0.95	1.00	1.03	1.01	1.02	1.04	30
San Fran-Oak CA	1.01	1.05	1.12	1.17	1.24	1.31	1.33	1.36	1.35	1.34	33
Salt Lake City UT	0.63	0.63	0.65	0.68	0.68	0.70	0.72	0.81	0.85	0.86	37
San Diego CA	0.78	0.83	0.91	0.95	1.00	1.08	1.13	1.18	1.22	1.22	56

See Table 4 for complete listing of urban areas.

Source: TTI Analysis

The ten urban areas with the smallest growth in congestion between 1982 and 1991 are shown in Table S-3. Phoenix, Houston, and Detroit all experienced decreases in congestion with Phoenix showing the greatest decrease (10 percent). Congestion increases in these areas were less than one percent per year.

Table S-3. Slowest Congestion Growth Areas

Urban Area	Year										Percent Change 1982 to 1991
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Phoenix AZ	1.15	1.16	1.10	1.13	1.20	1.18	1.00	1.03	1.03	1.04	-10
Houston TX	1.17	1.21	1.25	1.23	1.21	1.19	1.15	1.13	1.12	1.11	-5
Detroit MI	1.13	1.10	1.13	1.12	1.11	1.10	1.09	1.08	1.09	1.10	-3
Louisville KY	0.84	0.82	0.81	0.79	0.80	0.88	0.87	0.86	0.86	0.88	5
Pittsburgh PA	0.78	0.76	0.76	0.78	0.79	0.79	0.81	0.82	0.82	0.82	5
Philadelphia PA	1.00	1.03	1.04	0.90	1.06	1.06	1.07	1.05	1.05	1.06	6
Memphis TN	0.86	0.80	0.76	0.75	0.77	0.84	0.86	0.91	0.91	0.92	7
Corpus Christi TX	0.67	0.69	0.69	0.71	0.71	0.72	0.70	0.71	0.72	0.72	7
Orlando FL	0.66	0.68	0.67	0.71	0.71	0.72	0.74	0.72	0.72	0.72	9
Jacksonville FL	0.87	0.98	0.98	0.98	0.95	0.94	0.95	0.93	0.94	0.95	9

See Table 4 for complete listing of urban areas

Source: TTI Analysis

Table S-4 combines existing freeway and principal arterial street distances with (1987 to 1991) recent annual traffic volume growth rates to produce the number of additional lane-kilometers which would be necessary to avoid increases in areawide congestion. This value illustrates the amount of roadway that would have to be added *every year* to maintain a constant congestion level. Los Angeles would require 851 lane-kilometers (252 freeway, 599 principal arterial street) to maintain current levels of mobility. The urban area with the smallest additional lane-kilometers in this summary group, Cleveland, would require 201 lane-kilometers (101 freeway, 100 principal arterial street). Additional roadway facilities have not been constructed at these rates in most cities in the recent past, indicating a need to pursue other methods to improve mobility.

Table S-4. Roadway Necessary to Maintain Constant Congestion Levels

Urban Area	Existing (1991) Lane-km		Average Annual VKT Growth (%)[1]	Annual Additional Lane-km Needed		Rank[2]
	Freeway	Prin. Art.		Freeway	Prin. Art.	
Los Angeles CA	8,412	19,964	3.00	252	599	1
Chicago IL	3,920	6,843	5.61	220	384	2
New York NY	9,531	12,268	2.75	262	337	3
Phoenix AZ	1,030	5,184	5.60	58	290	4
San Diego CA	2,777	2,785	4.42	123	123	5
Detroit MI	2,866	5,997	2.53	73	152	6
Miami FL	990	3,349	4.98	49	167	7
San Bernardino-Riv CA	1,457	3,679	4.20	61	155	7
St. Louis MO	2,729	2,914	3.74	102	109	9
Cleveland OH	1,835	1,811	5.50	101	100	10

[1] Average Annual Growth rate of Freeway and Principal Arterial Streets DVKT between 1987-1991
[2] Ranked by total of freeway and principal arterial street lane-kilometers.

See Table 6 for complete listing of urban areas.
Source: TTI Analysis

The urban areas with the highest congestion costs are shown in Table S-5. The total congestion costs are comprised of delay and fuel costs. The delay and fuel costs have components related to the type of delay (recurring or incident) that occurs in the urban area. Los Angeles and New York had the highest total congestion costs with values of $7.79 billion and $6.62 billion, respectively. The tenth urban area in the table, Dallas, had a total congestion cost of $1.18 billion.

Table S-5. Component and Total Congestion Costs By Urban Area for 1991

Urban Area	Annual Cost Due to Congestion ($Millions)					Rank
	Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost	
Los Angeles CA	3,180	3,740	400	470	7,790	1
New York NY	2,030	3,840	260	490	6,620	2
San Fran-Oak CA	1,110	1,400	140	180	2,830	3
Washington DC	800	1,360	100	170	2,430	4
Chicago IL	970	1,120	130	150	2,360	5
Houston TX	660	900	80	110	1,750	6
Detroit MI	550	880	70	100	1,610	7
Boston MA	350	1,000	40	120	1,520	8
Seattle-Everett WA	450	600	60	80	1,190	9
Dallas TX	390	670	50	80	1,180	10

See Table 14 for complete listing of urban areas.

Source: TTI Analysis and Local Transportation Agency Reference

Congestion costs can be used in relation to registered vehicles to show the economic impact on each automobile in the urban area. Table S-6 lists the top ten congestion costs per registered vehicle for 1991. Washington D.C. ranks first with a cost of $1,440 per vehicle. Dallas and Houston each have costs of $780 per vehicle, or approximately $3 per workday.

Table S-6. 1991 Congestion Cost per Registered Vehicle

Urban Area	Congestion Cost Per Registered Vehicle	Rank
Washington DC	$1,440	1
San Bernardino-Riv. CA	$1,340	2
New York NY	$1,090	3
Los Angeles CA	$1,000	4
San Jose CA	$ 990	5
San Fran-Oak CA	$ 930	6
Boston MA	$ 920	7
Seattle-Everett WA	$ 890	8
Dallas TX	$ 780	10
Houston TX	$ 780	10

See Table 15 for complete listing of urban areas

Source: TTI Analysis

Expressing congestion costs on a per capita basis illustrates the congestion "tax" paid by residents (Table S-7). The highest 1991 cost per capita occurred in San Bernardino-Riverside with a cost per capita of $870. Boston had the smallest cost per capita of the top ten urban areas with a cost of approximately $2 per capita for each workday.

Table S-7. 1991 Congestion Cost per Capita

Urban Area	Congestion Cost Per Capita	Rank
San Bernardino-Riv CA	$ 870	1
Washington DC	$ 760	2
San Fran-Oak CA	$ 740	3
San Jose CA	$ 670	4
Los Angeles CA	$ 660	6
Seattle-Everett WA	$ 660	6
Dallas TX	$ 600	7
Houston TX	$ 570	8
Atlanta GA	$ 530	9
Miami FL	$ 510	10

See Table 15 for complete listing of urban areas
Source: TTI Analysis

By arranging the urban areas into groups based on characteristics such as population size, it is possible to view the effects of congestion on the different groups of areas in the study. Table S-8 shows the vehicle hours of delay present in the study areas. The largest group (Chicago, Los Angeles, New York) has vehicle delay of at least 110 hours per person annually. The smallest group, comprised of areas with populations of 810,000 or less, has vehicle delay of 55 hours per person. This seems to indicate that the average congestion impact is twice as large on the average resident of a city with a population greater than 7 million than in the group of the smallest cities in our study.

Table S-8. Annual Vehicle Hours of Delay for 1991 Grouped by Population

Population Group	Average Delay (Vehicle-hours)	Total Delay per 1000 Persons (Veh-Hours)
Fifth Group	1,311,390	110
Fourth Group	314,430	105
Third Group	157,090	100
Second Group	57,220	55
First Group	32,840	55

Source: TTI Analysis

INTRODUCTION

Volume 2 of this report contains supporting data for Volume 1, "Trends in Urban Roadway Congestion—1982 to 1991." It is divided into five appendices.

Appendix A contains a set of tables which correspond to those in the research report with the English unit equivalents. Each table from the report has a matching table in Appendix A. There are some tables which are repeated in Appendix A to provide a complete set of equivalent tables based on the English system.

Appendix B provides background information concerning the development of the congestion measurement methodology utilized in the report.

Appendix C contains congestion level and congestion cost data for each of the study areas. Levels of congestion are shown for each urban area for 1982 to 1991. Background information and methodology used to calculate congestion cost are shown.

Appendix D shows travel and system length statistics for the urban areas for 1982 to 1991. Included in this section are the same 1991 statistics which are normalized by population and urban area size.

Appendix E contains the congestion statistics for each urban area for 1982 to 1991. The tables are organized by individual urban area, rather than by topic or statistic. They are useful for analyses of congestion trends on urban area roadway systems.

APPENDIX A

ENGLISH UNIT EQUIVALENT TABLES

Table A-1. 1991 Freeway Mileage and Travel Volume

Urban Area	DVMT[1] (1000)	Lane-Miles	Avg. No. Lanes	DVMT/[2] Ln-Mile	Rank[3]
Los Angeles CA	110,280	5,230	8.2	21,110	1
San Fran-Oak CA	42,000	2,390	6.8	17,570	2
Washington DC	25,760	1,530	5.3	16,830	3
San Bernardino-Riv CA	14,970	910	7.2	16,540	4
San Diego CA	27,700	1,730	7.5	16,060	5
Chicago IL	38,980	2,440	5.7	16,010	6
Seattle-Everett WA	19,000	1,220	5.9	15,570	7
Houston TX	29,500	2,020	6.3	14,640	8
Atlanta GA	24,970	1,720	6.2	14,520	9
Miami FL	8,780	620	5.4	14,280	10
Boston MA	21,680	1,520	5.9	14,260	11
San Jose CA	16,520	1,180	6.6	14,060	12
New York NY	83,010	5,920	5.6	14,020	13
Dallas TX	23,900	1,720	5.9	13,940	14
Honolulu HI	4,700	340	5.2	13,820	15
New Orleans LA	5,040	370	5.8	13,810	16
Portland OR	7,520	560	5.1	13,430	17
Detroit MI	23,700	1,780	5.9	13,310	18
Milwaukee WI	7,810	600	5.6	13,020	19
Baltimore MD	16,040	1,250	5.4	12,830	20
Denver CO	11,430	900	5.2	12,770	21
Cincinnati OH	11,600	910	5.7	12,750	22
Phoenix AZ	8,160	640	5.6	12,750	22
Sacramento CA	9,640	760	6.9	12,680	24
Cleveland OH	13,970	1,140	4.8	12,250	25
Minn-St. Paul MN	18,210	1,500	4.9	12,180	26
Jacksonville FL	5,470	450	4.6	12,160	27
Philadelphia PA	18,400	1,520	5.1	12,150	28
Austin TX	5,500	460	5.6	12,090	29
Tampa FL	3,650	310	4.9	11,970	30
Fort Worth TX	12,300	1,030	5.9	11,940	31
Ft. Lauderdale FL	7,130	600	5.4	11,880	32
Norfolk VA	5,570	470	4.6	11,840	33
Albuquerque NM	2,480	220	5.0	11,530	34
San Antonio TX	9,380	830	5.3	11,300	35
Memphis TN	4,400	390	5.4	11,280	36
St. Louis MO	19,050	1,700	5.6	11,240	37
Hartford CT	6,240	580	5.5	10,760	38
Indianapolis IN	8,150	770	5.3	10,650	39
Salt Lake City UT	5,480	520	5.6	10,650	39
Louisville KY	6,250	590	4.6	10,590	41
Columbus OH	8,500	810	5.8	10,550	42
Nashville TN	5,210	510	4.6	10,320	43
Orlando FL	6,050	600	4.9	10,080	44
Oklahoma City OK	7,030	730	5.2	9,690	45
El Paso TX	3,390	360	5.3	9,550	46
Kansas City MO	12,520	1,360	4.4	9,200	47
Corpus Christi TX	1,610	190	5.5	8,630	48
Charlotte NC	2,490	300	4.2	8,300	49
Pittsburgh PA	8,250	1,020	4.3	8,130	50
Northeastern Avg	25,630	1,900	5.3	12,710	
Midwestern Avg	14,650	1,190	5.3	11,790	
Southern Avg	7,160	570	5.1	11,860	
Southwestern Avg	10,280	800	5.6	11,800	
Western Avg	28,040	1,590	6.6	15,650	
Texas Avg	12,220	940	5.7	11,730	
Total Avg	15,990	1,140	5.5	12,630	
Maximum Value	110,280	5,920	8.2	21,110	
Minimum Value	1,610	190	4.2	8,130	

Note: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile of freeway
[3] Rank value of 1 associated with most congested condition
Ranked by DVMT/Lane-mile

Source: TTI Analysis and Local Transportation Agency References

Table A-2. 1991 Principal Arterial Street Mileage and Travel Volume

Urban Area	DVMT[1] (1000)	Lane-Miles	Avg. No. Lanes	DVMT/[2] Ln-Mile	Rank[3]
Washington DC	19,650	2,320	4.0	8,470	1
Honolulu HI	1,620	200	3.8	8,100	2
Miami FL	16,000	2,080	4.3	7,690	3
Chicago IL	30,540	4,250	3.7	7,180	4
St. Louis MO	12,750	1,810	3.4	7,040	5
New York NY	53,020	7,620	3.4	6,960	6
Philadelphia PA	21,620	3,260	3.1	6,630	7
New Orleans LA	4,140	630	4.2	6,620	8
Portland OR	3,830	580	3.3	6,600	9
Los Angeles CA	81,710	12,400	4.0	6,590	10
Tampa FL	4,400	670	3.8	6,570	11
Detroit MI	24,180	3,730	4.4	6,490	12
Atlanta GA	9,890	1,580	3.7	6,280	13
Sacramento CA	7,000	1,120	4.1	6,280	13
Seattle-Everett WA	9,820	1,600	3.4	6,140	15
San Fran-Oak CA	14,030	2,300	4.0	6,100	16
Louisville KY	3,120	520	3.6	6,000	17
Pittsburgh PA	11,080	1,860	3.2	5,970	18
Baltimore MD	9,880	1,670	4.1	5,910	19
Charlotte NC	3,190	540	3.0	5,910	19
Norfolk VA	4,430	750	3.5	5,910	19
Salt Lake City UT	2,080	360	3.6	5,860	22
Hartford CT	3,800	650	3.8	5,850	23
Denver CO	10,800	1,850	3.9	5,840	24
Nashville TN	5,460	950	3.4	5,750	25
Phoenix AZ	18,020	3,220	4.1	5,590	26
San Diego CA	9,500	1,730	3.5	5,490	27
Oklahoma City OK	3,770	690	3.2	5,460	28
Ft. Lauderdale FL	6,000	1,130	4.3	5,330	29
Columbus OH	3,300	620	3.4	5,320	30
Memphis TN	4,200	810	4.3	5,220	31
Cleveland OH	5,850	1,130	3.0	5,200	32
Albuquerque NM	3,850	750	3.8	5,130	33
Houston TX	10,900	2,180	4.3	5,010	34
Austin TX	2,150	440	4.2	4,940	35
San Antonio TX	5,450	1,120	3.6	4,890	36
Dallas TX	8,400	1,720	4.8	4,880	37
Jacksonville FL	5,900	1,210	3.7	4,880	37
Milwaukee WI	4,930	1,010	3.4	4,880	37
Fort Worth TX	4,250	880	4.1	4,830	40
San Jose CA	6,730	1,400	4.2	4,800	41
Minn-St. Paul MN	5,720	1,210	3.4	4,730	42
San Bernardino-Riv CA	10,650	2,290	4.2	4,660	43
Cincinnati OH	3,800	830	3.3	4,610	44
Kansas City MO	4,840	1,050	3.5	4,610	44
Boston MA	12,500	2,760	2.3	4,530	46
Indianapolis IN	3,960	880	3.7	4,500	47
Corpus Christi TX	1,550	350	4.0	4,410	48
El Paso TX	3,280	840	4.2	3,900	49
Orlando FL	3,980	1,580	3.7	2,520	50
Northeastern Avg	18,790	2,880	3.4	6,330	
Midwestern Avg	8,900	1,480	3.5	5,500	
Southern Avg	6,140	1,080	3.8	5,700	
Southwestern Avg	6,430	1,240	4.1	5,030	
Western Avg	16,100	2,620	3.8	6,080	
Texas Avg	5,140	1,070	4.2	4,700	
Total Avg	10,430	1,740	3.7	5,660	
Maximum Value	81,710	12,400	4.8	8,470	
Minimum Value	1,550	200	2.3	2,520	

Notes: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile of principal arterial
[3] Rank value of 1 associated with most congested condition
Ranked by DVMT/Lane-mile

Source: TTI Analysis and Local Transportation Agency References

Table A-3. 1991 Roadway Congestion Index Value

Urban Area	Freeway / Expressway DVMT[1] (1000)	Freeway / Expressway DVMT/[2] Ln-Mile	Principal Arterial Street DVMT[1] (1000)	Principal Arterial Street DVMT/[2] Ln-Mile	Roadway[3] Congestion Index	Rank
Los Angeles CA	110,280	21,110	81,710	6,590	1.56	1
Washington DC	25,760	16,830	19,650	8,470	1.39	2
San Fran-Oak CA	42,000	17,570	14,030	6,100	1.34	3
Chicago IL	38,980	16,010	30,540	7,180	1.28	4
Miami FL	8,780	14,280	16,000	7,690	1.28	4
San Diego CA	27,700	16,060	9,500	5,490	1.22	6
San Bernardino-Riv CA	14,970	16,540	10,650	4,660	1.20	7
Seattle-Everett WA	19,000	15,570	9,820	6,140	1.20	7
Atlanta GA	24,970	14,520	9,890	6,280	1.14	9
New York NY	83,010	14,020	53,020	6,960	1.14	9
Honolulu HI	4,700	13,820	1,620	8,100	1.13	11
New Orleans LA	5,040	13,810	4,140	6,620	1.12	12
Houston TX	29,500	14,640	10,900	5,010	1.11	13
Detroit MI	23,700	13,310	24,180	6,490	1.10	14
Portland OR	7,520	13,430	3,830	6,600	1.08	15
San Jose CA	16,520	14,060	6,730	4,800	1.07	16
Boston MA	21,680	14,260	12,500	4,530	1.06	17
Dallas TX	23,900	13,940	8,400	4,880	1.06	17
Philadelphia PA	18,400	12,150	21,620	6,630	1.06	17
Tampa FL	3,650	11,970	4,400	6,570	1.05	20
Phoenix AZ	8,160	12,750	18,020	5,590	1.04	21
Sacramento CA	9,640	12,680	7,000	6,280	1.04	21
Denver CO	11,430	12,770	10,800	5,840	1.03	23
Baltimore MD	16,040	12,830	9,880	5,910	1.02	24
Milwaukee WI	7,810	13,020	4,930	4,880	1.00	25
St. Louis MO	19,050	11,240	12,750	7,040	0.98	26
Cincinnati OH	11,600	12,750	3,800	4,610	0.97	27
Norfolk VA	5,570	11,840	4,430	5,910	0.97	27
Cleveland OH	13,970	12,250	5,850	5,200	0.96	29
Ft. Lauderdale FL	7,130	11,880	6,000	5,330	0.95	30
Jacksonville FL	5,470	12,160	5,900	4,880	0.95	30
Albuquerque NM	2,480	11,530	3,850	5,130	0.94	32
Austin TX	5,500	12,090	2,150	4,940	0.94	32
Minn-St. Paul MN	18,210	12,180	5,720	4,730	0.94	32
Fort Worth TX	12,300	11,940	4,250	4,830	0.92	35
Memphis TN	4,400	11,280	4,200	5,220	0.92	35
Nashville TN	5,210	10,320	5,460	5,750	0.90	37
Hartford CT	6,240	10,760	3,800	5,850	0.89	38
San Antonio TX	9,380	11,300	5,450	4,890	0.89	38
Louisville KY	6,250	10,590	3,120	6,000	0.88	40
Salt Lake City UT	5,480	10,650	2,080	5,860	0.86	41
Columbus OH	8,500	10,550	3,300	5,320	0.84	42
Indianapolis IN	8,150	10,650	3,960	4,500	0.83	43
Charlotte NC	2,490	8,300	3,190	5,910	0.82	44
Pittsburgh PA	8,250	8,130	11,080	5,970	0.82	44
Oklahoma City OK	7,030	9,690	3,770	5,460	0.80	46
El Paso TX	3,390	9,550	3,280	3,900	0.75	47
Kansas City MO	12,520	9,200	4,840	4,610	0.74	48
Corpus Christi TX	1,610	8,630	1,550	4,410	0.72	49
Orlando FL	6,050	10,080	3,980	2,520	0.72	49
Northeastern Avg	25,630	12,710	18,790	6,330	1.05	
Midwestern Avg	14,650	11,790	8,900	5,500	0.94	
Southern Avg	7,160	11,860	6,140	5,700	0.98	
Southwestern Avg	10,280	11,800	6,430	5,030	0.93	
Western Avg	28,040	15,650	16,100	6,080	1.20	
Texas Avg	12,220	11,730	5,140	4,700	0.91	
Total Avg	15,990	12,630	10,430	5,660	1.01	
Maximum Value	110,280	21,110	81,710	8,470	1.56	
Minimum Value	1,610	8,130	1,550	2,520	0.72	

Notes: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile
[3] See Equation 1

Source: Equation 1 and Tables 2 and 5

Table A-4. Roadway Congestion Index Values, 1982 to 1991

Urban Area	Year										Percent Change
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1982 to 1991
Phoenix AZ	1.15	1.16	1.10	1.13	1.20	1.18	1.00	1.03	1.03	1.04	-10
Houston TX	1.17	1.21	1.25	1.23	1.21	1.19	1.15	1.13	1.12	1.11	-5
Detroit MI	1.13	1.10	1.13	1.12	1.11	1.10	1.09	1.08	1.09	1.10	-3
Louisville KY	0.84	0.82	0.81	0.79	0.80	0.88	0.87	0.86	0.86	0.88	5
Pittsburgh PA	0.78	0.76	0.76	0.78	0.79	0.79	0.81	0.82	0.82	0.82	5
Philadelphia PA	1.00	1.03	1.04	0.90	1.06	1.06	1.07	1.05	1.05	1.06	6
Memphis TN	0.86	0.80	0.76	0.75	0.77	0.84	0.86	0.91	0.91	0.92	7
Corpus Christi TX	0.67	0.69	0.69	0.71	0.71	0.72	0.70	0.71	0.72	0.72	7
Orlando FL	0.66	0.68	0.67	0.71	0.71	0.72	0.74	0.72	0.72	0.72	9
Jacksonville FL	0.87	0.98	0.98	0.98	0.95	0.94	0.95	0.93	0.94	0.95	9
San Bernardino-Riv CA	1.09	1.11	1.12	1.11	1.14	1.13	1.16	1.16	1.19	1.20	10
Ft. Lauderdale FL	0.86	0.85	0.84	0.84	0.84	0.90	0.90	0.92	0.94	0.95	10
Oklahoma City OK	0.72	0.72	0.75	0.74	0.71	0.76	0.78	0.78	0.79	0.80	11
Tampa FL	0.94	0.91	1.03	1.00	0.96	1.02	1.03	1.03	1.05	1.05	12
Cincinnati OH	0.86	0.83	0.82	0.83	0.84	0.87	0.88	0.94	0.96	0.97	13
New York NY	1.01	1.02	0.99	1.00	1.06	1.06	1.10	1.12	1.14	1.14	13
New Orleans LA	0.98	1.00	1.05	1.10	1.11	1.14	1.13	1.13	1.12	1.12	14
San Antonio TX	0.77	0.79	0.82	0.87	0.90	0.85	0.86	0.87	0.88	0.89	16
Indianapolis IN	0.71	0.66	0.75	0.76	0.80	0.85	0.84	0.85	0.83	0.83	17
Hartford CT	0.76	0.79	0.86	0.85	0.85	0.87	0.91	0.89	0.89	0.89	17
Boston MA	0.90	0.93	0.95	0.98	1.04	1.04	1.12	1.09	1.06	1.06	18
St. Louis MO	0.83	0.87	0.88	0.89	0.93	0.96	0.98	0.96	0.99	0.98	18
El Paso TX	0.63	0.64	0.65	0.70	0.75	0.71	0.74	0.74	0.74	0.75	19
Kansas City MO	0.62	0.62	0.60	0.65	0.69	0.71	0.72	0.72	0.74	0.74	19
Cleveland OH	0.80	0.82	0.83	0.81	0.86	0.89	0.97	0.95	0.97	0.96	20
Milwaukee WI	0.83	0.84	0.87	0.88	0.90	0.95	0.94	0.97	0.99	1.00	20
Albuquerque NM	0.78	0.83	0.89	0.93	0.88	0.91	0.90	0.91	0.93	0.94	21
Fort Worth TX	0.76	0.79	0.80	0.82	0.87	0.87	0.87	0.87	0.90	0.92	21
Denver CO	0.85	0.88	0.93	0.96	0.97	0.95	0.99	1.01	1.03	1.03	21
Baltimore MD	0.84	0.84	0.85	0.84	0.88	0.90	0.92	0.99	1.01	1.02	21
Honolulu HI	0.93	0.95	0.97	0.97	1.05	1.07	1.10	1.09	1.11	1.13	22
Nashville TN	0.74	0.76	0.83	0.81	0.86	0.88	0.94	0.90	0.89	0.90	22
Miami FL	1.05	1.09	1.07	1.13	1.10	1.14	1.18	1.25	1.26	1.28	22
Austin TX	0.77	0.84	0.89	0.91	0.98	0.96	0.96	0.96	0.94	0.94	22
Charlotte NC	0.67	0.72	0.72	0.73	0.73	0.74	0.73	0.74	0.78	0.82	22
Norfolk VA	0.79	0.77	0.79	0.84	0.90	0.93	0.94	0.95	0.96	0.97	23
Columbus OH	0.68	0.71	0.71	0.71	0.75	0.78	0.79	0.82	0.83	0.84	24
Portland OR	0.87	0.86	0.88	0.93	0.97	1.00	1.05	1.07	1.07	1.08	24
Chicago IL	1.02	1.02	1.05	1.08	1.15	1.15	1.18	1.21	1.25	1.28	25
San Jose CA	0.85	0.87	0.90	0.94	0.96	0.98	0.99	1.02	1.04	1.07	26
Dallas TX	0.84	0.89	0.94	0.98	1.04	1.02	1.02	1.02	1.05	1.06	26
Seattle-Everett WA	0.95	0.99	1.02	1.05	1.09	1.14	1.17	1.21	1.20	1.20	26
Minn-St. Paul MN	0.74	0.79	0.81	0.83	0.87	0.87	0.88	0.90	0.93	0.94	27
Los Angeles CA	1.22	1.27	1.32	1.36	1.42	1.47	1.52	1.54	1.55	1.56	28
Atlanta GA	0.89	0.94	0.97	1.02	1.09	1.11	1.14	1.14	1.11	1.14	28
Washington DC	1.07	1.09	1.12	1.20	1.28	1.30	1.32	1.36	1.37	1.39	30
Sacramento CA	0.80	0.84	0.88	0.92	0.95	1.00	1.03	1.01	1.02	1.04	30
San Fran-Oak CA	1.01	1.05	1.12	1.17	1.24	1.31	1.33	1.36	1.35	1.34	33
Salt Lake City UT	0.63	0.63	0.65	0.68	0.68	0.70	0.72	0.81	0.85	0.86	37
San Diego CA	0.78	0.83	0.91	0.95	1.00	1.08	1.13	1.18	1.22	1.22	56
Northeastern Avg	0.91	0.92	0.94	0.94	0.99	1.00	1.04	1.05	1.05	1.05	
Midwestern Avg	0.82	0.82	0.83	0.84	0.87	0.90	0.91	0.92	0.94	0.94	
Southern Avg	0.85	0.86	0.88	0.90	0.91	0.94	0.96	0.97	0.97	0.98	
Southwestern Avg	0.82	0.85	0.87	0.90	0.93	0.91	0.90	0.91	0.93	0.93	
Western Avg	0.94	0.97	1.01	1.04	1.09	1.13	1.16	1.18	1.19	1.20	
Texas Avg	0.80	0.84	0.86	0.89	0.92	0.90	0.90	0.90	0.91	0.91	
Total Avg	0.86	0.88	0.90	0.92	0.95	0.97	0.98	0.99	1.00	1.01	
Maximum Value	1.22	1.27	1.32	1.36	1.42	1.47	1.52	1.54	1.55	1.56	
Minimum Value	0.62	0.62	0.60	0.65	0.68	0.70	0.70	0.71	0.72	0.72	

Source: TTI Analysis

Table A-5. 1991 Urban Area Travel by Facility Type

Urban Area	Daily Vehicle-Miles of Travel			Fwy/Expwy % of Total	Prin.Art.Str. % of Total	Fwy/Prin.Art.Str. % of Total
	Fwy/Expwy	Prin.Art.Str.	Area Total			
Northeastern Cities						
Baltimore MD	16,040	9,880	36,920	43	27	70
Boston MA	21,680	12,500	51,640	42	24	66
Hartford CT	6,240	3,800	14,020	45	27	72
New York NY	83,010	53,020	225,220	37	24	61
Philadelphia PA	18,400	21,620	66,770	28	32	60
Pittsburgh PA	8,250	11,080	33,170	25	33	58
Washington DC	25,760	19,650	65,070	40	30	70
Midwestern Cities						
Chicago IL	38,980	30,540	126,440	31	24	55
Cincinnati OH	11,600	3,800	26,520	44	14	58
Cleveland OH	13,970	5,850	34,430	41	17	58
Columbus OH	8,500	3,300	20,660	41	16	57
Detroit MI	23,700	24,180	79,380	30	30	60
Indianapolis IN	8,150	3,960	20,830	39	19	58
Kansas City MO	12,520	4,840	27,970	45	17	62
Louisville KY	6,250	3,120	18,620	34	17	51
Milwaukee WI	7,810	4,930	29,450	27	17	44
Minn-St. Paul MN	18,210	5,720	43,930	41	13	54
Oklahoma City OK	7,030	3,770	19,510	36	19	55
St. Louis MO	19,050	12,750	45,280	42	28	70
Southern Cities						
Atlanta GA	24,970	9,890	62,660	40	16	56
Charlotte NC	2,490	3,190	10,580	24	30	54
Ft. Lauderdale FL	7,130	6,000	25,410	28	24	52
Jacksonville FL	5,470	5,900	18,150	30	33	63
Memphis TN	4,400	4,200	16,230	27	26	53
Miami FL	8,780	16,000	33,800	26	47	73
Nashville TN	5,210	5,460	15,400	34	35	69
New Orleans LA	5,040	4,140	15,380	33	27	60
Norfolk VA	5,570	4,430	20,570	27	22	49
Orlando FL	6,050	3,980	18,760	32	21	53
Tampa FL	3,650	4,400	16,250	22	27	49
Southwestern Cities						
Albuquerque NM	2,480	3,850	10,150	24	38	62
Austin TX	5,500	2,150	11,950	46	18	64
Corpus Christi TX	1,610	1,550	6,150	26	25	51
Dallas TX	23,900	8,400	49,830	48	17	65
Denver CO	11,430	10,800	28,960	39	37	76
El Paso TX	3,390	3,280	9,390	36	35	71
Fort Worth TX	12,300	4,250	26,830	46	16	62
Houston TX	29,500	10,900	73,090	40	15	55
Phoenix AZ	8,160	18,020	41,420	20	43	63
Salt Lake City UT	5,480	2,080	15,930	34	13	47
San Antonio TX	9,380	5,450	25,750	36	21	57
Western Cities						
Honolulu HI	4,700	1,620	10,950	43	15	58
Los Angeles CA	110,280	81,710	247,150	45	33	78
Portland OR	7,520	3,830	19,990	38	19	57
Sacramento CA	9,640	7,000	23,950	40	29	69
San Bernardino-Riv CA	14,970	10,650	27,010	55	39	94
San Diego CA	27,700	9,500	51,740	54	18	72
San Fran-Oak CA	42,000	14,030	76,480	55	18	73
San Jose CA	16,520	6,730	32,880	50	20	70
Seattle-Everett WA	19,000	9,820	43,100	44	23	67
Northeastern Avg	25,630	18,790	70,400	37	28	65
Midwestern Avg	14,650	8,900	41,080	38	19	57
Southern Avg	7,160	6,140	23,020	29	28	57
Southwestern Avg	10,280	6,430	27,220	36	25	61
Western Avg	28,040	16,100	59,250	47	24	71
Texas Avg	12,220	5,140	29,000	40	21	61
Total Avg	15,990	10,430	41,430	37	25	62
Maximum Value	110,280	81,710	247,150	55	47	94
Minimum Value	1,610	1,550	6,150	20	13	44

Notes: Percentage of Total Daily Vehicle-Miles of Travel serviced by specified facility
Source: TTI Analysis and Local Transportation Agency References

Table A-6. Illustration of Annual Capacity Increase Required to Prevent Congestion Growth

Urban Area	Existing (1991) Lane-mi		Average Annual VMT	Annual Additional Lane-mi Needed		Freeway Lane-mi:		Prin. Art. Lane-mi:	
	Freeway	Prin. Art.	Growth (%)[1]	Freeway	Prin. Art.	Needed	Added 87-91[2]	Needed	Added 87-91[2]
Albuquerque NM	215	750	3.24	7	24	28	15	96	100
Atlanta GA	1,720	1,575	1.93	33	30	132	80	120	180
Austin TX	455	435	1.18	5	5	20	35	20	20
Baltimore MD	1,250	1,670	3.33	42	56	168	10	224	-10
Boston MA	1,520	2,760	0.24	4	7	16	30	28	80
Charlotte NC	300	540	4.63	14	25	56	20	100	30
Chicago IL	2,435	4,250	5.61	137	239	548	250	956	510
Cincinnati OH	910	825	4.63	42	38	168	65	152	35
Cleveland OH	1,140	1,125	5.50	63	62	252	180	248	25
Columbus OH	806	620	3.33	27	21	108	31	84	25
Corpus Christi	186	350	1.33	2	5	8	6	20	30
Dallas TX	1,715	1,720	1.62	28	28	112	55	112	30
Denver CO	895	1,850	2.49	22	46	88	40	184	20
Detroit MI	1,780	3,725	2.53	45	94	180	170	376	275
El Paso TX	355	840	1.83	7	15	28	5	60	35
Fort Worth TX	1,030	880	2.07	21	18	84	40	72	20
Ft. Lauderdale	600	1,125	2.93	18	33	72	40	132	55
Hartford CT	580	650	2.59	15	17	60	30	68	65
Honolulu HI	340	200	2.21	8	4	32	10	16	10
Houston TX	2,015	2,175	2.71	55	59	220	375	236	205
Indianapolis IN	765	880	0.78	6	7	24	55	28	35
Jacksonville FL	450	1,210	2.41	11	29	44	50	116	70
Kansas City MO	1,360	1,050	1.64	22	17	88	30	68	10
Los Angeles CA	5,225	12,400	3.00	157	372	628	345	1,488	620
Louisville KY	590	520	2.93	17	15	68	80	60	15
Memphis TN	390	805	2.95	12	24	48	10	96	50
Miami FL	615	2,080	4.98	31	104	124	60	416	80
Milwaukee WI	600	1,010	2.68	16	27	64	50	108	30
Minn-St. Paul M	1,495	1,210	3.55	53	43	212	105	172	50
Nashville TN	505	950	3.22	16	31	64	75	124	45
New Orleans LA	365	625	1.32	5	8	20	35	32	5
New York NY	5,920	7,620	2.75	163	209	652	130	836	720
Norfolk VA	470	750	2.60	12	20	48	20	80	50
Oklahoma City OK	725	690	2.46	18	17	72	25	68	35
Orlando FL	600	1,580	2.34	14	37	56	55	148	50
Philadelphia PA	1,515	3,260	1.52	23	50	92	180	200	40
Phoenix AZ	640	3,220	5.60	36	180	144	300	720	655
Pittsburgh PA	1,015	1,855	3.12	32	58	128	80	232	155
Portland OR	560	580	3.48	20	20	80	20	80	55
Sacramento CA	760	1,115	4.07	31	45	124	100	180	115
Salt Lake City U	515	355	7.59	39	27	156	45	108	10
San Antonio TX	830	1,115	2.18	18	24	72	15	96	65
San Bernardino-Riv CA	905	2,285	4.20	38	96	152	50	384	565
San Diego CA	1,725	1,730	4.42	76	76	304	85	304	170
San Fran-Oak CA	2,390	2,300	1.78	42	41	168	85	164	295
San Jose CA	1,175	1,400	2.66	31	37	124	35	148	40
Seattle-Everett WA	1,220	1,600	3.06	37	49	148	80	196	125
St. Louis MO	1,695	1,810	3.74	63	68	252	265	272	65
Tampa FL	305	670	2.92	9	20	36	25	80	60
Washington DC	1,530	2,320	2.40	37	56	148	60	224	80

[1] Average annual growth rate of freeway and principal arterial streets between 1987 and 1991.
[2] Average annual lane-miles added from 1987 to 1991.

Source: TTI Analysis and Local Transportation Agency References

Table A-7. Speed Relationships with Average Daily Traffic (ADT) per Lane Volumes

Functional Class	Parameters	Severity of Congestion[1,2]			
		Uncongested	Moderate	Heavy	Severe
Freeway/Expressway	ADT/Lane	Under 15,000	15,000 - 17,500	17,501 - 20,000	Over 20,000
	Speed (kph)[3]	60	38	33	30
Principal Arterial Streets	ADT/Lane	Under 5,750	5,750 - 7,000	7,001 - 8,500	Over 8,500
	Speed (kph)[3]	35	28	25	23

Note: [1]Assumes congested freeway operation when ADT/Lane exceeds 15,000.
[2]Assumes congested principal arterial street operations when ADT/lane exceeds 5,750.
[3]Value represents a weighted average.

Source: TTI Analysis and Houston-Galveston Regional Transportation Study (Appendix B)

Table A-8. Freeway and Expressway Recurring and Incident Hours of Daily Delay for 1991[1]

Urban Area	Recurring Hours of Delay				Incident Hours of Delay			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	4,100	6,800	14,680	25,580	9,420	15,650	33,770	58,840
Boston MA	6,420	20,860	36,590	63,870	22,460	73,020	128,050	223,530
Hartford CT	3,200	880	410	4,490	8,650	2,370	1,110	12,130
New York NY	99,290	66,690	120,540	286,520	248,220	166,720	301,360	716,300
Philadelphia PA	9,540	5,800	10,930	26,270	20,040	12,190	22,940	55,170
Pittsburgh PA	1,430	2,820	6,460	10,710	4,160	8,170	18,720	31,050
Washington DC	8,840	34,700	67,860	111,400	19,450	76,340	149,300	245,090
Midwestern Cities								
Chicago IL	12,410	21,050	113,630	147,090	14,890	25,260	136,360	176,510
Cincinnati OH	8,690	6,850	2,720	18,260	6,950	5,480	2,180	14,610
Cleveland OH	9,100	6,430	2,620	18,150	6,370	4,500	1,830	12,700
Columbus OH	890	5,170	8,070	14,130	630	3,620	5,650	9,900
Detroit MI	8,700	7,500	46,900	63,100	19,140	16,510	103,190	138,840
Indianapolis IN	2,900	0	1,110	4,010	4,340	0	1,670	6,010
Kansas City MO	1,520	1,230	560	3,310	4,720	3,810	1,750	10,280
Louisville KY	770	30	950	1,750	850	30	1,050	1,930
Milwaukee WI	2,910	5,130	6,280	14,320	2,910	5,130	6,280	14,320
Minn-St. Paul MN	6,440	7,180	21,070	34,690	5,790	6,470	18,960	31,220
Oklahoma City OK	2,070	1,380	0	3,450	2,280	1,520	0	3,800
St. Louis MO	8,270	2,490	11,250	22,010	9,930	2,980	13,500	26,410
Southern Cities								
Atlanta GA	4,560	26,240	44,310	75,110	5,020	28,870	48,740	82,630
Charlotte NC	4,600	1,150	0	5,750	3,680	920	0	4,600
Ft. Lauderdale FL	4,390	3,650	1,340	9,380	6,580	5,470	2,010	14,060
Jacksonville FL	5,930	3,090	330	9,350	8,900	4,640	500	14,040
Memphis TN	2,550	450	0	3,000	2,800	490	0	3,290
Miami FL	7,670	5,340	19,730	32,740	11,510	8,010	29,600	49,120
Nashville TN	3,980	1,780	720	6,480	4,380	1,950	800	7,130
New Orleans LA	750	8,880	6,190	15,820	1,350	15,980	11,140	28,470
Norfolk VA	870	6,010	9,930	16,810	2,170	15,040	24,820	42,030
Orlando FL	6,540	2,260	4,090	12,890	9,800	3,390	6,130	19,320
Tampa FL	650	1,920	3,380	5,950	970	2,880	5,070	8,920
Southwestern Cities								
Albuquerque NM	800	1,190	890	2,880	880	1,310	980	3,170
Austin TX	4,500	6,990	6,370	17,860	4,950	7,690	7,010	19,650
Corpus Christi TX	630	100	0	730	690	110	0	800
Dallas TX	12,230	20,170	52,810	85,210	22,020	36,300	95,060	153,380
Denver CO	6,020	12,470	21,490	39,980	6,020	12,470	21,490	39,980
El Paso TX	1,560	1,750	250	3,560	1,710	1,930	280	3,920
Fort Worth TX	4,580	7,550	19,770	31,900	8,240	13,590	35,580	57,410
Houston TX	9,910	35,010	94,970	139,890	13,870	49,020	132,960	195,850
Phoenix AZ	3,380	15,000	12,550	30,930	1,350	6,000	5,020	12,370
Salt Lake City UT	1,800	2,880	1,600	6,280	1,080	1,730	960	3,770
San Antonio TX	2,040	9,200	13,360	24,600	2,240	10,130	14,700	27,070
Western Cities								
Honolulu HI	1,950	3,800	9,610	15,360	3,510	6,840	17,310	27,660
Los Angeles CA	23,160	21,820	553,640	598,620	27,800	26,190	664,370	718,360
Portland OR	6,870	4,770	7,680	19,320	13,740	9,550	15,360	38,650
Sacramento CA	9,420	10,650	3,250	23,320	5,650	6,390	1,950	13,990
San Bernardino-Riv CA	8,490	13,020	59,240	80,750	10,190	15,630	71,080	96,900
San Diego CA	14,290	20,200	44,110	78,600	8,580	12,120	26,460	47,160
San Fran-Oak CA	20,120	33,170	176,680	229,970	26,150	43,130	229,680	298,960
San Jose CA	10,040	13,180	53,280	76,500	12,050	15,810	63,930	91,790
Seattle-Everett WA	6,790	42,240	36,380	85,410	9,510	59,140	50,930	119,580
Northeastern Avg	18,970	19,790	36,780	75,540	47,480	50,640	93,610	191,730
Midwestern Avg	5,390	5,370	17,930	28,690	6,570	6,280	24,370	37,220
Southern Avg	3,860	5,520	8,180	17,560	5,200	7,970	11,710	24,880
Southwestern Avg	4,310	10,210	20,370	34,890	5,730	12,750	28,550	47,030
Western Avg	11,240	18,100	104,870	134,210	13,020	21,640	126,790	161,450
Texas Avg	5,060	11,540	26,790	43,390	7,670	16,960	40,800	65,430
Total Avg	7,770	10,780	34,610	53,160	12,970	17,050	50,630	80,650
Maximum Value	99,290	66,690	553,640	719,620	248,220	166,720	664,370	1079310
Minimum Value	630	0	0	630	630	0	0	630

Note: [1] Delay calculated based on vehicular speed in Table A-7.

Source: TTI Analysis

Table A-9. Principal Arterial Street Recurring and Incident Hours of Daily Delay for 1991[1]

	Recurring Hours of Delay				Incident Hours of Delay			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	960	4,170	15,740	20,870	1,060	4,590	17,320	22,970
Boston MA	4,530	3,620	19,370	27,520	4,980	3,980	21,310	30,270
Hartford CT	1,750	2,180	2,430	6,360	1,920	2,390	2,680	6,990
New York NY	25,750	41,210	177,030	243,990	28,330	45,330	194,740	268,400
Philadelphia PA	7,920	22,170	63,340	93,430	8,710	24,380	69,670	102,760
Pittsburgh PA	5,820	7,770	22,290	35,880	6,410	8,540	24,520	39,470
Washington DC	4,740	20,720	75,140	100,600	5,210	22,790	82,650	110,650
Midwestern Cities								
Chicago IL	14,560	29,050	64,870	108,480	16,010	31,960	71,350	119,320
Cincinnati OH	1,160	700	3,040	4,900	1,280	770	3,350	5,400
Cleveland OH	2,030	3,040	3,570	8,640	2,230	3,350	3,920	9,500
Columbus OH	940	2,450	4,800	8,190	1,030	2,700	5,280	9,010
Detroit MI	6,000	16,390	63,420	85,810	6,600	18,030	69,770	94,400
Indianapolis IN	1,750	300	1,270	3,320	1,920	330	1,400	3,650
Kansas City MO	670	1,190	5,160	7,020	740	1,310	5,680	7,730
Louisville KY	1,140	4,880	2,780	8,800	1,250	5,370	3,050	9,670
Milwaukee WI	1,750	2,300	4,930	8,980	1,920	2,530	5,420	9,870
Minn-St. Paul MN	2,020	1,820	14,510	18,350	2,220	2,000	15,960	20,180
Oklahoma City OK	970	1,940	4,300	7,210	1,070	2,130	4,730	7,930
St. Louis MO	4,900	17,820	17,850	40,570	5,390	19,600	19,630	44,620
Southern Cities								
Atlanta GA	3,180	8,480	25,430	37,090	3,500	9,320	27,970	40,790
Charlotte NC	420	2,290	10,040	12,750	460	2,520	11,040	14,020
Ft. Lauderdale FL	2,540	7,420	13,210	23,170	2,790	8,160	14,530	25,480
Jacksonville FL	3,070	4,020	8,150	15,240	3,370	4,420	8,960	16,750
Memphis TN	1,370	2,930	3,180	7,480	1,510	3,220	3,500	8,230
Miami FL	1,370	8,020	61,820	71,210	1,500	8,820	68,000	78,320
Nashville TN	920	2,710	9,200	12,830	1,010	2,980	10,130	14,120
New Orleans LA	1,320	2,490	7,870	11,680	1,450	2,730	8,660	12,840
Norfolk VA	1,400	1,990	4,890	8,280	1,530	2,190	5,380	9,100
Orlando FL	620	1,820	17,670	20,110	680	2,000	19,440	22,120
Tampa FL	3,350	2,460	10,910	16,720	3,680	2,710	12,000	18,390
Southwestern Cities								
Albuquerque NM	2,270	3,490	1,050	6,810	2,490	3,840	1,160	7,490
Austin TX	1,040	1,830	1,940	4,810	1,140	2,010	2,130	5,280
Corpus Christi TX	490	250	200	940	540	270	220	1,030
Dallas TX	3,470	3,990	4,450	11,910	3,820	4,390	4,900	13,110
Denver CO	2,440	8,250	20,380	31,070	2,680	9,070	22,410	34,160
El Paso TX	150	150	590	890	170	170	650	990
Fort Worth TX	1,760	2,020	2,250	6,030	1,930	2,220	2,480	6,630
Houston TX	3,630	11,630	13,800	29,060	4,000	12,800	15,180	31,980
Phoenix AZ	16,550	17,650	33,090	67,290	18,200	19,410	36,400	74,010
Salt Lake City UT	1,450	1,050	1,190	3,690	1,590	1,160	1,310	4,060
San Antonio TX	740	930	2,720	4,390	820	1,020	2,990	4,830
Western Cities								
Honolulu HI	1,450	910	3,940	6,300	1,600	1,000	4,330	6,930
Los Angeles CA	25,940	59,800	141,930	227,670	28,530	65,780	156,130	250,440
Portland OR	760	5,010	7,290	13,060	830	5,520	8,020	14,370
Sacramento CA	980	3,720	16,590	21,290	1,070	4,090	18,250	23,410
San Bernardino-Riv CA	10,170	11,020	10,830	32,020	11,190	12,120	11,920	35,230
San Diego CA	2,260	9,320	2,230	13,810	2,490	10,250	2,460	15,200
San Fran-Oak CA	2,770	4,920	44,280	51,970	3,040	5,410	48,700	57,150
San Jose CA	3,240	1,300	25,380	29,920	3,570	1,430	27,910	32,910
Seattle-Everett WA	3,220	5,560	22,260	31,040	3,550	6,110	24,480	34,140
Northeastern Avg	7,350	14,550	53,620	75,520	8,090	16,000	58,980	83,070
Midwestern Avg	3,160	6,820	15,870	25,850	3,470	7,510	17,460	28,440
Southern Avg	1,780	4,060	15,670	21,510	1,950	4,460	17,240	23,650
Southwestern Avg	3,090	4,660	7,420	15,170	3,400	5,120	8,170	16,690
Western Avg	5,640	11,280	30,530	47,450	6,210	12,410	33,580	52,200
Texas Avg	1,610	2,970	3,710	8,290	1,770	3,270	4,080	9,120
Total Avg	3,870	7,620	21,890	33,380	4,260	8,380	24,080	36,720
Maximum Value	25,940	59,800	177,030	262,770	28,530	65,780	194,740	289,050
Minimum Value	150	150	200	500	170	170	220	560

Note: [1] Delay calculation based on vehicular speed in Table A-7.

Source: TTI Analysis

Table A-10. Daily Vehicle Hours of Delay for 1991

Urban Area	Vehicle Hours of Delay				Daily Delay per 1000 Persons	
	Recurring	Incident	Total	Rank[1]		Rank[1]
Northeastern Cities						
Baltimore MD	46,460	81,800	128,260	20	60	31
Boston MA	91,380	253,800	345,180	8	120	9
Hartford CT	10,850	19,130	29,980	41	50	35
New York NY	530,510	984,690	1,515,200	2	90	14
Philadelphia PA	119,690	157,940	277,630	9	70	23
Pittsburgh PA	46,590	70,520	117,100	21	60	31
Washington DC	211,990	355,730	567,730	4	170	2
Midwestern Cities						
Chicago IL	255,560	295,830	551,390	5	70	23
Cincinnati OH	23,160	20,000	43,150	37	40	39
Cleveland OH	26,790	22,210	49,000	34	30	42
Columbus OH	22,330	18,910	41,250	38	50	35
Detroit MI	148,920	233,230	382,160	7	100	12
Indianapolis IN	7,330	9,660	16,990	48	20	46
Kansas City MO	10,340	18,000	28,340	42	20	46
Louisville KY	10,540	11,600	22,140	44	30	42
Milwaukee WI	23,290	24,190	47,480	36	40	39
Minn-St. Paul MN	53,050	51,410	104,460	22	50	35
Oklahoma City OK	10,660	11,730	22,390	43	30	42
St. Louis MO	62,580	71,040	133,620	19	70	23
Southern Cities						
Atlanta GA	112,200	123,420	235,620	13	120	9
Charlotte NC	18,490	18,620	37,110	40	80	17
Ft. Lauderdale FL	32,530	39,530	72,060	28	60	31
Jacksonville FL	24,590	30,790	55,380	32	70	23
Memphis TN	10,480	11,520	22,000	45	30	42
Miami FL	103,950	127,440	231,380	14	120	9
Nashville TN	19,310	21,240	40,550	39	70	23
New Orleans LA	27,490	41,310	68,810	29	60	31
Norfolk VA	25,090	51,140	76,230	26	80	17
Orlando FL	32,990	41,440	74,420	27	80	17
Tampa FL	22,660	27,310	49,970	33	70	23
Southwestern Cities						
Albuquerque NM	9,680	10,650	20,330	46	40	39
Austin TX	22,670	24,930	47,600	35	90	14
Corpus Christi TX	1,670	1,840	3,510	50	10	50
Dallas TX	97,130	166,490	263,610	11	130	8
Denver CO	71,040	74,150	145,190	18	90	14
El Paso TX	4,450	4,900	9,350	49	20	46
Fort Worth TX	37,920	64,040	101,960	23	80	17
Houston TX	168,960	227,820	396,770	6	140	7
Phoenix AZ	98,220	86,390	184,610	16	100	12
Salt Lake City UT	9,960	7,820	17,790	47	20	46
San Antonio TX	28,990	31,890	60,880	30	50	35
Western Cities						
Honolulu HI	21,660	34,580	56,240	31	80	17
Los Angeles CA	826,300	968,790	1,795,090	1	150	4
Portland OR	32,390	53,020	85,410	24	80	17
Sacramento CA	44,610	37,410	82,020	25	70	23
San Bernardino-Riv CA	112,770	132,130	244,900	12	200	1
San Diego CA	92,420	62,370	154,790	17	70	23
San Fran-Oak CA	281,930	356,120	638,060	3	170	2
San Jose CA	106,410	124,700	231,120	15	150	4
Seattle-Everett WA	116,450	153,720	270,170	10	150	4
Northeastern Avg	151,070	274,800	425,870		90	
Midwestern Avg	54,550	65,650	120,200		40	
Southern Avg	39,070	48,520	87,590		80	
Southwestern Avg	50,060	63,720	113,780		70	
Western Avg	181,660	213,650	395,310		130	
Texas Avg	51,680	74,560	126,240		70	
Total Avg	86,550	117,380	203,930		80	
Maximum Value	826,300	984,690	1,795,090		200	
Minimum Value	1,670	1,840	3,510		10	

Note: [1] Rank value of 1 associated with most congested conditions

Source: TTI Analysis

Table A-11. Annual Excess Fuel Consumed due to Traffic Congestion

Urban Area	Gallons of Fuel Wasted (millions) Recurring	Incident	Total	Rank[1]	Excess Fuel Consumed per 1000 Persons (Gallons)	Rank[1]
Northeastern Cities						
Baltimore MD	21	37	58	20	28,050	31
Boston MA	42	116	158	8	53,360	10
Hartford CT	5	9	14	41	22,720	37
New York NY	243	451	694	2	41,219	16
Philadelphia PA	51	68	119	11	28,244	30
Pittsburgh PA	20	30	50	21	26,871	33
Washington DC	94	157	251	4	76,620	3
Midwestern Cities						
Chicago IL	114	132	246	5	32,674	24
Cincinnati OH	11	10	21	37	17,492	40
Cleveland OH	13	11	23	33	13,094	43
Columbus OH	10	9	19	38	20,680	38
Detroit MI	65	102	167	7	41,840	14
Indianapolis IN	3	5	8	48	8,465	48
Kansas City MO	5	8	13	42	10,837	46
Louisville KY	5	5	10	45	11,750	44
Milwaukee WI	11	11	22	36	17,787	39
Minn-St. Paul MN	24	24	48	23	23,194	36
Oklahoma City OK	5	5	10	43	13,608	42
St. Louis MO	28	31	59	19	30,380	29
Southern Cities						
Atlanta GA	51	56	107	13	56,142	9
Charlotte NC	8	8	17	40	36,316	22
Ft. Lauderdale FL	14	17	32	28	24,978	34
Jacksonville FL	11	14	25	32	33,740	23
Memphis TN	5	5	10	44	11,492	45
Miami FL	45	55	100	15	52,946	11
Nashville TN	9	10	18	39	31,660	26
New Orleans LA	12	18	31	29	27,980	32
Norfolk VA	11	23	35	26	36,361	21
Orlando FL	15	19	33	27	37,962	20
Tampa FL	10	12	22	35	31,573	27
Southwestern Cities						
Albuquerque NM	4	5	9	46	16,718	41
Austin TX	11	12	23	34	43,050	12
Corpus Christi TX	1	1	2	50	5,773	50
Dallas TX	46	78	124	10	60,028	8
Denver CO	32	33	65	18	41,378	15
El Paso TX	2	2	5	49	8,131	49
Fort Worth TX	18	30	48	22	39,847	17
Houston TX	78	105	183	6	63,273	7
Phoenix AZ	43	38	81	16	41,843	13
Salt Lake City UT	5	4	8	47	9,883	47
San Antonio TX	14	15	28	30	24,114	35
Western Cities						
Honolulu HI	10	16	26	31	38,825	18
Los Angeles CA	371	435	805	1	68,469	6
Portland OR	15	25	40	24	38,028	19
Sacramento CA	21	17	38	25	32,469	25
San Bernardino-Riv CA	52	60	112	12	90,687	1
San Diego CA	44	29	73	17	31,122	28
San Fran-Oak CA	130	164	294	3	78,831	2
San Jose CA	49	57	106	14	70,523	4
Seattle-Everett WA	54	71	125	9	69,150	5
Northeastern Avg	68	123	192	-	42,231	-
Midwestern Avg	25	30	54	-	26,532	-
Southern Avg	18	22	39	-	37,850	-
Southwestern Avg	23	30	52	-	42,343	-
Western Avg	84	98	180	-	64,082	-
Texas Avg	24	35	59	-	47,342	-
Total Avg	39	53	92	-	43,380	-
Maximum Value	402	480	805	-	47,843	-
Minimum Value	1	1	2	-	5,773	-

[1] Rank value of 1 associated with greatest fuel consumption.

Source: TTI Analysis

Table A-12. Change in Daily Delay in 1991

Urban Area	Daily Delay (1000 Veh-Hours) 1986	1987	1988	1989	1990	1991	% change 1986-1991
Northeastern Cities							
Baltimore MD	95	100	105	120	125	130	37
Boston MA	285	270	370	350	335	345	21
Hartford CT	20	20	30	35	30	30	50
New York NY	1,190	1,265	1,370	1,515	1,510	1,515	27
Philadelphia PA	250	270	275	270	275	280	12
Pittsburgh PA	95	100	115	115	120	115	21
Washington DC	440	475	495	540	555	570	30
Midwestern Cities							
Chicago IL	480	470	470	495	530	550	15
Cincinnati OH	25	30	40	40	40	45	80
Cleveland OH	35	40	45	45	50	50	43
Columbus OH	30	35	35	40	40	40	33
Detroit MI	340	345	350	360	360	380	12
Indianapolis IN	10	10	15	15	15	15	50
Kansas City MO	20	20	25	25	30	30	50
Louisville KY	20	20	20	20	20	20	0
Milwaukee WI	35	40	45	45	45	45	29
Minn-St. Paul MN	70	95	95	95	105	105	50
Oklahoma City OK	20	20	25	20	20	20	0
St. Louis MO	115	120	105	140	135	135	17
Southern Cities							
Atlanta GA	225	240	225	230	235	235	4
Charlotte NC	25	25	30	30	35	35	40
Ft. Lauderdale FL	65	65	70	65	70	70	8
Jacksonville FL	40	45	45	55	55	55	38
Memphis TN	15	15	20	20	20	20	33
Miami FL	150	170	200	220	230	230	53
Nashville TN	30	35	40	40	40	40	33
New Orleans LA	65	65	70	70	70	70	8
Norfolk VA	60	70	70	75	75	75	25
Orlando FL	60	60	60	70	70	75	25
Tampa FL	35	40	45	45	50	50	43
Southwestern Cities							
Albuquerque NM	15	15	15	20	20	20	33
Austin TX	50	45	45	45	45	50	0
Corpus Christi TX	5	5	5	5	5	5	0
Dallas TX	260	235	240	240	260	265	2
Denver CO	110	110	115	120	135	145	32
El Paso TX	10	10	10	10	10	10	0
Fort Worth TX	95	90	90	90	95	100	5
Houston TX	370	355	365	375	385	395	7
Phoenix AZ	145	145	185	180	180	185	28
Salt Lake City UT	10	15	15	15	15	20	100
San Antonio TX	65	65	60	60	60	60	-8
Western Cities							
Honolulu HI	45	45	50	55	55	55	22
Los Angeles CA	1,645	1,715	1,685	1,750	1,780	1,795	9
Portland OR	50	60	70	75	80	85	70
Sacramento CA	40	55	70	80	80	80	100
San Bernardino-Riv CA	185	190	215	230	235	245	32
San Diego CA	95	125	145	155	155	155	63
San Fran-Oak CA	540	615	625	650	645	640	19
San Jose CA	195	210	215	225	225	230	18
Seattle-Everett WA	175	210	235	255	260	270	54
Northeastern Avg	340	360	395	420	420	425	25
Midwestern Avg	100	105	105	110	115	120	20
Southern Avg	70	75	80	85	85	90	29
Southwestern Avg	100	100	105	105	110	115	15
Western Avg	330	360	370	385	390	395	20
Texas Avg	120	115	115	120	120	125	4
Total Avg	170	180	185	195	200	205	21
Maximum Value	1,645	1,715	1,685	1,750	1,780	1,795	9
Minimum Value	5	5	5	5	5	5	0

Source: TTI Analysis and Local Transportation Agency References

Table A-13. Annual Wasted Fuel due to Congestion

Urban Area	Annual Wasted Gallons (million) 1986	1987	1988	1989	1990	1991	Pct Change 1986-1991
Northeastern Cities							
Baltimore MD	44	46	48	53	57	58	32
Boston MA	130	125	168	160	155	158	22
Hartford CT	9	10	14	15	14	14	56
New York NY	547	577	622	689	691	694	27
Philadelphia PA	107	115	118	117	119	119	11
Pittsburgh PA	41	44	48	49	51	50	22
Washington DC	199	214	221	240	246	251	26
Midwestern Cities							
Chicago IL	212	208	209	221	236	246	16
Cincinnati OH	12	15	18	19	20	21	75
Cleveland OH	16	18	21	22	23	23	44
Columbus OH	14	16	17	17	18	19	36
Detroit MI	150	151	153	157	158	167	11
Indianapolis IN	5	5	7	7	8	8	60
Kansas City MO	10	10	12	12	13	13	30
Louisville KY	8	9	9	9	9	10	25
Milwaukee WI	17	19	20	20	21	22	29
Minn-St. Paul MN	33	42	43	44	47	48	45
Oklahoma City OK	9	8	10	10	10	10	11
St. Louis MO	51	53	47	61	59	59	16
Southern Cities							
Atlanta GA	102	109	102	104	105	107	5
Charlotte NC	11	12	13	14	15	17	55
Ft. Lauderdale FL	27	29	30	30	31	32	19
Jacksonville FL	18	21	20	24	25	25	39
Memphis TN	7	7	8	9	9	10	43
Miami FL	67	73	87	95	99	100	49
Nashville TN	13	15	18	18	18	18	38
New Orleans LA	29	29	31	31	31	31	7
Norfolk VA	28	32	32	33	34	35	25
Orlando FL	27	28	28	31	32	33	22
Tampa FL	16	17	19	19	20	22	38
Southwestern Cities							
Albuquerque NM	6	7	7	9	9	9	50
Austin TX	23	22	22	22	22	23	0
Corpus Christi TX	1	1	1	1	1	2	100
Dallas TX	120	112	115	115	122	124	3
Denver CO	49	49	52	55	61	65	33
El Paso TX	4	4	4	4	5	5	25
Fort Worth TX	43	42	43	43	46	48	12
Houston TX	169	164	169	173	177	183	8
Phoenix AZ	63	63	79	78	78	81	29
Salt Lake City UT	5	6	6	7	7	8	60
San Antonio TX	29	29	28	28	28	28	-3
Western Cities							
Honolulu HI	21	21	24	24	25	26	24
Los Angeles CA	743	774	754	784	799	805	8
Portland OR	23	28	32	35	36	40	74
Sacramento CA	20	25	32	36	37	38	90
San Bernardino-Riv CA	85	87	98	104	108	112	32
San Diego CA	46	60	68	72	72	73	59
San Fran-Oak CA	246	280	287	297	297	294	20
San Jose CA	89	96	99	102	102	106	19
Seattle-Everett WA	81	98	109	118	121	125	54
Northeastern Avg	154	162	177	189	190	192	25
Midwestern Avg	45	46	47	50	52	54	20
Southern Avg	31	34	35	37	38	39	26
Southwestern Avg	47	45	48	49	50	52	11
Western Avg	150	163	167	175	178	180	20
Texas Avg	56	53	55	55	57	59	5
Total Avg	77	80	84	89	91	92	19
Maximum Value	743	774	754	784	799	805	8
Minimum Value	1	1	1	1	1	2	100

Source: TTI Analysis and Load Transportation Agency References

Table A-14. Component and Total Congestion Costs By Urban Area for 1991

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost	Rank
Los Angeles CA	3,120	3,660	510	600	7,890	1
New York NY	2,020	3,750	340	620	6,720	2
San Fran-Oak CA	1,070	1,360	180	230	2,840	3
Washington DC	800	1,340	130	220	2,480	4
Chicago IL	960	1,110	160	190	2,430	5
Houston TX	650	870	100	140	1,750	6
Detroit MI	560	870	90	130	1,650	7
Boston MA	350	970	60	160	1,520	8
Seattle-Everett WA	440	590	70	100	1,200	9
Philadelphia PA	450	590	70	90	1,190	10
Dallas TX	370	640	60	100	1,170	11
San Bernardino-Riv CA	430	500	70	80	1,090	12
Atlanta GA	430	470	60	70	1,030	14
San Jose CA	400	470	70	80	1,030	14
Miami FL	390	470	60	70	990	15
Phoenix AZ	370	320	60	50	800	16
San Diego CA	360	240	60	40	700	17
Denver CO	270	280	40	50	640	18
St. Louis MO	240	270	30	40	570	19
Baltimore MD	180	310	30	50	560	20
Pittsburgh PA	170	260	30	40	500	21
Minn-St. Paul MN	200	200	30	30	460	22
Fort Worth TX	150	250	20	40	450	23
Portland OR	120	200	20	30	380	24
Sacramento CA	170	140	30	20	370	25
Norfolk VA	100	190	20	30	340	26
Orlando FL	120	160	20	20	330	27
Ft. Lauderdale FL	120	150	20	20	310	28
New Orleans LA	100	160	20	20	300	29
San Antonio TX	110	120	20	20	270	30
Honolulu HI	80	130	20	30	260	31
Jacksonville FL	90	120	10	20	240	32
Cleveland OH	100	90	20	10	220	34
Tampa FL	90	100	10	20	220	34
Austin TX	90	100	10	20	210	36
Milwaukee WI	90	90	10	10	210	36
Cincinnati OH	90	80	10	10	200	37
Columbus OH	80	70	10	10	180	39
Nashville TN	70	80	10	10	180	39
Charlotte NC	70	70	10	10	160	40
Hartford CT	40	70	10	10	130	41
Kansas City MO	40	70	10	10	120	42
Memphis TN	40	40	10	10	100	44
Oklahoma City OK	40	40	10	10	100	44
Albuquerque NM	40	40	10	10	90	46
Louisville KY	40	40	10	10	90	46
Indianapolis IN	30	40	0	10	80	48
Salt Lake City UT	40	30	10	10	80	48
El Paso TX	20	20	0	0	40	49
Corpus Christi TX	10	10	0	0	20	50
Northeastern Avg	570	1,040	90	170	1,870	
Midwestern Avg	210	250	30	40	530	
Southern Avg	150	180	20	30	380	
Southwestern Avg	190	240	30	40	500	
Western Avg	690	810	110	130	1,750	
Texas Avg	200	290	30	40	560	
Total Avg	330	440	50	70	900	
Maximum Value	3,120	3,750	510	620	7,890	
Minimum Value	10	10	0	0	20	

Source: TTI Analysis and Local Transportation Agency References

Table A-15. Estimated Unit Costs of Congestion in 1991

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	540	280
Boston MA	920	520
Hartford CT	250	220
New York NY	1,110	400
Philadelphia PA	430	280
Pittsburgh PA	410	270
Washington DC	1,470	760
Midwestern Cities		
Chicago IL	600	320
Cincinnati OH	210	160
Cleveland OH	150	120
Columbus OH	240	200
Detroit MI	580	410
Indianapolis IN	130	80
Kansas City MO	160	100
Louisville KY	200	120
Milwaukee WI	390	170
Minn-St. Paul MN	270	220
Oklahoma City OK	200	130
St. Louis MO	560	290
Southern Cities		
Atlanta GA	650	540
Charlotte NC	430	350
Ft. Lauderdale FL	300	250
Jacksonville FL	400	330
Memphis TN	150	110
Miami FL	690	530
Nashville TN	340	310
New Orleans LA	340	270
Norfolk VA	400	350
Orlando FL	440	370
Tampa FL	340	310
Southwestern Cities		
Albuquerque NM	210	160
Austin TX	420	410
Corpus Christi TX	70	50
Dallas TX	780	570
Denver CO	460	400
El Paso TX	120	80
Fort Worth TX	450	380
Houston TX	780	600
Phoenix AZ	640	410
Salt Lake City UT	110	90
San Antonio TX	310	230
Western Cities		
Honolulu HI	500	390
Los Angeles CA	1,010	670
Portland OR	560	370
Sacramento CA	290	310
San Bernardino-Riv CA	1,360	880
San Diego CA	500	300
San Fran-Oak CA	930	760
San Jose CA	1,000	680
Seattle-Everett WA	900	670
Northeastern Avg	730	390
Midwestern Avg	310	200
Southern Avg	410	340
Southwestern Avg	400	310
Western Avg	780	560
Texas Avg	420	330
Total Avg	490	340
Maximum Value	1,470	880
Minimum Value	70	50

Source: TTI Analysis and Local Transportation Agency References

Table A-16. 1991 Rankings of Urban Area by Estimated Impact of Congestion

Urban Area	Total Congestion Cost	Congestion Cost per Capita	Congestion Cost per Reg. Vehicle	Roadway Congestion Index
Northeastern Cities				
Baltimore MD	20	31	18	24
Boston MA	8	11	7	17
Hartford CT	41	37	38	38
New York NY	2	16	3	9
Philadelphia PA	10	30	25	17
Pittsburgh PA	21	33	27	44
Washington DC	4	3	1	2
Midwestern Cities				
Chicago IL	5	24	14	4
Cincinnati OH	37	41	40	27
Cleveland OH	33	43	46	29
Columbus OH	38	38	39	42
Detroit MI	7	12	15	14
Indianapolis IN	48	48	47	43
Kansas City MO	42	46	44	48
Louisville KY	45	44	42	40
Milwaukee WI	36	39	30	25
Minn-St. Paul MN	22	36	37	32
Oklahoma City OK	43	42	43	46
St. Louis MO	19	29	16	26
Southern Cities				
Atlanta GA	13	9	12	9
Charlotte NC	40	21	24	44
Ft. Lauderdale FL	28	34	35	30
Jacksonville FL	32	23	29	30
Memphis TN	44	45	45	35
Miami FL	15	10	11	4
Nashville TN	39	26	31	37
New Orleans LA	29	32	32	12
Norfolk VA	26	22	28	27
Orlando FL	27	19	23	49
Tampa FL	34	27	33	20
Southwestern Cities				
Albuquerque NM	46	40	41	32
Austin TX	35	14	26	32
Corpus Christi TX	50	50	50	49
Dallas TX	11	8	10	17
Denver CO	18	15	21	23
El Paso TX	49	49	48	47
Fort Worth TX	23	18	22	35
Houston TX	6	7	9	13
Phoenix AZ	16	13	13	21
Salt Lake City UT	47	47	49	41
San Antonio TX	30	35	34	38
Western Cities				
Honolulu HI	31	17	19	11
Los Angeles CA	1	5	4	1
Portland OR	24	20	17	15
Sacramento CA	25	25	36	21
San Bernardino-Riv CA	12	1	2	7
San Diego CA	17	28	20	6
San Fran-Oak CA	3	2	6	3
San Jose CA	14	4	5	16
Seattle-Everett WA	9	6	8	7

Source: TTI Analysis

Table A-17. 1991 Congestion Index Values

Urban Area	DVMT/Ln-Miles		Roadway Congestion Index			Congestion Costs[1] Per Capita	
	Frwy	Prin. Art Street	1991 Value	Rank 1989	Rank 1990	1989	1990
Northeastern Cities							
Baltimore MD	12,830	5,910	1.02	24	24	270	280
Boston MA	14,260	4,530	1.06	16	17	490	520
Hartford CT	10,760	5,850	0.89	37	38	220	220
New York NY	14,020	6,960	1.14	9	9	390	400
Philadelphia PA	12,150	6,630	1.06	17	17	270	280
Pittsburgh PA	8,130	5,970	0.82	44	44	270	270
Washington DC	16,830	8,470	1.39	2	2	770	760
Midwestern Cities							
Chicago IL	16,010	7,180	1.28	5	4	300	320
Cincinnati OH	12,750	4,610	0.97	28	27	160	160
Cleveland OH	12,250	5,200	0.96	27	29	120	120
Columbus OH	10,550	5,320	0.84	42	42	200	200
Detroit MI	13,310	6,490	1.10	14	14	380	410
Indianapolis IN	10,650	4,500	0.83	42	43	80	80
Kansas City MO	9,200	4,610	0.74	47	48	100	100
Louisville KY	10,590	6,000	0.88	40	40	110	120
Milwaukee WI	13,020	4,880	1.00	25	25	160	170
Minn-St. Paul MN	12,180	4,730	0.94	33	32	220	220
Oklahoma City OK	9,690	5,460	0.80	45	46	120	130
St. Louis MO	11,240	7,040	0.98	25	26	290	290
Southern Cities							
Atlanta GA	14,520	6,280	1.14	12	9	530	540
Charlotte NC	8,300	5,910	0.82	46	44	320	350
Ft. Lauderdale FL	11,880	5,330	0.95	30	30	240	250
Jacksonville FL	12,160	4,880	0.95	30	30	330	330
Memphis TN	11,280	5,220	0.92	35	35	100	110
Miami FL	14,280	7,690	1.28	4	4	520	530
Nashville TN	10,320	5,750	0.90	37	37	310	310
New Orleans LA	13,810	6,620	1.12	10	12	270	270
Norfolk VA	11,840	5,910	0.97	28	27	350	350
Orlando FL	10,080	2,520	0.72	49	49	360	370
Tampa FL	11,970	6,570	1.05	17	20	290	310
Southwestern Cities							
Albuquerque NM	11,530	5,130	0.94	33	32	170	160
Austin TX	12,090	4,940	0.94	30	32	410	410
Corpus Christi TX	8,630	4,410	0.72	49	49	40	50
Dallas TX	13,940	4,880	1.06	17	17	570	570
Denver CO	12,770	5,840	1.03	21	23	370	400
El Paso TX	9,550	3,900	0.75	47	47	80	80
Fort Worth TX	11,940	4,830	0.92	36	35	350	380
Houston TX	14,640	5,010	1.11	10	13	570	600
Phoenix AZ	12,750	5,590	1.04	21	21	400	410
Salt Lake City UT	10,650	5,860	0.86	41	41	80	90
San Antonio TX	11,300	4,890	0.89	39	38	220	230
Western Cities							
Honolulu HI	13,820	8,100	1.13	12	11	360	390
Los Angeles CA	21,110	6,590	1.56	1	1	670	670
Portland OR	13,430	6,600	1.08	15	15	330	370
Sacramento CA	12,680	6,280	1.04	23	21	320	310
San Bernardino-Riv CA	16,540	4,660	1.20	8	7	880	880
San Diego CA	16,060	5,490	1.22	6	6	290	300
San Fran-Oak CA	17,570	6,100	1.34	3	3	760	760
San Jose CA	14,060	4,800	1.07	20	16	690	680
Seattle-Everett WA	15,570	6,140	1.20	7	7	660	670

Notes: [1] Cost includes delay and fuel

Source: TTI Analysis and Local Transportation Agency References

Table A-18. Component and Total Congestion Costs By Urban Area for 1986

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost
Northeastern Cities					
Baltimore MD	-	-	-	-	-
Boston MA	-	-	-	-	-
Hartford CT	20	40	-	-	-
New York NY	-	-	-	-	-
Philadelphia PA	-	-	-	-	-
Pittsburgh PA	-	-	-	-	-
Washington DC	-	-	-	-	-
Midwestern Cities					
Chicago IL	-	-	-	-	-
Cincinnati OH	-	-	-	-	-
Cleveland OH	-	-	-	-	-
Columbus OH	50	40	-	-	-
Detroit MI	-	-	-	-	-
Indianapolis IN	-	-	-	-	-
Kansas City MO	20	40	0	10	70
Louisville KY	30	30	0	0	60
Milwaukee WI	60	60	10	10	130
Minn-St. Paul MN	110	110	20	20	250
Oklahoma City OK	-	-	-	-	-
St. Louis MO	160	180	90	100	540
Southern Cities					
Atlanta GA	330	360	50	50	780
Charlotte NC	40	40	-	-	-
Ft. Lauderdale FL	90	100	10	20	220
Jacksonville FL	50	70	10	10	140
Memphis TN	20	20	0	0	50
Miami FL	210	250	30	40	520
Nashville TN	40	50	10	10	110
New Orleans LA	80	120	10	20	220
Norfolk VA	60	130	-	-	-
Orlando FL	80	100	10	20	210
Tampa FL	50	60	10	10	130
Southwestern Cities					
Albuquerque NM	20	20	0	0	50
Austin TX	70	80	10	10	180
Corpus Christi TX	0	0	0	0	10
Dallas TX	290	500	40	70	910
Denver CO	160	170	20	30	380
El Paso TX	10	20	0	0	30
Fort Worth TX	110	180	20	30	330
Houston TX	480	640	70	90	1,290
Phoenix AZ	230	210	40	30	500
Salt Lake City UT	20	20	0	0	40
San Antonio TX	90	100	10	10	220
Western Cities					
Honolulu HI	50	90	10	10	160
Los Angeles CA	2,300	2,690	360	420	5,760
Portland OR	60	90	10	10	170
Sacramento CA	70	60	10	10	150
San Bernardino-Riv CA	260	300	40	50	650
San Diego CA	180	120	30	20	350
San Fran-Oak CA	730	920	110	140	1,900
San Jose CA	270	320	40	50	690
Seattle-Everett WA	230	300	40	50	620
Northeastern Avg	20	40	-	-	-
Midwestern Avg	70	80	20	30	210
Southern Avg	100	120	20	20	260
Southwestern Avg	140	180	20	30	360
Western Avg	460	540	70	80	1,160
Texas Avg	150	220	20	30	420
Total Avg	190	230	30	40	520
Maximum Value	2,300	2,690	360	420	5,760
Minimum Value	0	0	0	0	10

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-19. Estimated Impact of Congestion in 1986

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	-	-
Boston MA	-	-
Hartford CT	-	-
New York NY	-	-
Philadelphia PA	-	-
Pittsburgh PA	-	-
Washington DC	-	-
Midwestern Cities		
Chicago IL	-	-
Cincinnati OH	-	-
Cleveland OH	-	-
Columbus OH	-	-
Detroit MI	-	-
Indianapolis IN	-	-
Kansas City MO	120	70
Louisville KY	140	80
Milwaukee WI	160	110
Minn-St. Paul MN	220	130
Oklahoma City OK	-	-
St. Louis MO	390	280
Southern Cities		
Atlanta GA	550	460
Charlotte NC	-	-
Ft. Lauderdale FL	230	190
Jacksonville FL	250	210
Memphis TN	110	60
Miami FL	370	290
Nashville TN	300	210
New Orleans LA	270	210
Norfolk VA	-	-
Orlando FL	370	300
Tampa FL	190	210
Southwestern Cities		
Albuquerque NM	130	100
Austin TX	390	380
Corpus Christi TX	40	40
Dallas TX	560	480
Denver CO	300	250
El Paso TX	100	70
Fort Worth TX	360	290
Houston TX	680	460
Phoenix AZ	450	290
Salt Lake City UT	60	50
San Antonio TX	280	230
Western Cities		
Honolulu HI	330	270
Los Angeles CA	750	540
Portland OR	290	170
Sacramento CA	140	160
San Bernardino-Riv CA	960	660
San Diego CA	320	180
San Fran-Oak CA	710	550
San Jose CA	710	510
Seattle-Everett WA	590	400
Northeastern Avg	-	-
Midwestern Avg	210	130
Southern Avg	290	240
Southwestern Avg	300	240
Western Avg	530	380
Texas Avg	340	280
Total Avg	350	260
Maximum Value	960	660
Minimum Value	40	40

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-20. Component and Total Congestion Costs By Urban Area for 1987

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost
Northeastern Cities					
Baltimore MD	120	200	20	30	360
Boston MA	240	620	30	90	970
Hartford CT	20	40	0	10	80
New York NY	1,390	2,570	200	370	4,540
Philadelphia PA	360	460	50	60	940
Pittsburgh PA	120	190	20	30	360
Washington DC	560	920	90	140	1,710
Midwestern Cities					
Chicago IL	680	780	100	120	1,680
Cincinnati OH	50	50	10	10	110
Cleveland OH	70	50	10	10	140
Columbus OH	60	50	10	10	120
Detroit MI	420	650	60	100	1,230
Indianapolis IN	-	-	-	-	-
Kansas City MO	20	50	0	10	80
Louisville KY	30	30	0	0	80
Milwaukee WI	60	70	10	10	150
Minn-St. Paul MN	150	140	20	20	340
Oklahoma City OK	-	-	-	-	-
St. Louis MO	180	200	20	30	430
Southern Cities					
Atlanta GA	360	390	50	60	860
Charlotte NC	40	40	10	10	90
Ft. Lauderdale FL	90	110	10	20	240
Jacksonville FL	60	80	10	10	170
Memphis TN	20	30	0	0	60
Miami FL	240	290	40	40	600
Nashville TN	50	50	10	10	120
New Orleans LA	80	120	10	20	230
Norfolk VA	70	150	10	20	250
Orlando FL	90	110	10	20	220
Tampa FL	60	70	10	10	140
Southwestern Cities					
Albuquerque NM	-	-	-	-	-
Austin TX	70	80	10	10	170
Corpus Christi TX	0	0	0	0	10
Dallas TX	280	470	40	70	860
Denver CO	160	170	30	30	390
El Paso TX	10	10	0	0	30
Fort Worth TX	110	180	20	30	330
Houston TX	480	640	70	100	1,290
Phoenix AZ	240	210	40	30	520
Salt Lake City UT	20	20	0	0	50
San Antonio TX	90	100	10	20	230
Western Cities					
Honolulu HI	50	90	10	10	170
Los Angeles CA	2,460	2,890	390	460	6,190
Portland OR	70	120	10	20	220
Sacramento CA	90	80	10	10	200
San Bernardino-Riv CA	270	320	40	50	690
San Diego CA	240	160	40	30	460
San Fran-Oak CA	850	1,070	130	170	2,230
San Jose CA	300	360	50	60	760
Seattle-Everett WA	290	380	50	60	770
Northeastern Avg	400	710	60	100	1,280
Midwestern Avg	170	210	30	30	440
Southern Avg	110	130	20	20	270
Southwestern Avg	150	190	20	30	390
Western Avg	510	610	80	100	1,300
Texas Avg	150	210	20	30	420
Total Avg	250	340	40	50	680
Maximum Value	2,460	2,890	390	460	6,190
Minimum Value	0	0	0	0	10

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-21. Estimated Impact of Congestion in 1987

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	370	190
Boston MA	640	340
Hartford CT	160	130
New York NY	790	280
Philadelphia PA	350	230
Pittsburgh PA	300	200
Washington DC	1,060	570
Midwestern Cities		
Chicago IL	430	230
Cincinnati OH	130	120
Cleveland OH	100	80
Columbus OH	170	150
Detroit MI	430	320
Indianapolis IN	-	-
Kansas City MO	120	70
Louisville KY	170	100
Milwaukee WI	290	120
Minn-St. Paul MN	210	180
Oklahoma City OK	-	-
St. Louis MO	450	220
Southern Cities		
Atlanta GA	570	490
Charlotte NC	260	230
Ft. Lauderdale FL	250	200
Jacksonville FL	290	250
Memphis TN	100	70
Miami FL	450	340
Nashville TN	250	230
New Orleans LA	280	220
Norfolk VA	320	290
Orlando FL	360	300
Tampa FL	250	220
Southwestern Cities		
Albuquerque NM	-	-
Austin TX	370	360
Corpus Christi TX	50	40
Dallas TX	550	450
Denver CO	300	260
El Paso TX	90	60
Fort Worth TX	330	290
Houston TX	580	460
Phoenix AZ	440	280
Salt Lake City UT	70	60
San Antonio TX	280	220
Western Cities		
Honolulu HI	340	270
Los Angeles CA	810	570
Portland OR	350	210
Sacramento CA	170	200
San Bernardino-Riv CA	970	680
San Diego CA	350	220
San Fran-Oak CA	760	630
San Jose CA	780	560
Seattle-Everett WA	670	480
Northeastern Avg	520	280
Midwestern Avg	250	160
Southern Avg	310	260
Southwestern Avg	310	250
Western Avg	580	430
Texas Avg	320	270
Total Avg	380	270
Maximum Value	1,060	680
Minimum Value	50	40

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-22. Component and Total Congestion Costs By Urban Area for 1988

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost
Northeastern Cities					
Baltimore MD	130	220	20	40	400
Boston MA	320	890	50	130	1,380
Hartford CT	30	70	10	10	120
New York NY	1,580	2,880	240	440	5,130
Philadelphia PA	390	490	60	70	1,010
Pittsburgh PA	150	210	20	30	410
Washington DC	600	990	100	160	1,850
Midwestern Cities					
Chicago IL	700	810	110	130	1,760
Cincinnati OH	70	60	10	10	150
Cleveland OH	80	60	10	10	170
Columbus OH	70	50	10	10	140
Detroit MI	440	680	70	110	1,290
Indianapolis IN	20	30	0	0	60
Kansas City MO	30	60	0	10	100
Louisville KY	30	30	0	0	70
Milwaukee WI	70	70	10	10	170
Minn-St. Paul MN	160	150	30	30	360
Oklahoma City OK	30	40	10	10	80
St. Louis MO	160	180	20	30	390
Southern Cities					
Atlanta GA	350	380	50	60	850
Charlotte NC	50	50	10	10	110
Ft. Lauderdale FL	100	120	20	20	250
Jacksonville FL	70	80	10	10	170
Memphis TN	30	30	0	0	70
Miami FL	290	360	50	60	750
Nashville TN	60	70	10	10	160
New Orleans LA	90	130	10	20	260
Norfolk VA	80	160	10	20	270
Orlando FL	90	110	10	20	230
Tampa FL	60	80	10	10	160
Southwestern Cities					
Albuquerque NM	20	30	0	0	60
Austin TX	70	80	10	10	180
Corpus Christi TX	0	0	0	0	10
Dallas TX	300	510	50	80	930
Denver CO	180	190	30	30	430
El Paso TX	10	20	0	0	40
Fort Worth TX	110	190	20	30	350
Houston TX	510	690	80	110	1,390
Phoenix AZ	300	290	50	50	680
Salt Lake City UT	20	20	0	0	50
San Antonio TX	90	100	10	20	230
Western Cities					
Honolulu HI	60	100	10	20	200
Los Angeles CA	2,510	2,940	410	480	6,340
Portland OR	90	140	10	20	260
Sacramento CA	120	100	20	20	260
San Bernardino-Riv CA	320	380	50	60	820
San Diego CA	280	190	50	30	550
San Fran-Oak CA	900	1,140	150	190	2,380
San Jose CA	330	380	50	60	820
Seattle-Everett WA	330	430	50	70	890
Northeastern Avg	460	820	70	130	1,470
Midwestern Avg	150	190	20	30	400
Southern Avg	110	140	20	20	300
Southwestern Avg	150	190	20	30	400
Western Avg	550	650	90	110	1,390
Texas Avg	160	230	30	40	450
Total Avg	260	350	40	60	700
Maximum Value	2,510	2,940	410	480	6,340
Minimum Value	0	0	0	0	10

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-23. Estimated Impact of Congestion in 1988

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	390	210
Boston MA	900	480
Hartford CT	230	190
New York NY	880	310
Philadelphia PA	370	240
Pittsburgh PA	340	220
Washington DC	1,130	610
Midwestern Cities		
Chicago IL	440	240
Cincinnati OH	160	150
Cleveland OH	110	90
Columbus OH	190	160
Detroit MI	450	330
Indianapolis IN	110	60
Kansas City MO	150	90
Louisville KY	160	90
Milwaukee WI	320	140
Minn-St. Paul MN	220	190
Oklahoma City OK	180	120
St. Louis MO	410	200
Southern Cities		
Atlanta GA	550	480
Charlotte NC	300	260
Ft. Lauderdale FL	260	210
Jacksonville FL	290	250
Memphis TN	110	80
Miami FL	550	410
Nashville TN	310	290
New Orleans LA	310	240
Norfolk VA	340	300
Orlando FL	360	300
Tampa FL	270	250
Southwestern Cities		
Albuquerque NM	160	120
Austin TX	370	360
Corpus Christi TX	50	40
Dallas TX	580	480
Denver CO	320	280
El Paso TX	100	70
Fort Worth TX	340	300
Houston TX	620	490
Phoenix AZ	580	370
Salt Lake City UT	70	60
San Antonio TX	250	190
Western Cities		
Honolulu HI	400	300
Los Angeles CA	810	570
Portland OR	430	280
Sacramento CA	210	250
San Bernardino-Riv CA	1,130	790
San Diego CA	400	250
San Fran-Oak CA	790	660
San Jose CA	830	600
Seattle-Everett WA	760	550
Northeastern Avg	610	320
Midwestern Avg	240	160
Southern Avg	330	280
Southwestern Avg	310	250
Western Avg	640	470
Texas Avg	330	280
Total Avg	400	280
Maximum Value	1,130	790
Minimum Value	50	40

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-24. Component and Total Congestion Costs By Urban Area for 1989

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost
Northeastern Cities					
Baltimore MD	150	260	30	40	470
Boston MA	320	880	50	140	1,390
Hartford CT	40	80	10	10	140
New York NY	1,810	3,380	300	560	6,040
Philadelphia PA	400	520	60	80	1,060
Pittsburgh PA	160	230	20	30	440
Washington DC	690	1,140	110	190	2,130
Midwestern Cities					
Chicago IL	780	900	130	150	1,970
Cincinnati OH	70	60	10	10	160
Cleveland OH	90	70	20	10	190
Columbus OH	70	60	10	10	150
Detroit MI	480	740	80	120	1,410
Indianapolis IN	20	30	0	10	60
Kansas City MO	30	60	0	10	100
Louisville KY	30	40	10	10	80
Milwaukee WI	70	80	10	10	180
Minn-St. Paul MN	170	160	30	30	390
Oklahoma City OK	30	40	10	10	80
St. Louis MO	220	250	30	40	540
Southern Cities					
Atlanta GA	370	410	60	70	910
Charlotte NC	50	50	10	10	120
Ft. Lauderdale FL	100	130	20	20	270
Jacksonville FL	80	100	10	20	210
Memphis TN	30	30	10	10	80
Miami FL	330	410	50	70	870
Nashville TN	70	70	10	10	160
New Orleans LA	90	140	20	20	270
Norfolk VA	80	170	10	30	290
Orlando FL	100	130	20	20	270
Tampa FL	70	80	10	10	170
Southwestern Cities					
Albuquerque NM	30	40	10	10	80
Austin TX	80	80	10	10	180
Corpus Christi TX	0	0	0	0	10
Dallas TX	310	530	50	90	980
Denver CO	200	210	30	30	480
El Paso TX	20	20	0	0	40
Fort Worth TX	120	200	20	30	370
Houston TX	550	740	90	120	1,500
Phoenix AZ	320	290	50	50	700
Salt Lake City UT	30	20	0	0	60
San Antonio TX	100	110	20	20	240
Western Cities					
Honolulu HI	70	110	10	20	220
Los Angeles CA	2,750	3,220	480	560	7,000
Portland OR	100	160	20	30	310
Sacramento CA	140	120	30	20	310
San Bernardino-Riv CA	360	420	60	70	920
San Diego CA	320	210	60	40	620
San Fran-Oak CA	980	1,240	170	220	2,620
San Jose CA	360	420	60	70	910
Seattle-Everett WA	380	500	60	80	1,020
Northeastern Avg	510	930	80	150	1,670
Midwestern Avg	170	210	30	30	440
Southern Avg	130	160	20	30	330
Southwestern Avg	160	200	30	30	420
Western Avg	610	710	110	120	1,550
Texas Avg	170	240	30	40	470
Total Avg	280	390	50	60	780
Maximum Value	2,750	3,380	480	560	7,000
Minimum Value	0	0	0	0	10

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-25. Estimated Impact of Congestion in 1989

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	460	250
Boston MA	840	470
Hartford CT	270	230
New York NY	1,020	370
Philadelphia PA	380	250
Pittsburgh PA	360	240
Washington DC	1,280	690
Midwestern Cities		
Chicago IL	480	270
Cincinnati OH	170	140
Cleveland OH	130	110
Columbus OH	200	180
Detroit MI	490	360
Indianapolis IN	110	70
Kansas City MO	150	90
Louisville KY	170	100
Milwaukee WI	330	140
Minn-St. Paul MN	240	200
Oklahoma City OK	180	120
St. Louis MO	570	280
Southern Cities		
Atlanta GA	590	490
Charlotte NC	330	280
Ft. Lauderdale FL	260	210
Jacksonville FL	360	300
Memphis TN	120	90
Miami FL	610	470
Nashville TN	320	290
New Orleans LA	320	260
Norfolk VA	360	310
Orlando FL	380	340
Tampa FL	270	250
Southwestern Cities		
Albuquerque NM	190	160
Austin TX	370	370
Corpus Christi TX	50	40
Dallas TX	660	500
Denver CO	350	310
El Paso TX	110	70
Fort Worth TX	380	320
Houston TX	690	520
Phoenix AZ	590	370
Salt Lake City UT	90	80
San Antonio TX	270	200
Western Cities		
Honolulu HI	440	330
Los Angeles CA	900	620
Portland OR	460	300
Sacramento CA	250	300
San Bernardino-Riv CA	1,200	840
San Diego CA	440	280
San Fran-Oak CA	850	720
San Jose CA	900	650
Seattle-Everett WA	810	610
Northeastern Avg	660	360
Midwestern Avg	270	170
Southern Avg	360	300
Southwestern Avg	340	270
Western Avg	690	520
Texas Avg	360	290
Total Avg	440	310
Maximum Value	1,280	840
Minimum Value	50	40

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-26. Component and Total Congestion Costs By Urban Area for 1990

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost
Northeastern Cities					
Baltimore MD	170	300	30	50	550
Boston MA	330	910	60	160	1,460
Hartford CT	40	70	10	10	130
New York NY	1,950	3,630	350	640	6,560
Philadelphia PA	430	570	70	90	1,160
Pittsburgh PA	170	260	30	40	500
Washington DC	760	1,260	130	220	2,370
Midwestern Cities					
Chicago IL	900	1,040	160	190	2,280
Cincinnati OH	90	70	20	10	190
Cleveland OH	100	80	20	10	210
Columbus OH	80	70	10	10	170
Detroit MI	510	800	80	130	1,530
Indianapolis IN	30	40	0	10	80
Kansas City MO	40	70	10	10	120
Louisville KY	40	40	10	10	90
Milwaukee WI	80	90	10	10	200
Minn-St. Paul MN	190	190	30	30	440
Oklahoma City OK	40	40	10	10	90
St. Louis MO	230	260	30	40	560
Southern Cities					
Atlanta GA	410	450	60	70	1,000
Charlotte NC	60	60	10	10	150
Ft. Lauderdale FL	120	140	20	20	300
Jacksonville FL	90	110	20	20	240
Memphis TN	40	40	10	10	90
Miami FL	370	460	60	70	970
Nashville TN	70	80	10	10	170
New Orleans LA	100	150	20	30	300
Norfolk VA	90	180	20	30	320
Orlando FL	120	150	20	20	310
Tampa FL	80	90	10	20	200
Southwestern Cities					
Albuquerque NM	40	40	10	10	90
Austin TX	80	90	10	20	210
Corpus Christi TX	0	10	0	0	10
Dallas TX	350	610	60	100	1,120
Denver CO	240	250	40	40	580
El Paso TX	20	20	0	0	40
Fort Worth TX	140	230	20	40	420
Houston TX	600	810	100	140	1,650
Phoenix AZ	340	300	60	50	750
Salt Lake City UT	30	30	10	0	70
San Antonio TX	100	120	20	20	260
Western Cities					
Honolulu HI	80	120	20	30	240
Los Angeles CA	3,000	3,530	530	620	7,670
Portland OR	110	180	20	30	340
Sacramento CA	160	140	30	20	350
San Bernardino-Riv CA	400	470	70	80	1,030
San Diego CA	340	230	60	40	670
San Fran-Oak CA	1,050	1,330	190	240	2,810
San Jose CA	380	440	70	80	970
Seattle-Everett WA	420	550	70	100	1,140
Northeastern Avg	550	1,000	100	170	1,820
Midwestern Avg	190	230	30	40	500
Southern Avg	140	170	20	30	370
Southwestern Avg	180	230	30	40	470
Western Avg	660	780	120	140	1,690
Texas Avg	190	270	30	40	530
Total Avg	310	420	50	70	860
Maximum Value	3,000	3,630	530	640	7,670
Minimum Value	0	10	0	0	10

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-27. Estimated Impact of Congestion in 1990

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	530	270
Boston MA	880	490
Hartford CT	250	220
New York NY	1,090	390
Philadelphia PA	420	270
Pittsburgh PA	400	270
Washington DC	1,420	770
Midwestern Cities		
Chicago IL	570	300
Cincinnati OH	200	160
Cleveland OH	140	120
Columbus OH	230	200
Detroit MI	530	380
Indianapolis IN	130	80
Kansas City MO	160	100
Louisville KY	190	110
Milwaukee WI	370	160
Minn-St. Paul MN	270	220
Oklahoma City OK	190	120
St. Louis MO	540	290
Southern Cities		
Atlanta GA	640	530
Charlotte NC	390	320
Ft. Lauderdale FL	290	240
Jacksonville FL	400	330
Memphis TN	140	100
Miami FL	680	520
Nashville TN	340	310
New Orleans LA	340	270
Norfolk VA	390	350
Orlando FL	420	360
Tampa FL	310	290
Southwestern Cities		
Albuquerque NM	210	170
Austin TX	410	410
Corpus Christi TX	50	40
Dallas TX	750	570
Denver CO	420	370
El Paso TX	120	80
Fort Worth TX	420	350
Houston TX	750	570
Phoenix AZ	630	400
Salt Lake City UT	90	80
San Antonio TX	290	220
Western Cities		
Honolulu HI	470	360
Los Angeles CA	980	670
Portland OR	500	330
Sacramento CA	280	320
San Bernardino-Riv CA	1,320	880
San Diego CA	480	290
San Fran-Oak CA	930	760
San Jose CA	960	690
Seattle-Everett WA	880	660
Northeastern Avg	710	380
Midwestern Avg	290	190
Southern Avg	390	330
Southwestern Avg	380	300
Western Avg	760	550
Texas Avg	400	320
Total Avg	480	340
Maximum Value	1,420	880
Minimum Value	50	40

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-28. Component and Total Congestion Costs By Urban Area for 1991

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost
Northeastern Cities					
Baltimore MD	180	310	30	50	560
Boston MA	350	970	60	160	1,520
Hartford CT	40	70	10	10	130
New York NY	2,020	3,750	340	620	6,720
Philadelphia PA	450	590	70	90	1,190
Pittsburgh PA	170	260	30	40	500
Washington DC	800	1,340	130	220	2,480
Midwestern Cities					
Chicago IL	960	1,110	160	190	2,430
Cincinnati OH	90	80	10	10	200
Cleveland OH	100	90	20	10	220
Columbus OH	80	70	10	10	180
Detroit MI	560	870	90	130	1,650
Indianapolis IN	30	40	0	10	80
Kansas City MO	40	70	10	10	120
Louisville KY	40	40	10	10	90
Milwaukee WI	90	90	10	10	210
Minn-St. Paul MN	200	200	30	30	460
Oklahoma City OK	40	40	10	10	100
St. Louis MO	240	270	30	40	570
Southern Cities					
Atlanta GA	430	470	60	70	1,030
Charlotte NC	70	70	10	10	160
Ft. Lauderdale FL	120	150	20	20	310
Jacksonville FL	90	120	10	20	240
Memphis TN	40	40	10	10	100
Miami FL	390	470	60	70	990
Nashville TN	70	80	10	10	180
New Orleans LA	100	160	20	20	300
Norfolk VA	100	190	20	30	340
Orlando FL	120	160	20	20	330
Tampa FL	90	100	10	20	220
Southwestern Cities					
Albuquerque NM	40	40	10	10	90
Austin TX	90	100	10	20	210
Corpus Christi TX	10	10	0	0	20
Dallas TX	370	640	60	100	1,170
Denver CO	270	280	40	50	640
El Paso TX	20	20	0	0	40
Fort Worth TX	150	250	20	40	450
Houston TX	650	870	100	140	1,750
Phoenix AZ	370	320	60	50	800
Salt Lake City UT	40	30	10	10	80
San Antonio TX	110	120	20	20	270
Western Cities					
Honolulu HI	80	130	20	30	260
Los Angeles CA	3,120	3,660	510	600	7,890
Portland OR	120	200	20	30	380
Sacramento CA	170	140	30	20	370
San Bernardino-Riv CA	430	500	70	80	1,090
San Diego CA	360	240	60	40	700
San Fran-Oak CA	1,070	1,360	180	230	2,840
San Jose CA	400	470	70	80	1,030
Seattle-Everett WA	440	590	70	100	1,200
Northeastern Avg	570	1,040	90	170	1,870
Midwestern Avg	210	250	30	40	530
Southern Avg	150	180	20	30	380
Southwestern Avg	190	240	30	40	500
Western Avg	690	810	110	130	1,750
Texas Avg	200	290	30	40	560
Total Avg	330	440	50	70	900
Maximum Value	3,120	3,750	510	620	7,890
Minimum Value	10	10	0	0	20

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-29. Estimated Impact of Congestion in 1991

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	540	280
Boston MA	920	520
Hartford CT	250	220
New York NY	1,110	400
Philadelphia PA	430	280
Pittsburgh PA	410	270
Washington DC	1,470	760
Midwestern Cities		
Chicago IL	600	320
Cincinnati OH	210	160
Cleveland OH	150	120
Columbus OH	240	200
Detroit MI	580	410
Indianapolis IN	130	80
Kansas City MO	160	100
Louisville KY	200	120
Milwaukee WI	390	170
Minn-St. Paul MN	270	220
Oklahoma City OK	200	130
St. Louis MO	560	290
Southern Cities		
Atlanta GA	650	540
Charlotte NC	430	350
Ft. Lauderdale FL	300	250
Jacksonville FL	400	330
Memphis TN	150	110
Miami FL	690	530
Nashville TN	340	310
New Orleans LA	340	270
Norfolk VA	400	350
Orlando FL	440	370
Tampa FL	340	310
Southwestern Cities		
Albuquerque NM	210	160
Austin TX	420	410
Corpus Christi TX	70	50
Dallas TX	780	570
Denver CO	460	400
El Paso TX	120	80
Fort Worth TX	450	380
Houston TX	780	600
Phoenix AZ	640	410
Salt Lake City UT	110	90
San Antonio TX	310	230
Western Cities		
Honolulu HI	500	390
Los Angeles CA	1,010	670
Portland OR	560	370
Sacramento CA	290	310
San Bernardino-Riv CA	1,360	880
San Diego CA	500	300
San Fran-Oak CA	930	760
San Jose CA	1,000	680
Seattle-Everett WA	900	670
Northeastern Avg	730	390
Midwestern Avg	310	200
Southern Avg	410	340
Southwestern Avg	400	310
Western Avg	780	560
Texas Avg	420	330
Total Avg	490	340
Maximum Value	1,470	880
Minimum Value	70	50

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table A-30. Urban Area Grouping by Population Size

Urban Area	Population 1991 (000)	Population Pct Change 1982 to 1991	Roadway Congestion Index 1991 Value	Roadway Congestion Index Pct Change 1982 to 1991
First Group				
Corpus Christi TX	285	14.00	0.72	7.46
Charlotte NC	460	31.43	0.82	22.39
Austin TX	525	38.16	0.94	22.08
Albuquerque NM	540	20.00	0.94	20.51
El Paso TX	560	24.44	0.75	19.05
Nashville TN	575	2.68	0.90	21.62
Hartford CT	610	7.96	0.89	17.11
Honolulu HI	665	16.67	1.13	21.51
Tampa FL	710	31.48	1.05	11.70
Oklahoma City OK	740	15.63	0.80	11.11
Jacksonville FL	750	21.95	0.95	11.76
Louisville KY	810	5.19	0.88	4.76
Second Group				
Salt Lake City UT	840	23.53	0.86	36.51
Memphis TN	865	6.79	0.92	6.98
Orlando FL	880	44.26	0.72	9.09
Columbus OH	900	7.78	0.84	23.53
Indianapolis IN	950	10.47	0.83	16.90
Norfolk VA	950	23.38	0.97	22.78
Portland OR	1,040	2.97	1.08	24.14
New Orleans LA	1,095	1.39	1.12	14.29
Kansas City MO	1,160	5.45	0.74	19.35
Sacramento CA	1,165	40.36	1.04	30.00
San Antonio TX	1,180	24.21	0.89	15.58
Fort Worth TX	1,200	10.60	0.92	21.05
Third Group				
Cincinnati OH	1,200	-2.44	0.97	12.79
Milwaukee WI	1,225	1.24	1.00	20.48
San Bernardino-Riv CA	1,235	30.69	1.20	10.09
Ft. Lauderdale FL	1,275	19.72	0.95	10.47
San Jose CA	1,500	25.00	1.07	25.88
Denver CO	1,580	17.04	1.03	21.18
Cleveland OH	1,790	-9.60	0.96	20.00
Seattle-Everett WA	1,802	25.14	1.20	26.32
Pittsburgh PA	1,865	3.04	0.82	5.13
Miami FL	1,880	8.67	1.28	21.90
Atlanta GA	1,900	18.01	1.14	28.09
Phoenix AZ	1,930	36.88	1.04	-9.57
Fourth Group				
St. Louis MO	1,950	5.41	0.98	18.07
Baltimore MD	2,051	66.75	1.02	21.43
Minn-St. Paul MN	2,060	17.71	0.94	27.03
Dallas TX	2,070	14.36	1.06	26.19
San Diego CA	2,350	32.02	1.22	56.41
Houston TX	2,900	20.33	1.11	-5.13
Boston MA	2,960	3.86	1.06	17.78
Washington DC	3,280	-4.65	1.39	29.91
San Fran-Oak CA	3,725	11.86	1.34	32.67
Detroit MI	3,985	4.59	1.10	-2.65
Philadelphia PA	4,225	3.81	1.06	6.00
Fifth Group				
Chicago IL	7,515	6.14	1.28	25.49
Los Angeles CA	11,760	18.79	1.56	27.87
New York NY	16,830	1.02	1.14	12.87

Source: TTI Analysis and Local Transportation Agency References

Table A-31. 1991 Freeway Travel Volume and Roadway Supply Grouped by Population

Population Group	DVMT[1] (1000)	Lane-Mi.	Avg. No. Lanes	DVMT/ Ln-Mi[2,3]
Fifth Group	77,420	4,530	6.5	17,050
Fourth Group	24,180	1,690	5.9	14,090
Third Group	12,720	950	5.7	13,210
Second Group	7,880	700	5.4	11,450
First Group	4,500	420	5.0	10,780

Note: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile of freeway
[3] Value in excess of 13,000 indicates undesirable level of congestion on area freeway system

Source: TTI Analysis and Local Transportation Agency References

Table A-32. 1991 Principal Arterial Street Travel Volume and Roadway Supply Grouped by Population

Population Group	DVMT[1] (1000)	Lane-Mi.	Avg. No. Lanes	DVMT/ Ln-Mi[2,3]
Fifth Group	55,090	8,090	3.7	6,910
Fourth Group	13,560	2,240	3.8	5,940
Third Group	9,460	1,660	3.7	5,580
Second Group	4,290	860	3.8	5,260
First Group	3,510	650	3.7	5,570

Note: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile of principal arterial street
[3] Value in excess of 5,000 indicates undesirable level of congestion on area principal arterial street system

Source: TTI Analysis and Local Transportation Agency References

Table A-33. 1991 Roadway Congestion Index Values Grouped by Population

	Freeway / Expressway		Principal Arterial Street		
Population Group	DVMT[1] (1000)	DVMT/[2] Ln-Mi	DVMT[1] (1000)	DVMT/[2] Ln-Mi	Roadway[3] Congestion Index
Fifth Group	77,420	17,050	55,090	6,910	1.33
Fourth Group	24,180	14,090	13,530	5,940	1.12
Third Group	12,720	13,210	9,460	5,580	1.05
Second Group	7,580	11,450	4,290	5,260	0.91
First Group	4,500	10,780	3,510	5,570	0.90

Notes: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile
[3] See Equation 1

Source: TTI Analysis

Table A-34. Roadway Congestion Index Values Grouped by Population, 1982 to 1991

Population Group	Year										% Change 1982 to 1991
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Fifth Group	1.08	1.10	1.12	1.15	1.21	1.23	1.27	1.29	1.31	1.33	22
Fourth Group	0.94	0.97	1.00	1.01	1.06	1.08	1.09	1.10	1.11	1.12	19
Third Group	0.91	0.93	0.94	0.96	0.98	1.00	1.01	1.03	1.04	1.05	16
Second Group	0.76	0.76	0.78	0.81	0.84	0.87	0.88	0.89	0.90	0.91	20
First Group	0.78	0.80	0.84	0.84	0.85	0.87	0.88	0.88	0.89	0.90	16

Source: TTI Analysis

Table A-35. Daily Vehicle Hours of Delay for 1991 Grouped by Population

Population Group	Total Delay (vehicle hours)	Total Delay per 1000 Persons
Fifth Group	1,287,230	105
Fourth Group	321,910	105
Third Group	155,980	95
Second Group	41,060	55
First Group	32,880	55

Source: TTI Analysis

Table A-36. 1991 Component and Total Congestion Costs Grouped by Population

	Annual Cost Due to Congestion ($Millions)			Cost per Registered	Cost per
Population Group	Delay	Fuel	Total	Vehicle ($)	Capita ($)
Fifth Group	4,870	810	5,680	910	460
Fourth Group	1,160	190	1,360	700	450
Third Group	590	90	680	600	420
Second Group	210	30	250	300	240
First Group	130	20	150	290	240

Source: TTI Analysis and Local Transportation Agency References

Table A-37. Urban Area Grouping by Population Density

Urban Area	Population Density 1991 (Persons/SqMi)	Population Density Pct Change 1982 to 1991	Roadway Congestion Index 1991 Value	Roadway Congestion Index Pct Change 1982 to 1991
First Group				
Nashville TN	1,150	-32.23	0.90	21.62
Norfolk VA	1,166	20.35	0.97	22.78
Atlanta GA	1,226	11.16	1.14	28.09
Jacksonville FL	1,389	17.43	0.95	11.76
Fort Worth TX	1,412	5.39	0.92	21.05
Dallas TX	1,428	8.05	1.06	26.19
Austin TX	1,458	-23.25	0.94	22.08
Oklahoma City OK	1,480	-7.50	0.80	11.11
Tampa FL	1,578	2.26	1.05	11.70
Corpus Christi TX	1,583	7.67	0.72	7.46
Hartford CT	1,694	4.97	0.89	17.11
Houston TX	1,768	-3.88	1.11	-5.13
Denver CO	1,775	9.15	1.03	21.18
Second Group				
Salt Lake City UT	1,787	-5.38	0.86	36.51
Kansas City MO	1,902	5.45	0.74	19.35
Charlotte NC	1,917	9.52	0.82	22.39
Phoenix AZ	1,959	-23.57	1.04	-9.57
Minn-St. Paul MN	2,020	-7.67	0.94	27.03
Memphis TN	2,060	-11.01	0.92	6.98
Albuquerque NM	2,077	-3.08	0.94	20.51
Cincinnati OH	2,087	3.50	0.97	12.79
Louisville KY	2,132	-0.34	0.88	4.76
Orlando FL	2,146	33.71	0.72	9.09
Indianapolis IN	2,159	5.44	0.83	16.90
Milwaukee WI	2,227	1.24	1.00	20.48
San Antonio TX	2,433	-10.36	0.89	15.58
Third Group				
Portland OR	2,447	-15.20	1.08	24.14
Seattle-Everett WA	2,486	12.19	1.20	26.32
Pittsburgh PA	2,503	35.54	0.82	5.13
San Bernardino-Riv CA	2,520	6.68	1.20	10.09
El Paso TX	2,667	-11.11	0.75	19.05
Boston MA	2,766	-11.67	1.06	17.78
Cleveland OH	2,775	9.33	0.96	20.00
St. Louis MO	2,810	-1.28	0.98	18.07
Columbus OH	2,857	4.36	0.84	23.53
Ft. Lauderdale FL	2,965	-5.34	0.95	10.47
New Orleans LA	3,042	-4.24	1.12	14.29
Detroit MI	3,163	-9.52	1.10	-2.65
Fourth Group				
Sacramento CA	3,192	7.67	1.04	30.00
San Diego CA	3,310	13.43	1.22	56.41
San Jose CA	3,333	12.50	1.07	25.88
Washington DC	3,565	-15.02	1.39	29.91
Baltimore MD	3,663	22.08	1.02	21.43
Philadelphia PA	3,722	-11.28	1.06	6.00
Chicago IL	3,776	1.34	1.28	25.49
Miami FL	3,876	-8.13	1.28	21.90
San Fran-Oak CA	4,257	2.27	1.34	32.67
Honolulu HI	4,926	-0.62	1.13	21.51
New York NY	5,282	0.83	1.14	12.87
Los Angeles CA	5,382	-0.51	1.56	27.87

Source: TTI Analysis and Local Transportation Agency References

Table A-38. 1991 Freeway Travel Volume and Roadway Supply Grouped by Population Density

Pop. Density Group	DVMT[1] (1000)	Lane-Mi.	Avg. No. Lanes	DVMT/ Ln-Mi[2,3]
Fourth Group	33,480	2,070	6.1	15,120
Third Group	12,680	100	5.6	12,540
Second Group	7,920	710	5.1	11,100
First Group	10,550	850	5.4	11,940

Note: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile of freeway
[3] Value in excess of 13,000 indicates undesirable level of congestion on area freeway system

Source: TTI Analysis and Local Transportation Agency References

Table A-39. 1991 Principal Arterial Street Travel Volume and Roadway Supply Grouped by Population Density

Pop. Density Group	DVMT[1] (1000)	Lane-Mi.	Avg. No. Lanes	DVMT/ Ln-Mi[2,3]
Fourth Group	22,610	3,360	3.8	6,680
Third Group	8,950	1,580	3.6	5,650
Second Group	5,160	1,070	3.6	4,960
First Group	5,820	1,070	3.9	5,430

Note: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile of principal arterial street
[3] Value in excess of 5,000 indicates undesirable level of congestion on area principal arterial street system

Source: TTI Analysis and Local Transportation Agency References

Table A-40. 1991 Roadway Congestion Index Values Grouped by Population Density

	Freeway / Expressway		Principal Arterial Street		
Pop. Density Group	DVMT[1] (1000)	DVMT/[2] Ln-Mi	DVMT[1] (1000)	DVMT/[2] Ln-Mi	Roadway[3] Congestion Index
Fourth Group	33,480	22,610	22,610	6,680	1.21
Third Group	12,680	8,150	8,950	5,650	1.00
Second Group	7,920	5,160	5,160	4,960	0.89
First Group	10,950	5,820	5,820	5,430	0.96

Notes: [1] Daily vehicle-miles of travel
[2] Daily vehicle-miles of travel per lane-mile
[3] See Equation 1

Source: TTI Analysis

Table A-41. Roadway Congestion Index Values Grouped by Population Density, 1982 to 1991

Population Density Group	Year										% Change 1982 to 1991
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Fourth Group	0.96	0.99	1.02	1.04	1.10	1.13	1.16	1.18	1.20	1.21	25
Third Group	0.88	0.89	0.90	0.92	0.95	0.97	0.99	1.00	1.00	1.00	15
Second Group	0.78	0.78	0.79	0.81	0.83	0.85	0.84	0.86	0.86	0.89	14
First Group	0.83	0.86	0.90	0.91	0.93	0.94	0.95	0.95	0.95	0.96	16

Source: TTI Analysis

Table A-42. Daily Vehicle-Hours of Delay for 1991 Grouped by Population Density

Pop. Density Group	Daily Delay (vehicle-hours)	Daily Delay per 1000 Persons
Fourth Group	519,070	110
Third Group	151,580	85
Second Group	52,290	45
First Group	112,980	80

Source: TTI Analysis

Table A-43. 1991 Component and Total Congestion Costs Grouped by Population Density

	Annual Cost Due to Congestion ($Millions)			Cost per Registered	Cost per
Pop. Density Group	Delay	Fuel	Total	Vehicle ($)	Capita ($)
Fourth Group	1,960	330	2,290	760	470
Third Group	570	90	660	540	360
Second Group	210	40	230	280	200
First Group	430	70	500	430	350

Source: TTI Analysis and Local Transportation Agency References

APPENDIX B

DEVELOPMENT OF THE URBAN AREAWIDE CONGESTION MEASUREMENT METHODOLOGY

(Reprinted from TTI Research Report 1131-3)

Previous research (1,2,3,4,5,6,7) on areawide mobility levels in Texas resulted in a methodology to compare urban roadway congestion levels. This section summarizes the purpose, data base, analysis procedure, and major findings of that research effort and an FHWA research report on urban freeway congestion.

Purpose of Congestion Measurement Techniques

Transportation professionals and the general public are increasingly aware of the traffic congestion levels experienced in major cities. This interest resulted in research to develop a procedure that would allow quantitative comparisons of urbanized areawide traffic volumes and roadway length. Obviously, a procedure that utilizes generally available data would be more desirable than one which required new or more extensive data collection.

Previous Urban Mobility Comparison Studies

Lack of comparable and significant urban travel data has hampered the analysis of congestion levels on a national basis. The amount of roadway system performance statistics collected and reported by local and state agencies varies significantly across the nation. Differences in roadway functional classification terminology have resulted in significant variations between major and minor arterial street facility length. The Highway Performance Monitoring System (HPMS) data base (10) compiled by FHWA since 1980 was used as the basic source of data for this analysis. Local planning and transportation agencies and state departments of transportation (DOT) were also contacted to obtain relevant data and provide local review.

HPMS data is submitted to FHWA by state DOTs and includes information on state and locally maintained roadway systems. This should give a more accurate representation of the urbanized area roadway condition than information that could be developed from a single organization. The differences in functional classification and the amount of data used to update the database each year varies in each state. Locally developed planning data were, therefore, used to provide another source of information concerning the urban roadway system.

The boundary chosen for inclusion in a mobility analysis is also significant. City or county jurisdictions vary in the percentage of urbanized area included and the density of development. State laws pertaining to municipal incorporation and the time and manner in which the area developed also have a substantial impact on land use patterns.

In conducting the initial relative mobility studies, data availability proved to be the largest problem. Consistent data that allowed an accurate comparative assessment of urban congestion are not available from any agency or group of agencies. Data collected in several ways by many sources were acquired. In the opinion of the research staff and reviewers of the research report, however, the quantitative measures used in the studies (1,2,3,4,5,6,7) did provide a reasonably accurate measure of overall urban mobility. The general nature of the mobility assessment and the variety of data sources, as well as the experience of the reviewing agencies, combined to provide analysis results consistent with the accuracy level desired.

Comparability of the measures was achieved using several estimates of both travel and area statistics. For example, in defining urbanized area, it was not always possible to use jurisdictional limits as the defining boundaries due to either lack of data on related travel measures or non-comparability of information. County boundaries may appear to provide consistency, but variations in county size, as well as percentage of urbanization, significantly impaired the utility of county-based data. This study uses a population density of more than 1,000 persons per square kilometer as the criterion for urbanized area delineation.

A 1986 FHWA research report entitled, "Quantification of Urban Freeway Congestion and Analysis of Remedial Measures" (13) utilized the HPMS data base to develop detailed estimates of congestion due to recurring delay (usual, high traffic volumes) and incident delay. Freeway systems in the 37 Metropolitan Statistical Areas (MSAs) with populations greater than one million were analyzed for travel delay and excess fuel consumption. The study ranked the urbanized areas according to a congestion severity index (total delay per million vehicle-kilometers of travel) for 1984 and 2005. The future values were derived from the traffic volume growth estimates in HPMS and applied to the existing roadway system to illustrate the effect a construction moratorium would have on the systems.

The 1984 FHWA rankings are compared to those developed within this report. It should be noted that the FHWA report (13) focused on relatively detailed estimates of urbanized area freeway delay for large MSAs, while this project analyzed planning level estimates of delay, fuel, and insurance costs for freeways and principal arterial streets. While not directly comparable, these studies should illustrate areas of concern to transportation planners.

Study Design

The urbanized area traffic volume level that was consistent with desirable overall mobility was determined using data derived from the Houston area. During the late 1960s and early 1970s, citizens in Houston enjoyed one of the best transportation systems in the nation. Peak-hour speed on most facilities was reasonable, and congestion did not extend for a significant period beyond either peak hour. By 1980, however, Houston had acquired, and probably deserved, a reputation as one of the most congested cities in the country. At some point, transportation mobility had declined from desirable to undesirable.

The initial focus of the 1982 research effort (1) was to develop an estimate of the initial point at which mobility levels could be described as undesirable. Having estimated this point, the measures of mobility levels associated with that time could be assumed to be representative of undesirable congestion levels.

Houston's Experience with Declining Mobility

The Houston data detailing the increase in congestion were analyzed to provide a basis for quantitative indicators of mobility decline. The rapid increase in congestion on Houston area freeways and arterial streets during the 1970s emphasized the need for actions to restore and maintain good mobility.

The disparity between increases in freeway lane-kilometers and freeway travel during the 1970s in Houston is quantified in Table B-1 and Figure B-1. The rate of new freeway construction in the 1970s was one-sixth that of the 1960s, while daily freeway VKT increased at approximately the same rate throughout the 20-year period (2). Vehicle registration, population, and traffic

volume counts were thoroughly analyzed and also indicated the shift from relatively good mobility to relatively poor mobility in only a few years.

Table B-1. City of Houston Growth Trends, 1950 to 1985

Year	Annual Average Population (1000)	Annual Average Vehicles (1000)	Freeway Travel in VKT Per Day[1] (1000)	Freeway Capacity (Lane-kilometers)	Daily VKT Per Freeway Lane-Km
1950	595[2]	240	322	40	8,400
1955	690[2]	375	998	161	6,200
1960	940[2]	480	1,682	298	5,600
1965	1,085	625	5,514	733	7,500
1970	1,235	775	11,785	1,224	9,600
1975	1,440	1,000	18,298	1,449	12,700
1980	1,610	1,270	26,259	1,546	17,000
1985	1,730	1,450	33,166	1,771	18,700
			Percent Increase Per Year		
1960-70	2.8	4.9	19.6	15.1	5.5
1970-80	2.6	5.1	8.4	2.4	5.9

Notes: [1]VKT--Vehicle-Kilometers of Travel
[2]As of April 1

Source: References 1, 2, 10, 11

Congestion increases were also apparent in the travel delay estimates. Peak-period volume and travel time information were utilized to generate the data in Table B-2 and Figure B-2. Six major radial freeways were evaluated in each of four travel studies conducted by the Houston-Galveston Regional Transportation Study (HGRTS) (14). The dramatic (380 percent) increase in delay between I-610 and Beltway 8 (Figure B-2) from 1969 to 1979 indicates the decline in mobility outside the central city area. The decrease in delay inside I-610 (a major circumferential freeway approximately eight kilometers from downtown) may be attributable to several factors, including the completion of certain freeway sections and the traffic metering effect of I-610. As on most radial freeways, the number of lanes outside Loop 610 is less than that inside the Loop. Volumes, however, are not significantly lower, resulting in greater congestion outside I-610.

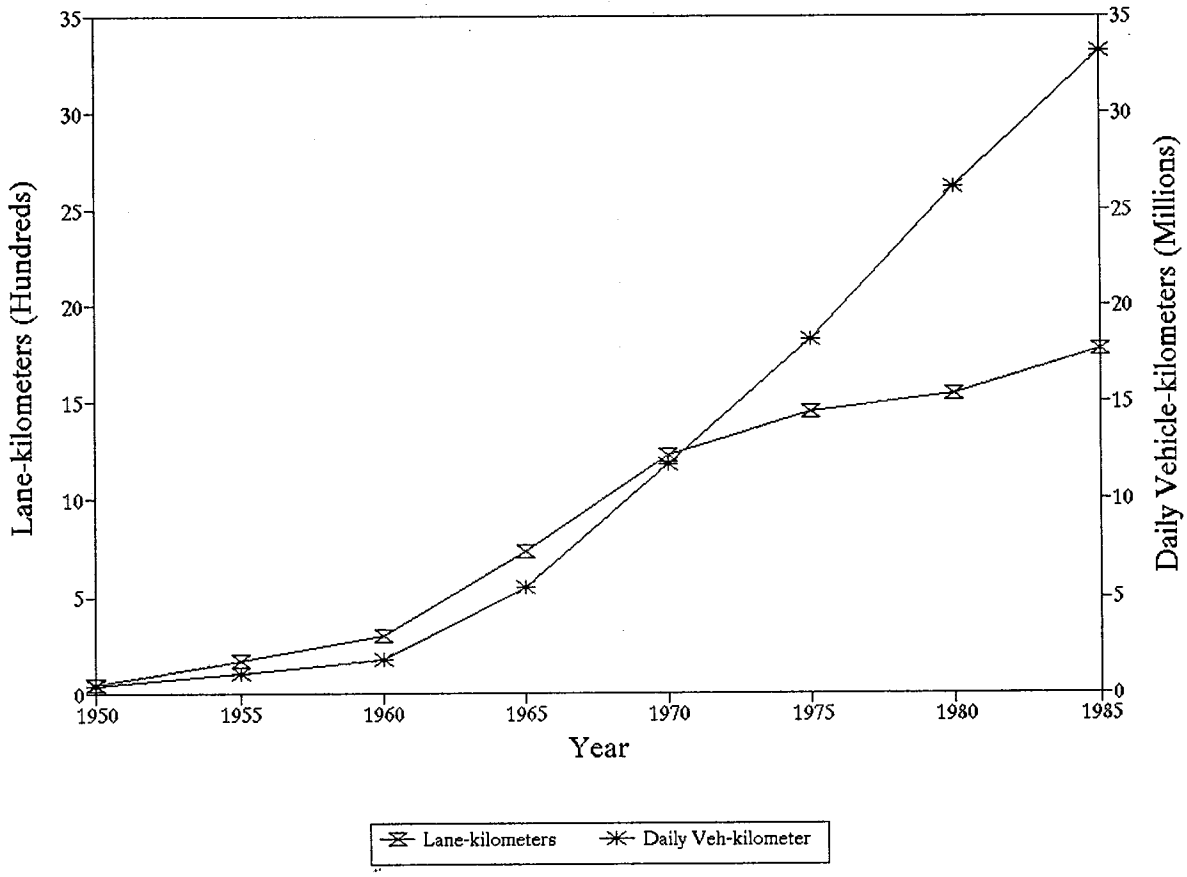

Figure B-1. Freeway Capacity and Travel in Houston, 1950 to 1986

Note: The values presented are averages of the six freeways studied (I-10W, I-10E, US 59S, US 59N, I-45S, I-45N).

Source: References 1, 3

Table B-2. Average Evening Peak-Period Delay by Freeway Segment Per Major Radial Freeway

Year	Inside I-610 (Veh-Hours)	I-610 to Beltway 8 (Veh-Hours)	Total (Veh-Hours)
1969	1,315	390	1,705
1973	1,560	685	2,245
1976	2,110	1,165	3,275
1979	1,830	1,860	3,690
1982	1,480	3,000	4,480
1985	1,615	2,565	4,180

Note: Evening peak period used for analysis was 3:30 to 6:30 p.m.

Source: References 1, 3, 13

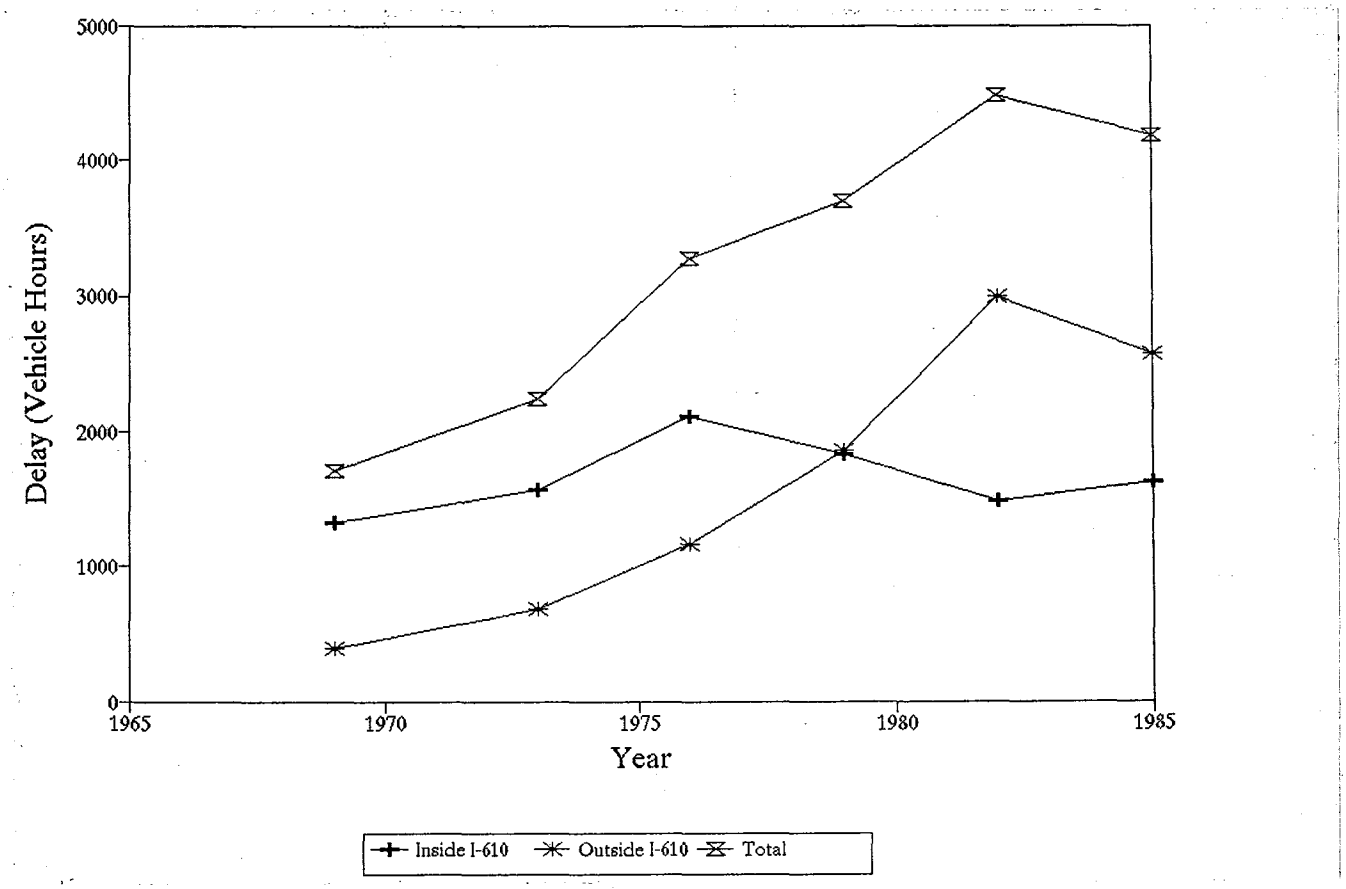

Figure B-2. Delay by Segments for Houston Freeways, P.M. Peak Period

Note: The values presented are averages of the six freeways studied (I-10W, I-10E, US 59S, US 59N, I-45S, I-45N).

Source: References 1, 3, 13

The maximum freeway service flow rate for level-of-service C (LOS C) is 1,550 passenger cars per lane per hour (volume/capacity ratio equal to 0.77) for a 113 kph design speed facility (15). Using average values for k-factor (the percentage of daily traffic volume during the peak hour) and directional distribution, and including some adjustment for trucks, these values can be interpreted to indicate that 15,000 vehicles per lane per day is an estimate of the beginning of level-of-service D operation. (The development of this value is consistent with the planning level analysis methodology presented in this report.)

The use of the boundary between level-of-service C and D as the beginning of congestion is consistent with reports by the Department of Transportation to Congress on the status of highways in the United States (16) (congestion begins at a volume/capacity ratio of 0.8) and the AASHTO Policy on Geometric Design of Highways and Streets (16) (urban freeways and streets should be designed for level-of-service C). While the use of a single number tends to mask the myriad of factors used in roadway capacity analyses, the level of accuracy of the data base, and the planning nature of the ultimate use of the results of this methodology are compatible with this approach.

Figure B-3 quantifies the increase in congested freeway lane-kilometers in Harris County between 1965 and 1985. Although it is not known what percentage of the freeway system exceeding 15,000 vehicles per lane per day (operating at LOS D or worse in the peak hour) is an "acceptable" measure, it can be assumed that the 10 percent value in 1970 did not suggest county-wide deficiencies; however, the 45 percent in 1980 would appear to suggest such deficiencies did exist.

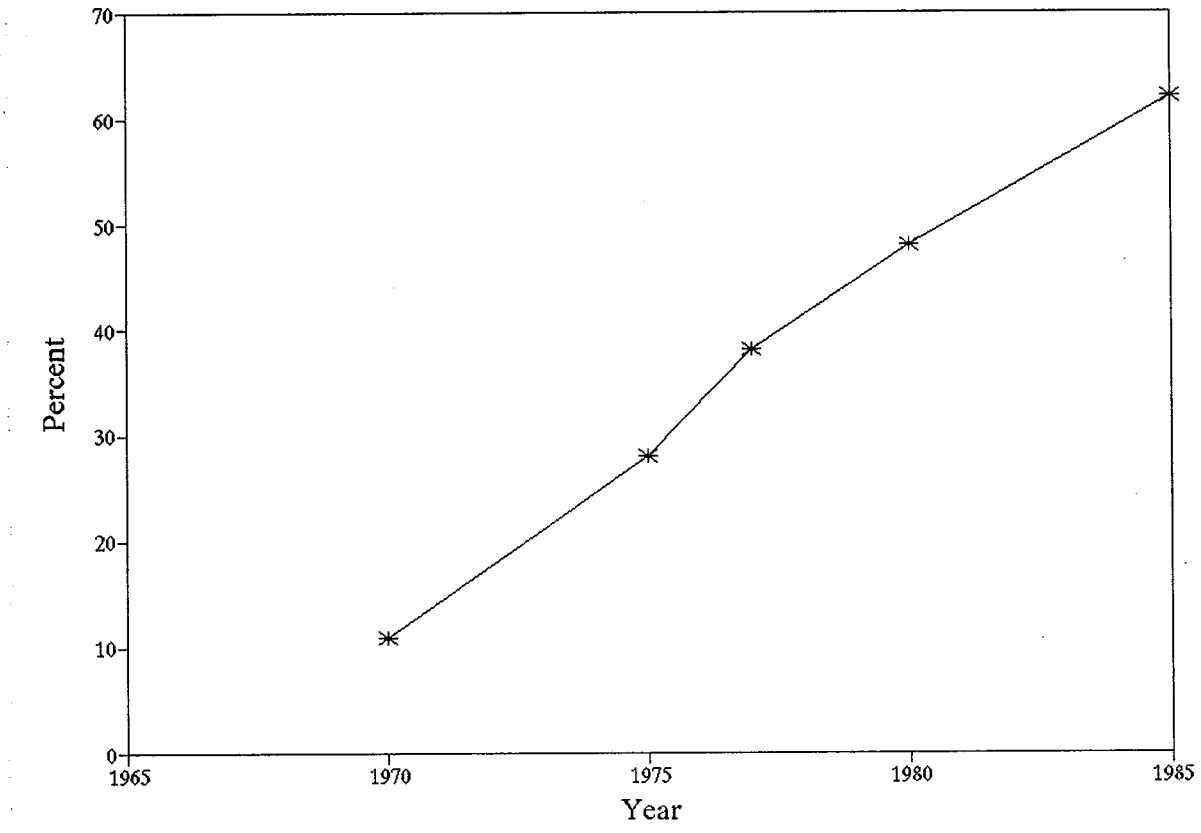

Figure B-3. Percent of Freeway Lane-kilometers with more than 15,000 ADT for Harris County (Houston), 1970 to 1985

Source: 1, 3, 18

The data available to the study team did not allow the determination of a specific date at which Houston's traffic problems became critical. For purposes of the overall analysis, however, this was not required. Prior to 1975, mobility in Houston could be characterized as "reasonably good." Peak-period speeds on freeways and major arterials were fairly high, and traffic delay was not a major concern. By the late 1970s, however, peak-period travel delay had doubled from 1970 levels, and volume per lane values reflected two or more hours of congested operation during both the morning and evening peak periods. Congested freeway lane-kilometers in Harris County (Figure B-2) increased from 10 percent in 1970 to 40 percent in 1978. When rural areas of Harris County were subtracted from the analysis, the 1978 congested urban freeway system length approached 50 percent.

Congestion Indicator Determination

The data on mobility decline for Houston indicated that an "unacceptable" level of transportation service was reached somewhere in the 1975-1976 time frame. That assumption allowed quantitative measures of impending congestion problems to be developed and compared for the major urbanized areas of Texas. The following factors, listed in apparent order of reliability and usefulness, represent guidelines that can be used to determine if congestion in an urbanized area is becoming critical.

Traffic Per Lane

As shown previously, 15,000 vehicles per lane per day for freeways can be interpreted to represent the beginning of LOS D operation. Once traffic volume has entered that range, congestion is becoming critical. As a measure of approaching congestion, the 13,000 vehicles per lane per day value used by the Federal Highway Administration in the highway needs estimate (17) and by the Texas Department of Highways and Public Transportation in their Project Development Process (18) would appear to represent a more appropriate value. That standard also was attained on an average urbanized area basis in Houston during the period (1975-76) when mobility was becoming unacceptable.

The corresponding measure for urban arterial streets would appear to be approximately 5,000 vehicles per lane per day. This value was not reached in Houston until 1979-80, but the design of the Houston area principal arterial street system would not accommodate traffic volumes representative of congestion in other urbanized areas. An inconsistent arterial system with respect to both the number of lanes and continuous roadway length, reduced the levels of traffic volume necessary to cause undesirable congestion. This value is also in general agreement with values presented in the Highway Capacity Manual (13).

- Urbanized Area Average Traffic Volume
  - Freeway: 13,000 daily vehicle-kilometers of travel per lane-kilometer
  - Principal Arterial Street: 5,000 daily vehicle-kilometers of travel per lane-kilometer

Roadway Congestion Index

Combining the freeway and principal arterial street traffic volume per lane values into one indicator (Equation B-1) generates a value to compare the major mobility providing roadways of each urbanized area. Weighing the vehicle-kilometers of travel (VKT) per lane values by the amount of VKT in each functional class provides flexibility in applying the formula to areas with very different freeway and street travel characteristics. The congestion levels are normalized, with a value of 1.0 representing the beginning of undesirable mobility levels.

Eq. B-1

$$\text{Roadway Congestion Index} = \frac{\dfrac{\text{Freeway VKT/Lane-km}}{13{,}000} \times \text{Freeway VKT} + \dfrac{\text{Prin. Art. Str. VKT/Lane-Km}}{5{,}000} \times \text{Prin. Art. Str. VKT}}{\text{Freeway VKT} + \text{Prin. Art. Str. VKT}}$$

Percentage of Congested Freeway

The percentage of the freeway system operating under congested conditions (15,000 vehicles per lane per day or more) was determined to be another description of congestion and mobility levels. Those data for the Houston area were presented previously (Figure B-3). From that information, using the 1975-76 time frame, it appears that once 30 percent of the lane-kilometers are operating at or above 15,000 vehicles per day, mobility has become significantly impaired.

- Percentage of Freeway System with ADT Greater than 15,000 Per Lane: 30 percent.

Summary

These measures are only some of the variables examined during the assessment of possible mobility indicators (2). While all of the measures have limitations due to the reliability and accuracy of the data base, the three indicators below are illustrative of urban travel conditions:

- Urbanized Area traffic volumes,
- Roadway Congestion Index, and
- Percentage of freeway system with ADT per lane greater than 15,000.

These factors are also available without any new data collection requirements, which allows the use of historical traffic data collected during the usual urban planning process. A single variable may not be indicative of the traffic congestion in an urbanized area, but if all of the measures are examined, the relative mobility levels should become apparent. The analysis in the following section used the indicators to assess relative mobility levels in the study areas.

APPENDIX C

CONGESTION CLASSIFICATION AND COST ESTIMATES

Relationship Between Travel Demand and Urban Area Population

In previous reports (4,5,6,7), reference was made to relationships of DVKT and facility lane-kilometers to urban area population and size. The relationship between travel demand, lane-kilometers, and population indicates on what facilities motorists place the highest demand, while the relationship between DVKT, facility lane-kilometers, and area size indicates the density of both the freeway and principal arterial street systems.

Tables C-1 and C-2 show the relationship between travel, facility length, urban area population, and size. In both tables, the urban areas are ranked by DVKT and facility lane-kilometers per person. Comparison of the summary statistics of these tables indicates:

- The DVKT per person value shows each geographic region studied depends on the freeway system for service of the majority of travel demand;
- The freeway systems in the Texas region and the principal arterial street systems in the Southern region are the most dense across the regions; and
- The greatest travel per capita occurs on the freeways in the Western region and on the principal arterial street system in the Southern region.

Tables C-3 through C-12 show the congestion information for the freeways and principal arterial street travel for 1982 through 1991.

Table C-1. Summary of Freeway Travel Frequency and Urban Population Statistics for 1991

Urban Area	Popn (1000)	Urban Area (Sq.Km)	Popn Density Pers/Sq Km	DVKT[1] Per Sq. Km	Rank[3]	Ln Km[2] Per Sq. Km	Rank[3]
Northeastern Cities							
Baltimore MD	2,050	1,450	1,410	28.64	7	2.23	42
Boston MA	2,960	2,770	1,070	20.26	16	1.42	26
Hartford CT	610	930	650	17.33	26	1.61	32
New York NY	16,830	8,250	2,040	26.05	13	1.86	40
Philadelphia PA	4,230	2,940	1,440	16.21	30	1.33	22
Pittsburgh PA	1,870	1,930	970	11.07	41	1.36	23
Washington DC	3,280	2,380	1,380	27.99	8	1.66	33
Midwestern Cities							
Chicago IL	7,520	5,150	1,460	19.59	18	1.22	16
Cincinnati OH	1,200	1,490	810	20.17	17	1.58	31
Cleveland OH	1,790	1,670	1,070	21.66	14	1.77	38
Columbus OH	900	820	1,100	26.98	10	2.56	48
Detroit MI	3,990	3,260	1,220	18.81	20	1.41	25
Indianapolis IN	950	1,140	830	18.52	21	1.74	37
Kansas City MO	1,160	1,580	730	20.52	15	2.23	42
Louisville KY	810	980	820	16.45	29	1.55	30
Milwaukee WI	1,230	1,420	860	14.20	36	1.09	11
Minn-St. Paul MN	2,060	2,640	780	17.85	24	1.47	29
Oklahoma City OK	740	1,300	570	14.05	37	1.45	27
St. Louis MO	1,950	1,800	1,080	27.45	9	2.44	46
Southern Cities							
Atlanta GA	1,900	4,010	470	16.11	32	1.11	13
Charlotte NC	460	620	740	10.38	44	1.25	18
Ft. Lauderdale FL	1,280	1,110	1,140	16.58	27	1.40	24
Jacksonville FL	750	1,400	540	10.13	45	0.83	4
Memphis TN	870	1,090	800	10.48	42	0.93	6
Miami FL	1,880	1,260	1,500	18.10	22	1.27	20
Nashville TN	580	1,300	440	10.42	43	1.01	7
New Orleans LA	1,100	930	1,170	14.00	38	1.01	7
Norfolk VA	950	2,110	450	6.83	50	0.58	1
Orlando FL	880	1,060	830	14.74	34	1.46	28
Tampa FL	710	1,170	610	8.11	49	0.68	3
Southwestern Cities							
Albuquerque NM	540	670	800	9.54	46	0.83	4
Austin TX	530	930	560	15.28	33	1.26	19
Corpus Christi TX	290	470	610	8.92	47	1.03	10
Dallas TX	2,070	3,760	550	16.48	28	1.18	14
Denver CO	1,580	2,310	690	12.84	39	1.01	7
El Paso TX	560	540	1,030	16.14	31	1.69	35
Fort Worth TX	1,200	2,200	550	14.47	35	1.21	15
Houston TX	2,900	4,250	680	17.99	23	1.23	17
Phoenix AZ	1,930	2,550	760	8.28	48	0.65	2
Salt Lake City UT	840	1,220	690	11.67	40	1.10	12
San Antonio TX	1,180	1,260	940	19.33	19	1.71	36
Western Cities							
Honolulu HI	670	350	1,900	34.81	5	2.52	47
Los Angeles CA	11,760	5,660	2,080	50.47	1	2.39	44
Portland OR	1,040	1,100	940	17.69	25	1.32	21
Sacramento CA	1,170	950	1,230	26.41	11	2.08	41
San Bernardino-Riv CA	1,240	1,270	970	30.55	6	1.85	39
San Diego CA	2,350	1,840	1,280	39.01	3	2.43	45

Notes: [1] Daily vehicle-kilometers of travel per person
[2] Lane-kilometers per 1000 persons
[3] Rank value of 1 associated with most congested condition

Source: TTI Analysis and Local Transportation Agency References

Table C-2. Principal Arterial Street Travel Frequency and Population Density Statistics for 1991

Urban Area	Popn (1000)	Urban Area (Sq.Mi)	Popn Density Pers/Sq Mi	DVKT[1] Per Person	Rank[3]	Ln Mi[2] Per 1000 Pers	Rank[3]
Northeastern Cities							
Baltimore MD	2,050	560	3,660	4.81	24	0.81	19
Boston MA	2,960	1,070	2,770	4.22	30	0.93	27
Hartford CT	610	360	1,690	6.23	11	1.07	39
New York NY	16,830	3,190	5,280	3.15	47	0.45	3
Philadelphia PA	4,230	1,140	3,720	5.12	21	0.77	17
Pittsburgh PA	1,870	750	2,500	5.94	16	0.99	37
Washington DC	3,280	920	3,570	5.99	15	0.71	13
Midwestern Cities							
Chicago IL	7,520	1,990	3,780	4.06	34	0.57	5
Cincinnati OH	1,200	580	2,090	3.17	46	0.69	11
Cleveland OH	1,790	650	2,780	3.27	45	0.63	9
Columbus OH	900	320	2,860	3.67	43	0.69	11
Detroit MI	3,990	1,260	3,160	6.07	13	0.93	27
Indianapolis IN	950	440	2,160	4.17	31	0.93	27
Kansas City MO	1,160	610	1,900	4.17	31	0.91	26
Louisville KY	810	380	2,130	3.85	38	0.64	10
Milwaukee WI	1,230	550	2,230	4.02	37	0.82	20
Minn-St. Paul MN	2,060	1,020	2,020	2.78	48	0.59	7
Oklahoma City OK	740	500	1,480	5.09	22	0.93	27
St. Louis MO	1,950	690	2,810	6.54	10	0.93	27
Southern Cities							
Atlanta GA	1,900	1,550	1,230	5.21	20	0.83	21
Charlotte NC	460	240	1,920	6.93	8	1.17	41
Ft. Lauderdale FL	1,280	430	2,970	4.71	25	0.88	24
Jacksonville FL	750	540	1,390	7.87	5	1.61	46
Memphis TN	870	420	2,060	4.86	23	0.93	27
Miami FL	1,880	490	3,880	8.51	4	1.11	40
Nashville TN	580	500	1,150	9.50	1	1.65	47
New Orleans LA	1,100	360	3,040	3.78	39	0.57	5
Norfolk VA	950	820	1,170	4.66	26	0.79	18
Orlando FL	880	410	2,150	4.52	28	1.80	49
Tampa FL	710	450	1,580	6.20	12	0.94	34
Southwestern Cities							
Albuquerque NM	540	260	2,080	7.13	6	1.39	44
Austin TX	530	360	1,460	4.10	33	0.83	21
Corpus Christi TX	290	180	1,580	5.42	19	1.23	43
Dallas TX	2,070	1,450	1,430	4.06	34	0.83	21
Denver CO	1,580	890	1,780	6.84	9	1.17	41
El Paso TX	560	210	2,670	5.85	17	1.50	45
Fort Worth TX	1,200	850	1,410	3.54	44	0.73	14
Houston TX	2,900	1,640	1,770	3.76	41	0.75	16
Phoenix AZ	1,930	990	1,960	9.33	2	1.67	48
Salt Lake City UT	840	470	1,790	2.48	49	0.42	2
San Antonio TX	1,180	490	2,430	4.62	27	0.94	34
Western Cities							
Honolulu HI	670	140	4,930	2.44	50	0.30	1
Los Angeles CA	11,760	2,190	5,380	6.95	7	1.05	38
Portland OR	1,040	430	2,450	3.68	42	0.56	4
Sacramento CA	1,170	370	3,190	6.01	14	0.96	36
San Bernardino-Riv CA	1,240	490	2,520	8.62	3	1.85	50
San Diego CA	2,350	710	3,310	4.04	36	0.74	15
San Fran-Oak CA	3,730	880	4,260	3.77	40	0.62	8
San Jose CA	1,500	450	3,330	4.48	29	0.93	27
Seattle-Everett WA	1,800	730	2,490	5.45	18	0.89	25
Northeastern Avg	4,550	1,140	3,310	5.07		0.82	
Midwestern Avg	2,020	750	2,450	4.24		0.77	
Southern Avg	1,030	560	2,050	6.07		1.12	
Southwestern Avg	1,240	710	1,850	5.19		1.04	
Western Avg	2,800	710	3,540	5.05		0.88	
Texas Avg	1,250	740	1,820	4.48		0.97	
Total Avg	2,130	750	2,550	5.11		0.93	
Maximum Value	16,830	3,190	5,380	9.50		1.85	
Minimum Value	290	140	1,150	2.44		0.30	

Notes: [1] Daily vehicle-kilometers of travel per person
[2] Lane-kilometers per 1000 persons
[3] Rank value of 1 associated

Source: TTI Analysis and Local Transportation Agency References

Table C-3. Percent of Congested DVKT by AADT Congestion Ranges for 1982

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	14	6	0	20	3	7	14	25
Boston MA	4	10	16	30	11	6	19	35
Hartford CT	10	0	0	10	7	10	3	20
New York NY	28	9	17	55	22	29	24	75
Philadelphia PA	8	4	8	20	17	10	43	70
Pittsburgh PA	15	0	0	15	20	13	17	50
Washington DC	38	10	12	60	9	25	46	80
Midwestern Cities								
Chicago IL	9	15	26	50	14	21	24	60
Cincinnati OH	19	0	1	20	8	7	4	20
Cleveland OH	20	0	0	20	20	0	0	20
Columbus OH	0	2	23	25	7	19	9	35
Detroit MI	17	13	10	40	25	9	26	60
Indianapolis IN	5	0	0	5	4	9	2	15
Kansas City MO	5	0	0	5	8	5	7	20
Louisville KY	3	2	1	5	15	35	5	55
Milwaukee WI	14	6	0	20	6	18	7	30
Minn-St. Paul MN	13	7	0	20	12	18	20	50
Oklahoma City OK	3	3	0	5	3	9	21	33
St. Louis MO	11	14	0	25	25	10	30	65
Southern Cities								
Atlanta GA	16	20	4	40	18	24	18	60
Charlotte NC	35	0	0	35	25	24	1	50
Ft. Lauderdale FL	9	4	7	20	39	0	26	65
Jacksonville FL	25	0	0	25	7	7	22	35
Memphis TN	2	8	0	10	14	12	4	30
Miami FL	6	25	9	40	2	10	49	60
Nashville TN	5	12	3	20	7	26	7	40
New Orleans LA	37	0	3	40	13	5	27	45
Norfolk VA	36	3	1	40	0	9	21	30
Orlando FL	0	0	0	0	2	20	52	75
Tampa FL	0	11	9	20	12	44	4	60
Southwestern Cities								
Albuquerque NM	5	0	0	5	17	14	5	35
Austin TX	5	45	0	50	1	37	2	40
Corpus Christi TX	5	0	0	5	0	3	7	10
Dallas TX	0	31	14	45	8	17	0	25
Denver CO	31	13	2	45	26	3	21	50
El Paso TX	15	0	0	15	1	4	0	5
Fort Worth TX	0	20	10	30	8	17	0	25
Houston TX	2	9	54	65	18	3	29	50
Phoenix AZ	44	6	0	50	30	17	18	65
Salt Lake City UT	4	4	3	10	17	2	16	35
San Antonio TX	0	0	35	35	4	1	0	5
Western Cities								
Honolulu HI	4	13	23	40	18	19	27	65
Los Angeles CA	17	19	39	75	8	22	5	35
Portland OR	16	4	10	30	33	6	21	60
Sacramento CA	0	25	0	25	0	0	40	40
San Bernardino-Riv CA	70	0	0	70	60	0	0	60
San Diego CA	23	12	0	35	0	0	0	0
San Fran-Oak CA	17	12	35	65	35	3	22	60
San Jose CA	9	23	28	60	56	3	2	60
Seattle-Everett WA	23	9	8	40	9	21	21	50

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-4. Percent of Congested DVKT by AADT Congestion Ranges for 1983

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	16	4	0	20	2	6	17	25
Boston MA	6	9	15	30	6	11	18	35
Hartford CT	10	0	0	10	11	10	4	25
New York NY	20	20	15	55	19	27	29	75
Philadelphia PA	9	3	8	20	25	18	27	70
Pittsburgh PA	9	6	0	15	19	16	20	55
Washington DC	22	27	11	60	9	13	58	80
Midwestern Cities								
Chicago IL	14	18	18	50	16	24	26	65
Cincinnati OH	16	3	1	20	9	10	2	20
Cleveland OH	20	0	0	20	20	0	0	20
Columbus OH	7	11	6	25	28	8	5	40
Detroit MI	12	12	12	35	24	6	24	55
Indianapolis IN	5	0	0	5	6	6	4	15
Kansas City MO	0	5	0	5	11	1	8	20
Louisville KY	1	2	2	5	10	35	5	50
Milwaukee WI	17	3	0	20	5	21	4	30
Minn-St. Paul MN	10	8	2	20	6	27	17	50
Oklahoma City OK	3	3	0	5	3	9	21	33
St. Louis MO	11	19	0	30	26	14	26	65
Southern Cities								
Atlanta GA	16	19	5	40	13	27	20	60
Charlotte NC	35	0	0	35	32	8	16	56
Ft. Lauderdale FL	10	10	0	20	36	22	7	65
Jacksonville FL	0	25	0	25	9	16	10	35
Memphis TN	10	0	0	10	26	0	4	30
Miami FL	19	12	14	45	8	22	29	60
Nashville TN	11	2	7	20	5	19	15	40
New Orleans LA	33	4	3	40	19	3	23	45
Norfolk VA	36	3	1	40	0	8	22	30
Orlando FL	25	0	0	25	20	8	47	75
Tampa FL	3	5	12	20	9	18	32	60
Southwestern Cities								
Albuquerque NM	5	0	0	5	27	6	7	40
Austin TX	13	4	32	50	7	26	7	40
Corpus Christi TX	5	0	0	5	2	3	6	10
Dallas TX	13	4	32	50	4	21	0	25
Denver CO	18	19	8	45	17	12	21	50
El Paso TX	15	0	0	15	2	3	0	5
Fort Worth TX	9	3	23	35	4	21	0	25
Houston TX	13	10	42	65	12	0	38	50
Phoenix AZ	48	7	0	55	34	15	16	65
Salt Lake City UT	1	9	0	10	8	5	22	35
San Antonio TX	0	0	35	35	4	1	5	10
Western Cities								
Honolulu HI	1	10	29	40	20	16	29	65
Los Angeles CA	16	15	49	80	12	6	17	35
Portland OR	17	4	5	25	29	7	24	60
Sacramento CA	0	25	0	25	0	0	40	40
San Bernardino-Riv CA	70	0	0	70	60	0	0	60
San Diego CA	25	10	0	35	25	0	0	25
San Fran-Oak CA	12	21	37	70	15	16	24	55
San Jose CA	3	11	46	60	60	3	2	65
Seattle-Everett WA	13	23	10	45	13	15	27	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-5. Percent of Congested DVKT by AADT Congestion Ranges for 1984

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	15	2	8	25	2	5	23	30
Boston MA	11	7	18	35	6	8	21	35
Hartford CT	10	0	0	10	6	10	8	25
New York NY	32	8	15	55	25	33	17	75
Philadelphia PA	10	4	6	20	14	25	32	70
Pittsburgh PA	8	3	5	15	18	12	25	55
Washington DC	20	31	14	65	12	15	53	80
Midwestern Cities								
Chicago IL	8	12	35	55	15	16	34	65
Cincinnati OH	1	19	0	20	7	8	5	20
Cleveland OH	20	5	0	25	20	0	0	20
Columbus OH	7	7	11	25	25	11	3	40
Detroit MI	13	13	14	40	12	18	30	60
Indianapolis IN	5	0	0	5	0	5	10	15
Kansas City MO	1	2	3	5	11	1	8	20
Louisville KY	0	3	2	5	23	25	3	50
Milwaukee WI	18	7	0	25	13	18	4	35
Minn-St. Paul MN	11	5	4	20	9	17	29	55
Oklahoma City OK	3	3	0	5	4	11	25	39
St. Louis MO	11	5	5	20	20	10	35	65
Southern Cities								
Atlanta GA	27	18	0	45	23	21	20	65
Charlotte NC	40	0	0	40	32	10	13	56
Ft. Lauderdale FL	10	0	10	20	26	22	22	70
Jacksonville FL	19	6	0	25	11	8	21	40
Memphis TN	6	4	0	10	30	0	0	30
Miami FL	18	12	15	45	15	4	41	60
Nashville TN	10	0	10	20	5	12	23	40
New Orleans LA	7	14	24	45	12	6	32	50
Norfolk VA	12	28	1	40	0	9	21	30
Orlando FL	25	2	3	30	10	26	44	80
Tampa FL	1	0	19	20	15	19	32	65
Southwestern Cities								
Albuquerque NM	5	0	0	5	22	16	7	45
Austin TX	22	0	28	50	10	27	8	45
Corpus Christi TX	5	0	0	5	0	10	0	10
Dallas TX	17	7	27	50	14	6	10	30
Denver CO	4	27	14	45	12	6	32	50
El Paso TX	15	0	0	15	3	2	0	5
Fort Worth TX	12	5	19	35	14	6	10	30
Houston TX	12	12	46	70	11	0	44	55
Phoenix AZ	0	48	12	60	34	15	16	65
Salt Lake City UT	6	4	0	10	20	7	13	40
San Antonio TX	20	0	15	35	2	0	8	10
Western Cities								
Honolulu HI	3	9	33	45	11	12	42	65
Los Angeles CA	16	16	48	80	11	5	24	40
Portland OR	20	5	5	30	37	5	18	60
Sacramento CA	18	7	0	25	17	16	12	45
San Bernardino-Riv CA	34	36	0	70	40	20	0	60
San Diego CA	12	14	9	35	30	0	0	30
San Fran-Oak CA	5	21	49	75	6	18	37	60
San Jose CA	9	4	47	60	48	0	17	65
Seattle-Everett WA	14	17	18	50	11	19	25	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-6. Percent of Congested DVKT by AADT Congestion Ranges for 1985

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	14	5	6	25	3	4	28	35
Boston MA	15	4	15	35	6	7	23	35
Hartford CT	8	0	2	10	6	10	9	25
New York NY	20	21	14	55	21	19	36	75
Philadelphia PA	18	3	4	25	8	27	40	75
Pittsburgh PA	5	3	7	15	21	26	13	60
Washington DC	33	12	20	65	10	24	46	80
Midwestern Cities								
Chicago IL	5	9	41	55	17	8	45	70
Cincinnati OH	5	10	5	20	6	12	6	25
Cleveland OH	6	17	2	25	20	0	0	20
Columbus OH	9	6	9	25	22	15	3	40
Detroit MI	11	11	14	35	6	11	39	55
Indianapolis IN	5	0	0	5	3	5	8	15
Kansas City MO	2	1	2	5	11	3	6	20
Louisville KY	0	1	4	5	6	39	5	50
Milwaukee WI	7	18	0	25	3	24	8	35
Minn-St. Paul MN	6	6	8	20	13	17	25	55
Oklahoma City OK	3	3	0	5	4	11	25	39
St. Louis MO	5	12	3	20	16	14	35	65
Southern Cities								
Atlanta GA	24	19	8	50	13	15	37	65
Charlotte NC	32	8	0	40	35	2	23	60
Ft. Lauderdale FL	8	5	7	20	17	31	22	70
Jacksonville FL	22	0	8	30	12	10	18	40
Memphis TN	8	2	0	10	14	9	7	30
Miami FL	28	5	17	50	11	3	56	70
Nashville TN	8	8	0	15	8	13	19	40
New Orleans LA	9	14	23	45	10	5	35	50
Norfolk VA	5	34	1	40	7	2	21	30
Orlando FL	21	0	9	30	19	18	43	80
Tampa FL	3	17	0	20	14	10	42	65
Southwestern Cities								
Albuquerque NM	6	4	0	10	21	10	9	40
Austin TX	31	7	17	55	8	23	14	45
Corpus Christi TX	5	0	0	5	2	6	2	10
Dallas TX	20	10	21	50	16	7	8	30
Denver CO	16	15	15	45	22	11	17	50
El Paso TX	20	0	0	20	5	1	0	5
Fort Worth TX	14	7	15	35	16	7	8	30
Houston TX	13	9	49	70	9	5	41	55
Phoenix AZ	0	17	53	70	31	20	19	70
Salt Lake City UT	5	2	3	10	23	4	12	40
San Antonio TX	15	0	25	40	6	0	9	15
Western Cities								
Honolulu HI	8	1	36	45	22	17	31	70
Los Angeles CA	14	17	49	80	8	11	27	45
Portland OR	16	10	4	30	36	11	13	60
Sacramento CA	27	0	3	30	1	10	34	45
San Bernardino-Riv CA	51	19	0	70	36	0	29	65
San Diego CA	13	5	17	35	0	30	0	30
San Fran-Oak CA	6	15	54	75	8	16	36	60
San Jose CA	11	6	48	65	42	0	23	65
Seattle-Everett WA	20	11	19	50	12	11	32	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-7. Percent of Congested DVKT by AADT Congestion Ranges for 1986

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	15	7	3	25	5	8	22	35
Boston MA	12	8	20	40	7	6	22	35
Hartford CT	5	3	2	10	3	13	9	25
New York NY	22	22	10	55	22	9	44	75
Philadelphia PA	18	3	4	25	14	13	48	75
Pittsburgh PA	4	7	9	20	21	20	19	60
Washington DC	25	24	16	65	13	20	47	80
Midwestern Cities								
Chicago IL	4	8	43	55	11	10	48	70
Cincinnati OH	11	7	2	20	9	7	9	25
Cleveland OH	6	17	2	25	12	8	0	20
Columbus OH	6	11	7	25	20	13	13	45
Detroit MI	13	11	17	40	4	7	50	60
Indianapolis IN	5	0	0	5	6	3	6	15
Kansas City MO	3	0	2	5	7	7	6	20
Louisville KY	2	1	3	5	7	30	13	50
Milwaukee WI	6	17	2	25	1	24	10	35
Minn-St. Paul MN	10	10	6	25	11	7	33	50
Oklahoma City OK	3	3	0	5	4	11	25	39
St. Louis MO	11	7	2	20	18	17	30	65
Southern Cities								
Atlanta GA	8	9	34	50	10	12	43	65
Charlotte NC	38	2	0	40	6	33	21	60
Ft. Lauderdale FL	15	10	0	25	8	20	42	70
Jacksonville FL	28	2	0	30	18	8	14	40
Memphis TN	10	0	0	10	22	6	8	35
Miami FL	21	11	18	50	12	22	36	70
Nashville TN	9	6	0	15	3	11	26	40
New Orleans LA	12	15	23	50	5	4	40	50
Norfolk VA	16	9	20	45	3	4	23	30
Orlando FL	26	2	7	35	4	30	47	80
Tampa FL	4	9	7	20	11	20	34	65
Southwestern Cities								
Albuquerque NM	0	9	1	10	25	8	7	40
Austin TX	15	14	25	55	9	11	25	45
Corpus Christi TX	10	0	0	10	2	5	3	10
Dallas TX	7	13	35	55	15	10	5	30
Denver CO	17	15	19	50	25	10	15	50
El Paso TX	5	14	1	20	5	0	0	5
Fort Worth TX	5	10	25	40	15	10	5	30
Houston TX	8	15	52	75	12	8	35	55
Phoenix AZ	4	4	62	70	31	13	26	70
Salt Lake City UT	3	5	2	10	30	4	11	45
San Antonio TX	6	0	34	40	6	3	6	15
Western Cities								
Honolulu HI	11	6	28	45	23	16	31	70
Los Angeles CA	6	13	66	85	9	9	32	50
Portland OR	12	15	3	30	29	20	11	60
Sacramento CA	28	0	2	30	2	33	5	40
San Bernardino-Riv CA	20	40	15	75	25	20	20	65
San Diego CA	23	4	13	40	13	17	0	30
San Fran-Oak CA	7	6	62	75	13	8	39	60
San Jose CA	4	13	48	65	10	15	45	70
Seattle-Everett WA	18	21	17	55	17	4	34	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-8. Percent of Congested DVKT by AADT Congestion Ranges for 1987

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	14	5	5	25	7	5	24	35
Boston MA	17	10	13	40	8	4	23	35
Hartford CT	5	3	2	10	9	14	8	30
New York NY	21	18	17	55	16	13	46	75
Philadelphia PA	15	7	3	25	13	12	50	75
Pittsburgh PA	3	9	9	20	20	13	28	60
Washington DC	21	25	19	65	13	18	54	85
Midwestern Cities								
Chicago IL	5	12	38	55	14	8	48	70
Cincinnati OH	16	7	2	25	11	6	8	25
Cleveland OH	7	16	2	25	11	14	0	25
Columbus OH	2	10	13	25	16	17	12	45
Detroit MI	13	7	20	40	4	6	51	60
Indianapolis IN	5	0	0	5	7	4	5	15
Kansas City MO	4	0	1	5	6	4	10	20
Louisville KY	3	0	2	5	8	31	16	55
Milwaukee WI	7	14	9	30	9	19	7	35
Minn-St. Paul MN	5	8	17	30	15	6	34	55
Oklahoma City OK	3	3	0	5	0	14	21	35
St. Louis MO	9	7	5	20	23	11	31	65
Southern Cities								
Atlanta GA	2	15	34	50	11	15	38	65
Charlotte NC	38	2	0	40	10	20	30	60
Ft. Lauderdale FL	15	5	5	25	9	24	37	70
Jacksonville FL	21	8	2	30	11	16	18	45
Memphis TN	10	0	0	10	18	8	9	35
Miami FL	21	13	15	50	11	4	55	70
Nashville TN	15	3	2	20	7	6	27	40
New Orleans LA	24	4	22	50	9	2	39	50
Norfolk VA	8	14	23	45	6	8	21	35
Orlando FL	24	2	9	35	8	14	59	80
Tampa FL	7	1	12	20	12	15	39	65
Southwestern Cities								
Albuquerque NM	1	4	5	10	24	10	6	40
Austin TX	22	11	22	55	7	15	23	45
Corpus Christi TX	10	0	0	10	2	5	3	10
Dallas TX	19	11	25	55	10	12	7	30
Denver CO	15	18	16	50	26	12	12	50
El Paso TX	7	13	0	20	3	2	0	5
Fort Worth TX	14	8	18	40	10	12	7	30
Houston TX	12	9	49	70	12	8	30	50
Phoenix AZ	3	25	42	70	32	18	20	70
Salt Lake City UT	4	9	2	15	16	14	9	40
San Antonio TX	6	3	31	40	6	2	12	20
Western Cities								
Honolulu HI	14	4	27	45	36	15	19	70
Los Angeles CA	5	11	69	85	13	12	25	50
Portland OR	17	11	7	35	12	24	25	60
Sacramento CA	19	15	1	35	7	24	14	45
San Bernardino-Riv CA	13	47	16	75	27	18	20	65
San Diego CA	13	19	13	45	5	25	0	30
San Fran-Oak CA	8	4	68	80	9	11	40	60
San Jose CA	8	9	53	70	12	10	48	70
Seattle-Everett WA	24	19	22	65	11	18	26	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-9. Percent of Congested DVKT by AADT Congestion Ranges for 1988

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	12	5	8	25	7	5	23	35
Boston MA	8	8	29	45	9	9	23	40
Hartford CT	7	4	5	15	9	13	8	30
New York NY	22	15	18	55	13	16	51	80
Philadelphia PA	16	7	2	25	11	10	54	75
Pittsburgh PA	10	3	7	20	7	10	43	60
Washington DC	20	27	19	65	9	22	54	85
Midwestern Cities								
Chicago IL	6	12	38	56	14	15	35	65
Cincinnati OH	16	11	3	30	5	7	12	25
Cleveland OH	10	14	1	25	14	13	3	30
Columbus OH	0	12	13	25	6	27	12	45
Detroit MI	10	7	23	40	9	5	46	60
Indianapolis IN	10	0	0	10	12	3	5	20
Kansas City MO	2	1	2	5	8	8	8	25
Louisville KY	2	0	3	5	17	28	10	55
Milwaukee WI	6	11	13	30	12	16	8	35
Minn-St. Paul MN	7	8	16	30	14	8	33	55
Oklahoma City OK	5	5	0	10	1	11	23	35
St. Louis MO	7	0	8	15	14	13	28	55
Southern Cities								
Atlanta GA	4	19	23	45	12	18	35	65
Charlotte NC	38	7	0	45	7	17	41	65
Ft. Lauderdale FL	15	5	5	25	7	28	34	70
Jacksonville FL	28	2	0	30	11	20	14	45
Memphis TN	10	0	0	10	14	8	13	35
Miami FL	14	16	30	60	1	18	51	70
Nashville TN	9	10	5	25	4	6	29	40
New Orleans LA	18	7	25	50	5	2	43	50
Norfolk VA	4	18	24	45	9	10	16	35
Orlando FL	25	2	8	35	11	17	53	80
Tampa FL	10	3	13	25	7	5	47	60
Southwestern Cities								
Albuquerque NM	7	8	5	20	20	11	4	35
Austin TX	20	15	20	55	14	14	18	45
Corpus Christi TX	10	0	0	10	2	6	1	10
Dallas TX	16	9	30	55	13	13	4	30
Denver CO	12	21	17	50	27	12	10	50
El Paso TX	7	13	0	20	3	2	0	5
Fort Worth TX	12	6	22	40	13	13	4	30
Houston TX	11	11	48	70	7	28	15	50
Phoenix AZ	23	9	28	60	18	20	43	80
Salt Lake City UT	8	6	1	15	17	15	8	40
San Antonio TX	8	6	26	40	5	1	8	15
Western Cities								
Honolulu HI	10	11	28	50	32	13	26	70
Los Angeles CA	4	4	67	75	11	10	29	50
Portland OR	20	11	9	40	11	26	24	60
Sacramento CA	21	22	2	45	11	22	17	50
San Bernardino-Riv CA	7	13	56	75	27	18	20	65
San Diego CA	12	9	24	45	5	20	6	30
San Fran-Oak CA	10	5	66	80	9	3	48	60
San Jose CA	12	10	48	70	13	6	57	75
Seattle-Everett WA	21	24	24	70	11	15	30	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-10. Percent of Congested DVKT by AADT Congestion Ranges for 1989

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	6	9	10	25	6	8	21	35
Boston MA	8	16	21	45	7	8	25	40
Hartford CT	4	5	5	15	9	16	10	35
New York NY	26	8	27	60	15	11	54	80
Philadelphia PA	14	7	4	25	14	9	52	75
Pittsburgh PA	12	0	8	20	9	9	43	60
Washington DC	10	29	26	65	8	20	57	85
Midwestern Cities								
Chicago IL	9	8	38	55	13	17	35	65
Cincinnati OH	20	7	3	30	10	3	12	25
Cleveland OH	13	9	3	25	10	13	7	30
Columbus OH	3	10	12	25	6	25	14	45
Detroit MI	10	5	26	40	5	8	47	60
Indianapolis IN	10	0	0	10	13	3	4	20
Kansas City MO	3	1	2	5	8	9	8	25
Louisville KY	2	0	3	5	18	26	11	55
Milwaukee WI	10	9	11	30	12	15	8	35
Minn-St. Paul MN	7	8	16	30	17	6	33	55
Oklahoma City OK	7	3	0	10	7	11	16	35
St. Louis MO	8	4	8	20	8	17	35	60
Southern Cities								
Atlanta GA	8	12	25	45	12	12	41	65
Charlotte NC	38	7	0	45	8	15	43	65
Ft. Lauderdale FL	15	7	3	25	14	25	31	70
Jacksonville FL	27	8	0	35	15	17	19	50
Memphis TN	10	0	0	10	10	14	11	35
Miami FL	11	15	33	60	2	8	60	70
Nashville TN	15	7	3	25	5	5	30	40
New Orleans LA	4	20	26	50	15	3	32	50
Norfolk VA	3	16	25	45	11	5	19	35
Orlando FL	30	2	8	40	4	19	57	80
Tampa FL	8	12	5	25	20	8	36	65
Southwestern Cities								
Albuquerque NM	7	8	5	20	17	11	11	40
Austin TX	20	17	18	55	16	17	11	45
Corpus Christi TX	10	0	0	10	6	3	1	10
Dallas TX	17	13	24	55	9	13	9	30
Denver CO	15	19	17	50	18	14	18	50
El Paso TX	9	11	0	20	2	1	2	5
Fort Worth TX	13	10	18	40	9	13	9	30
Houston TX	7	19	44	70	9	23	18	50
Phoenix AZ	18	8	34	60	20	18	37	75
Salt Lake City UT	6	3	6	15	18	14	8	40
San Antonio TX	6	16	18	40	5	1	9	15
Western Cities								
Honolulu HI	10	10	29	50	28	12	29	70
Los Angeles CA	4	3	68	75	9	14	27	50
Portland OR	19	6	15	40	10	25	26	60
Sacramento CA	21	18	6	45	3	17	30	50
San Bernardino-Riv CA	5	15	59	80	26	24	14	65
San Diego CA	12	7	27	45	4	25	2	30
San Fran-Oak CA	11	5	64	80	6	3	51	60
San Jose CA	10	15	45	70	12	9	55	75
Seattle-Everett WA	9	35	26	70	14	8	34	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-11. Percent of Congested DVKT by AADT Congestion Ranges for 1990

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	6	8	12	25	4	4	26	35
Boston MA	10	15	19	45	8	7	26	40
Hartford CT	11	3	1	15	12	12	11	35
New York NY	28	10	22	60	14	17	49	80
Philadelphia PA	12	6	7	25	13	14	48	75
Pittsburgh PA	4	6	10	20	14	9	37	60
Washington DC	12	20	34	65	6	26	53	85
Midwestern Cities								
Chicago IL	7	11	37	55	16	19	30	65
Cincinnati OH	18	8	4	30	10	3	12	25
Cleveland OH	15	8	2	25	10	10	10	30
Columbus OH	2	10	13	25	8	15	22	45
Detroit MI	10	5	25	40	8	12	40	60
Indianapolis IN	8	0	2	10	13	1	6	20
Kansas City MO	3	2	0	5	4	3	17	25
Louisville KY	3	0	2	5	14	29	12	55
Milwaukee WI	8	10	12	30	12	9	14	35
Minn-St. Paul MN	7	6	17	30	14	4	37	55
Oklahoma City OK	7	3	0	10	9	11	15	35
St. Louis MO	10	2	8	20	13	29	18	60
Southern Cities								
Atlanta GA	4	15	26	45	8	14	42	65
Charlotte NC	38	7	0	45	3	22	41	65
Ft. Lauderdale FL	15	8	2	25	10	27	33	70
Jacksonville FL	27	8	0	35	11	15	24	50
Memphis TN	9	1	0	10	8	15	12	35
Miami FL	18	8	33	60	2	8	60	70
Nashville TN	18	5	3	25	4	9	27	40
New Orleans LA	4	30	16	50	12	10	28	50
Norfolk VA	3	16	25	45	10	9	16	35
Orlando FL	26	6	8	40	4	13	63	80
Tampa FL	4	8	12	25	18	9	38	65
Southwestern Cities								
Albuquerque NM	6	9	5	20	15	20	5	40
Austin TX	18	20	17	55	15	15	15	45
Corpus Christi TX	10	0	0	10	7	2	1	10
Dallas TX	12	16	27	55	14	8	8	30
Denver CO	11	13	25	50	11	14	25	50
El Paso TX	10	9	1	20	1	1	3	5
Fort Worth TX	9	12	19	40	14	8	8	30
Houston TX	6	21	43	70	11	22	17	50
Phoenix AZ	7	32	21	60	28	24	23	75
Salt Lake City UT	7	6	2	15	18	11	11	40
San Antonio TX	6	18	17	40	5	2	8	15
Western Cities								
Honolulu HI	11	13	25	50	28	12	30	70
Los Angeles CA	4	3	68	75	11	17	22	50
Portland OR	18	9	13	40	7	26	27	60
Sacramento CA	23	16	6	45	2	13	35	50
San Bernardino-Riv CA	15	10	55	80	30	20	15	65
San Diego CA	13	11	21	45	8	20	2	30
San Fran-Oak CA	14	8	58	80	4	9	47	60
San Jose CA	14	13	44	70	17	7	52	75
Seattle-Everett WA	11	38	21	70	10	8	37	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Table C-12. Percent of Congested DVKT by AADT Congestion Ranges for 1991

Urban Area	Freeway & Expressway				Principal Arterial Street			
	Moderate	Heavy	Severe	Total	Moderate	Heavy	Severe	Total
Northeastern Cities								
Baltimore MD	6	7	12	25	3	8	24	35
Boston MA	7	16	23	45	11	6	23	40
Hartford CT	12	2	1	15	14	11	10	35
New York NY	28	13	19	60	15	15	50	80
Philadelphia PA	12	5	8	25	11	20	44	75
Pittsburgh PA	4	6	10	20	16	14	30	60
Washington DC	8	22	35	65	7	21	57	85
Midwestern Cities								
Chicago IL	7	9	39	55	15	18	32	65
Cincinnati OH	17	10	3	30	10	4	12	25
Cleveland OH	15	8	3	25	11	10	9	30
Columbus OH	2	10	13	25	9	14	22	45
Detroit MI	8	5	26	40	8	13	39	60
Indianapolis IN	8	0	2	10	14	1	5	20
Kansas City MO	3	2	1	5	4	5	16	25
Louisville KY	3	0	2	5	11	30	13	55
Milwaukee WI	9	11	11	30	11	9	15	35
Minn-St. Paul MN	8	6	15	30	11	6	38	55
Oklahoma City OK	7	3	0	10	8	10	17	35
St. Louis MO	10	2	8	20	12	27	21	60
Southern Cities								
Atlanta GA	4	17	24	45	10	17	38	65
Charlotte NC	43	8	0	50	4	14	47	65
Ft. Lauderdale FL	14	8	3	25	13	24	33	70
Jacksonville FL	25	9	1	35	16	13	21	50
Memphis TN	13	2	0	15	10	14	11	35
Miami FL	20	10	30	60	3	10	58	70
Nashville TN	18	6	2	25	5	10	25	40
New Orleans LA	3	29	16	49	10	12	28	50
Norfolk VA	4	18	24	45	10	9	16	35
Orlando FL	25	6	9	40	5	9	66	80
Tampa FL	4	9	12	25	24	11	37	72
Southwestern Cities								
Albuquerque NM	7	8	5	20	18	18	4	40
Austin TX	19	21	15	55	15	17	13	45
Corpus Christi TX	9	1	0	10	10	3	2	15
Dallas TX	12	14	29	55	13	9	8	30
Denver CO	12	18	25	55	7	15	28	50
El Paso TX	11	8	1	20	1	1	3	5
Fort Worth TX	9	10	21	40	13	9	8	30
Houston TX	8	19	43	70	10	21	19	50
Phoenix AZ	10	30	21	60	29	19	27	75
Salt Lake City UT	8	9	4	20	22	10	9	40
San Antonio TX	5	16	19	40	4	3	7	15
Western Cities								
Honolulu HI	10	13	27	50	28	11	36	75
Los Angeles CA	5	3	67	75	10	14	26	50
Portland OR	21	10	14	45	6	25	28	60
Sacramento CA	23	18	5	45	4	10	35	50
San Bernardino-Riv CA	13	14	53	80	30	20	15	65
San Diego CA	12	12	21	45	7	19	4	30
San Fran-Oak CA	11	13	56	80	6	7	47	60
San Jose CA	14	13	43	70	15	4	56	75
Seattle-Everett WA	8	36	26	70	10	11	34	55

AADT per Lane Ranges:

	Moderate	Heavy	Severe
Freeway & Expressway	15,000-17,500	17,501-20,000	Over 20,000
Principal Arterial Street	5,750-7,000	7,001-8,500	Over 8,500

Note: - Denotes Data Not Available or Missing in HPMS Sample Data

Source: TTI Analysis and Local Transportation Agency References

Delay in travel time represents a significant cost to the motoring public. This section attempts to quantify these costs to the drivers in terms of time and fuel. The delay calculations are affected by a number of constants and urbanized area/state specific variables that will be discussed in the following sections.

Cost Estimate Constants

The congestion cost estimate calculations are utilized in the following derived constant values.

1. Occupancy—1.25 persons per vehicle,
2. 250 working days per year,
3. Average cost of time (11)—$10.25 per person hour,[1]
4. Commercial vehicle operating cost (10)—$1.27 per kilometer,
5. Vehicle mix—95 percent passenger and 5 percent commercial, and
6. Vehicular speeds: Table C-13 (14).

These constants were applied to all study areas consistently for the cost estimate calculations.

Table C-13. Congested Daily Vehicle-Kilometers of Travel by Average Annual Daily Traffic per Lane Volumes

Functional Class	Parameters	Uncongested	Congested DVKT[1,2]		
			Moderate	Heavy	Severe
Freeway/Expressway	ADT/Lane	Under 15,000	15,000 - 17,500	17,501 - 20,000	Over 20,000
	Speed (kph)[3]	100	61	53	48
Principal Arterial Streets	ADT/Lane	Under 5,750	5,750 - 7,000	7,001 - 8,500	Over 8,500
	Speed (kph)[3]	60	45	40	37

Notes: [1] Assumes congested freeway operation when ADT/Lane exceeds 15,000.
[2] Assumes congested principal arterial street operations when ADT/lane exceeds 5,750
[3] Value represents a weighted average (10).

Source: TTI Analysis and Houston-Galveston Regional Transportation Study

[1]Referenced value of $8.00/hr in 1985 adjusted with the Consumer Price Index to value used for 1991 wage rate.

Cost Estimate Variables

In addition to the derived constants, five urbanized area/state specific variables were identified and used in the congestion cost estimate calculations. These variables are illustrated in Table C-14.

Daily Vehicle-Kilometers Of Travel

The daily vehicle-kilometers of travel (DVKT) is the average daily traffic (ADT) of a section of roadway multiplied by the length (in kilometers) of that section of roadway. This allows the daily volume of all urban facilities to be represented in terms that can be quantified and utilized in cost calculations. DVKT was estimated for the freeways and principal arterial streets located in each study urbanized area. These estimates originate from the HPMS data base and other local transportation data sources and are presented in a previous section of this report.

Fuel Costs

Statewide average fuel cost estimates were obtained from 1991 data published by the American Automobile Association (AAA) (18). These data represent the average reported fuel cost for 1991. Values for different fuel types used in motor vehicles, i.e., diesel and gasoline, did not vary enough to be reported separately. Therefore, an average rate for fuel was used in cost estimate calculations.

Registered Vehicles

The registered vehicle data was obtained from the county Tax Assessor's office in each study area. These data represent the passenger automobiles and light trucks (pick-ups) registered within the study area in 1991.

Table C-14. 1991 Congestion Cost Estimate Variables

Urban Area	Daily VKT		State	Registered		Popn
	Frwy (1000)	Prin.Art.St. (1000)	Avg Fuel Cost, $	Autos (1000)	Population (1000)	Per Reg.Veh.
Northeastern Cities						
Baltimore MD	25,820	15,900	0.37	1,050	2,050	1.95
Boston MA	34,900	20,130	0.35	1,660	2,960	1.78
Hartford CT	10,050	6,120	0.37	530	610	1.16
New York NY	133,650	85,360	0.36	6,070	16,830	2.77
Philadelphia PA	29,620	34,810	0.35	2,790	4,230	1.51
Pittsburgh PA	13,280	17,830	0.35	1,240	1,870	1.51
Washington DC	41,470	31,640	0.36	1,690	3,280	1.94
Midwestern Cities						
Chicago IL	62,760	49,160	0.37	4,050	7,520	1.86
Cincinnati OH	18,680	6,120	0.35	930	1,200	1.28
Cleveland OH	22,490	9,420	0.35	1,490	1,790	1.20
Columbus OH	13,690	5,310	0.35	750	900	1.20
Detroit MI	38,160	38,930	0.35	2,870	3,990	1.39
Indianapolis IN	13,120	6,380	0.34	580	950	1.63
Kansas City MO	20,150	7,790	0.31	750	1,160	1.55
Louisville KY	10,060	5,020	0.34	460	810	1.75
Milwaukee WI	12,570	7,940	0.35	540	1,230	2.27
Minn-St. Paul MN	29,320	9,210	0.35	1,700	2,060	1.21
Oklahoma City OK	11,310	6,070	0.34	490	740	1.51
St. Louis MO	30,670	20,530	0.31	1,020	1,950	1.91
Southern Cities						
Atlanta GA	40,200	15,920	0.33	1,590	1,900	1.20
Charlotte NC	4,010	5,140	0.35	380	460	1.22
Ft. Lauderdale FL	11,480	9,660	0.35	1,030	1,280	1.24
Jacksonville FL	8,810	9,500	0.35	610	750	1.24
Memphis TN	7,080	6,760	0.35	630	870	1.38
Miami FL	14,140	25,760	0.35	1,430	1,880	1.31
Nashville TN	8,390	8,790	0.35	510	580	1.12
New Orleans LA	8,110	6,660	0.36	880	1,100	1.24
Norfolk VA	8,960	7,130	0.35	830	950	1.14
Orlando FL	9,730	6,400	0.35	740	880	1.18
Tampa FL	5,880	7,080	0.35	640	710	1.11
Southwestern Cities						
Albuquerque NM	3,990	6,200	0.35	420	540	1.28
Austin TX	8,860	3,460	0.34	510	530	1.03
Corpus Christi TX	2,580	2,490	0.34	220	290	1.31
Dallas TX	38,480	13,520	0.34	1,510	2,070	1.37
Denver CO	18,390	17,390	0.36	1,390	1,580	1.14
El Paso TX	5,460	5,270	0.34	350	560	1.62
Fort Worth TX	19,800	6,840	0.34	1,000	1,200	1.20
Houston TX	47,500	17,550	0.34	2,240	2,900	1.29
Phoenix AZ	13,140	29,000	0.35	1,240	1,930	1.56
Salt Lake City UT	8,830	3,350	0.36	700	840	1.20
San Antonio TX	15,090	8,770	0.34	870	1,180	1.35
Western Cities						
Honolulu HI	7,570	2,610	0.43	510	670	1.31
Los Angeles CA	177,550	131550	0.36	7,810	11,760	1.51
Portland OR	12,110	6,170	0.36	680	1,040	1.52
Sacramento CA	15,520	11,270	0.36	1,280	1,170	0.91
San Bernardino-Riv CA	24,100	17,150	0.36	800	1,240	1.55
San Diego CA	44,600	15,300	0.36	1,410	2,350	1.67
San Fran-Oak CA	67,620	22,590	0.36	3,040	3,730	1.23
San Jose CA	26,600	10,830	0.36	1,020	1,500	1.47
Seattle-Everett WA	30,590	15,810	0.36	1,330	1,800	1.35
Northeastern Avg	41,260	30,250	0.36	2,150	4,550	1.80
Midwestern Avg	23,580	14,320	0.34	1,300	2,020	1.56
Southern Avg	11,530	9,890	0.35	840	1,030	1.22
Southwestern Avg	16,560	10,350	0.35	950	1,240	1.30
Western Avg	45,140	25,920	0.37	1,990	2,800	1.39
Texas Avg	19,680	8,270	0.34	960	1,250	1.31
Total Avg	25,740	16,790	0.35	1,370	2,130	1.43
Maximum Value	177,550	131550	0.43	7,810	16,830	2.77
Minimum Value	2,580	2,490	0.31	220	290	0.91

Source: TTI Analysis and Local Transportation Agency References

Population

Population data were obtained from the combination of 1990 U.S. Census Bureau estimates and 1991 population estimates reported in the Federal Highway Administration's Highway Performance Monitoring System (HPMS).

Cost Estimate Calculations

The first step in the cost estimate procedure was to convert DVKT into vehicle-hours of delay. Vehicle-hours of delay is the basis for the delay and fuel cost calculations. To obtain vehicle-hours of delay, vehicle-kilometers of travel on congested roadways during each peak period was estimated. This was accomplished by the use of two factors.

Highway Performance Monitoring System (HPMS) data were used to determine the percentage of urbanized area DVKT occurring on congested facilities. Two functional classes, freeways/expressways and principal arterial streets, were considered in the calculation of this factor. Congested conditions for these facilities were defined by the following ADT per lane values:

- Freeways/Expressways-------ADT per lane greater than 15,000, and
- Principal Arterial Streets--------ADT per lane greater than 5,750.

Using these values, the percentage of DVKT operating in congested conditions could be calculated for each functional class. This percentage adjusts DVKT to congested DVKT, the first step in the process to obtain travel volume that occurs during congested conditions.

The congested daily travel values were adjusted by a factor to represent the percentage of travel occurring in the peak period. This factor was calculated using the Texas Department of Transportation's (TxDOT) 1986 Automatic Traffic Recorder Data (20) for the study areas in Texas. Using these data, the percentage of ADT occurring during the morning and evening peak periods was estimated using these data. These data indicated that a relatively consistent value

of 45 percent of total daily traffic occurred during the peak periods. This factor was applied to all the study areas.

Once the DVKT was converted to peak-period congested vehicle-kilometers of travel (Table C-15), the recurring vehicle-hours of delay were computed (Equation C-1). Recurring delay is caused by the peak facility conditions during normal operations. This value does not include delay resulting from accidents, construction, or maintenance operations.

$$\text{Recurring Vehicle-Hours of Delay Per Day} = \frac{\text{Peak-Period Congested DVKT}}{\text{Avg. Peak-Period Speed}} - \frac{\text{Peak-Period Congested DVKT}}{\text{Avg. Off-Peak Speed}} \qquad \text{Eq. C-1}$$

This calculation was performed for both freeways and principal arterial streets in a study area; the total recurring vehicle-hours of delay is the sum of the two. The result of these calculations is shown in Table C-16.

Another type of delay encountered by vehicles is incident delay. This is the delay that results from an accident or disabled vehicle. Incident vehicle-hours of delay vary for each area by facility type, i.e., freeway/expressway or arterial street. For the freeway system in individual study areas, the ratio of recurring to incident delay reported by Lindley (13) were used. The resulting incident delay was calculated using Equation C-2.

$$\text{Frwy Incident Vehicle-Hours of Delay Per Day} = \text{Peak-Period Frwy Vehicle-Hours of Delay Per Day} \times \text{Frwy Incident/Recurring Ratio} \qquad \text{Eq. C-2}$$

Table C-15. 1991 Congested Daily Vehicle-Kilometers of Travel

Urban Area	Daily Vehicle-Kilometers of Travel		Percent of Peak-Period[1],[2] VKT on Congested Roads		Peak Period Congested DVKT[1],[3]		
	Frwy (1000)	Prin.Art.St. (1000)	Frwy (%)	Prin.Art.St. (%)	Frwy (1000)	Prin.Art.St. (1000)	Frwy & Prin. Art.St. (1000)
Northeastern Cities							
Baltimore MD	25,820	15,900	25	35	2,910	2,500	5,410
Boston MA	34,900	20,130	45	40	7,070	3,620	10,690
Hartford CT	10,050	6,120	15	35	680	960	1,640
New York NY	133,650	85,360	60	80	36,080	30,730	66,810
Philadelphia PA	29,620	34,810	25	75	3,330	11,750	15,080
Pittsburgh PA	13,280	17,830	20	60	1,200	4,810	6,010
Washington DC	41,470	31,640	65	85	12,130	12,100	24,230
Midwestern Cities							
Chicago IL	62,760	49,160	55	65	15,530	14,380	29,910
Cincinnati OH	18,680	6,120	30	25	2,520	690	3,210
Cleveland OH	22,490	9,420	25	30	2,530	1,270	3,800
Columbus OH	13,690	5,310	25	45	1,540	1,080	2,620
Detroit MI	38,160	38,930	40	60	6,870	10,510	17,380
Indianapolis IN	13,120	6,380	10	20	590	570	1,160
Kansas City MO	20,150	7,790	5	25	450	880	1,330
Louisville KY	10,060	5,020	5	55	230	1,240	1,470
Milwaukee WI	12,570	7,940	30	35	1,700	1,250	2,950
Minn-St. Paul MN	29,320	9,210	30	55	3,960	2,280	6,240
Oklahoma City OK	11,310	6,070	10	35	510	960	1,460
St. Louis MO	30,670	20,530	20	60	2,760	5,540	8,300
Southern Cities							
Atlanta GA	40,200	15,920	45	65	8,140	4,660	12,800
Charlotte NC	4,010	5,140	50	65	900	1,500	2,400
Ft. Lauderdale FL	11,480	9,660	25	70	1,290	3,040	4,330
Jacksonville FL	8,810	9,500	35	50	1,390	2,140	3,520
Memphis TN	7,080	6,760	15	35	480	1,070	1,540
Miami FL	14,140	25,760	60	70	3,820	8,110	11,930
Nashville TN	8,390	8,790	25	40	940	1,580	2,530
New Orleans LA	8,110	6,660	50	50	1,830	1,500	3,320
Norfolk VA	8,960	7,130	45	35	1,810	1,120	2,940
Orlando FL	9,730	6,400	40	80	1,750	2,300	4,060
Tampa FL	5,880	7,080	25	65	660	2,070	2,730
Southwestern Cities							
Albuquerque NM	3,990	6,200	20	40	360	1,120	1,480
Austin TX	8,860	3,460	55	45	2,190	700	2,890
Corpus Christi TX	2,580	2,490	10	15	120	170	280
Dallas TX	38,480	13,520	55	30	9,520	1,830	11,350
Denver CO	18,390	17,390	55	50	4,550	3,910	8,460
El Paso TX	5,460	5,270	20	5	490	120	610
Fort Worth TX	19,800	6,840	40	30	3,560	920	4,490
Houston TX	47,500	17,550	70	50	14,960	3,950	18,910
Phoenix AZ	13,140	29,000	60	75	3,550	9,790	13,340
Salt Lake City UT	8,830	3,350	20	40	790	600	1,400
San Antonio TX	15,090	8,770	40	15	2,720	590	3,310
Western Cities							
Honolulu HI	7,570	2,610	50	75	1,700	880	2,580
Los Angeles CA	177,550	131550	75	50	59,920	29,600	89,520
Portland OR	12,110	6,170	45	60	2,450	1,660	4,120
Sacramento CA	15,520	11,270	45	50	3,140	2,540	5,680
San Bernardino-Riv CA	24,100	17,150	80	65	8,680	5,020	13,690
San Diego CA	44,600	15,300	45	30	9,030	2,060	11,100
San Fran-Oak CA	67,620	22,590	80	60	24,340	6,100	30,440
San Jose CA	26,600	10,830	70	75	8,380	3,650	12,030
Seattle-Everett WA	30,590	15,810	70	55	9,640	3,910	13,550
Northeastern Avg	41,260	30,250	36	59	9,060	9,500	18,550
Midwestern Avg	23,580	14,320	24	43	3,270	3,390	6,650
Southern Avg	11,530	9,890	38	57	2,090	2,650	4,740
Southwestern Avg	16,560	10,350	40	36	3,890	2,150	6,050
Western Avg	45,140	25,920	62	58	14,140	6,160	20,300
Texas Avg	19,680	8,270	41	27	4,790	1,180	5,980
Total Avg	25,740	16,790	39	49	5,910	4,310	10,220
Maximum Value	177,550	131550	80	85	59,920	30,730	89,520
Minimum Value	2,580	2,490	5	5	120	120	280

Notes: [1] Daily vehicle-kilometers of travel
[2] Represents the percentage of daily vehicle-kilometers of travel on each roadway system during the peak period operating on congested conditions
[3] Daily vehicle-kilometers of travel multiplied by peak-period vehicle travel and percent of congested DVKT

Source: TTI Analysis and Local Transportation Agency References

Table C-16. Recurring and Incident Delay Relationships for 1991

Urban Area	Peak Period Congested DVKT[1]			Ratio of Incident[2] Delay to Recurring Delay		Daily Recurring Vehicle[3] Hours of Delay			Daily Incident Vehicle[3] Hours of Delay		
	Frwy (1000)	Prin.Art.St. (1000)	Frwy&Prin. Art.St. (1000)	Frwy	Prin.Art. Street	Frwy	Prin.Art. Street	Total	Frwy	Prin.Art. Street	Total
Northeastern Cities											
Baltimore MD	2,910	2,500	5,410	2.30	1.10	26,860	19,920	46,780	61,780	21,910	83,690
Boston MA	7,070	3,620	10,690	3.50	1.10	66,980	26,100	93,080	234,420	28,720	263,130
Hartford CT	680	960	1,640	2.70	1.10	4,770	6,010	10,780	12,880	6,610	19,480
New York NY	36,080	30,730	66,810	2.50	1.10	301,890	232,160	534,050	754,720	255,370	1010090
Philadelphia PA	3,330	11,750	15,080	2.10	1.10	27,690	89,010	116,700	58,150	97,910	156,060
Pittsburgh PA	1,200	4,810	6,010	2.90	1.10	11,240	34,060	45,290	32,580	37,460	70,040
Washington DC	12,130	12,100	24,230	2.20	1.10	116,780	95,990	212,770	256,920	105,590	362,510
Midwestern Cities											
Chicago IL	15,530	14,380	29,910	1.20	1.10	154,190	103,130	257,320	185,030	113,440	298,470
Cincinnati OH	2,520	690	3,210	0.80	1.10	19,290	4,630	23,920	15,430	5,100	20,530
Cleveland OH	2,530	1,270	3,800	0.70	1.10	19,180	8,180	27,360	13,430	9,000	22,420
Columbus OH	1,540	1,080	2,620	0.70	1.10	14,820	7,800	22,620	10,370	8,580	18,950
Detroit MI	6,870	10,510	17,380	2.20	1.10	66,220	81,800	148,020	145,690	89,980	235,670
Indianapolis IN	590	570	1,160	1.50	1.10	4,250	3,100	7,350	6,380	3,400	9,780
Kansas City MO	450	880	1,330	3.10	1.10	3,500	6,690	10,190	10,850	7,360	18,200
Louisville KY	230	1,240	1,470	1.10	1.10	1,850	8,370	10,220	2,030	9,210	11,240
Milwaukee WI	1,700	1,250	2,950	1.00	1.10	15,040	8,510	23,550	15,040	9,360	24,400
Minn-St. Paul MN	3,960	2,280	6,240	0.90	1.10	36,440	17,450	53,890	32,800	19,200	51,990
Oklahoma City OK	510	960	1,460	1.10	1.10	3,660	6,850	10,510	4,020	7,540	11,560
St. Louis MO	2,760	5,540	8,300	1.20	1.10	23,200	38,630	61,830	27,840	42,500	70,340
Southern Cities											
Atlanta GA	8,140	4,660	12,800	1.10	1.10	78,710	35,330	114,040	86,590	38,860	125,450
Charlotte NC	900	1,500	2,400	0.80	1.10	6,100	12,180	18,280	4,880	13,390	18,270
Ft. Lauderdale FL	1,290	3,040	4,330	1.50	1.10	9,900	22,050	31,950	14,840	24,260	39,100
Jacksonville FL	1,390	2,140	3,520	1.50	1.10	9,910	14,440	24,350	14,870	15,880	30,750
Memphis TN	480	1,070	1,540	1.10	1.10	3,190	7,100	10,290	3,510	7,810	11,320
Miami FL	3,820	8,110	11,930	1.50	1.10	34,420	68,000	102,430	51,640	74,800	126,440
Nashville TN	940	1,580	2,530	1.10	1.10	6,860	12,230	19,090	7,550	13,450	21,000
New Orleans LA	1,830	1,500	3,320	1.80	1.10	16,570	11,110	27,680	29,830	12,220	42,050
Norfolk VA	1,810	1,120	2,940	2.50	1.10	17,620	7,860	25,470	44,040	8,640	52,680
Orlando FL	1,750	2,300	4,060	1.50	1.10	13,610	19,190	32,800	20,420	21,110	41,530
Tampa FL	660	2,070	2,730	1.50	1.10	6,240	15,830	22,070	9,360	17,420	26,770

Table C-16. Recurring and Incident Delay Relationships for 1991 (continued)

Urban Area	Peak Period Congested DVKT[1] Frwy (1000)	Prin.Art.St. (1000)	Frwy&Prin. Art.St. (1000)	Ratio of Incident[2] Delay to Recurring Delay Frwy	Prin.Art. Street	Daily Recurring Vehicle[3] Hours of Delay Frwy	Prin.Art. Street	Total	Daily Incident Vehicle[3] Hours of Delay Frwy	Prin.Art. Street	Total
Southwestern Cities											
Albuquerque NM	360	1,120	1,480	1.10	1.10	3,030	6,420	9,450	3,330	7,060	10,390
Austin TX	2,190	700	2,890	1.10	1.10	18,790	4,550	23,340	20,670	5,010	25,680
Corpus Christi TX	120	170	280	1.10	1.10	770	880	1,650	850	970	1,820
Dallas TX	9,520	1,830	11,350	1.80	1.10	89,430	11,250	100,680	160,980	12,380	173,350
Denver CO	4,550	3,910	8,460	1.00	1.10	41,970	29,610	71,570	41,970	32,570	74,530
El Paso TX	490	120	610	1.10	1.10	3,760	840	4,600	4,140	930	5,070
Fort Worth TX	3,560	920	4,490	1.80	1.10	33,470	5,690	39,160	60,250	6,260	66,510
Houston TX	14,960	3,950	18,910	1.40	1.10	146,610	27,670	174,280	205,260	30,430	235,690
Phoenix AZ	3,550	9,790	13,340	0.40	1.10	32,450	63,630	96,080	12,980	70,000	82,980
Salt Lake City UT	790	600	1,400	0.60	1.10	6,610	3,460	10,070	3,960	3,810	7,770
San Antonio TX	2,720	590	3,310	1.10	1.10	25,790	4,170	29,960	28,370	4,590	32,950
Western Cities											
Honolulu HI	1,700	880	2,580	1.80	1.10	16,120	5,960	22,070	29,010	6,550	35,570
Los Angeles CA	59,920	29,600	89,520	1.20	1.10	626,950	216,650	843,590	752,330	238,310	990,650
Portland OR	2,450	1,660	4,120	2.00	1.10	20,360	12,470	32,840	40,730	13,720	54,450
Sacramento CA	3,140	2,540	5,680	0.60	1.10	24,600	20,310	44,910	14,760	22,340	37,100
San Bernardino-Riv CA	8,680	5,020	13,690	1.20	1.10	84,680	30,200	114,880	101,620	33,220	134,840
San Diego CA	9,030	2,060	11,100	0.60	1.10	82,560	13,150	95,710	49,530	14,470	64,000
San Fran-Oak CA	24,340	6,100	30,440	1.30	1.10	241,090	49,540	290,630	313,420	54,500	367,910
San Jose CA	8,380	3,650	12,030	1.20	1.10	80,270	28,440	108,710	96,320	31,280	127,600
Seattle-Everett WA	9,640	3,910	13,550	1.40	1.10	89,540	29,530	119,080	125,360	32,490	157,850
Northeastern Avg	9,056	9,498	18,554	2.60	1.10	79,457	71,892	151,349	201,634	79,081	280,715
Midwestern Avg	3,266	3,387	6,653	1.29	1.10	30,137	24,595	54,732	39,076	27,055	66,131
Southern Avg	2,092	2,645	4,737	1.45	1.10	18,467	20,483	38,950	26,138	22,531	48,669
Southwestern Avg	3,893	2,154	6,047	1.14	1.10	36,607	14,380	50,987	49,340	15,818	65,158
Western Avg	14,143	6,159	20,301	1.26	1.10	140,685	45,139	185,825	169,232	49,653	218,885
Texas Avg	4,795	1,183	5,978	1.34	1.10	45,518	7,865	53,383	68,644	8,651	77,295
Total Avg	5,914	4,307	10,221	1.47	1.10	55,796	31,763	87,559	84,674	34,939	119,613
Maximum Value	59,923	30,730	89,523	3.50	1.10	626,945	232,158	843,595	754,718	255,374	1010092
Minimum Value	116	119	284	0.40	1.10	772	844	1,653	849	928	1,818

Notes: [1] Daily vehicle-kilometers of travel
Represents the percentage of Daily Vehicle-Kilometers of travel on each roadway system during the peak period operating in congested conditions
[2] Percentage of Incident Delay related to Recurring Delay
[3] Facility delays as calculated by type and urban area

Source: TTI Analysis and Local Transportation Agency References

An incident will have varying effects on different types of facilities; for the purpose of this study, incident delay for arterial streets is defined as 110 percent of arterial street recurring delay. This incident delay factor was calculated using Equation C-3.

$$\text{Principal Arterial Street Incident Vehicle-Hour Delay Per Day} = \text{Principal Arterial Street Recurring Vehicle-Hour Delay Per Day} \times 1.1 \qquad \text{Eq. C-3}$$

The factor of 1.1 is based on the following assumptions as they relate to delay:

1. Arterial street system designs are more consistent from city to city than freeway design;

2. The side streets, drives, median openings, and other appurtenances associated with arterial streets allow numerous opportunities to remove incidents from the travelled way; and

3. Historical data shows the accident rate on arterial streets to be approximately twice that of freeways but, as stated in the second assumption, there is a greater opportunity to remove the incident from the roadway.

Table C-16 shows the results of the freeway and principal arterial street recurring and incident delay calculations.

Prior to calculating the congestion costs, two other variables were calculated to simplify the cost equations. These variables are the average vehicular speed and the average fuel economy for the vehicles operating in congested conditions. The average vehicular speed is a weighted average of the operating speeds on the facility under consideration, and is defined by Equation C-4.

$$\text{Avg. Speed (kph)} = \frac{(\text{Frwy speed}^1 \times \text{Peak-Period Frwy VKT}) + (\text{Prin.Art. Speed}^1 \times \text{Peak-Period Prin. Art. Str. VKT})}{\text{Total Peak-Period VKT}} \qquad \text{Eq. C-4}$$

[1] Speeds determined by congestion severity (Table C-1).

Congestion Cost

Two cost components can be associated with congestion: delay cost and fuel cost. These costs can be directly related to the vehicle-hours of delay. Table C-17 is a summary of the cost calculations for the component congestion cost per each urbanized area.

The average fuel economy represents the fuel consumption of the vehicles operating in congested conditions. The equation (Equation C-5) is a linear regression applied to a modified version of fuel consumption reported by Raus (21).

$$\text{Average Fuel Economy}_{(kph)} = 3.74 + 0.11\,(\text{Average Vehicular Speed}_{(kph)}) \qquad \text{Eq. C-5}$$

Delay Cost - The delay cost is the cost of lost time due to congested roadways. This cost was calculated by Equation C-6.

$$\text{Annual Delay Cost} = \frac{\text{Vehicle-Hrs. of Delay}}{\text{Day}} \times \frac{1.25 \text{ person}}{\text{Vehicle}} \times \frac{\$10.25}{\text{Hour}} \times \frac{250 \text{ Workdays}}{\text{Year}} \qquad \text{Eq. C-6}$$

where: vehicle-hours of delay/day is the combined freeway and principal arterial street representing the city's recurring or incident delay.

This equation is used to separately calculate delay costs resulting from both incident and recurring delays.

Table C-17. Component and Total Congestion Costs By Urban Area for 1991

Urban Area	Annual Cost Due to Congestion ($Millions) Recurring Delay	Incident Delay	Recurring Fuel	Incident Fuel	Delay&Fuel Cost	Rank
Los Angeles CA	3,180	3,740	400	470	7,790	1
New York NY	2,030	3,840	260	490	6,620	2
San Fran-Oak CA	1,110	1,400	140	180	2,830	3
Washington DC	800	1,360	100	170	2,430	4
Chicago IL	970	1,120	130	150	2,360	5
Houston TX	660	900	80	110	1,750	6
Detroit MI	550	880	70	100	1,610	7
Boston MA	350	1,000	40	120	1,520	8
Seattle-Everett WA	450	600	60	80	1,190	9
Dallas TX	390	670	50	80	1,180	10
Philadelphia PA	430	580	50	70	1,140	11
San Bernardino-Riv CA	440	510	60	70	1,070	12
Atlanta GA	430	470	50	50	1,010	14
San Jose CA	410	490	50	60	1,010	14
Miami FL	380	470	50	60	950	15
Phoenix AZ	360	310	40	40	750	16
San Diego CA	370	250	50	30	690	17
Denver CO	270	280	30	40	620	18
Baltimore MD	180	320	20	40	550	20
St. Louis MO	230	260	30	30	550	20
Pittsburgh PA	170	260	20	30	480	21
Fort Worth TX	150	260	20	30	450	23
Minn-St. Paul MN	200	200	20	20	450	23
Portland OR	130	210	20	30	380	24
Sacramento CA	170	140	20	20	350	25
Norfolk VA	100	200	10	20	330	26
Orlando FL	120	160	10	20	310	27
Ft. Lauderdale FL	120	150	10	20	300	28
New Orleans LA	100	160	10	20	290	29
San Antonio TX	110	130	10	20	270	30
Honolulu HI	80	140	10	20	250	31
Jacksonville FL	90	120	10	10	230	32
Cleveland OH	110	90	10	10	220	33
Austin TX	90	100	10	10	210	35
Tampa FL	80	100	10	10	210	35
Milwaukee WI	90	90	10	10	200	36
Cincinnati OH	90	80	10	10	190	37
Columbus OH	90	70	10	10	180	38
Nashville TN	70	80	10	10	170	39
Charlotte NC	70	70	10	10	150	40
Hartford CT	40	70	10	10	130	41
Kansas City MO	40	70	0	10	120	42
Louisville KY	40	40	0	0	90	44
Memphis TN	40	40	0	10	90	44
Oklahoma City OK	40	40	0	10	90	44
Albuquerque NM	40	40	0	0	80	47
Salt Lake City UT	40	30	0	0	80	47
Indianapolis IN	30	40	0	0	70	48
El Paso TX	20	20	0	0	40	49
Corpus Christi TX	10	10	0	0	10	50
Northeastern Avg	570	1,060	70	130	1,840	
Midwestern Avg	210	250	30	30	510	
Southern Avg	150	180	20	20	370	
Southwestern Avg	190	250	20	30	500	
Western Avg	700	830	90	110	1,730	
Texas Avg	200	300	20	40	560	
Total Avg	330	450	40	60	880	
Maximum Value	3,180	3,840	400	490	7,790	
Minimum Value	10	10	0	0	10	

Source: TTI Analysis and Local Transportation Agency References

Fuel Cost - Fuel cost was also related to vehicle-hours of delay per day and speed by Equation C-7 for passenger vehicles and Equation C-8 for commercial vehicles.

$$\text{Passenger Fuel Cost} = \frac{\frac{\text{Vehicle-Hrs. of Delay}}{\text{Day}} \times 95\% \times \text{Avg. Speed} \times \text{Avg. fuel cost}}{\text{Avg. Fuel Economy}} \qquad \text{Eq. C-7}$$

$$\text{Commercial Fuel Cost} = \frac{\frac{\text{Vehicle-Hrs. of Delay}}{\text{Day}} \times 5\% \times \text{Avg. Speed} \times \text{Avg. fuel cost}}{\text{Avg. Fuel Economy}} \qquad \text{Eq. C-8}$$

where: vehicle-hours of delay is the combined value for freeways and principal arterial streets representing either recurring or incident delay

These calculations were completed for both incident and recurring delay. The respective portions, i.e., incident and recurring, were combined in Equation C-9 to determine the yearly fuel cost due to congestion resulting from incident and recurring delay.

$$\text{Average Urbanized Area Fuel Cost} = (\text{Passenger Fuel Cost} + \text{Commercial Fuel Cost}) \times \frac{250 \text{ Days}}{\text{Year}} \qquad \text{Eq. C-9}$$

This calculation was done for each study area using the specific area/state fuel cost, peak-period congested VKT, and vehicle-hours of recurring and incident delay per day.

Results of Cost Estimate Calculations

Using the methods and equations discussed in the previous sections, the annual cost for each urbanized area was calculated (Table C-17). Reviewing the component costs of delay and fuel, it is shown that congestion costs associated with delay make up the majority of annual congestion cost.

Table C-18 illustrates the impacts of the component and total congestion cost in terms of per capita and per registered vehicle.

Table C-19 illustrates the categorical ranking of the urban study areas by annual congestion cost, annual cost per capita, and annual cost per registered vehicle.

Table C-18. Estimated Impact of Congestion in 1991

	Total Congestion Cost	
	Per Registered Vehicle (Dollars)	Per Capita (Dollars)
Northeastern Cities		
Baltimore MD	530	270
Boston MA	920	510
Hartford CT	250	210
New York NY	1,090	390
Philadelphia PA	410	270
Pittsburgh PA	390	260
Washington DC	1,440	740
Midwestern Cities		
Chicago IL	580	310
Cincinnati OH	210	160
Cleveland OH	140	120
Columbus OH	240	200
Detroit MI	560	400
Indianapolis IN	130	80
Kansas City MO	160	100
Louisville KY	190	110
Milwaukee WI	380	170
Minn-St. Paul MN	270	220
Oklahoma City OK	190	130
St. Louis MO	540	280
Southern Cities		
Atlanta GA	640	530
Charlotte NC	410	340
Ft. Lauderdale FL	290	230
Jacksonville FL	390	310
Memphis TN	150	110
Miami FL	670	510
Nashville TN	330	290
New Orleans LA	330	270
Norfolk VA	400	350
Orlando FL	420	360
Tampa FL	320	290
Southwestern Cities		
Albuquerque NM	200	150
Austin TX	410	400
Corpus Christi TX	70	50
Dallas TX	780	570
Denver CO	450	390
El Paso TX	120	80
Fort Worth TX	450	380
Houston TX	780	600
Phoenix AZ	600	390
Salt Lake City UT	110	90
San Antonio TX	310	230
Western Cities		
Honolulu HI	500	380
Los Angeles CA	1,000	660
Portland OR	550	360
Sacramento CA	280	300
San Bernardino-Riv CA	1,340	870
San Diego CA	490	300
San Fran-Oak CA	930	760
San Jose CA	990	670
Seattle-Everett WA	890	660
Northeastern Avg	720	380
Midwestern Avg	300	190
Southern Avg	400	330
Southwestern Avg	390	300
Western Avg	770	550
Texas Avg	420	330
Total Avg	480	340
Maximum Value	1,440	870
Minimum Value	70	50

Note: - Denotes Data Not Available

Source: TTI Analysis and Local Transportation Agency References

Table C-19. 1991 Rankings of Urban Area by Estimated Impact of Congestion

Urban Area	Total Congestion Cost	Congestion Cost Per Capita	Congestion Cost Per Reg. Vehicle
Northeastern Cities			
Baltimore MD	19	30	18
Boston MA	8	10	7
Hartford CT	41	37	38
New York NY	2	15	3
Philadelphia PA	11	32	26
Pittsburgh PA	21	33	29
Washington DC	4	3	1
Midwestern Cities			
Chicago IL	5	23	14
Cincinnati OH	37	40	40
Cleveland OH	33	43	46
Columbus OH	38	38	39
Detroit MI	7	13	15
Indianapolis IN	48	48	47
Kansas City MO	42	46	44
Louisville KY	45	44	42
Milwaukee WI	36	39	30
Minn-St. Paul MN	23	36	37
Oklahoma City OK	43	42	43
St. Louis MO	20	29	17
Southern Cities			
Atlanta GA	14	9	12
Charlotte NC	40	22	25
Ft. Lauderdale FL	28	34	35
Jacksonville FL	32	24	28
Memphis TN	44	45	45
Miami FL	15	11	11
Nashville TN	39	27	32
New Orleans LA	29	31	31
Norfolk VA	26	21	27
Orlando FL	27	20	23
Tampa FL	35	28	33
Southwestern Cities			
Albuquerque NM	46	41	41
Austin TX	34	12	24
Corpus Christi TX	50	50	50
Dallas TX	10	8	9
Denver CO	18	14	22
El Paso TX	49	49	48
Fort Worth TX	22	18	21
Houston TX	6	7	10
Phoenix AZ	16	16	13
Salt Lake City UT	47	47	49
San Antonio TX	30	35	34
Western Cities			
Honolulu HI	31	17	19
Los Angeles CA	1	5	4
Portland OR	24	19	16
Sacramento CA	25	25	36
San Bernardino-Riv CA	12	1	2
San Diego CA	17	26	20
San Fran-Oak CA	3	2	6
San Jose CA	13	4	5
Seattle-Everett WA	9	6	8

Source: TTI Analysis and Local Transportation Agency References

APPENDIX D

FREEWAY AND PRINCIPAL ARTERIAL STREET TRAVEL AND SYSTEM LENGTH STATISTICS 1982 TO 1991

Table D-1. Summary of Normalized Freeway Travel and Distance Statistics for 1991

Urban Area	Normalized by Population Density							
	VKT Per Person	Rank	VKT Per Sq Km	Rank	Ln Km Per 1000 Pers	Rank	Ln Km Per Sq Km	Rank
Northeastern Cities								
Baltimore MD	8.90	40	20.25	24	0.69	39	1.58	29
Boston MA	11.03	33	18.97	27	0.77	37	1.33	34
Hartford CT	25.18	7	26.49	11	2.34	8	2.46	3
New York NY	3.89	50	12.77	44	0.28	50	0.91	46
Philadelphia PA	4.88	49	11.28	49	0.40	46	0.93	45
Pittsburgh PA	7.36	43	11.45	48	0.90	34	1.41	32
Washington DC	9.18	38	20.33	23	0.55	43	1.21	39
Midwestern Cities								
Chicago IL	5.73	47	13.44	41	0.35	48	0.84	50
Cincinnati OH	19.32	13	25.03	14	1.52	14	1.96	13
Cleveland OH	11.72	31	20.21	25	0.96	29	1.65	26
Columbus OH	13.78	23	24.46	16	1.31	21	2.32	5
Detroit MI	7.84	42	15.40	36	0.59	42	1.15	41
Indianapolis IN	16.57	17	22.22	20	1.56	13	2.09	11
Kansas City MO	23.66	9	27.95	7	2.57	4	3.04	1
Louisville KY	15.10	19	19.99	26	1.43	16	1.88	17
Milwaukee WI	11.94	29	16.51	34	0.92	32	1.27	37
Minn-St. Paul MN	18.25	14	22.89	19	1.51	15	1.89	16
Oklahoma City OK	26.74	6	24.59	15	2.76	3	2.54	2
St. Louis MO	14.50	22	25.30	13	1.29	22	2.25	7
Southern Cities								
Atlanta GA	44.70	1	34.04	1	3.10	2	2.35	4
Charlotte NC	11.77	30	14.03	40	1.41	18	1.69	22
Ft. Lauderdale FL	7.86	41	14.48	39	0.66	40	1.22	38
Jacksonville FL	21.89	10	18.89	28	1.80	9	1.55	30
Memphis TN	10.31	35	13.18	43	0.91	33	1.17	40
Miami FL	5.02	48	12.09	45	0.35	47	0.85	49
Nashville TN	32.85	3	23.47	18	3.19	1	2.27	6
New Orleans LA	6.31	45	11.92	46	0.45	44	0.86	47
Norfolk VA	20.96	11	15.18	37	1.75	10	1.29	36
Orlando FL	13.35	27	17.79	32	1.32	20	1.76	20
Tampa FL	13.58	26	13.31	42	1.14	26	1.12	43
Southwestern Cities								
Albuquerque NM	9.22	37	11.90	47	0.80	36	1.04	44
Austin TX	29.97	5	27.14	9	2.49	6	2.24	8
Corpus Christi TX	14.83	21	14.59	38	1.71	11	1.68	24
Dallas TX	33.74	2	29.90	4	2.42	7	2.14	10
Denver CO	16.98	16	18.73	29	1.34	19	1.47	31
El Paso TX	9.46	36	15.68	35	0.99	27	1.64	27
Fort Worth TX	30.28	4	26.55	10	2.54	5	2.22	9
Houston TX	23.98	8	26.35	12	1.63	12	1.80	19
Phoenix AZ	9.00	39	10.94	50	0.70	38	0.86	48
Salt Lake City UT	15.24	18	16.91	33	1.42	17	1.59	28
San Antonio TX	13.61	25	20.58	22	1.20	24	1.82	18
Western Cities								
Honolulu HI	5.98	46	18.30	31	0.43	45	1.32	35
Los Angeles CA	7.27	44	24.29	17	0.34	49	1.15	42
Portland OR	12.32	28	18.72	30	0.92	30	1.40	33
Sacramento CA	10.80	34	21.43	21	0.85	35	1.69	23
San Bernardino-Riv CA	20.05	12	31.39	2	1.21	23	1.90	15
San Diego CA	14.85	20	30.53	3	0.92	31	1.90	14
San Fran-Oak CA	11.05	32	29.20	5	0.63	41	1.66	25
San Jose CA	13.77	24	28.52	6	0.98	28	2.03	12
Seattle-Everett WA	17.68	15	27.31	8	1.14	25	1.75	21
Northeastern Avg	10.06		17.36		0.85		1.40	
Midwestern Avg	15.43		21.50		1.40		1.91	
Southern Avg	17.15		17.13		1.46		1.47	
Southwestern Avg	18.75		19.93		1.57		1.68	
Western Avg	12.64		25.52		0.82		1.64	
Texas Avg	22.27		22.97		1.85		1.94	
Total Avg	15.29		20.34		1.27		1.64	
Maximum Value	44.70		34.04		3.19		3.04	
Minimum Value	3.89		10.94		0.28		0.84	

Source: TTI Analysis and Local Transportation Agency References

Table D-2. Summary of Normalized Principal Arterial Street Travel and System Length Statistics for 1991

Urban Area	Normalized by Population Density							
	VKT Per Person	Rank	VKT Per Sq Km	Rank	Ln Km Per 1000 Pers	Rank	Ln Km Per Sq Km	Rank
Northeastern Cities								
Baltimore MD	5.48	41	12.47	24	0.92	42	2.11	32
Boston MA	6.36	34	10.94	30	1.40	27	2.42	20
Hartford CT	15.33	8	16.14	11	2.63	11	2.77	12
New York NY	2.49	49	8.16	47	0.36	49	1.17	48
Philadelphia PA	5.74	39	13.25	21	0.86	43	2.00	34
Pittsburgh PA	9.89	17	15.38	16	1.65	23	2.58	14
Washington DC	7.01	32	15.52	15	0.83	44	1.83	38
Midwestern Cities								
Chicago IL	4.48	47	10.52	34	0.63	47	1.47	46
Cincinnati OH	6.33	35	8.20	46	1.38	29	1.77	40
Cleveland OH	4.91	46	8.46	45	0.95	40	1.62	42
Columbus OH	5.36	43	9.50	43	1.01	37	1.79	39
Detroit MI	8.00	27	15.72	13	1.23	33	2.42	18
Indianapolis IN	8.05	26	10.80	31	1.80	21	2.40	24
Kansas City MO	9.14	22	10.80	31	2.00	19	2.34	25
Louisville KY	7.53	30	9.98	38	1.25	31	1.66	41
Milwaukee WI	7.53	31	10.42	37	1.54	25	2.14	31
Minn-St. Paul MN	5.74	38	7.19	48	1.22	34	1.53	44
Oklahoma City OK	14.34	10	13.20	22	2.62	12	2.41	21
St. Louis MO	9.71	19	16.93	10	1.38	28	2.41	23
Southern Cities								
Atlanta GA	17.72	4	13.48	20	2.82	8	2.16	29
Charlotte NC	15.08	9	17.96	8	2.55	13	3.04	9
Ft. Lauderdale FL	6.62	33	12.19	25	1.24	32	2.29	27
Jacksonville FL	23.63	2	20.38	5	4.83	2	4.18	5
Memphis TN	9.84	18	12.58	23	1.88	20	2.41	22
Miami FL	9.15	20	22.04	4	1.19	35	2.87	11
Nashville TN	34.45	1	24.59	1	5.98	1	4.28	4
New Orleans LA	5.18	44	9.78	39	0.78	46	1.48	45
Norfolk VA	16.67	5	12.09	26	2.83	7	2.04	33
Orlando FL	8.78	25	11.71	28	3.50	4	4.65	2
Tampa FL	16.39	6	16.05	12	2.48	14	2.45	17
Southwestern Cities								
Albuquerque NM	14.32	11	18.47	6	2.79	9	3.59	7
Austin TX	11.72	15	10.60	33	2.37	16	2.15	30
Corpus Christi TX	14.27	12	14.04	19	3.24	5	3.17	8
Dallas TX	11.86	14	10.50	35	2.42	15	2.16	28
Denver CO	16.07	7	17.70	9	2.75	10	3.03	10
El Paso TX	9.15	21	15.15	17	2.35	17	3.88	6
Fort Worth TX	10.46	16	9.17	44	2.16	18	1.91	37
Houston TX	8.87	24	9.74	41	1.77	22	1.95	35
Phoenix AZ	19.86	3	24.18	2	3.55	3	4.32	3
Salt Lake City UT	5.79	37	6.42	49	0.98	38	1.10	49
San Antonio TX	7.92	28	11.97	27	1.61	24	2.45	16
Western Cities								
Honolulu HI	2.07	50	6.31	50	0.25	50	0.78	50
Los Angeles CA	5.38	42	18.00	7	0.81	45	2.73	13
Portland OR	6.27	36	9.54	42	0.95	39	1.44	47
Sacramento CA	7.85	29	15.56	14	1.25	30	2.47	15
San Bernardino-Riv CA	14.26	13	22.33	3	3.06	6	4.79	1
San Diego CA	5.09	45	10.47	36	0.93	41	1.91	36
San Fran-Oak CA	3.69	48	9.75	40	0.61	48	1.60	43
San Jose CA	5.60	40	11.61	29	1.16	36	2.42	19
Seattle-Everett WA	9.14	23	14.11	18	1.49	26	2.30	26
Northeastern Avg	7.47		13.12		1.24		2.12	
Midwestern Avg	7.59		10.98		1.42		2.00	
Southern Avg	14.86		15.71		2.74		2.89	
Southwestern Avg	11.84		13.45		2.36		2.70	
Western Avg	6.60		13.08		1.17		2.27	
Texas Avg	10.61		11.60		2.27		2.52	
Total Avg	9.93		13.24		1.85		2.42	
Maximum Value	34.45		24.59		5.98		4.79	
Minimum Value	2.07		6.31		0.25		0.78	

Source: TTI Analysis and Local Transportation Agency References

Table D-3. Summary of 1982 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	16,490	1,590	5.0	10,400	0.84
Boston MA	25,610	2,270	5.5	11,280	0.90
Hartford CT	6,960	720	5.0	9,600	0.76
New York NY	101,700	8,440	5.2	12,060	1.01
Philadelphia PA	19,920	2,010	5.0	9,900	1.00
Pittsburgh PA	8,890	1,250	4.1	7,120	0.78
Washington DC	25,900	2,000	4.9	12,970	1.07
Midwestern Cities					
Chicago IL	40,980	3,290	5.4	12,450	1.02
Cincinnati OH	13,660	1,210	5.2	11,310	0.86
Cleveland OH	16,100	1,550	4.6	10,420	0.80
Columbus OH	9,710	1,140	5.6	8,550	0.68
Detroit MI	32,520	2,380	5.7	13,650	1.13
Indianapolis IN	9,230	1,080	5.1	8,550	0.71
Kansas City MO	14,330	1,830	4.0	7,840	0.62
Louisville KY	6,300	660	4.3	9,550	0.84
Milwaukee WI	9,020	870	5.3	10,370	0.83
Minn-St. Paul MN	18,030	1,900	4.4	9,490	0.74
Oklahoma City OK	9,380	1,070	4.9	8,760	0.72
St. Louis MO	19,380	1,950	5.3	9,950	0.83
Southern Cities					
Atlanta GA	25,380	2,200	5.7	11,550	0.89
Charlotte NC	2,280	400	4.0	5,660	0.67
Ft. Lauderdale FL	8,600	840	5.2	10,270	0.86
Jacksonville FL	5,390	550	4.0	9,850	0.87
Memphis TN	4,910	480	5.1	10,170	0.86
Miami FL	9,580	830	5.2	11,550	1.05
Nashville TN	5,230	560	4.3	9,290	0.74
New Orleans LA	6,280	520	5.6	12,000	0.98
Norfolk VA	6,230	660	4.2	9,440	0.79
Orlando FL	6,960	760	4.3	9,190	0.66
Tampa FL	3,190	310	4.7	10,420	0.94
Southwestern Cities					
Albuquerque NM	2,470	310	4.7	8,080	0.78
Austin TX	4,070	430	5.2	9,550	0.77
Corpus Christi TX	2,090	260	5.2	8,130	0.67
Dallas TX	27,160	2,500	5.3	10,880	0.84
Denver CO	12,720	1,280	5.1	9,940	0.85
El Paso TX	4,120	520	4.9	7,880	0.63
Fort Worth TX	13,890	1,460	5.0	9,530	0.76
Houston TX	33,940	2,210	5.9	15,330	1.17
Phoenix AZ	4,590	340	4.8	13,570	1.15
Salt Lake City UT	4,620	640	5.5	7,180	0.63
San Antonio TX	12,240	1,220	4.9	10,000	0.77
Western Cities					
Honolulu HI	5,960	520	5.0	11,380	0.93
Los Angeles CA	121,540	7,330	8.1	16,590	1.22
Portland OR	7,630	710	4.9	10,770	0.87
Sacramento CA	8,530	1,010	6.8	8,410	0.80
San Bernardino-Riv CA	18,870	1,300	6.7	14,470	1.09
San Diego CA	24,270	2,450	7.3	9,920	0.78
San Fran-Oak CA	46,470	3,540	6.7	13,120	1.01
San Jose CA	19,420	1,740	6.2	11,170	0.85
Seattle-Everett WA	19,750	1,620	5.7	12,210	0.95
Northeastern Avg	29,350	2,610	5.0	10,480	0.91
Midwestern Avg	16,550	1,580	5.0	10,070	0.82
Southern Avg	7,640	740	4.8	9,940	0.85
Southwestern Avg	11,080	1,020	5.1	10,010	0.82
Western Avg	30,270	2,250	6.4	12,010	0.94
Texas Avg	13,930	1,230	5.2	10,180	0.80
Total Avg	17,650	1,530	5.2	10,430	0.86
Maximum Value	121,540	8,440	8.1	16,590	1.22
Minimum Value	2,090	260	4.0	5,660	0.62

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-4. Summary of 1982 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	12,040	2,420	3.8	4,990	0.84
Boston MA	20,540	4,150	2.3	4,940	0.90
Hartford CT	3,780	870	3.4	4,350	0.76
New York NY	71,380	10,790	3.4	6,620	1.01
Philadelphia PA	30,590	4,350	2.8	7,040	1.00
Pittsburgh PA	14,260	2,460	2.9	5,810	0.78
Washington DC	20,290	3,140	3.4	6,460	1.07
Midwestern Cities					
Chicago IL	33,670	5,590	3.4	6,030	1.02
Cincinnati OH	4,860	1,250	3.3	3,900	0.86
Cleveland OH	7,240	1,770	2.9	4,090	0.80
Columbus OH	3,680	900	3.2	4,080	0.68
Detroit MI	34,340	5,230	4.3	6,560	1.13
Indianapolis IN	6,070	1,330	3.6	4,570	0.71
Kansas City MO	6,130	1,630	3.4	3,750	0.62
Louisville KY	4,710	790	3.7	5,970	0.84
Milwaukee WI	6,910	1,500	3.0	4,610	0.83
Minn-St. Paul MN	6,920	1,790	3.2	3,870	0.74
Oklahoma City OK	4,430	930	3.0	4,780	0.72
St. Louis MO	14,420	2,700	3.0	5,330	0.83
Southern Cities					
Atlanta GA	9,240	1,960	3.4	4,700	0.89
Charlotte NC	3,780	720	3.0	5,210	0.67
Ft. Lauderdale FL	8,630	1,640	4.2	5,260	0.86
Jacksonville FL	8,240	1,650	3.5	5,250	0.87
Memphis TN	5,640	1,080	4.1	5,220	0.86
Miami FL	19,110	3,020	4.2	6,330	1.05
Nashville TN	5,230	1,270	2.9	4,110	0.74
New Orleans LA	5,310	910	4.0	5,840	0.98
Norfolk VA	5,260	1,070	3.3	4,920	0.79
Orlando FL	5,580	2,280	3.7	2,450	0.66
Tampa FL	5,140	880	3.8	5,850	0.94
Southwestern Cities					
Albuquerque NM	4,600	920	3.5	5,020	0.78
Austin TX	2,570	550	4.0	4,690	0.77
Corpus Christi TX	2,010	500	3.6	4,030	0.67
Dallas TX	10,370	2,500	4.6	4,140	0.84
Denver CO	14,750	2,810	3.6	5,250	0.85
El Paso TX	4,190	1,220	3.9	3,420	0.63
Fort Worth TX	5,890	1,260	3.9	4,660	0.76
Houston TX	15,660	2,870	3.8	5,450	1.17
Phoenix AZ	24,040	3,990	3.3	6,020	1.15
Salt Lake City UT	2,340	450	3.1	5,200	0.63
San Antonio TX	5,680	1,510	3.2	3,750	0.77
Western Cities					
Honolulu HI	2,000	290	3.5	6,890	0.93
Los Angeles CA	92,000	17,650	3.9	5,210	1.22
Portland OR	4,470	830	3.1	5,390	0.87
Sacramento CA	8,040	1,340	3.9	6,020	0.80
San Bernardino-Riv CA	12,360	2,450	4.0	5,050	1.09
San Diego CA	9,870	2,300	3.3	4,290	0.78
San Fran-Oak CA	15,590	2,950	3.7	5,280	1.01
San Jose CA	8,440	2,060	3.9	4,070	0.85
Seattle-Everett WA	11,000	2,160	3.2	5,100	0.95
Northeastern Avg	24,700	4,020	3.1	5,740	0.91
Midwestern Avg	11,110	2,120	3.3	4,800	0.82
Southern Avg	7,380	1,500	3.6	5,010	0.85
Southwestern Avg	8,370	1,690	3.7	4,690	0.82
Western Avg	18,200	3,560	3.6	5,260	0.94
Texas Avg	6,620	1,490	3.9	4,310	0.80
Total Avg	12,870	2,410	3.5	5,040	0.86
Maximum Value	92,000	17,650	4.6	7,040	1.22
Minimum Value	2,000	290	2.3	2,450	0.62

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-5. Summary of 1983 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	16,990	1,650	5.2	10,290	0.84
Boston MA	27,070	2,280	5.5	11,880	0.93
Hartford CT	7,760	810	5.0	9,640	0.79
New York NY	103,430	8,560	5.3	12,090	1.02
Philadelphia PA	21,650	2,040	5.0	10,590	1.03
Pittsburgh PA	9,850	1,370	4.2	7,200	0.76
Washington DC	26,000	2,000	5.0	13,020	1.09
Midwestern Cities					
Chicago IL	41,600	3,310	5.5	12,570	1.02
Cincinnati OH	13,660	1,270	5.2	10,740	0.83
Cleveland OH	16,450	1,550	4.6	10,650	0.82
Columbus OH	10,400	1,160	5.6	8,970	0.71
Detroit MI	31,640	2,380	5.7	13,280	1.10
Indianapolis IN	8,470	1,090	5.1	7,790	0.66
Kansas City MO	14,470	1,870	4.0	7,750	0.62
Louisville KY	7,140	720	4.4	9,860	0.82
Milwaukee WI	9,340	870	5.3	10,740	0.84
Minn-St. Paul MN	19,590	1,900	4.5	10,310	0.79
Oklahoma City OK	9,560	1,090	4.9	8,800	0.72
St. Louis MO	20,990	2,000	5.3	10,510	0.87
Southern Cities					
Atlanta GA	27,380	2,270	6.0	12,060	0.94
Charlotte NC	2,500	410	4.0	6,080	0.72
Ft. Lauderdale FL	8,630	850	5.2	10,210	0.85
Jacksonville FL	6,490	580	4.0	11,190	0.98
Memphis TN	4,830	520	5.1	9,230	0.80
Miami FL	10,090	830	5.2	12,170	1.09
Nashville TN	5,310	560	4.4	9,430	0.76
New Orleans LA	6,440	530	5.6	12,120	1.00
Norfolk VA	6,270	680	4.3	9,270	0.77
Orlando FL	7,260	760	4.3	9,490	0.68
Tampa FL	3,130	310	4.7	10,240	0.91
Southwestern Cities					
Albuquerque NM	2,600	310	4.7	8,500	0.83
Austin TX	4,780	450	5.4	10,610	0.84
Corpus Christi TX	2,210	270	5.2	8,300	0.69
Dallas TX	29,620	2,540	5.3	11,650	0.89
Denver CO	13,270	1,280	5.1	10,360	0.88
El Paso TX	4,330	540	4.9	8,030	0.64
Fort Worth TX	14,860	1,510	5.2	9,870	0.79
Houston TX	36,310	2,270	6.0	16,000	1.21
Phoenix AZ	4,690	340	4.9	13,860	1.16
Salt Lake City UT	4,790	680	5.5	7,080	0.63
San Antonio TX	12,820	1,250	4.9	10,280	0.79
Western Cities					
Honolulu HI	6,030	520	5.0	11,520	0.95
Los Angeles CA	127,740	7,450	8.1	17,140	1.27
Portland OR	8,650	810	4.9	10,750	0.86
Sacramento CA	9,340	1,010	6.8	9,210	0.84
San Bernardino-Riv CA	19,080	1,310	6.7	14,540	1.11
San Diego CA	26,520	2,500	7.3	10,630	0.83
San Fran-Oak CA	48,300	3,560	6.7	13,570	1.05
San Jose CA	20,050	1,760	6.2	11,370	0.87
Seattle-Everett WA	21,080	1,670	5.7	12,650	0.99
Northeastern Avg	30,390	2,670	5.0	10,670	0.92
Midwestern Avg	16,940	1,600	5.0	10,160	0.82
Southern Avg	8,030	750	4.8	10,140	0.86
Southwestern Avg	11,840	1,040	5.2	10,410	0.85
Western Avg	31,870	2,290	6.4	12,380	0.97
Texas Avg	14,990	1,260	5.3	10,680	0.84
Total Avg	18,430	1,560	5.3	10,680	0.88
Maximum Value	127,740	8,560	8.1	17,140	1.27
Minimum Value	2,210	270	4.0	6,080	0.62

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-6. Summary of 1983 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	12,530	2,440	3.8	5,140	0.84
Boston MA	20,910	4,190	2.3	5,000	0.93
Hartford CT	4,530	890	3.4	5,070	0.79
New York NY	74,140	10,950	3.4	6,770	1.02
Philadelphia PA	31,430	4,440	2.8	7,070	1.03
Pittsburgh PA	14,390	2,550	3.0	5,640	0.76
Washington DC	21,900	3,190	3.5	6,870	1.09
Midwestern Cities					
Chicago IL	34,780	5,780	3.4	6,020	1.02
Cincinnati OH	5,100	1,250	3.3	4,080	0.83
Cleveland OH	7,290	1,770	2.9	4,110	0.82
Columbus OH	3,980	920	3.2	4,330	0.71
Detroit MI	33,670	5,260	4.3	6,390	1.10
Indianapolis IN	5,990	1,340	3.6	4,480	0.66
Kansas City MO	6,210	1,630	3.4	3,800	0.62
Louisville KY	4,380	800	3.7	5,490	0.82
Milwaukee WI	6,890	1,510	3.0	4,550	0.84
Minn-St. Paul MN	7,160	1,800	3.2	3,970	0.79
Oklahoma City OK	4,670	970	3.0	4,790	0.72
St. Louis MO	14,950	2,700	3.0	5,530	0.87
Southern Cities					
Atlanta GA	10,530	2,080	3.4	5,070	0.94
Charlotte NC	4,120	740	3.0	5,570	0.72
Ft. Lauderdale FL	8,530	1,670	4.2	5,100	0.85
Jacksonville FL	8,890	1,740	3.5	5,960	0.98
Memphis TN	5,470	1,090	4.1	5,000	0.80
Miami FL	19,800	3,060	4.2	6,470	1.09
Nashville TN	5,470	1,300	3.0	4,190	0.76
New Orleans LA	5,510	910	4.0	6,060	1.00
Norfolk VA	5,160	1,080	3.3	4,780	0.77
Orlando FL	5,800	2,300	3.7	2,520	0.68
Tampa FL	4,930	880	3.8	5,620	0.91
Southwestern Cities					
Albuquerque NM	4,960	930	3.5	5,360	0.83
Austin TX	2,750	580	4.0	4,750	0.84
Corpus Christi TX	2,090	510	3.6	4,130	0.69
Dallas TX	11,330	2,570	4.6	4,410	0.89
Denver CO	15,130	2,870	3.6	5,270	0.88
El Paso TX	4,360	1,260	3.9	3,470	0.64
Fort Worth TX	6,190	1,290	3.9	4,810	0.79
Houston TX	16,660	2,970	3.8	5,610	1.21
Phoenix AZ	24,090	4,010	3.4	6,010	1.16
Salt Lake City UT	2,460	470	3.2	5,260	0.63
San Antonio TX	5,930	1,550	3.2	3,820	0.79
Western Cities					
Honolulu HI	2,090	290	3.5	7,220	0.95
Los Angeles CA	96,930	17,870	3.9	5,420	1.27
Portland OR	4,390	830	3.1	5,290	0.86
Sacramento CA	8,370	1,370	3.9	6,120	0.84
San Bernardino-Riv CA	13,300	2,510	4.0	5,290	1.11
San Diego CA	10,450	2,330	3.3	4,480	0.83
San Fran-Oak CA	16,460	2,980	3.7	5,530	1.05
San Jose CA	8,710	2,100	3.9	4,150	0.87
Seattle-Everett WA	11,790	2,200	3.2	5,360	0.99
Northeastern Avg	25,690	4,090	3.2	5,940	0.92
Midwestern Avg	11,250	2,150	3.3	4,800	0.82
Southern Avg	7,660	1,530	3.7	5,120	0.86
Southwestern Avg	8,720	1,730	3.7	4,810	0.85
Western Avg	19,170	3,610	3.6	5,430	0.97
Texas Avg	7,040	1,530	3.9	4,430	0.84
Total Avg	13,350	2,450	3.5	5,140	0.88
Maximum Value	96,930	17,870	4.6	7,220	1.27
Minimum Value	2,090	290	2.3	2,520	0.62

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-7. Summary of 1984 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	17,520	1,710	5.4	10,220	0.85
Boston MA	27,840	2,290	5.5	12,140	0.95
Hartford CT	8,590	830	5.1	10,360	0.86
New York NY	105,160	9,060	5.5	11,600	0.99
Philadelphia PA	21,950	2,040	5.0	10,740	1.04
Pittsburgh PA	10,400	1,390	4.2	7,470	0.76
Washington DC	29,080	2,210	5.2	13,170	1.12
Midwestern Cities					
Chicago IL	43,090	3,340	5.5	12,900	1.05
Cincinnati OH	13,930	1,300	5.3	10,690	0.82
Cleveland OH	16,760	1,550	4.6	10,840	0.83
Columbus OH	10,550	1,180	5.6	8,970	0.71
Detroit MI	33,420	2,400	5.7	13,930	1.13
Indianapolis IN	9,800	1,090	5.1	8,960	0.75
Kansas City MO	15,100	2,010	4.1	7,500	0.60
Louisville KY	7,410	760	4.4	9,790	0.81
Milwaukee WI	9,470	880	5.3	10,790	0.87
Minn-St. Paul MN	20,930	1,980	4.5	10,570	0.81
Oklahoma City OK	9,760	1,090	5.0	8,910	0.75
St. Louis MO	23,200	2,210	5.4	10,520	0.88
Southern Cities					
Atlanta GA	29,150	2,370	6.0	12,270	0.97
Charlotte NC	2,660	430	4.0	6,230	0.72
Ft. Lauderdale FL	8,760	850	5.3	10,260	0.84
Jacksonville FL	7,170	590	4.0	12,210	0.98
Memphis TN	4,850	550	5.1	8,870	0.76
Miami FL	10,420	850	5.3	12,320	1.07
Nashville TN	5,870	600	4.4	9,720	0.83
New Orleans LA	6,680	530	5.6	12,580	1.05
Norfolk VA	6,720	690	4.3	9,710	0.79
Orlando FL	7,490	790	4.4	9,490	0.67
Tampa FL	4,090	350	4.7	11,550	1.03
Southwestern Cities					
Albuquerque NM	2,750	310	4.7	9,000	0.89
Austin TX	5,310	470	5.4	11,380	0.89
Corpus Christi TX	2,190	270	5.2	8,240	0.69
Dallas TX	32,080	2,610	5.7	12,300	0.94
Denver CO	14,070	1,290	5.1	10,930	0.93
El Paso TX	4,510	560	5.0	8,120	0.65
Fort Worth TX	15,590	1,550	5.2	10,040	0.80
Houston TX	39,250	2,380	6.0	16,470	1.25
Phoenix AZ	5,070	450	5.0	11,250	1.10
Salt Lake City UT	4,860	680	5.5	7,190	0.65
San Antonio TX	13,600	1,260	4.9	10,760	0.82
Western Cities					
Honolulu HI	6,220	530	5.0	11,710	0.97
Los Angeles CA	134,250	7,530	8.2	17,820	1.32
Portland OR	8,970	820	4.9	10,920	0.88
Sacramento CA	10,430	1,030	6.9	10,130	0.88
San Bernardino-Riv CA	19,510	1,320	6.8	14,780	1.12
San Diego CA	29,750	2,540	7.3	11,730	0.91
San Fran-Oak CA	51,870	3,560	6.8	14,580	1.12
San Jose CA	21,320	1,800	6.3	11,820	0.90
Seattle-Everett WA	22,400	1,710	5.8	13,070	1.02
Northeastern Avg	31,510	2,790	5.1	10,810	0.94
Midwestern Avg	17,780	1,650	5.0	10,360	0.83
Southern Avg	8,530	780	4.8	10,470	0.88
Southwestern Avg	12,660	1,070	5.2	10,520	0.87
Western Avg	33,860	2,320	6.4	12,950	1.01
Texas Avg	16,080	1,300	5.3	11,040	0.86
Total Avg	19,440	1,610	5.3	10,950	0.90
Maximum Value	134,250	9,060	8.2	17,820	1.32
Minimum Value	2,190	270	4.0	6,230	0.60

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-8. Summary of 1984 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	13,330	2,480	3.8	5,380	0.85
Boston MA	21,170	4,200	2.3	5,040	0.95
Hartford CT	5,020	900	3.5	5,570	0.86
New York NY	74,690	10,950	3.4	6,820	0.99
Philadelphia PA	31,890	4,510	2.8	7,070	1.04
Pittsburgh PA	14,620	2,670	3.0	5,470	0.76
Washington DC	23,830	3,220	3.8	7,400	1.12
Midwestern Cities					
Chicago IL	36,320	5,950	3.5	6,110	1.05
Cincinnati OH	5,190	1,250	3.3	4,160	0.82
Cleveland OH	7,320	1,770	2.9	4,130	0.83
Columbus OH	4,030	940	3.2	4,280	0.71
Detroit MI	34,010	5,310	4.3	6,400	1.13
Indianapolis IN	6,540	1,340	3.7	4,860	0.75
Kansas City MO	6,300	1,640	3.5	3,830	0.60
Louisville KY	4,260	800	3.7	5,340	0.81
Milwaukee WI	7,490	1,510	3.0	4,950	0.87
Minn-St. Paul MN	7,490	1,820	3.2	4,120	0.81
Oklahoma City OK	5,360	1,010	3.0	5,290	0.75
St. Louis MO	15,690	2,750	3.1	5,700	0.88
Southern Cities					
Atlanta GA	12,010	2,150	3.4	5,590	0.97
Charlotte NC	4,200	760	3.0	5,550	0.72
Ft. Lauderdale FL	8,390	1,690	4.3	4,910	0.84
Jacksonville FL	9,520	1,770	3.5	5,370	0.98
Memphis TN	5,340	1,110	4.1	4,800	0.76
Miami FL	19,320	3,100	4.3	6,230	1.07
Nashville TN	6,910	1,370	3.1	5,050	0.83
New Orleans LA	5,810	900	4.1	6,450	1.05
Norfolk VA	5,150	1,090	3.3	4,740	0.79
Orlando FL	5,540	2,370	3.7	2,340	0.67
Tampa FL	5,880	920	3.7	6,410	1.03
Southwestern Cities					
Albuquerque NM	5,430	940	3.5	5,760	0.89
Austin TX	2,940	610	4.0	4,800	0.89
Corpus Christi TX	2,170	520	3.6	4,220	0.69
Dallas TX	12,300	2,660	4.6	4,630	0.94
Denver CO	16,270	2,870	3.7	5,660	0.93
El Paso TX	4,540	1,290	3.9	3,530	0.65
Fort Worth TX	6,460	1,330	3.9	4,870	0.80
Houston TX	17,480	3,090	3.8	5,660	1.25
Phoenix AZ	24,640	4,030	3.4	6,120	1.10
Salt Lake City UT	2,700	480	3.3	5,580	0.65
San Antonio TX	6,310	1,580	3.2	4,000	0.82
Western Cities					
Honolulu HI	2,130	290	3.5	7,330	0.97
Los Angeles CA	102,120	18,110	4.0	5,640	1.32
Portland OR	4,500	830	3.2	5,430	0.88
Sacramento CA	8,730	1,450	4.0	6,020	0.88
San Bernardino-Riv CA	13,930	2,690	4.0	5,180	1.12
San Diego CA	11,410	2,380	3.4	4,790	0.91
San Fran-Oak CA	17,370	3,060	3.8	5,680	1.12
San Jose CA	9,270	2,150	3.9	4,310	0.90
Seattle-Everett WA	12,540	2,270	3.3	5,520	1.02
Northeastern Avg	26,360	4,130	3.2	6,110	0.94
Midwestern Avg	11,670	2,180	3.4	4,930	0.83
Southern Avg	8,010	1,570	3.7	5,220	0.88
Southwestern Avg	9,200	1,760	3.7	4,980	0.87
Western Avg	20,220	3,690	3.7	5,540	1.01
Texas Avg	7,460	1,580	3.9	4,530	0.86
Total Avg	13,920	2,500	3.5	5,280	0.90
Maximum Value	102,120	18,110	4.6	7,400	1.32
Minimum Value	2,130	290	2.3	2,340	0.60

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-9. Summary of 1985 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	19,590	1,930	5.4	10,140	0.84
Boston MA	29,300	2,330	5.6	12,550	0.98
Hartford CT	8,610	840	5.2	10,280	0.85
New York NY	106,350	9,080	5.5	11,710	1.00
Philadelphia PA	22,230	2,070	5.0	10,740	0.90
Pittsburgh PA	10,710	1,420	4.2	7,560	0.78
Washington DC	32,010	2,240	5.2	14,310	1.20
Midwestern Cities					
Chicago IL	46,160	3,430	5.5	13,460	1.08
Cincinnati OH	14,240	1,320	5.3	10,790	0.83
Cleveland OH	16,190	1,550	4.6	10,470	0.81
Columbus OH	10,730	1,210	5.7	8,890	0.71
Detroit MI	34,540	2,500	5.7	13,840	1.12
Indianapolis IN	10,110	1,110	5.1	9,100	0.76
Kansas City MO	16,410	2,030	4.1	8,090	0.65
Louisville KY	7,160	770	4.4	9,270	0.79
Milwaukee WI	9,760	890	5.3	11,030	0.88
Minn-St. Paul MN	22,030	2,040	4.6	10,780	0.83
Oklahoma City OK	9,620	1,100	5.0	8,720	0.74
St. Louis MO	23,850	2,280	5.4	10,470	0.89
Southern Cities					
Atlanta GA	31,280	2,440	6.0	12,830	1.02
Charlotte NC	2,870	430	4.1	6,610	0.73
Ft. Lauderdale FL	8,970	870	5.3	10,310	0.84
Jacksonville FL	7,330	600	4.0	12,300	0.98
Memphis TN	4,910	590	5.2	8,360	0.75
Miami FL	11,450	870	5.3	13,170	1.13
Nashville TN	6,300	680	4.5	9,210	0.81
New Orleans LA	6,890	530	5.6	12,970	1.10
Norfolk VA	7,200	710	4.3	10,160	0.84
Orlando FL	8,420	850	4.4	9,960	0.71
Tampa FL	4,580	420	4.9	10,940	1.00
Southwestern Cities					
Albuquerque NM	2,930	310	4.7	9,330	0.93
Austin TX	7,870	680	5.3	11,640	0.91
Corpus Christi TX	2,250	270	5.2	8,480	0.71
Dallas TX	33,970	2,640	5.7	12,870	0.98
Denver CO	14,570	1,290	5.1	11,310	0.96
El Paso TX	5,020	560	5.0	9,040	0.70
Fort Worth TX	16,210	1,570	5.6	10,330	0.82
Houston TX	38,830	2,380	6.0	16,290	1.23
Phoenix AZ	5,680	470	5.1	12,170	1.13
Salt Lake City UT	5,180	680	5.6	7,670	0.68
San Antonio TX	14,620	1,290	5.0	11,350	0.87
Western Cities					
Honolulu HI	6,420	530	5.0	12,090	0.97
Los Angeles CA	141,100	7,650	8.2	18,450	1.36
Portland OR	9,540	830	4.9	11,500	0.93
Sacramento CA	11,110	1,030	6.9	10,780	0.92
San Bernardino-Riv CA	19,720	1,340	6.8	14,670	1.11
San Diego CA	31,640	2,570	7.4	12,320	0.95
San Fran-Oak CA	55,810	3,650	6.8	15,270	1.17
San Jose CA	22,430	1,820	6.4	12,330	0.94
Seattle-Everett WA	23,910	1,770	5.8	13,500	1.05
Northeastern Avg	32,690	2,840	5.2	11,040	0.94
Midwestern Avg	18,400	1,690	5.1	10,410	0.84
Southern Avg	9,110	820	4.9	10,620	0.90
Southwestern Avg	13,380	1,100	5.3	10,950	0.90
Western Avg	35,740	2,360	6.5	13,440	1.04
Texas Avg	16,970	1,340	5.4	11,430	0.89
Total Avg	20,370	1,650	5.3	11,210	0.92
Maximum Value	141,100	9,080	8.2	18,450	1.36
Minimum Value	2,250	270	4.0	6,610	0.65

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-10. Summary of 1985 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	13,880	2,600	3.8	5,340	0.84
Boston MA	21,710	4,220	2.3	5,150	0.98
Hartford CT	5,180	920	3.5	5,650	0.85
New York NY	75,190	10,950	3.4	6,870	1.00
Philadelphia PA	32,850	6,330	2.8	5,190	0.90
Pittsburgh PA	15,210	2,660	3.0	5,720	0.78
Washington DC	25,600	3,400	3.9	7,540	1.20
Midwestern Cities					
Chicago IL	36,820	5,990	3.6	6,150	1.08
Cincinnati OH	5,300	1,260	3.3	4,220	0.83
Cleveland OH	7,460	1,770	2.9	4,210	0.81
Columbus OH	4,070	950	3.2	4,290	0.71
Detroit MI	34,190	5,380	4.4	6,360	1.12
Indianapolis IN	6,600	1,340	3.7	4,910	0.76
Kansas City MO	6,840	1,660	3.5	4,130	0.65
Louisville KY	4,440	810	3.7	5,510	0.79
Milwaukee WI	7,760	1,550	3.1	5,020	0.88
Minn-St. Paul MN	7,870	1,840	3.4	4,290	0.83
Oklahoma City OK	5,390	1,040	3.0	5,190	0.74
St. Louis MO	16,520	2,790	3.1	5,930	0.89
Southern Cities					
Atlanta GA	13,470	2,170	3.4	6,200	1.02
Charlotte NC	4,340	790	3.0	5,500	0.73
Ft. Lauderdale FL	8,370	1,710	4.3	4,910	0.84
Jacksonville FL	9,460	1,800	3.6	5,270	0.98
Memphis TN	5,670	1,160	4.2	4,890	0.75
Miami FL	20,450	3,160	4.3	6,480	1.13
Nashville TN	7,380	1,420	3.1	5,210	0.81
New Orleans LA	6,300	920	4.1	6,860	1.10
Norfolk VA	5,650	1,090	3.4	5,200	0.84
Orlando FL	5,690	2,420	3.7	2,360	0.71
Tampa FL	6,180	960	3.8	6,450	1.00
Southwestern Cities					
Albuquerque NM	5,800	970	3.5	6,000	0.93
Austin TX	3,220	640	4.0	5,000	0.91
Corpus Christi TX	2,210	520	3.8	4,280	0.71
Dallas TX	12,800	2,700	4.6	4,750	0.98
Denver CO	16,860	2,870	3.7	5,870	0.96
El Paso TX	4,640	1,290	4.0	3,600	0.70
Fort Worth TX	6,670	1,350	3.9	4,930	0.82
Houston TX	17,470	3,110	3.9	5,620	1.23
Phoenix AZ	25,290	4,060	3.4	6,230	1.13
Salt Lake City UT	2,890	530	3.4	5,440	0.68
San Antonio TX	6,900	1,640	3.3	4,200	0.87
Western Cities					
Honolulu HI	2,000	300	3.6	6,730	0.97
Los Angeles CA	107,600	18,350	4.0	5,860	1.36
Portland OR	4,770	840	3.3	5,700	0.93
Sacramento CA	9,100	1,510	4.0	6,010	0.92
San Bernardino-Riv CA	14,100	2,700	4.0	5,210	1.11
San Diego CA	12,080	2,420	3.4	5,000	0.95
San Fran-Oak CA	18,320	3,120	3.8	5,870	1.17
San Jose CA	9,750	2,170	4.0	4,490	0.94
Seattle-Everett WA	12,980	2,320	3.3	5,600	1.05
Northeastern Avg	27,090	4,440	3.2	5,920	0.94
Midwestern Avg	11,940	2,200	3.4	5,020	0.84
Southern Avg	8,450	1,600	3.7	5,390	0.90
Southwestern Avg	9,520	1,790	3.8	5,080	0.90
Western Avg	21,190	3,750	3.7	5,610	1.04
Texas Avg	7,700	1,610	3.9	4,630	0.89
Total Avg	14,430	2,570	3.6	5,350	0.92
Maximum Value	107,600	18,350	4.6	7,540	1.36
Minimum Value	2,000	300	2.3	2,360	0.65

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-11. Summary of 1986 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	20,950	1,960	5.4	10,710	0.88
Boston MA	32,300	2,370	5.7	13,650	1.04
Hartford CT	8,920	860	5.3	10,360	0.85
New York NY	115,270	9,100	5.5	12,670	1.06
Philadelphia PA	22,740	2,090	5.0	10,870	1.06
Pittsburgh PA	11,110	1,470	4.2	7,580	0.79
Washington DC	36,070	2,320	5.2	15,520	1.28
Midwestern Cities					
Chicago IL	49,820	3,510	5.6	14,190	1.15
Cincinnati OH	14,350	1,320	5.3	10,870	0.84
Cleveland OH	17,240	1,550	4.6	11,150	0.86
Columbus OH	11,770	1,230	5.7	9,560	0.75
Detroit MI	34,890	2,540	5.8	13,720	1.11
Indianapolis IN	11,130	1,110	5.1	10,010	0.80
Kansas City MO	17,560	2,040	4.2	8,620	0.69
Louisville KY	7,700	810	4.4	9,570	0.80
Milwaukee WI	10,170	890	5.3	11,480	0.90
Minn-St. Paul MN	23,440	2,080	4.7	11,290	0.87
Oklahoma City OK	9,310	1,110	5.0	8,380	0.71
St. Louis MO	25,150	2,290	5.5	11,000	0.93
Southern Cities					
Atlanta GA	34,660	2,540	6.0	13,630	1.09
Charlotte NC	3,030	440	4.1	6,840	0.73
Ft. Lauderdale FL	9,180	890	5.3	10,270	0.84
Jacksonville FL	7,520	630	4.1	11,970	0.95
Memphis TN	5,010	590	5.2	8,520	0.77
Miami FL	11,230	870	5.3	12,920	1.10
Nashville TN	6,840	680	4.6	10,000	0.86
New Orleans LA	6,960	530	5.7	13,110	1.11
Norfolk VA	7,980	720	4.5	11,130	0.90
Orlando FL	8,560	850	4.6	10,030	0.71
Tampa FL	4,730	430	4.9	10,890	0.96
Southwestern Cities					
Albuquerque NM	3,110	310	4.7	9,900	0.88
Austin TX	8,530	680	5.5	12,620	0.98
Corpus Christi TX	2,290	270	5.2	8,350	0.71
Dallas TX	36,350	2,660	5.8	13,680	1.04
Denver CO	14,960	1,310	5.2	11,400	0.97
El Paso TX	5,510	560	5.1	9,910	0.75
Fort Worth TX	17,310	1,570	5.6	11,030	0.87
Houston TX	38,830	2,430	6.1	15,970	1.21
Phoenix AZ	7,440	500	5.2	14,900	1.20
Salt Lake City UT	5,550	720	5.6	7,750	0.68
San Antonio TX	15,210	1,300	5.1	11,670	0.90
Western Cities					
Honolulu HI	6,770	530	5.2	12,740	1.05
Los Angeles CA	148,300	7,730	8.2	19,190	1.42
Portland OR	10,180	850	5.0	12,050	0.97
Sacramento CA	11,910	1,050	6.9	11,380	0.95
San Bernardino-Riv CA	20,400	1,350	6.9	15,080	1.14
San Diego CA	33,840	2,620	7.4	12,940	1.00
San Fran-Oak CA	59,450	3,680	6.8	16,160	1.24
San Jose CA	22,960	1,830	6.5	12,560	0.96
Seattle-Everett WA	24,960	1,790	5.8	13,960	1.09
Northeastern Avg	35,340	2,880	5.2	11,620	0.99
Midwestern Avg	19,380	1,710	5.1	10,820	0.87
Southern Avg	9,610	840	4.9	10,850	0.91
Southwestern Avg	14,100	1,120	5.4	11,560	0.93
Western Avg	37,640	2,380	6.5	14,010	1.09
Texas Avg	17,720	1,350	5.5	11,890	0.92
Total Avg	21,590	1,670	5.4	11,670	0.95
Maximum Value	148,300	9,100	8.2	19,190	1.42
Minimum Value	2,290	270	4.1	6,840	0.68

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-12. Summary of 1986 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	14,380	2,640	3.8	5,450	0.88
Boston MA	21,590	4,240	2.3	5,090	1.04
Hartford CT	5,180	940	3.5	5,500	0.85
New York NY	76,400	10,980	3.4	6,960	1.06
Philadelphia PA	34,490	4,750	2.8	7,260	1.06
Pittsburgh PA	15,790	2,700	3.0	5,840	0.79
Washington DC	28,010	3,570	4.1	7,840	1.28
Midwestern Cities					
Chicago IL	40,220	6,010	3.6	6,700	1.15
Cincinnati OH	5,220	1,260	3.3	4,150	0.84
Cleveland OH	7,620	1,770	2.9	4,300	0.86
Columbus OH	4,190	950	3.2	4,410	0.75
Detroit MI	34,530	5,470	4.4	6,310	1.11
Indianapolis IN	6,360	1,350	3.7	4,700	0.80
Kansas City MO	7,060	1,670	3.5	4,240	0.69
Louisville KY	4,400	810	3.7	5,470	0.80
Milwaukee WI	7,570	1,560	3.3	4,850	0.90
Minn-St. Paul MN	8,210	1,850	3.4	4,430	0.87
Oklahoma City OK	5,330	1,040	3.1	5,130	0.71
St. Louis MO	17,330	2,790	3.2	6,220	0.93
Southern Cities					
Atlanta GA	14,580	2,200	3.4	6,630	1.09
Charlotte NC	4,440	810	3.0	5,520	0.73
Ft. Lauderdale FL	8,340	1,710	4.3	4,860	0.84
Jacksonville FL	9,130	1,810	3.6	5,040	0.95
Memphis TN	6,050	1,180	4.2	5,120	0.77
Miami FL	19,800	3,180	4.3	6,230	1.10
Nashville TN	7,740	1,450	3.1	5,340	0.86
New Orleans LA	6,500	930	4.1	6,970	1.11
Norfolk VA	5,840	1,120	3.5	5,220	0.90
Orlando FL	5,760	2,460	3.7	2,340	0.71
Tampa FL	5,880	970	3.8	6,080	0.96
Southwestern Cities					
Albuquerque NM	5,230	990	3.5	5,280	0.88
Austin TX	3,530	660	4.2	5,340	0.98
Corpus Christi TX	2,250	520	3.8	4,380	0.71
Dallas TX	13,250	2,700	4.7	4,900	1.04
Denver CO	17,190	2,890	3.7	5,950	0.97
El Paso TX	4,690	1,300	4.1	3,620	0.75
Fort Worth TX	6,840	1,370	3.9	5,000	0.87
Houston TX	17,400	3,150	4.1	5,530	1.21
Phoenix AZ	25,500	4,090	3.5	6,240	1.20
Salt Lake City UT	2,940	540	3.4	5,450	0.68
San Antonio TX	7,380	1,660	3.4	4,450	0.90
Western Cities					
Honolulu HI	2,320	300	3.6	7,780	1.05
Los Angeles CA	113,360	18,690	4.0	6,060	1.42
Portland OR	5,060	850	3.3	5,980	0.97
Sacramento CA	9,470	1,560	4.0	6,070	0.95
San Bernardino-Riv CA	14,280	2,700	4.0	5,280	1.14
San Diego CA	12,640	2,460	3.4	5,130	1.00
San Fran-Oak CA	19,320	3,180	3.8	6,080	1.24
San Jose CA	9,970	2,170	4.1	4,580	0.96
Seattle-Everett WA	13,400	2,330	3.3	5,740	1.09
Northeastern Avg	27,980	4,260	3.3	6,280	0.99
Midwestern Avg	12,340	2,210	3.4	5,080	0.87
Southern Avg	8,550	1,620	3.7	5,400	0.91
Southwestern Avg	9,660	1,810	3.8	5,100	0.93
Western Avg	22,200	3,810	3.7	5,860	1.09
Texas Avg	7,910	1,620	4.0	4,750	0.92
Total Avg	14,880	2,570	3.6	5,460	0.95
Maximum Value	113,360	18,690	4.7	7,840	1.42
Minimum Value	2,250	300	2.3	2,340	0.68

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-13. Summary of 1987 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	22,110	2,000	5.4	11,080	0.90
Boston MA	32,530	2,400	5.8	13,560	1.04
Hartford CT	9,440	890	5.4	10,660	0.87
New York NY	118,520	9,320	5.5	12,710	1.06
Philadelphia PA	24,350	2,150	5.1	11,330	1.06
Pittsburgh PA	11,580	1,510	4.2	7,690	0.79
Washington DC	36,890	2,370	5.2	15,590	1.30
Midwestern Cities					
Chicago IL	49,820	3,520	5.6	14,160	1.15
Cincinnati OH	15,390	1,360	5.3	11,310	0.87
Cleveland OH	18,010	1,550	4.6	11,650	0.89
Columbus OH	12,380	1,250	5.7	9,920	0.78
Detroit MI	35,100	2,590	5.8	13,540	1.10
Indianapolis IN	12,300	1,140	5.1	10,760	0.85
Kansas City MO	19,190	2,140	4.3	8,960	0.71
Louisville KY	8,660	820	4.4	10,550	0.88
Milwaukee WI	10,980	890	5.3	12,400	0.95
Minn-St. Paul MN	25,150	2,240	4.8	11,240	0.87
Oklahoma City OK	10,190	1,130	5.0	9,040	0.76
St. Louis MO	26,230	2,300	5.5	11,390	0.96
Southern Cities					
Atlanta GA	36,970	2,640	6.1	14,000	1.11
Charlotte NC	3,070	450	4.1	6,800	0.74
Ft. Lauderdale FL	9,980	900	5.4	11,070	0.90
Jacksonville FL	7,680	640	4.5	11,930	0.94
Memphis TN	6,010	610	5.3	9,820	0.84
Miami FL	11,950	890	5.4	13,370	1.14
Nashville TN	7,250	690	4.6	10,470	0.88
New Orleans LA	7,490	530	5.7	14,090	1.14
Norfolk VA	8,320	720	4.5	11,480	0.93
Orlando FL	8,920	880	4.7	10,170	0.72
Tampa FL	5,310	450	4.9	11,790	1.02
Southwestern Cities					
Albuquerque NM	3,260	320	5.0	10,130	0.91
Austin TX	8,290	680	5.5	12,260	0.96
Corpus Christi TX	2,420	290	5.3	8,330	0.72
Dallas TX	35,580	2,670	5.8	13,310	1.02
Denver CO	15,380	1,380	5.2	11,170	0.95
El Paso TX	5,150	560	5.2	9,140	0.71
Fort Worth TX	17,710	1,590	5.7	11,110	0.87
Houston TX	41,540	2,640	6.2	15,730	1.19
Phoenix AZ	7,370	550	5.3	13,470	1.18
Salt Lake City UT	6,130	760	5.6	8,110	0.70
San Antonio TX	14,170	1,310	5.1	10,800	0.85
Western Cities					
Honolulu HI	6,980	530	5.2	13,140	1.07
Los Angeles CA	155,990	7,860	8.2	19,850	1.47
Portland OR	10,790	870	5.0	12,410	1.00
Sacramento CA	12,970	1,060	6.9	12,200	1.00
San Bernardino-Riv CA	20,690	1,380	6.9	15,030	1.13
San Diego CA	37,280	2,640	7.4	14,120	1.08
San Fran-Oak CA	63,720	3,710	6.8	17,170	1.31
San Jose CA	23,490	1,840	6.5	12,800	0.98
Seattle-Everett WA	26,730	1,840	5.8	14,560	1.14
Northeastern Avg	36,490	2,950	5.2	11,800	1.00
Midwestern Avg	20,280	1,740	5.1	11,240	0.90
Southern Avg	10,270	860	5.0	11,360	0.94
Southwestern Avg	14,270	1,160	5.4	11,230	0.91
Western Avg	39,850	2,410	6.5	14,590	1.13
Texas Avg	17,840	1,390	5.5	11,530	0.90
Total Avg	22,550	1,710	5.4	11,950	0.97
Maximum Value	155,990	9,320	8.2	19,850	1.47
Minimum Value	2,420	290	4.1	6,800	0.70

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-14. Summary of 1987 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	14,520	2,700	3.9	5,370	0.90
Boston MA	22,060	4,310	2.3	5,110	1.04
Hartford CT	5,160	940	3.5	5,480	0.87
New York NY	78,070	11,110	3.4	7,030	1.06
Philadelphia PA	36,310	5,180	2.9	7,000	1.06
Pittsburgh PA	15,950	2,740	3.1	5,830	0.79
Washington DC	29,620	3,610	4.1	8,210	1.30
Midwestern Cities					
Chicago IL	40,190	6,020	3.6	6,680	1.15
Cincinnati OH	5,340	1,270	3.3	4,200	0.87
Cleveland OH	7,790	1,770	2.9	4,400	0.89
Columbus OH	4,290	960	3.2	4,480	0.78
Detroit MI	34,690	5,550	4.4	6,240	1.10
Indianapolis IN	6,600	1,360	3.7	4,850	0.85
Kansas City MO	7,000	1,670	3.5	4,180	0.71
Louisville KY	4,790	810	3.7	5,890	0.88
Milwaukee WI	7,470	1,580	3.3	4,730	0.95
Minn-St. Paul MN	8,370	1,870	3.4	4,480	0.87
Oklahoma City OK	5,580	1,050	3.1	5,290	0.76
St. Louis MO	18,060	2,810	3.2	6,430	0.96
Southern Cities					
Atlanta GA	15,050	2,250	3.4	6,700	1.11
Charlotte NC	4,570	820	3.0	5,570	0.74
Ft. Lauderdale FL	8,860	1,720	4.3	5,140	0.90
Jacksonville FL	8,970	1,840	3.6	4,890	0.94
Memphis TN	6,330	1,220	4.3	5,210	0.84
Miami FL	20,930	3,220	4.3	6,500	1.14
Nashville TN	7,910	1,460	3.1	5,430	0.88
New Orleans LA	6,530	1,000	4.2	6,540	1.14
Norfolk VA	6,210	1,130	3.5	5,510	0.93
Orlando FL	5,790	2,460	3.7	2,350	0.72
Tampa FL	6,250	980	3.8	6,360	1.02
Southwestern Cities					
Albuquerque NM	5,720	1,050	3.5	5,460	0.91
Austin TX	3,460	670	4.2	5,180	0.96
Corpus Christi TX	2,400	520	3.8	4,660	0.72
Dallas TX	13,200	2,720	4.7	4,850	1.02
Denver CO	17,070	2,950	3.8	5,790	0.95
El Paso TX	4,830	1,300	4.2	3,730	0.71
Fort Worth TX	6,840	1,380	3.9	4,940	0.87
Houston TX	16,910	3,170	4.2	5,330	1.19
Phoenix AZ	26,520	4,130	3.6	6,420	1.18
Salt Lake City UT	3,000	560	3.5	5,410	0.70
San Antonio TX	7,730	1,690	3.4	4,570	0.85
Western Cities					
Honolulu HI	2,340	310	3.7	7,660	1.07
Los Angeles CA	118,830	18,970	4.0	6,270	1.47
Portland OR	5,150	850	3.3	6,100	1.00
Sacramento CA	9,880	1,610	4.0	6,140	1.00
San Bernardino-Riv CA	14,330	2,770	4.0	5,170	1.13
San Diego CA	13,170	2,510	3.4	5,240	1.08
San Fran-Oak CA	20,400	3,230	3.9	6,320	1.31
San Jose CA	10,210	2,190	4.1	4,660	0.98
Seattle-Everett WA	14,410	2,370	3.3	6,070	1.14
Northeastern Avg	28,810	4,370	3.3	6,290	1.00
Midwestern Avg	12,510	2,230	3.4	5,150	0.90
Southern Avg	8,850	1,640	3.7	5,470	0.94
Southwestern Avg	9,790	1,830	3.9	5,120	0.91
Western Avg	23,190	3,870	3.7	5,960	1.13
Texas Avg	7,910	1,640	4.1	4,750	0.90
Total Avg	15,310	2,610	3.6	5,520	0.97
Maximum Value	118,830	18,970	4.7	8,210	1.47
Minimum Value	2,340	310	2.3	2,350	0.70

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-15. Summary of 1988 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	22,410	1,950	5.4	11,500	0.92
Boston MA	36,570	2,430	5.9	15,040	1.12
Hartford CT	9,760	890	5.5	11,020	0.91
New York NY	125,590	9,350	5.5	13,430	1.10
Philadelphia PA	26,850	2,250	5.2	11,910	1.07
Pittsburgh PA	11,880	1,530	4.3	7,770	0.81
Washington DC	38,000	2,400	5.2	15,850	1.32
Midwestern Cities					
Chicago IL	51,460	3,550	5.6	14,500	1.18
Cincinnati OH	15,700	1,360	5.3	11,540	0.88
Cleveland OH	20,400	1,590	4.6	12,800	0.97
Columbus OH	12,630	1,260	5.7	9,990	0.79
Detroit MI	35,450	2,640	5.8	13,430	1.09
Indianapolis IN	12,470	1,160	5.3	10,760	0.84
Kansas City MO	19,670	2,170	4.4	9,090	0.72
Louisville KY	9,720	910	4.4	10,690	0.87
Milwaukee WI	11,490	940	5.6	12,200	0.94
Minn-St. Paul MN	26,440	2,310	4.9	11,440	0.88
Oklahoma City OK	10,660	1,140	5.0	9,390	0.78
St. Louis MO	27,990	2,390	5.5	11,710	0.98
Southern Cities					
Atlanta GA	38,540	2,660	6.1	14,510	1.14
Charlotte NC	3,080	450	4.1	6,840	0.73
Ft. Lauderdale FL	10,380	930	5.4	11,120	0.90
Jacksonville FL	8,290	680	4.5	12,260	0.95
Memphis TN	6,360	610	5.4	10,390	0.86
Miami FL	12,690	930	5.4	13,710	1.18
Nashville TN	7,710	710	4.6	10,890	0.94
New Orleans LA	7,660	550	5.7	14,000	1.13
Norfolk VA	8,420	730	4.5	11,490	0.94
Orlando FL	9,310	890	4.8	10,420	0.74
Tampa FL	5,540	470	4.9	11,860	1.03
Southwestern Cities					
Albuquerque NM	3,580	320	5.0	11,130	0.90
Austin TX	8,400	680	5.6	12,430	0.96
Corpus Christi TX	2,430	300	5.3	8,160	0.70
Dallas TX	36,030	2,700	5.9	13,360	1.02
Denver CO	16,890	1,380	5.2	12,200	0.99
El Paso TX	5,350	560	5.2	9,490	0.74
Fort Worth TX	17,950	1,610	5.7	11,150	0.87
Houston TX	43,630	2,880	6.2	15,140	1.15
Phoenix AZ	8,940	840	5.6	10,670	1.00
Salt Lake City UT	6,560	770	5.6	8,490	0.72
San Antonio TX	14,570	1,320	5.2	11,040	0.86
Western Cities					
Honolulu HI	7,100	530	5.2	13,360	1.10
Los Angeles CA	164,450	7,990	8.2	20,590	1.52
Portland OR	11,430	870	5.0	13,150	1.05
Sacramento CA	13,560	1,090	6.9	12,470	1.03
San Bernardino-Riv CA	21,820	1,400	7.0	15,570	1.16
San Diego CA	40,310	2,730	7.4	14,770	1.13
San Fran-Oak CA	64,990	3,740	6.8	17,360	1.33
San Jose CA	24,080	1,850	6.6	13,000	0.99
Seattle-Everett WA	27,680	1,840	5.8	15,080	1.17
Northeastern Avg	38,720	2,970	5.3	12,360	1.04
Midwestern Avg	21,170	1,790	5.2	11,460	0.91
Southern Avg	10,730	870	5.0	11,590	0.96
Southwestern Avg	14,940	1,210	5.5	11,200	0.90
Western Avg	41,710	2,450	6.5	15,040	1.16
Texas Avg	18,340	1,440	5.6	11,540	0.90
Total Avg	23,660	1,740	5.5	12,200	0.98
Maximum Value	164,450	9,350	8.2	20,590	1.52
Minimum Value	2,430	300	4.1	6,840	0.70

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-16. Summary of 1988 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	14,750	2,800	4.0	5,260	0.92
Boston MA	20,700	4,330	2.3	4,780	1.12
Hartford CT	5,670	940	3.5	6,020	0.91
New York NY	80,030	11,450	3.4	6,990	1.10
Philadelphia PA	35,610	5,200	3.0	6,850	1.07
Pittsburgh PA	17,110	2,840	3.1	6,020	0.81
Washington DC	30,270	3,670	4.1	8,250	1.32
Midwestern Cities					
Chicago IL	41,960	6,050	3.6	6,940	1.18
Cincinnati OH	5,530	1,280	3.3	4,320	0.88
Cleveland OH	8,070	1,790	2.9	4,510	0.97
Columbus OH	4,450	970	3.2	4,610	0.79
Detroit MI	34,890	5,670	4.4	6,160	1.09
Indianapolis IN	6,340	1,370	3.7	4,640	0.84
Kansas City MO	7,230	1,680	3.5	4,300	0.72
Louisville KY	4,600	820	3.7	5,610	0.87
Milwaukee WI	7,610	1,590	3.4	4,770	0.94
Minn-St. Paul MN	8,530	1,880	3.4	4,530	0.88
Oklahoma City OK	5,550	1,050	3.1	5,260	0.78
St. Louis MO	18,470	2,810	3.2	6,570	0.98
Southern Cities					
Atlanta GA	15,750	2,400	3.5	6,570	1.14
Charlotte NC	4,580	840	3.0	5,470	0.73
Ft. Lauderdale FL	8,920	1,750	4.3	5,080	0.90
Jacksonville FL	9,070	1,870	3.7	4,860	0.95
Memphis TN	6,520	1,300	4.3	5,030	0.86
Miami FL	22,120	3,250	4.3	6,800	1.18
Nashville TN	8,670	1,470	3.2	5,890	0.94
New Orleans LA	6,540	1,000	4.2	6,550	1.13
Norfolk VA	6,380	1,140	3.5	5,580	0.94
Orlando FL	5,800	2,500	3.7	2,320	0.74
Tampa FL	6,540	1,010	3.8	6,500	1.03
Southwestern Cities					
Albuquerque NM	5,450	1,130	3.5	4,840	0.90
Austin TX	3,320	680	4.2	4,920	0.96
Corpus Christi TX	2,320	520	3.8	4,500	0.70
Dallas TX	13,120	2,730	4.8	4,810	1.02
Denver CO	16,820	2,950	3.8	5,690	0.99
El Paso TX	5,010	1,300	4.2	3,860	0.74
Fort Worth TX	6,760	1,390	4.0	4,860	0.87
Houston TX	16,410	3,190	4.2	5,150	1.15
Phoenix AZ	26,850	4,640	4.0	5,790	1.00
Salt Lake City UT	3,080	560	3.5	5,460	0.72
San Antonio TX	8,030	1,720	3.5	4,660	0.86
Western Cities					
Honolulu HI	2,460	310	3.7	8,030	1.10
Los Angeles CA	125,970	19,320	4.0	6,520	1.52
Portland OR	5,280	850	3.3	6,250	1.05
Sacramento CA	10,710	1,690	4.0	6,340	1.03
San Bernardino-Riv CA	14,730	2,870	4.0	5,140	1.16
San Diego CA	14,240	2,610	3.4	5,460	1.13
San Fran-Oak CA	21,800	3,290	3.9	6,620	1.33
San Jose CA	10,470	2,210	4.1	4,740	0.99
Seattle-Everett WA	14,190	2,370	3.4	5,980	1.17
Northeastern Avg	29,160	4,460	3.3	6,310	1.04
Midwestern Avg	12,770	2,250	3.4	5,180	0.91
Southern Avg	9,170	1,680	3.8	5,510	0.96
Southwestern Avg	9,740	1,890	4.0	4,960	0.90
Western Avg	24,430	3,950	3.8	6,120	1.16
Texas Avg	7,850	1,650	4.1	4,680	0.90
Total Avg	15,710	2,660	3.7	5,530	0.98
Maximum Value	125,970	19,320	4.8	8,250	1.52
Minimum Value	2,320	310	2.3	2,320	0.70

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-17. Summary of 1989 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	24,440	1,980	5.4	12,340	0.99
Boston MA	35,540	2,440	5.9	14,570	1.09
Hartford CT	9,950	930	5.5	10,660	0.89
New York NY	130,270	9,440	5.6	13,800	1.12
Philadelphia PA	29,420	2,420	5.1	12,140	1.05
Pittsburgh PA	12,480	1,580	4.3	7,910	0.82
Washington DC	40,280	2,450	5.3	16,460	1.36
Midwestern Cities					
Chicago IL	55,450	3,700	5.7	14,970	1.21
Cincinnati OH	17,530	1,430	5.5	12,240	0.94
Cleveland OH	21,270	1,710	4.7	12,460	0.95
Columbus OH	13,040	1,270	5.8	10,250	0.82
Detroit MI	36,310	2,720	5.8	13,340	1.08
Indianapolis IN	12,700	1,160	5.3	10,960	0.85
Kansas City MO	19,920	2,180	4.3	9,130	0.72
Louisville KY	9,890	940	4.6	10,500	0.86
Milwaukee WI	12,100	950	5.6	12,740	0.97
Minn-St. Paul MN	27,140	2,330	4.9	11,630	0.90
Oklahoma City OK	11,000	1,160	5.1	9,490	0.78
St. Louis MO	30,140	2,710	5.5	11,110	0.96
Southern Cities					
Atlanta GA	39,600	2,700	6.1	14,640	1.14
Charlotte NC	3,570	470	4.2	7,530	0.74
Ft. Lauderdale FL	11,000	950	5.4	11,580	0.92
Jacksonville FL	8,370	710	4.5	11,820	0.93
Memphis TN	6,850	610	5.4	11,200	0.91
Miami FL	13,440	930	5.4	14,400	1.25
Nashville TN	7,910	770	4.6	10,230	0.90
New Orleans LA	7,820	560	5.8	13,890	1.13
Norfolk VA	8,590	740	4.6	11,600	0.95
Orlando FL	9,370	930	4.9	10,120	0.72
Tampa FL	5,520	470	4.9	11,630	1.03
Southwestern Cities					
Albuquerque NM	3,720	340	5.0	11,000	0.91
Austin TX	8,530	680	5.6	12,470	0.96
Corpus Christi TX	2,450	300	5.3	8,220	0.71
Dallas TX	36,460	2,720	5.9	13,400	1.02
Denver CO	17,280	1,380	5.2	12,480	1.01
El Paso TX	5,310	560	5.2	9,430	0.74
Fort Worth TX	18,160	1,630	5.7	11,110	0.87
Houston TX	44,500	2,990	6.2	14,860	1.13
Phoenix AZ	11,350	970	5.6	11,650	1.03
Salt Lake City UT	8,180	820	5.6	9,960	0.81
San Antonio TX	14,770	1,330	5.2	11,120	0.87
Western Cities					
Honolulu HI	7,290	550	5.2	13,310	1.09
Los Angeles CA	171,750	8,240	8.2	20,840	1.54
Portland OR	12,030	890	5.0	13,580	1.07
Sacramento CA	14,250	1,180	6.9	12,120	1.01
San Bernardino-Riv CA	21,930	1,420	7.0	15,480	1.16
San Diego CA	43,080	2,770	7.4	15,560	1.18
San Fran-Oak CA	67,570	3,780	6.8	17,860	1.36
San Jose CA	25,020	1,870	6.6	13,400	1.02
Seattle-Everett WA	29,300	1,870	3.4	15,690	1.21
Northeastern Avg	40,340	3,030	5.3	12,550	1.05
Midwestern Avg	22,210	1,860	5.2	11,570	0.92
Southern Avg	11,100	900	5.1	11,690	0.97
Southwestern Avg	15,520	1,250	5.5	11,430	0.91
Western Avg	43,580	2,510	6.3	15,310	1.18
Texas Avg	18,600	1,460	5.6	11,520	0.90
Total Avg	24,680	1,790	5.5	12,380	0.99
Maximum Value	171,750	9,440	8.2	20,840	1.54
Minimum Value	2,450	300	3.4	7,530	0.71

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-18. Summary of 1989 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	15,010	2,630	4.0	5,700	0.99
Boston MA	20,370	4,360	2.3	4,680	1.09
Hartford CT	5,860	1,000	3.7	5,870	0.89
New York NY	81,840	11,830	3.4	6,920	1.12
Philadelphia PA	34,040	5,220	3.0	6,510	1.05
Pittsburgh PA	17,330	2,850	3.1	6,080	0.82
Washington DC	30,800	3,680	4.0	8,370	1.36
Midwestern Cities					
Chicago IL	45,050	6,520	3.8	6,910	1.21
Cincinnati OH	5,830	1,280	3.3	4,550	0.94
Cleveland OH	8,350	1,800	3.0	4,650	0.95
Columbus OH	4,890	970	3.3	5,070	0.82
Detroit MI	35,130	5,760	4.4	6,090	1.08
Indianapolis IN	6,170	1,370	3.7	4,510	0.85
Kansas City MO	7,040	1,680	3.5	4,180	0.72
Louisville KY	4,650	820	3.7	5,670	0.86
Milwaukee WI	7,510	1,610	3.3	4,670	0.97
Minn-St. Paul MN	8,680	1,910	3.3	4,550	0.90
Oklahoma City OK	5,770	1,090	3.2	5,270	0.78
St. Louis MO	19,660	2,890	3.2	6,800	0.96
Southern Cities					
Atlanta GA	15,630	2,510	3.6	6,220	1.14
Charlotte NC	4,600	850	3.0	5,390	0.74
Ft. Lauderdale FL	9,020	1,770	4.3	5,100	0.92
Jacksonville FL	9,250	1,920	3.7	4,830	0.93
Memphis TN	6,630	1,300	4.3	5,120	0.91
Miami FL	23,840	3,280	4.3	7,280	1.25
Nashville TN	8,690	1,510	3.3	5,780	0.90
New Orleans LA	6,540	1,000	4.2	6,560	1.13
Norfolk VA	6,570	1,170	3.5	5,630	0.95
Orlando FL	6,000	2,510	3.7	2,390	0.72
Tampa FL	6,730	1,010	3.8	6,630	1.03
Southwestern Cities					
Albuquerque NM	5,760	1,130	3.5	5,110	0.91
Austin TX	3,300	680	4.2	4,820	0.96
Corpus Christi TX	2,330	520	3.8	4,530	0.71
Dallas TX	13,250	2,730	4.8	4,860	1.02
Denver CO	17,070	2,960	3.9	5,760	1.01
El Paso TX	5,110	1,340	4.2	3,830	0.74
Fort Worth TX	6,790	1,390	4.0	4,880	0.87
Houston TX	16,740	3,240	4.3	5,170	1.13
Phoenix AZ	26,800	4,590	4.0	5,840	1.03
Salt Lake City UT	3,140	570	3.5	5,490	0.81
San Antonio TX	8,340	1,740	3.5	4,800	0.87
Western Cities					
Honolulu HI	2,500	310	3.8	7,970	1.09
Los Angeles CA	128,490	19,610	4.0	6,550	1.54
Portland OR	5,430	880	3.3	6,180	1.07
Sacramento CA	10,960	1,740	4.0	6,310	1.01
San Bernardino-Riv CA	15,090	2,940	4.2	5,130	1.16
San Diego CA	14,380	2,690	3.4	5,350	1.18
San Fran-Oak CA	22,070	3,410	3.9	6,470	1.36
San Jose CA	10,880	2,230	4.2	4,880	1.02
Seattle-Everett WA	14,590	2,430	3.4	6,000	1.21
Northeastern Avg	29,320	4,510	3.4	6,310	1.05
Midwestern Avg	13,230	2,310	3.5	5,240	0.92
Southern Avg	9,410	1,710	3.8	5,540	0.97
Southwestern Avg	9,880	1,900	4.0	5,010	0.91
Western Avg	24,930	4,030	3.8	6,090	1.18
Texas Avg	7,980	1,660	4.1	4,700	0.90
Total Avg	16,010	2,700	3.7	5,560	0.99
Maximum Value	128,490	19,610	4.8	8,370	1.54
Minimum Value	2,330	310	2.3	2,390	0.71

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-19. Summary of 1990 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	25,440	2,010	5.4	12,640	1.01
Boston MA	34,790	2,450	5.9	14,220	1.06
Hartford CT	10,020	930	5.5	10,730	0.89
New York NY	133,500	9,500	5.6	14,050	1.14
Philadelphia PA	29,500	2,430	5.1	12,140	1.05
Pittsburgh PA	13,190	1,610	4.3	8,200	0.82
Washington DC	40,790	2,460	5.3	16,610	1.37
Midwestern Cities					
Chicago IL	61,230	3,900	5.7	15,680	1.25
Cincinnati OH	18,320	1,460	5.7	12,570	0.96
Cleveland OH	22,060	1,770	4.7	12,450	0.97
Columbus OH	13,440	1,290	5.8	10,440	0.83
Detroit MI	36,460	2,740	5.8	13,320	1.09
Indianapolis IN	12,960	1,220	5.3	10,590	0.83
Kansas City MO	20,210	2,190	4.4	9,230	0.74
Louisville KY	9,970	950	4.6	10,500	0.86
Milwaukee WI	12,380	960	5.6	12,920	0.99
Minn-St. Paul MN	28,640	2,380	4.9	12,020	0.93
Oklahoma City OK	11,170	1,160	5.1	9,630	0.79
St. Louis MO	30,780	2,730	5.5	11,280	0.99
Southern Cities					
Atlanta GA	39,060	2,750	6.1	14,190	1.11
Charlotte NC	3,700	480	4.2	7,670	0.78
Ft. Lauderdale FL	11,440	970	5.4	11,840	0.94
Jacksonville FL	8,660	720	4.6	11,960	0.94
Memphis TN	6,990	630	5.4	11,130	0.91
Miami FL	13,800	970	5.4	14,170	1.26
Nashville TN	8,050	790	4.6	10,200	0.89
New Orleans LA	8,000	580	5.8	13,810	1.12
Norfolk VA	8,770	750	4.6	11,720	0.96
Orlando FL	9,580	950	4.9	10,080	0.72
Tampa FL	5,840	480	4.9	12,100	1.05
Southwestern Cities					
Albuquerque NM	3,860	350	5.0	11,160	0.93
Austin TX	8,760	720	5.6	12,090	0.94
Corpus Christi TX	2,510	300	5.4	8,430	0.72
Dallas TX	38,120	2,750	5.9	13,850	1.05
Denver CO	18,140	1,420	5.2	12,730	1.03
El Paso TX	5,360	560	5.2	9,510	0.74
Fort Worth TX	19,060	1,640	5.8	11,610	0.90
Houston TX	45,450	3,090	6.3	14,700	1.12
Phoenix AZ	12,350	1,010	5.6	12,270	1.03
Salt Lake City UT	8,580	820	5.6	10,450	0.85
San Antonio TX	14,940	1,330	5.3	11,250	0.88
Western Cities					
Honolulu HI	7,440	550	5.2	13,590	1.11
Los Angeles CA	177,660	8,420	8.2	21,100	1.55
Portland OR	12,030	890	5.1	13,460	1.07
Sacramento CA	14,910	1,210	6.9	12,350	1.02
San Bernardino-Riv CA	23,470	1,440	7.1	16,290	1.19
San Diego CA	44,580	2,780	7.4	16,050	1.22
San Fran-Oak CA	68,570	3,850	6.8	17,820	1.35
San Jose CA	25,410	1,870	6.6	13,600	1.04
Seattle-Everett WA	30,460	1,950	6.0	15,640	1.20
Northeastern Avg	41,030	3,060	5.3	12,660	1.05
Midwestern Avg	23,140	1,900	5.3	11,720	0.94
Southern Avg	11,260	920	5.1	11,710	0.97
Southwestern Avg	16,100	1,270	5.5	11,640	0.93
Western Avg	44,950	2,550	6.6	15,540	1.19
Texas Avg	19,170	1,490	5.6	11,630	0.91
Total Avg	25,410	1,820	5.5	12,520	1.00
Maximum Value	177,660	9,500	8.2	21,100	1.55
Minimum Value	2,510	300	4.2	7,670	0.72

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-20. Summary of 1990 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	15,860	2,670	4.1	5,930	1.01
Boston MA	20,190	4,440	2.3	4,540	1.06
Hartford CT	6,040	1,020	3.7	5,910	0.89
New York NY	83,810	12,170	3.4	6,890	1.14
Philadelphia PA	34,440	5,230	3.1	6,580	1.05
Pittsburgh PA	17,570	2,930	3.2	5,990	0.82
Washington DC	31,490	3,700	4.0	8,500	1.37
Midwestern Cities					
Chicago IL	46,760	6,700	3.7	6,980	1.25
Cincinnati OH	5,910	1,320	3.3	4,480	0.96
Cleveland OH	9,320	1,800	3.0	5,170	0.97
Columbus OH	5,120	980	3.3	5,210	0.83
Detroit MI	36,830	5,800	4.4	6,350	1.09
Indianapolis IN	6,390	1,420	3.7	4,510	0.83
Kansas City MO	7,740	1,710	3.5	4,540	0.74
Louisville KY	4,740	840	3.6	5,660	0.86
Milwaukee WI	7,700	1,620	3.4	4,760	0.99
Minn-St. Paul MN	9,080	1,930	3.3	4,700	0.93
Oklahoma City OK	5,770	1,090	3.2	5,270	0.79
St. Louis MO	20,870	2,900	3.2	7,200	0.99
Southern Cities					
Atlanta GA	15,750	2,530	3.7	6,230	1.11
Charlotte NC	4,970	860	3.0	5,770	0.78
Ft. Lauderdale FL	9,340	1,800	4.3	5,200	0.94
Jacksonville FL	9,350	1,930	3.7	4,840	0.94
Memphis TN	6,820	1,300	4.3	5,230	0.91
Miami FL	25,450	3,340	4.3	7,620	1.26
Nashville TN	8,760	1,510	3.3	5,790	0.89
New Orleans LA	6,600	1,010	4.2	6,560	1.12
Norfolk VA	6,850	1,180	3.5	5,790	0.96
Orlando FL	6,200	2,530	3.7	2,450	0.72
Tampa FL	7,020	1,060	3.8	6,610	1.05
Southwestern Cities					
Albuquerque NM	6,100	1,160	3.7	5,260	0.93
Austin TX	3,360	690	4.2	4,860	0.94
Corpus Christi TX	2,420	520	3.9	4,620	0.72
Dallas TX	13,380	2,750	4.8	4,860	1.05
Denver CO	17,550	2,980	3.9	5,890	1.03
El Paso TX	5,150	1,340	4.2	3,830	0.74
Fort Worth TX	6,830	1,400	4.1	4,870	0.90
Houston TX	17,440	3,430	4.3	5,080	1.12
Phoenix AZ	28,350	5,020	4.1	5,640	1.03
Salt Lake City UT	3,280	570	3.6	5,730	0.85
San Antonio TX	8,440	1,750	3.5	4,810	0.88
Western Cities					
Honolulu HI	2,530	320	3.8	7,860	1.11
Los Angeles CA	129,400	19,970	4.0	6,480	1.55
Portland OR	5,970	930	3.3	6,400	1.07
Sacramento CA	11,260	1,770	4.0	6,360	1.02
San Bernardino-Riv CA	16,340	3,450	4.2	4,740	1.19
San Diego CA	15,040	2,750	3.4	5,460	1.22
San Fran-Oak CA	22,530	3,690	3.9	6,110	1.35
San Jose CA	10,910	2,250	4.2	4,860	1.04
Seattle-Everett WA	14,700	2,540	3.4	5,800	1.20
Northeastern Avg	29,910	4,600	3.4	6,340	1.05
Midwestern Avg	13,850	2,340	3.5	5,400	0.94
Southern Avg	9,740	1,730	3.8	5,640	0.97
Southwestern Avg	10,210	1,970	4.0	5,040	0.93
Western Avg	25,410	4,190	3.8	6,010	1.19
Texas Avg	8,140	1,700	4.1	4,700	0.91
Total Avg	16,470	2,770	3.7	5,620	1.00
Maximum Value	129,400	19,970	4.8	8,500	1.55
Minimum Value	2,420	320	2.3	2,450	0.72

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-21. Summary of 1991 Relative Mobility Values for Freeways and Expressways

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	25,820	2,010	5.4	12,830	1.02
Boston MA	34,900	2,450	5.9	14,260	1.06
Hartford CT	10,050	930	5.5	10,760	0.89
New York NY	133,650	9,530	5.6	14,020	1.14
Philadelphia PA	29,620	2,440	5.1	12,150	1.06
Pittsburgh PA	13,280	1,630	4.3	8,130	0.82
Washington DC	41,470	2,460	5.3	16,830	1.39
Midwestern Cities					
Chicago IL	62,760	3,920	5.7	16,010	1.28
Cincinnati OH	18,680	1,470	5.7	12,750	0.97
Cleveland OH	22,490	1,840	4.8	12,250	0.96
Columbus OH	13,690	1,300	5.8	10,550	0.84
Detroit MI	38,160	2,870	5.9	13,310	1.10
Indianapolis IN	13,120	1,230	5.3	10,650	0.83
Kansas City MO	20,150	2,190	4.4	9,200	0.74
Louisville KY	10,060	950	4.6	10,590	0.88
Milwaukee WI	12,570	970	5.6	13,020	1.00
Minn-St. Paul MN	29,320	2,410	4.9	12,180	0.94
Oklahoma City OK	11,310	1,170	5.2	9,690	0.80
St. Louis MO	30,670	2,730	5.6	11,240	0.98
Southern Cities					
Atlanta GA	40,200	2,770	6.2	14,520	1.14
Charlotte NC	4,010	480	4.2	8,300	0.82
Ft. Lauderdale FL	11,480	970	5.4	11,880	0.95
Jacksonville FL	8,810	720	4.6	12,160	0.95
Memphis TN	7,080	630	5.4	11,280	0.92
Miami FL	14,140	990	5.4	14,280	1.28
Nashville TN	8,390	810	4.6	10,320	0.90
New Orleans LA	8,110	590	5.8	13,810	1.12
Norfolk VA	8,960	760	4.6	11,840	0.97
Orlando FL	9,730	970	4.9	10,080	0.72
Tampa FL	5,880	490	4.9	11,970	1.05
Southwestern Cities					
Albuquerque NM	3,990	350	5.0	11,530	0.94
Austin TX	8,860	730	5.6	12,090	0.94
Corpus Christi TX	2,580	300	5.5	8,630	0.72
Dallas TX	38,480	2,760	5.9	13,940	1.06
Denver CO	18,390	1,440	5.2	12,770	1.03
El Paso TX	5,460	570	5.3	9,550	0.75
Fort Worth TX	19,800	1,660	5.9	11,940	0.92
Houston TX	47,500	3,240	6.3	14,640	1.11
Phoenix AZ	13,140	1,030	5.6	12,750	1.04
Salt Lake City UT	8,830	830	5.6	10,650	0.86
San Antonio TX	15,090	1,340	5.3	11,300	0.89
Western Cities					
Honolulu HI	7,570	550	5.2	13,820	1.13
Los Angeles CA	177,550	8,410	8.2	21,110	1.56
Portland OR	12,110	900	5.1	13,430	1.08
Sacramento CA	15,520	1,220	6.9	12,680	1.04
San Bernardino-Riv CA	24,100	1,460	7.2	16,540	1.20
San Diego CA	44,600	2,780	7.5	16,060	1.22
San Fran-Oak CA	67,620	3,850	6.8	17,570	1.34
San Jose CA	26,600	1,890	6.6	14,060	1.07
Seattle-Everett WA	30,590	1,960	5.9	15,570	1.20
Northeastern Avg	41,260	3,070	5.3	12,710	1.05
Midwestern Avg	23,580	1,920	5.3	11,790	0.94
Southern Avg	11,530	930	5.1	11,860	0.98
Southwestern Avg	16,560	1,300	5.6	11,800	0.93
Western Avg	45,140	2,560	6.6	15,650	1.20
Texas Avg	19,680	1,510	5.7	11,730	0.91
Total Avg	25,740	1,840	5.5	12,630	1.01
Maximum Value	177,550	9,530	8.2	21,110	1.56
Minimum Value	2,580	300	4.2	8,130	0.72

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

Table D-22. Summary of 1991 Relative Mobility Values for Principal Arterial Streets

Urban Area	DVKT[1] (1000)	Lane-Km	Avg. No. Lanes	DVKT/[2] Ln-Km	Congestion Index
Northeastern Cities					
Baltimore MD	15,900	2,690	4.1	5,910	1.02
Boston MA	20,130	4,440	2.3	4,530	1.06
Hartford CT	6,120	1,050	3.8	5,850	0.89
New York NY	85,360	12,270	3.4	6,960	1.14
Philadelphia PA	34,810	5,250	3.1	6,630	1.06
Pittsburgh PA	17,830	2,990	3.2	5,970	0.82
Washington DC	31,640	3,740	4.0	8,470	1.39
Midwestern Cities					
Chicago IL	49,160	6,840	3.7	7,180	1.28
Cincinnati OH	6,120	1,330	3.3	4,610	0.97
Cleveland OH	9,420	1,810	3.0	5,200	0.96
Columbus OH	5,310	1,000	3.4	5,320	0.84
Detroit MI	38,930	6,000	4.4	6,490	1.10
Indianapolis IN	6,380	1,420	3.7	4,500	0.83
Kansas City MO	7,790	1,690	3.5	4,610	0.74
Louisville KY	5,020	840	3.6	6,000	0.88
Milwaukee WI	7,940	1,630	3.4	4,880	1.00
Minn-St. Paul MN	9,210	1,950	3.4	4,730	0.94
Oklahoma City OK	6,070	1,110	3.2	5,460	0.80
St. Louis MO	20,530	2,910	3.4	7,040	0.98
Southern Cities					
Atlanta GA	15,920	2,540	3.7	6,280	1.14
Charlotte NC	5,140	870	3.0	5,910	0.82
Ft. Lauderdale FL	9,660	1,810	4.3	5,330	0.95
Jacksonville FL	9,500	1,950	3.7	4,880	0.95
Memphis TN	6,760	1,300	4.3	5,220	0.92
Miami FL	25,760	3,350	4.3	7,690	1.28
Nashville TN	8,790	1,530	3.4	5,750	0.90
New Orleans LA	6,660	1,010	4.2	6,620	1.12
Norfolk VA	7,130	1,210	3.5	5,910	0.97
Orlando FL	6,400	2,540	3.7	2,520	0.72
Tampa FL	7,080	1,080	3.8	6,570	1.05
Southwestern Cities					
Albuquerque NM	6,200	1,210	3.8	5,130	0.94
Austin TX	3,460	700	4.2	4,940	0.94
Corpus Christi TX	2,490	560	4.0	4,410	0.72
Dallas TX	13,520	2,770	4.8	4,880	1.06
Denver CO	17,390	2,980	3.9	5,840	1.03
El Paso TX	5,270	1,350	4.2	3,900	0.75
Fort Worth TX	6,840	1,420	4.1	4,830	0.92
Houston TX	17,550	3,500	4.3	5,010	1.11
Phoenix AZ	29,000	5,180	4.1	5,590	1.04
Salt Lake City UT	3,350	570	3.6	5,860	0.86
San Antonio TX	8,770	1,800	3.6	4,890	0.89
Western Cities					
Honolulu HI	2,610	320	3.8	8,100	1.13
Los Angeles CA	131,550	19,960	4.0	6,590	1.56
Portland OR	6,170	930	3.3	6,600	1.08
Sacramento CA	11,270	1,800	4.1	6,280	1.04
San Bernardino-Riv CA	17,150	3,680	4.2	4,660	1.20
San Diego CA	15,300	2,790	3.5	5,490	1.22
San Fran-Oak CA	22,590	3,700	4.0	6,100	1.34
San Jose CA	10,830	2,250	4.2	4,800	1.07
Seattle-Everett WA	15,810	2,580	3.4	6,140	1.20
Northeastern Avg	30,250	4,630	3.4	6,330	1.05
Midwestern Avg	14,320	2,380	3.5	5,500	0.94
Southern Avg	9,890	1,740	3.8	5,700	0.98
Southwestern Avg	10,350	2,000	4.1	5,030	0.93
Western Avg	25,920	4,220	3.8	6,080	1.20
Texas Avg	8,270	1,730	4.2	4,700	0.91
Total Avg	16,790	2,800	3.7	5,660	1.01
Maximum Value	131,550	19,960	4.8	8,470	1.56
Minimum Value	2,490	320	2.3	2,520	0.72

Notes: [1] Daily vehicle-kilometers of travel
[2] Daily vehicle-kilometers of travel per lane-kilometer of roadway

Source: TTI Analysis and Local Transportation Agency References

APPENDIX E

URBAN AREA
MOBILITY AND CONGESTION STATISTICS

Table E-1. Mobility and Congestion Variables in Albuquerque NM

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	2,471	2,600	2,753	2,930	3,107	3,260	3,582	3,719	3,864	3,993
Lane-kilometers	306	306	306	314	314	322	322	338	346	346
VKT/Lane-kilometer	8,079	8,500	9,000	9,333	9,897	10,125	11,125	11,000	11,163	11,535
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	5	5	5	10	10	10	20	20	20	20
Percent of Moderate Congestion	100.0	100.0	100.0	55.6	-	10.0	35.0	33.3	27.7	37.0
Percent of Heavy Congestion	-	-	-	44.4	90.0	40.0	40.0	40.0	46.8	39.1
Percent of Severe Congestion	-	-	-	-	10.0	50.0	25.0	26.7	25.5	23.9
Principal Arterial Streets										
Daily VKT (000)	4,605	4,959	5,426	5,796	5,233	5,716	5,450	5,764	6,102	6,199
Lane-kilometers	918	926	942	966	990	1,047	1,127	1,127	1,159	1,208
VKT/Lane-kilometer	5,018	5,357	5,761	6,000	5,285	5,462	4,836	5,114	5,264	5,133
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	35	40	45	40	40	40	35	40	40	40
Percent of Moderate Congestion	47.8	67.5	49.1	53.3	63.3	60.0	58.1	43.4	37.9	45.8
Percent of Heavy Congestion	39.1	15.0	34.5	24.4	20.0	25.0	30.2	28.3	50.0	44.1
Percent of Severe Congestion	13.0	17.5	16.4	22.2	16.7	15.0	11.6	28.3	12.1	10.2
Population (000)	450	420	420	455	465	475	485	500	525	540
Urban Area (Square Kilometers)	544	544	544	648	648	648	648	648	660	673
Registered Vehicles	-	-	-	-	380,360	364,110	364,000	420,490	421,000	423,500
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.28	0.30	0.33	0.36	0.35
Total VKT (000)	11,682	10,822	13,579	14,266	12,684	19,439	15,627	16,380	16,491	16,343
Total Kilometers	3,027	3,017	2,665	2,724	602	2,653	2,956	2,937	2,950	2,979

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-2. Mobility and Congestion Variables in Atlanta GA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	25,382	27,378	29,149	31,282	34,663	36,974	38,543	39,598	39,059	40,202
Lane-kilometers	2,198	2,270	2,375	2,439	2,544	2,640	2,657	2,705	2,753	2,769
VKT/Lane-kilometer	11,549	12,060	12,275	12,825	13,627	14,003	14,509	14,640	14,187	14,517
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	40	45	50	50	50	45	45	45	45
Percent of Moderate Congestion	40.0	39.1	60.7	47.5	15.0	3.0	8.8	18.4	9.1	9.4
Percent of Heavy Congestion	50.0	47.8	39.3	37.5	18.0	30.0	41.2	26.3	33.3	38.1
Percent of Severe Congestion	10.0	13.0	-	15.0	67.0	67.0	50.0	55.3	57.6	52.6
Principal Arterial Streets										
Daily VKT (000)	9,241	10,529	12,011	13,468	14,579	15,054	15,754	15,633	15,746	15,923
Lane-kilometers	1,964	2,077	2,149	2,174	2,198	2,246	2,399	2,512	2,528	2,536
VKT/Lane-kilometer	4,705	5,070	5,588	6,196	6,634	6,703	6,567	6,224	6,229	6,279
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	60	65	65	65	65	65	65	65	65
Percent of Moderate Congestion	30.0	21.1	36.1	19.4	14.7	17.5	18.5	18.3	13.0	15.4
Percent of Heavy Congestion	40.0	45.6	32.8	23.6	18.7	23.8	27.7	18.3	22.1	25.6
Percent of Severe Congestion	30.0	33.3	31.1	56.9	66.7	58.7	53.9	63.4	64.9	59.0
Population (000)	1,610	1,610	1,610	1,615	1,695	1,770	1,775	1,860	1,875	1,900
Urban Area (Square Kilometers)	3,781	3,807	3,807	3,885	3,937	3,963	3,989	3,989	4,002	4,015
Registered Vehicles	-	-	-	-	1,411,339	1,522,281	1,530,170	1,548,870	1,564,360	1,586,500
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.27	0.29	0.32	0.34	0.33
Total VKT (000)	51,396	64,363	69,789	77,744	85,444	91,395	92,108	118,710	104,378	100,878
Total Kilometers	8,813	12,534	13,030	13,510	13,522	13,735	13,809	14,112	15,603	15,805

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-3. Mobility and Congestion Variables in Austin TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	4,073	4,782	5,313	7,873	8,533	8,292	8,404	8,533	8,758	8,855
Lane-kilometers	427	451	467	676	676	676	676	684	725	733
VKT/Lane-kilometer	9,547	10,607	11,379	11,643	12,619	12,262	12,429	12,471	12,089	12,088
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	50	50	50	55	55	55	55	55	55	55
Percent of Moderate Congestion	10.0	26.5	43.2	56.5	28.1	40.0	36.4	36.4	32.6	34.3
Percent of Heavy Congestion	90.0	8.8	-	12.9	26.3	20.0	27.3	30.9	36.4	37.7
Percent of Severe Congestion	-	64.7	56.8	30.6	45.6	40.0	36.4	32.6	30.9	28.1
Principal Arterial Streets										
Daily VKT (000)	2,568	2,753	2,938	3,220	3,526	3,462	3,325	3,301	3,365	3,462
Lane-kilometers	547	580	612	644	660	668	676	684	692	700
VKT/Lane-kilometer	4,691	4,750	4,803	5,000	5,341	5,181	4,917	4,824	4,860	4,943
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	40	40	45	45	45	45	45	45	45	45
Percent of Moderate Congestion	2.2	16.4	23.0	18.6	20.0	15.6	30.0	36.6	32.8	33.4
Percent of Heavy Congestion	93.3	65.5	59.0	51.4	24.4	33.3	30.0	38.0	34.4	36.7
Percent of Severe Congestion	4.4	18.2	18.0	30.0	55.6	51.1	40.0	25.4	32.8	29.9
Population (000)	380	380	380	450	465	480	495	505	510	525
Urban Area (Square Kilometers)	518	311	311	842	855	881	894	894	907	932
Registered Vehicles	-	-	-	-	453,970	468,306	485,290	496,450	506,380	510,300
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	11,433	12,840	13,849	17,457	18,542	18,629	18,776	18,723	19,312	19,243
Total Kilometers	2,500	2,602	2,705	3,470	3,598	3,821	3,975	4,141	4,139	4,143

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-4. Mobility and Congestion Variables in Baltimore MD

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	16,486	16,986	17,517	19,594	20,954	22,113	22,411	24,440	25,438	25,824
Lane-kilometers	1,586	1,650	1,715	1,932	1,956	1,996	1,948	1,980	2,013	2,013
VKT/Lane-kilometer	10,396	10,293	10,216	10,142	10,712	11,077	11,504	12,341	12,640	12,832
Incident Ratio	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	25	25	25	25	25	25	25	25
Percent of Moderate Congestion	71.4	80.0	59.1	54.2	59.1	56.8	46.5	24.0	22.6	23.5
Percent of Heavy Congestion	28.6	20.0	9.1	20.8	27.3	21.6	20.9	36.0	30.2	27.6
Percent of Severe Congestion	-	-	31.8	25.0	13.6	21.6	32.6	40.0	47.2	48.8
Principal Arterial Streets										
Daily VKT (000)	12,043	12,526	13,331	13,878	14,377	14,522	14,748	15,013	15,859	15,899
Lane-kilometers	2,415	2,439	2,479	2,600	2,640	2,705	2,801	2,632	2,673	2,689
VKT/Lane-kilometer	4,987	5,135	5,377	5,337	5,445	5,369	5,264	5,703	5,934	5,913
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	25	25	30	35	35	35	35	35	35	35
Percent of Moderate Congestion	13.5	9.4	5.6	7.8	14.3	19.1	19.8	17.4	12.6	8.6
Percent of Heavy Congestion	28.9	24.5	16.7	11.7	23.4	13.1	14.0	22.1	12.6	23.5
Percent of Severe Congestion	57.7	66.0	77.8	80.5	62.3	67.9	66.3	60.5	74.7	67.9
Population (000)	1,230	1,820	1,820	1,940	1,860	1,875	1,905	1,915	1,990	2,051
Urban Area (Square Kilometers)	1,062	1,269	1,347	1,347	1,347	1,360	1,373	1,386	1,425	1,450
Registered Vehicles	-	-	-	-	-	993,750	1,007,940	1,015,873	1,031,200	1,053,600
Fuel Cost ($/Liter)	-	-	-	-	-	0.28	0.31	0.35	0.38	0.37
Total VKT (000)	31,340	42,837	45,843	49,023	51,330	52,955	53,666	56,274	58,562	59,446
Total Kilometers	5,506	7,844	9,077	9,185	9,256	9,333	9,420	9,517	9,576	9,678

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-5. Mobility and Congestion Variables in Boston MA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	25,607	27,072	27,845	29,302	32,297	32,530	36,571	35,541	34,792	34,905
Lane-kilometers	2,270	2,278	2,294	2,335	2,367	2,399	2,431	2,439	2,447	2,447
VKT/Lane-kilometer	11,280	11,883	12,137	12,552	13,646	13,560	15,043	14,571	14,217	14,263
Incident Ratio	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	30	30	35	35	40	40	45	45	45	45
Percent of Moderate Congestion	12.5	20.8	30.0	44.2	30.0	42.9	16.9	17.6	22.9	15.2
Percent of Heavy Congestion	33.3	29.2	20.0	11.6	20.0	23.8	18.2	35.3	34.3	34.8
Percent of Severe Congestion	54.2	50.0	50.0	44.2	50.0	33.3	64.9	47.1	42.9	50.0
Principal Arterial Streets										
Daily VKT (000)	20,536	20,914	21,172	21,711	21,590	22,057	20,705	20,367	20,189	20,125
Lane-kilometers	4,154	4,186	4,202	4,218	4,242	4,315	4,331	4,355	4,444	4,444
VKT/Lane-kilometer	4,944	4,996	5,038	5,147	5,089	5,112	4,781	4,677	4,543	4,529
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	35	35	35	35	35	35	40	40	40	40
Percent of Moderate Congestion	30.2	18.3	17.0	16.0	18.9	21.4	21.3	18.7	19.2	28.2
Percent of Heavy Congestion	15.9	31.0	23.0	18.7	17.6	11.4	22.5	20.0	16.4	14.1
Percent of Severe Congestion	54.0	50.7	60.0	65.3	63.5	67.1	56.2	61.3	64.4	57.7
Population (000)	2,850	2,760	2,760	2,760	2,760	2,850	2,905	2,950	2,955	2,960
Urban Area (Square Kilometers)	2,357	2,668	2,668	2,668	2,668	2,681	2,707	2,758	2,771	2,771
Registered Vehicles	-	-	-	-	-	1,510,555	1,537,040	1,649,100	1,657,350	1,661,300
Fuel Cost ($/Liter)	-	-	-	-	-	0.26	0.28	0.31	0.36	0.35
Total VKT (000)	70,277	72,142	73,154	75,131	78,017	78,779	79,312	82,780	82,659	83,142
Total Kilometers	14,818	14,815	14,815	14,822	14,820	14,822	14,825	14,825	15,010	15,131

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-6. Mobility and Congestion Variables in Charlotte NC

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	2,278	2,496	2,657	2,874	3,027	3,067	3,083	3,574	3,703	4,009
Lane-kilometers	403	411	427	435	443	451	451	475	483	483
VKT/Lane-kilometer	5,660	6,078	6,226	6,611	6,836	6,804	6,839	7,525	7,667	8,300
Incident Ratio	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	35	35	40	40	40	40	45	45	45	50
Percent of Moderate Congestion	100.0	100.0	100.0	81.0	93.9	94.1	84.4	84.4	84.4	85.0
Percent of Heavy Congestion	-	-	-	19.1	6.1	5.9	15.6	15.6	15.6	15.0
Percent of Severe Congestion	-	-	-	-	-	-	-	-	-	-
Principal Arterial Streets										
Daily VKT (000)	3,775	4,122	4,202	4,339	4,444	4,572	4,580	4,597	4,967	5,136
Lane-kilometers	725	741	757	789	805	821	837	853	861	869
VKT/Lane-kilometer	5,211	5,565	5,553	5,500	5,520	5,569	5,471	5,387	5,766	5,907
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	50	56	56	60	60	60	65	65	65	65
Percent of Moderate Congestion	50.8	57.1	57.6	58.6	10.3	16.7	10.8	11.9	4.3	6.3
Percent of Heavy Congestion	47.5	14.3	18.6	2.9	54.4	33.3	26.2	22.4	33.3	21.5
Percent of Severe Congestion	1.7	28.6	23.7	38.6	35.3	50.0	63.0	65.7	62.3	72.2
Population (000)	350	350	355	360	400	415	435	440	450	460
Urban Area (Square Kilometers)	518	544	570	583	583	596	596	622	622	622
Registered Vehicles	-	-	-	-	346,550	358,620	375,000	376,720	377,000	378,200
Fuel Cost ($/Liter)	-	-	-	-	-	0.27	0.29	0.32	0.36	0.35
Total VKT (000)	10,859	11,283	11,507	12,383	14,814	12,370	13,910	14,823	16,335	17,034
Total Kilometers	2,903	2,964	2,998	3,053	3,078	3,159	3,199	3,299	3,350	3,452

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-7. Mobility and Congestion Variables in Chicago IL

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	40,983	41,602	43,092	46,159	49,821	49,821	51,464	55,448	61,228	62,758
Lane-kilometers	3,292	3,309	3,341	3,429	3,510	3,518	3,550	3,703	3,904	3,920
VKT/Lane-kilometer	12,447	12,574	12,899	13,460	14,195	14,162	14,497	14,974	15,682	16,008
Incident Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	50	50	55	55	55	55	55	55	55	55
Percent of Moderate Congestion	18.5	28.3	14.5	9.2	6.8	9.2	10.9	16.4	12.2	13.3
Percent of Heavy Congestion	29.6	35.8	21.0	15.8	14.9	22.4	21.8	15.1	20.3	16.0
Percent of Severe Congestion	51.8	35.8	64.5	75.0	78.4	68.4	69.1	68.5	67.6	70.7
Principal Arterial Streets										
Daily VKT (000)	33,665	34,776	36,322	36,821	40,218	40,194	41,965	45,048	46,762	49,161
Lane-kilometers	5,587	5,780	5,949	5,989	6,005	6,021	6,046	6,521	6,698	6,843
VKT/Lane-kilometer	6,026	6,017	6,106	6,148	6,697	6,675	6,941	6,909	6,982	7,185
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	65	65	70	70	70	65	65	65	65
Percent of Moderate Congestion	23.9	24.2	23.2	24.7	16.1	20.2	22.1	20.0	24.7	22.8
Percent of Heavy Congestion	35.8	36.4	24.6	11.1	14.8	11.9	23.4	26.3	28.6	28.5
Percent of Severe Congestion	40.3	39.4	52.2	64.2	69.1	67.9	54.5	53.7	46.7	48.7
Population (000)	7,080	7,100	7,100	7,100	7,160	7,200	7,340	7,405	7,510	7,515
Urban Area (Square Kilometers)	4,921	5,076	5,076	5,076	5,076	5,076	5,154	5,141	5,154	5,154
Registered Vehicles	-	-	-	-	-	3,960,000	4,032,970	4,058,280	4,037,990	4,046,000
Fuel Cost ($/Liter)	-	-	-	-	-	0.28	0.31	0.34	0.39	0.37
Total VKT (000)	154,252	158,715	163,536	166,839	172,969	176,435	181,944	192,622	198,788	203,567
Total Kilometers	30,490	30,783	30,577	30,501	30,547	30,780	30,815	31,104	31,087	31,131

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-8. Mobility and Congestion Variables in Cincinnati OH

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	13,661	13,661	13,935	14,240	14,345	15,392	15,698	17,533	18,322	18,676
Lane-kilometers	1,208	1,272	1,304	1,320	1,320	1,360	1,360	1,433	1,457	1,465
VKT/Lane-kilometer	11,313	10,741	10,685	10,787	10,866	11,314	11,538	12,236	12,575	12,747
Incident Ratio	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	20	20	20	25	30	30	30	30
Percent of Moderate Congestion	96.4	80.8	6.2	27.3	55.0	65.5	54.0	66.7	60.0	57.5
Percent of Heavy Congestion	-	15.4	93.7	50.0	35.0	27.6	35.1	23.1	26.7	32.1
Percent of Severe Congestion	3.6	3.8	-	22.7	10.0	6.9	10.8	10.3	13.3	10.4
Principal Arterial Streets										
Daily VKT (000)	4,862	5,096	5,192	5,297	5,216	5,337	5,530	5,828	5,909	6,118
Lane-kilometers	1,248	1,248	1,248	1,256	1,256	1,272	1,280	1,280	1,320	1,328
VKT/Lane-kilometer	3,897	4,084	4,161	4,218	4,154	4,196	4,321	4,553	4,476	4,606
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	20	20	20	25	25	25	25	25	25	25
Percent of Moderate Congestion	40.7	42.9	33.3	25.8	34.3	43.2	21.6	41.0	40.0	38.0
Percent of Heavy Congestion	37.0	47.6	40.0	48.4	28.6	24.3	29.7	12.8	12.5	14.3
Percent of Severe Congestion	22.2	9.5	26.7	25.8	37.1	32.4	48.6	46.1	47.5	47.7
Population (000)	1,230	1,130	1,130	1,130	1,130	930	950	1,140	1,140	1,200
Urban Area (Square Kilometers)	1,580	1,450	1,450	1,450	1,450	1,088	1,114	1,463	1,476	1,489
Registered Vehicles	-	-	-	-	-	888,749	904,760	937,700	928,320	934,200
Fuel Cost ($/Liter)	-	-	-	-	-	0.27	0.30	0.34	0.36	0.35
Total VKT (000)	31,624	32,487	33,061	33,491	33,940	35,396	36,117	36,987	38,709	42,692
Total Kilometers	6,144	5,848	5,918	6,044	6,015	6,021	6,055	6,091	6,097	6,128

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-9. Mobility and Congestion Variables in Cleveland OH

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	16,100	16,454	16,760	16,189	17,235	18,008	20,399	21,268	22,057	22,492
Lane-kilometers	1,546	1,546	1,546	1,546	1,546	1,546	1,594	1,707	1,771	1,835
VKT/Lane-kilometer	10,417	10,646	10,844	10,474	11,151	11,651	12,798	12,462	12,455	12,254
Incident Ratio	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	25	25	25	25	25	25	25	25
Percent of Moderate Congestion	100.0	100.0	81.8	23.1	23.1	28.6	40.9	50.0	60.0	60.0
Percent of Heavy Congestion	-	-	18.2	69.2	69.2	64.3	54.5	36.7	32.0	30.0
Percent of Severe Congestion	-	-	-	7.7	7.7	7.1	4.5	13.3	8.0	10.0
Principal Arterial Streets										
Daily VKT (000)	7,237	7,285	7,317	7,462	7,615	7,792	8,066	8,348	9,322	9,419
Lane-kilometers	1,771	1,771	1,771	1,771	1,771	1,771	1,787	1,795	1,803	1,811
VKT/Lane-kilometer	4,086	4,114	4,132	4,214	4,300	4,400	4,514	4,650	5,170	5,200
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	20	20	20	20	20	25	30	30	30	30
Percent of Moderate Congestion	100.0	100.0	100.0	100.0	61.5	42.3	46.5	34.3	34.8	36.0
Percent of Heavy Congestion	-	-	-	-	38.5	57.7	44.8	41.8	33.3	33.7
Percent of Severe Congestion	-	-	-	-	-	-	8.6	23.9	31.8	30.3
Population (000)	1,980	1,750	1,750	1,750	1,750	1,750	1,785	1,785	1,790	1,790
Urban Area (Square Kilometers)	2,020	1,632	1,632	1,632	1,632	1,632	1,658	1,658	1,671	1,671
Registered Vehicles	-	-	-	-	-	1,444,386	1,475,210	1,500,380	1,485,380	1,493,600
Fuel Cost ($/Liter)	-	-	-	-	-	0.27	0.30	0.34	0.36	0.35
Total VKT (000)	49,884	41,557	42,335	42,087	43,647	44,824	47,857	50,878	53,080	55,437
Total Kilometers	9,568	8,243	8,296	8,301	8,628	8,869	8,879	8,898	8,913	8,915

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-10. Mobility and Congestion Variables in Columbus OH

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	9,708	10,401	10,546	10,731	11,769	12,381	12,630	13,041	13,444	13,685
Lane-kilometers	1,135	1,159	1,175	1,208	1,232	1,248	1,264	1,272	1,288	1,298
VKT/Lane-kilometer	8,553	8,972	8,973	8,887	9,556	9,923	9,994	10,253	10,438	10,546
Incident Ratio	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	25	25	25	25	25	25	25	25	25	25
Percent of Moderate Congestion	-	29.0	28.0	37.9	25.9	7.1	-	12.0	8.0	9.7
Percent of Heavy Congestion	7.7	45.2	28.0	24.1	44.4	39.3	46.4	40.0	40.0	39.7
Percent of Severe Congestion	92.3	25.8	44.0	37.9	29.6	53.6	53.6	48.0	52.0	50.6
Principal Arterial Streets										
Daily VKT (000)	3,679	3,977	4,033	4,073	4,186	4,291	4,452	4,894	5,120	5,313
Lane-kilometers	902	918	942	950	950	958	966	966	982	998
VKT/Lane-kilometer	4,080	4,333	4,282	4,288	4,407	4,479	4,608	5,067	5,213	5,323
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	35	40	40	40	45	45	45	45	45	45
Percent of Moderate Congestion	20.6	69.0	63.3	55.6	43.4	35.7	14.0	12.8	18.5	19.6
Percent of Heavy Congestion	52.9	19.1	28.6	37.0	28.3	37.5	59.6	55.3	33.3	32.1
Percent of Severe Congestion	26.5	11.9	8.2	7.4	28.3	26.8	26.3	31.9	48.1	48.2
Population (000)	835	835	835	835	835	840	840	840	850	900
Urban Area (Square Kilometers)	790	790	790	790	790	790	790	790	803	816
Registered Vehicles	-	-	-	-	725,660	734,510	743,360	752,210	744,690	750,300
Fuel Cost ($/Liter)	-	-	-	-	-	0.27	0.30	0.34	0.36	0.35
Total VKT (000)	20,057	20,742	21,033	20,978	22,247	23,029	23,857	26,512	29,597	33,269
Total Kilometers	4,589	4,585	4,867	5,038	5,041	5,052	5,102	5,141	5,146	5,142

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-11. Mobility and Congestion Variables in Corpus Christi TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	2,093	2,206	2,190	2,254	2,286	2,415	2,431	2,447	2,512	2,584
Lane-kilometers	258	266	266	266	274	290	298	298	298	299
VKT/Lane-kilometer	8,125	8,303	8,242	8,485	8,353	8,333	8,162	8,216	8,432	8,629
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	5	5	5	5	10	10	10	10	10	10
Percent of Moderate Congestion	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
Percent of Heavy Congestion	-	-	-	-	-	-	-	-	-	10.0
Percent of Severe Congestion	-	-	-	-	-	-	-	-	-	-
Principal Arterial Streets										
Daily VKT (000)	2,013	2,093	2,174	2,206	2,254	2,399	2,318	2,335	2,415	2,487
Lane-kilometers	499	507	515	515	515	515	515	515	523	564
VKT/Lane-kilometer	4,032	4,127	4,219	4,281	4,375	4,656	4,500	4,531	4,615	4,414
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	10	10	10	10	10	10	10	10	10	15
Percent of Moderate Congestion	-	16.1	-	22.2	24.2	21.3	23.5	56.4	67.4	66.2
Percent of Heavy Congestion	25.5	28.6	100.0	60.0	47.0	47.5	61.8	30.8	21.7	20.6
Percent of Severe Congestion	74.5	55.4	-	17.8	28.8	31.1	14.7	12.8	10.9	13.1
Population (000)	250	250	250	260	270	275	275	275	280	285
Urban Area (Square Kilometers)	440	440	440	440	453	453	453	453	453	466
Registered Vehicles	-	-	-	-	273,810	224,245	223,580	213,050	217,310	217,500
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	8,554	8,705	8,630	8,874	9,869	10,119	10,074	10,259	10,546	9,897
Total Kilometers	2,280	2,355	2,486	2,573	2,668	2,813	2,908	3,017	3,019	2,515

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-12. Mobility and Congestion Variables in Dallas TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	27,161	29,624	32,079	33,971	36,346	35,581	36,032	36,458	38,125	38,479
Lane-kilometers	2,496	2,544	2,608	2,640	2,657	2,673	2,697	2,721	2,753	2,761
VKT/Lane-kilometer	10,884	11,646	12,299	12,866	13,682	13,313	13,361	13,399	13,848	13,936
Incident Ratio	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	45	50	50	50	55	55	55	55	55	55
Percent of Moderate Congestion	-	26.5	33.3	39.0	13.0	34.5	29.4	31.5	22.4	21.4
Percent of Heavy Congestion	68.0	8.8	13.3	19.5	24.1	20.0	15.7	24.1	29.3	25.0
Percent of Severe Congestion	32.0	64.7	53.3	41.5	63.0	45.5	54.9	44.4	48.3	53.6
Principal Arterial Streets										
Daily VKT (000)	10,368	11,326	12,300	12,800	13,250	13,202	13,122	13,250	13,379	13,524
Lane-kilometers	2,504	2,568	2,657	2,697	2,705	2,721	2,729	2,729	2,753	2,769
VKT/Lane-kilometer	4,141	4,411	4,630	4,746	4,899	4,852	4,808	4,855	4,860	4,884
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	25	25	30	30	30	30	30	30	30	30
Percent of Moderate Congestion	33.3	17.2	46.8	51.8	51.1	34.1	43.2	29.0	46.3	42.9
Percent of Heavy Congestion	66.7	82.8	21.3	22.2	31.9	41.5	43.2	42.1	26.8	30.8
Percent of Severe Congestion	-	-	31.9	25.9	17.0	24.4	13.5	29.0	26.8	26.3
Population (000)	1,810	1,830	1,845	1,865	1,890	1,910	1,950	1,970	1,990	2,070
Urban Area (Square Kilometers)	3,548	3,587	3,600	3,626	3,652	3,678	3,717	3,724	3,730	3,756
Registered Vehicles	-	-	-	-	1,621,007	1,569,867	1,598,360	1,485,855	1,500,710	1,510,600
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	61,898	65,166	68,027	72,291	78,611	78,911	79,529	81,001	83,929	80,218
Total Kilometers	14,590	15,166	15,731	16,382	17,042	18,014	18,769	19,822	19,827	17,509

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-13. Mobility and Congestion Variables in Denver CO

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	12,719	13,266	14,071	14,571	14,957	15,376	16,889	17,275	18,145	18,394
Lane-kilometers	1,280	1,280	1,288	1,288	1,312	1,377	1,385	1,385	1,425	1,441
VKT/Lane-kilometer	9,937	10,365	10,925	11,313	11,399	11,170	12,198	12,477	12,734	12,765
Incident Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	45	45	45	45	50	50	50	50	50	55
Percent of Moderate Congestion	67.9	40.0	8.9	34.8	33.3	30.8	23.1	29.4	22.4	22.1
Percent of Heavy Congestion	28.3	42.2	60.0	32.6	29.4	36.5	42.3	37.2	26.9	32.3
Percent of Severe Congestion	3.8	17.8	31.1	32.6	37.2	32.7	34.6	33.3	50.7	45.6
Principal Arterial Streets										
Daily VKT (000)	14,748	15,134	16,269	16,857	17,195	17,066	16,816	17,066	17,549	17,388
Lane-kilometers	2,809	2,874	2,874	2,874	2,890	2,946	2,954	2,962	2,979	2,979
VKT/Lane-kilometer	5,249	5,266	5,661	5,866	5,950	5,792	5,692	5,761	5,892	5,838
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	50	50	50	50	50	50	50	50	50	50
Percent of Moderate Congestion	51.9	34.0	24.5	44.1	50.0	52.9	54.7	36.8	22.0	14.1
Percent of Heavy Congestion	5.8	24.0	12.2	22.0	19.6	23.5	24.5	28.1	28.0	29.7
Percent of Severe Congestion	42.3	42.0	63.3	33.9	30.4	23.5	20.8	35.1	50.0	56.2
Population (000)	1,350	1,350	1,450	1,485	1,500	1,510	1,550	1,565	1,580	1,580
Urban Area (Square Kilometers)	2,150	2,150	2,176	2,214	2,240	2,266	2,292	2,292	2,305	2,305
Registered Vehicles	-	-	-	-	1,249,335	1,323,705	1,359,650	1,359,650	1,386,850	1,392,000
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.32	0.32	0.37	0.36
Total VKT (000)	39,946	39,453	44,206	44,737	44,731	45,790	46,481	43,810	43,712	46,624
Total Kilometers	8,213	9,478	9,072	9,180	9,249	9,394	9,436	9,475	9,547	9,586

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-14. Mobility and Congestion Variables in Detroit MI

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	32,522	31,645	33,416	34,543	34,889	35,098	35,449	36,306	36,458	38,157
Lane-kilometers	2,383	2,383	2,399	2,496	2,544	2,592	2,640	2,721	2,737	2,866
VKT/Lane-kilometer	13,649	13,280	13,930	13,842	13,715	13,540	13,426	13,343	13,321	13,315
Incident Ratio	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	35	40	35	40	40	40	40	40	40
Percent of Moderate Congestion	42.5	33.3	32.0	30.0	31.3	33.3	23.9	24.2	25.0	21.1
Percent of Heavy Congestion	31.9	33.3	32.0	30.0	26.6	16.7	17.9	11.3	11.7	12.9
Percent of Severe Congestion	25.5	33.3	36.0	40.0	42.2	50.0	58.2	64.5	63.3	66.0
Principal Arterial Streets										
Daily VKT (000)	34,341	33,665	34,011	34,188	34,526	34,687	34,889	35,130	36,829	38,930
Lane-kilometers	5,233	5,265	5,313	5,377	5,474	5,555	5,667	5,764	5,796	5,997
VKT/Lane-kilometer	6,563	6,395	6,402	6,358	6,307	6,245	6,156	6,095	6,354	6,491
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	55	60	55	60	60	60	60	60	60
Percent of Moderate Congestion	41.2	44.4	20.0	10.0	6.5	6.2	15.1	8.2	13.8	12.9
Percent of Heavy Congestion	14.7	11.1	30.0	20.0	10.9	9.4	7.5	12.9	19.5	22.0
Percent of Severe Congestion	44.1	44.4	50.0	70.0	82.6	84.4	77.4	78.8	66.7	65.2
Population (000)	3,810	3,810	3,810	3,885	3,885	3,885	3,900	3,900	4,000	3,985
Urban Area (Square Kilometers)	2,823	2,823	2,823	3,212	3,225	3,225	3,238	3,238	3,250	3,263
Registered Vehicles	-	-	-	-	-	2,872,927	2,888,890	2,888,670	2,875,000	2,868,000
Fuel Cost ($/Liter)	-	-	-	-	-	0.28	0.30	0.33	0.36	0.35
Total VKT (000)	104,634	100,884	102,407	106,888	116,150	115,659	123,363	127,274	125,939	127,803
Total Kilometers	19,747	19,756	19,808	20,653	20,631	20,286	20,658	20,663	20,294	20,407

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-15. Mobility and Congestion Variables in El Paso TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	4,122	4,331	4,508	5,023	5,506	5,152	5,345	5,313	5,361	5,458
Lane-kilometers	523	539	555	555	555	564	564	564	564	572
VKT/Lane-kilometer	7,877	8,030	8,116	9,043	9,913	9,143	9,486	9,429	9,514	9,549
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	15	15	15	20	20	20	20	20	20	20
Percent of Moderate Congestion	100.0	100.0	100.0	100.0	25.0	36.1	34.3	45.0	50.0	52.9
Percent of Heavy Congestion	-	-	-	-	70.0	63.9	65.7	55.0	43.3	42.1
Percent of Severe Congestion	-	-	-	-	5.0	-	-	-	6.7	5.0
Principal Arterial Streets										
Daily VKT (000)	4,186	4,355	4,540	4,637	4,693	4,830	5,007	5,112	5,152	5,273
Lane-kilometers	1,224	1,256	1,288	1,288	1,296	1,296	1,296	1,336	1,344	1,352
VKT/Lane-kilometer	3,421	3,468	3,525	3,600	3,621	3,727	3,863	3,825	3,832	3,899
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	5	5	5	5	5	5	5	5	5	5
Percent of Moderate Congestion	27.0	31.6	59.3	90.0	100.0	60.7	60.0	47.8	25.0	28.6
Percent of Heavy Congestion	73.0	68.4	40.7	10.0	-	39.3	40.0	21.7	18.8	17.9
Percent of Severe Congestion	-	-	-	-	-	-	-	30.4	56.2	53.6
Population (000)	450	450	180	455	480	500	510	520	540	560
Urban Area (Square Kilometers)	389	492	1,166	479	492	518	531	531	544	544
Registered Vehicles	-	-	-	-	346,984	352,388	359,160	343,650	344,800	345,900
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	10,599	10,840	11,098	11,927	12,516	13,218	14,327	14,659	15,224	15,120
Total Kilometers	2,343	2,436	2,595	2,695	2,805	2,974	4,083	4,273	4,273	3,415

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-16. Mobility and Congestion Variables in Fort Worth TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	13,886	14,860	15,593	16,213	17,308	17,710	17,952	18,161	19,062	19,803
Lane-kilometers	1,457	1,505	1,554	1,570	1,570	1,594	1,610	1,634	1,642	1,658
VKT/Lane-kilometer	9,530	9,872	10,036	10,328	11,026	11,111	11,150	11,113	11,608	11,942
Incident Ratio	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	30	35	35	35	40	40	40	40	40	40
Percent of Moderate Congestion	-	26.5	33.3	39.0	13.0	34.5	29.4	31.5	22.4	21.4
Percent of Heavy Congestion	68.0	8.8	13.3	19.5	24.1	20.0	15.7	24.1	29.3	25.0
Percent of Severe Congestion	32.0	64.7	53.3	41.5	63.0	45.5	54.9	44.4	48.3	53.6
Principal Arterial Streets										
Daily VKT (000)	5,893	6,190	6,464	6,665	6,843	6,843	6,762	6,794	6,826	6,843
Lane-kilometers	1,264	1,288	1,328	1,352	1,369	1,385	1,393	1,393	1,401	1,417
VKT/Lane-kilometer	4,662	4,806	4,867	4,929	5,000	4,942	4,855	4,879	4,874	4,830
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	25	25	30	30	30	30	30	30	30	30
Percent of Moderate Congestion	33.3	17.2	46.8	51.8	51.1	34.1	43.2	29.0	46.3	42.9
Percent of Heavy Congestion	66.7	82.8	21.3	22.2	31.9	41.5	43.2	42.1	26.8	30.8
Percent of Severe Congestion	-	-	31.9	25.9	17.0	24.4	13.5	29.0	26.8	26.3
Population (000)	1,085	1,090	1,095	1,100	1,120	1,130	1,150	1,165	1,200	1,200
Urban Area (Square Kilometers)	2,098	2,098	2,111	2,124	2,137	2,150	2,189	2,189	2,202	2,202
Registered Vehicles	-	-	-	-	902,139	1,000,327	1,017,700	984,000	998,760	999,100
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	33,329	35,090	36,629	38,925	42,330	42,490	42,823	43,617	45,193	43,193
Total Kilometers	7,857	8,166	8,472	8,821	9,177	9,700	10,106	10,674	10,676	9,428

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-17. Mobility and Congestion Variables in Ft. Lauderdale FL

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	8,597	8,630	8,758	8,968	9,177	9,982	10,385	10,996	11,439	11,479
Lane-kilometers	837	845	853	869	894	902	934	950	966	966
VKT/Lane-kilometer	10,269	10,210	10,264	10,315	10,270	11,071	11,121	11,576	11,842	11,883
Incident Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	20	20	25	25	25	25	25	25
Percent of Moderate Congestion	45.2	50.8	50.0	37.7	60.0	60.0	60.0	60.0	60.0	56.7
Percent of Heavy Congestion	19.4	49.2	-	26.4	40.0	20.0	20.0	28.0	32.0	33.3
Percent of Severe Congestion	35.5	-	50.0	35.8	-	20.0	20.0	12.0	8.0	10.0
Principal Arterial Streets										
Daily VKT (000)	8,630	8,533	8,388	8,372	8,340	8,855	8,919	9,024	9,338	9,660
Lane-kilometers	1,642	1,674	1,691	1,707	1,715	1,723	1,755	1,771	1,795	1,811
VKT/Lane-kilometer	5,255	5,096	4,962	4,906	4,864	5,140	5,083	5,095	5,202	5,333
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	65	65	70	70	70	70	70	70	70	70
Percent of Moderate Congestion	60.5	55.6	36.5	24.4	11.5	12.4	10.1	20.0	14.3	18.8
Percent of Heavy Congestion	-	33.3	31.8	43.6	28.2	34.6	40.6	35.7	38.6	34.3
Percent of Severe Congestion	39.5	11.1	31.8	32.0	60.3	53.1	49.3	44.3	47.1	46.9
Population (000)	1,065	1,090	1,105	1,135	1,165	1,170	1,205	1,255	1,270	1,275
Urban Area (Square Kilometers)	881	1,010	1,036	1,036	1,036	1,062	1,088	1,114	1,114	1,114
Registered Vehicles	-	-	-	-	951,840	955,100	982,040	1,023,670	1,025,000	1,030,000
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.34	0.36	0.35
Total VKT (000)	30,010	30,229	30,976	32,250	32,762	35,634	39,199	38,273	39,121	40,902
Total Kilometers	5,284	5,379	5,505	5,501	5,542	6,055	6,773	6,783	6,775	6,775

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-18. Mobility and Congestion Variables in Hartford CT

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	6,955	7,760	8,589	8,605	8,919	9,443	9,757	9,950	10,022	10,046
Lane-kilometers	725	805	829	837	861	886	886	934	934	934
VKT/Lane-kilometer	9,600	9,640	10,359	10,279	10,355	10,664	11,018	10,655	10,733	10,759
Incident Ratio	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	10	10	10	10	10	10	15	15	15	15
Percent of Moderate Congestion	100.0	100.0	100.0	80.8	48.1	50.0	43.7	28.6	75.0	78.8
Percent of Heavy Congestion	-	-	-	-	33.3	32.1	25.0	35.7	18.8	15.3
Percent of Severe Congestion	-	-	-	19.2	18.5	17.9	31.3	35.7	6.2	5.9
Principal Arterial Streets										
Daily VKT (000)	3,784	4,532	5,023	5,184	5,176	5,160	5,667	5,860	6,038	6,118
Lane-kilometers	869	894	902	918	942	942	942	998	1,022	1,047
VKT/Lane-kilometer	4,352	5,072	5,571	5,649	5,496	5,479	6,017	5,871	5,906	5,846
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	20	25	25	25	25	30	30	35	35	35
Percent of Moderate Congestion	35.6	43.7	25.0	23.5	13.7	29.4	29.6	26.8	34.9	40.9
Percent of Heavy Congestion	48.9	41.7	41.7	41.2	51.0	45.1	42.6	44.6	34.9	31.8
Percent of Severe Congestion	15.6	14.6	33.3	35.3	35.3	25.5	27.8	28.6	30.2	27.3
Population (000)	565	570	575	575	585	590	600	605	610	610
Urban Area (Square Kilometers)	907	919	919	919	919	932	932	932	932	932
Registered Vehicles	450,000	460,000	470,000	480,000	500,000	510,000	510,000	520,000	524,250	525,300
Fuel Cost ($/Liter)	-	-	-	-	-	0.29	0.32	0.36	0.38	0.37
Total VKT (000)	15,305	17,630	18,380	18,378	19,930	22,843	21,841	21,883	22,376	22,571
Total Kilometers	3,006	3,716	3,742	3,755	3,774	3,780	3,806	3,838	3,856	3,875

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-19. Mobility and Congestion Variables in Honolulu HI

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	5,957	6,029	6,223	6,424	6,770	6,979	7,100	7,285	7,438	7,567
Lane-kilometers	523	523	531	531	531	531	531	547	547	547
VKT/Lane-kilometer	11,385	11,523	11,712	12,091	12,742	13,136	13,364	13,309	13,588	13,824
Incident Ratio	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	40	45	45	45	45	50	50	50	50
Percent of Moderate Congestion	9.7	3.6	6.9	17.1	24.4	31.1	20.5	20.8	22.6	19.1
Percent of Heavy Congestion	32.3	25.0	20.7	2.9	13.3	8.9	22.7	20.8	26.4	26.4
Percent of Severe Congestion	58.1	71.4	72.4	80.0	62.2	60.0	56.8	58.3	50.9	54.5
Principal Arterial Streets										
Daily VKT (000)	1,996	2,093	2,125	2,004	2,318	2,343	2,455	2,504	2,529	2,608
Lane-kilometers	290	290	290	298	298	306	306	314	322	322
VKT/Lane-kilometer	6,889	7,222	7,333	6,730	7,784	7,658	8,026	7,974	7,855	8,100
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	65	65	65	70	70	70	70	70	70	75
Percent of Moderate Congestion	28.2	30.6	17.1	31.4	32.9	51.4	45.1	40.6	40.5	37.1
Percent of Heavy Congestion	29.6	25.0	18.4	24.3	23.3	21.4	18.3	17.4	16.7	14.5
Percent of Severe Congestion	42.2	44.4	64.5	44.3	43.8	27.1	36.6	42.0	42.9	48.3
Population (000)	570	580	585	585	595	610	655	660	660	665
Urban Area (Square Kilometers)	298	298	311	311	337	337	350	350	350	350
Registered Vehicles	-	-	-	-	489,920	491,960	495,790	497,850	507,800	509,100
Fuel Cost ($/Liter)	-	-	-	-	0.29	0.31	0.34	0.37	0.44	0.43
Total VKT (000)	14,092	14,606	14,421	14,936	16,379	17,023	17,348	18,087	17,658	17,634
Total Kilometers	1,235	1,270	1,438	1,319	1,354	1,370	1,381	1,396	1,407	1,389

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-20. Mobility and Congestion Variables in Houston TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	33,939	36,314	39,252	38,825	38,825	41,538	43,631	44,500	45,450	47,495
Lane-kilometers	2,214	2,270	2,383	2,383	2,431	2,640	2,882	2,995	3,091	3,244
VKT/Lane-kilometer	15,331	15,996	16,473	16,294	15,970	15,732	15,140	14,860	14,703	14,640
Incident Ratio	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	65	65	70	70	75	70	70	70	70	70
Percent of Moderate Congestion	3.0	20.3	16.9	18.1	11.1	17.8	15.7	9.7	8.6	11.1
Percent of Heavy Congestion	13.6	15.6	16.9	12.5	19.8	12.3	15.7	27.8	30.0	27.6
Percent of Severe Congestion	83.3	64.1	66.2	69.4	69.1	69.9	68.6	62.5	61.4	61.3
Principal Arterial Streets										
Daily VKT (000)	15,657	16,664	17,485	17,469	17,404	16,905	16,406	16,744	17,436	17,549
Lane-kilometers	2,874	2,970	3,091	3,107	3,148	3,172	3,188	3,236	3,429	3,502
VKT/Lane-kilometer	5,448	5,610	5,656	5,622	5,529	5,330	5,146	5,174	5,085	5,011
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	50	50	55	55	55	50	50	50	50	50
Percent of Moderate Congestion	35.6	24.2	20.3	17.1	21.8	24.0	14.3	18.0	21.5	20.8
Percent of Heavy Congestion	6.8	-	-	9.2	14.6	16.0	55.4	45.9	44.6	41.5
Percent of Severe Congestion	57.6	75.8	79.7	73.7	63.6	60.0	30.4	36.1	33.8	37.7
Population (000)	2,410	2,410	2,410	2,415	2,790	2,820	2,850	2,865	2,880	2,900
Urban Area (Square Kilometers)	3,393	4,015	4,015	4,092	4,144	4,170	4,222	4,235	4,248	4,248
Registered Vehicles	-	-	-	-	1,901,164	2,220,527	2,244,090	2,176,370	2,219,890	2,242,000
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	87,077	90,319	92,245	92,741	99,269	103,238	111,370	116,934	115,297	117,667
Total Kilometers	16,203	17,353	18,233	18,829	21,386	23,226	26,444	27,354	27,372	27,451

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-21. Mobility and Congestion Variables in Indianapolis IN

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	9,225	8,469	9,805	10,111	11,125	12,300	12,469	12,703	12,961	13,122
Lane-kilometers	1,079	1,087	1,095	1,111	1,111	1,143	1,159	1,159	1,224	1,232
VKT/Lane-kilometer	8,552	7,793	8,956	9,101	10,014	10,761	10,757	10,958	10,592	10,654
Incident Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	5	5	5	5	5	5	10	10	10	10
Percent of Moderate Congestion	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.9	81.8
Percent of Heavy Congestion	-	-	-	-	-	-	-	-	-	-
Percent of Severe Congestion	-	-	-	-	-	-	-	-	23.1	18.2
Principal Arterial Streets										
Daily VKT (000)	6,070	5,989	6,537	6,601	6,360	6,601	6,343	6,166	6,392	6,376
Lane-kilometers	1,328	1,336	1,344	1,344	1,352	1,360	1,369	1,369	1,417	1,417
VKT/Lane-kilometer	4,570	4,482	4,862	4,910	4,702	4,852	4,635	4,506	4,511	4,500
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	15	15	15	15	15	15	20	20	20	20
Percent of Moderate Congestion	26.1	37.8	-	20.0	40.0	45.0	60.0	63.6	65.8	68.7
Percent of Heavy Congestion	58.7	37.8	32.6	30.0	20.0	25.0	16.7	15.2	5.3	7.4
Percent of Severe Congestion	15.2	24.3	67.4	50.0	40.0	30.0	23.3	21.2	29.0	23.9
Population (000)	860	860	860	865	895	925	930	930	945	950
Urban Area (Square Kilometers)	1,088	1,088	1,088	1,088	1,101	1,114	1,127	1,127	1,140	1,140
Registered Vehicles	-	-	-	-	485,471	544,299	561,770	581,180	582,230	583,000
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.28	0.30	0.33	0.35	0.34
Total VKT (000)	24,231	23,356	25,470	25,061	23,149	29,621	29,862	31,110	33,929	33,533
Total Kilometers	6,227	6,252	6,007	5,849	5,870	5,997	6,078	6,112	6,129	6,166

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-22. Mobility and Congestion Variables in Jacksonville FL

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	5,394	6,488	7,173	7,326	7,519	7,680	8,292	8,372	8,662	8,807
Lane-kilometers	547	580	588	596	628	644	676	708	725	725
VKT/Lane-kilometer	9,853	11,194	12,205	12,297	11,974	11,925	12,262	11,818	11,956	12,156
Incident Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	25	25	25	30	30	30	30	35	35	35
Percent of Moderate Congestion	100.0	-	75.0	72.7	92.9	68.7	94.1	76.5	77.4	71.3
Percent of Heavy Congestion	-	100.0	25.0	-	7.1	25.0	5.9	23.5	22.6	26.3
Percent of Severe Congestion	-	-	-	27.3	-	6.2	-	-	-	2.3
Principal Arterial Streets										
Daily VKT (000)	8,243	8,887	9,515	9,459	9,129	8,968	9,072	9,249	9,346	9,499
Lane-kilometers	1,650	1,739	1,771	1,795	1,811	1,835	1,868	1,916	1,932	1,948
VKT/Lane-kilometer	4,995	5,111	5,373	5,269	5,040	4,886	4,858	4,828	4,838	4,876
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	35	35	40	40	40	45	45	50	50	50
Percent of Moderate Congestion	19.2	26.7	27.7	29.7	45.6	23.8	24.4	29.2	21.6	32.3
Percent of Heavy Congestion	19.2	44.4	19.1	24.3	19.6	35.7	44.4	33.3	29.7	26.5
Percent of Severe Congestion	61.5	28.9	53.2	46.0	34.8	40.5	31.1	37.5	48.6	41.2
Population (000)	615	620	630	645	650	660	690	715	720	750
Urban Area (Square Kilometers)	1,347	1,347	1,373	1,373	1,386	1,386	1,386	1,399	1,399	1,399
Registered Vehicles	-	-	-	-	537,140	575,510	586,120	594,290	598,350	605,000
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.34	0.36	0.35
Total VKT (000)	22,197	25,765	25,974	26,431	26,229	25,961	26,641	28,721	28,634	29,215
Total Kilometers	4,323	5,802	5,815	5,843	5,828	5,596	5,804	5,971	5,901	5,901

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-23. Mobility and Congestion Variables in Kansas City MO

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	14,329	14,466	15,102	16,406	17,557	19,191	19,674	19,916	20,214	20,149
Lane-kilometers	1,827	1,868	2,013	2,029	2,037	2,141	2,165	2,182	2,190	2,190
VKT/Lane-kilometer	7,841	7,746	7,504	8,087	8,621	8,962	9,086	9,129	9,232	9,202
Incident Ratio	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	5	5	5	5	5	5	5	5	5	5
Percent of Moderate Congestion	100.0	-	11.1	38.5	57.1	76.2	30.8	50.0	55.6	56.0
Percent of Heavy Congestion	-	100.0	33.3	23.1	4.8	4.8	23.1	11.1	44.4	32.0
Percent of Severe Congestion	-	-	55.6	38.5	38.1	19.1	46.1	38.9	-	12.0
Principal Arterial Streets										
Daily VKT (000)	6,126	6,207	6,295	6,843	7,060	7,004	7,229	7,036	7,744	7,792
Lane-kilometers	1,634	1,634	1,642	1,658	1,666	1,674	1,682	1,682	1,707	1,691
VKT/Lane-kilometer	3,749	3,798	3,833	4,126	4,237	4,183	4,297	4,182	4,538	4,610
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	20	20	20	20	20	20	25	25	25	25
Percent of Moderate Congestion	42.1	53.5	53.3	54.5	36.4	29.8	32.3	30.8	16.9	17.2
Percent of Heavy Congestion	24.6	6.9	6.7	14.6	34.5	21.1	33.8	35.4	13.3	19.2
Percent of Severe Congestion	33.3	39.7	40.0	30.9	29.1	49.1	33.8	33.8	69.9	63.6
Population (000)	1,100	1,100	1,100	1,130	1,135	1,140	1,145	1,155	1,160	1,160
Urban Area (Square Kilometers)	1,580	1,580	1,580	1,476	1,502	1,528	1,554	1,580	1,580	1,580
Registered Vehicles	-	-	-	-	621,987	644,685	675,140	681,730	749,900	750,200
Fuel Cost ($/Liter)	-	-	-	-	0.23	0.26	0.28	0.32	0.32	0.31
Total VKT (000)	32,211	32,916	33,559	36,297	37,729	39,361	40,688	40,609	44,223	45,028
Total Kilometers	9,605	9,428	9,552	11,096	11,103	11,360	11,391	11,201	9,993	9,971

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-24. Mobility and Congestion Variables in Los Angeles CA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	121,539	127,737	134,250	141,100	148,297	155,993	164,445	171,755	177,655	177,551
Lane-kilometers	7,326	7,454	7,535	7,648	7,728	7,857	7,986	8,243	8,420	8,412
VKT/Lane-kilometer	16,591	17,136	17,817	18,451	19,190	19,855	20,593	20,836	21,098	21,106
Incident Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	75	80	80	80	85	85	75	75	75	75
Percent of Moderate Congestion	22.8	20.0	20.0	17.9	6.9	5.6	5.5	5.4	5.4	6.5
Percent of Heavy Congestion	25.3	18.8	20.0	21.4	14.9	13.3	5.5	4.3	4.3	4.3
Percent of Severe Congestion	51.9	61.2	60.0	60.7	78.2	81.1	89.0	90.3	90.3	89.2
Principal Arterial Streets										
Daily VKT (000)	92,003	96,930	102,122	107,596	113,360	118,834	125,966	128,486	129,396	131,553
Lane-kilometers	17,646	17,871	18,113	18,354	18,692	18,966	19,320	19,610	19,972	19,964
VKT/Lane-kilometer	5,214	5,424	5,638	5,862	6,065	6,266	6,520	6,552	6,479	6,590
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	35	35	40	45	50	50	50	50	50	50
Percent of Moderate Congestion	23.9	34.6	27.9	17.2	18.3	26.0	22.2	18.5	22.0	19.8
Percent of Heavy Congestion	63.0	17.3	11.5	23.4	18.3	24.7	19.8	27.2	34.1	28.5
Percent of Severe Congestion	13.0	48.1	60.7	59.4	63.4	49.3	58.0	54.3	43.9	51.8
Population (000)	9,900	9,900	9,900	10,500	10,710	10,920	11,140	11,305	11,420	11,760
Urban Area (Square Kilometers)	4,740	4,740	4,740	5,180	5,310	5,439	5,569	5,620	5,659	5,659
Registered Vehicles	-	-	-	-	7,664,286	7,652,769	7,790,210	7,813,240	7,790,300	7,810,800
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.35	0.38	0.36
Total VKT (000)	266,286	284,059	296,134	315,906	326,577	353,566	377,407	394,392	403,584	397,912
Total Kilometers	36,792	37,555	37,566	38,168	38,371	38,745	39,548	40,099	40,368	40,553

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-25. Mobility and Congestion Variables in Louisville KY

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	6,303	7,140	7,406	7,165	7,704	8,662	9,724	9,885	9,974	10,063
Lane-kilometers	660	725	757	773	805	821	910	942	950	950
VKT/Lane-kilometer	9,549	9,856	9,787	9,271	9,570	10,549	10,690	10,496	10,500	10,593
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	5	5	5	5	5	5	5	5	5	5
Percent of Moderate Congestion	53.8	12.5	-	7.7	35.1	51.1	47.2	43.3	56.8	56.8
Percent of Heavy Congestion	34.6	41.7	54.5	15.4	10.8	-	2.8	-	2.7	1.6
Percent of Severe Congestion	11.5	45.8	45.5	76.9	54.0	48.9	50.0	56.7	40.5	40.5
Principal Arterial Streets										
Daily VKT (000)	4,709	4,379	4,258	4,436	4,403	4,790	4,605	4,653	4,741	5,023
Lane-kilometers	789	797	797	805	805	813	821	821	837	837
VKT/Lane-kilometer	5,969	5,495	5,343	5,510	5,470	5,891	5,608	5,667	5,663	6,000
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	55	50	50	50	50	55	55	55	55	55
Percent of Moderate Congestion	27.6	20.8	45.1	13.0	14.6	14.8	30.4	33.3	25.8	20.6
Percent of Heavy Congestion	63.8	69.8	49.0	77.8	60.0	55.7	51.8	47.4	53.2	55.3
Percent of Severe Congestion	8.6	9.4	5.9	9.3	25.5	29.5	17.9	19.3	21.0	24.1
Population (000)	770	780	780	785	785	790	805	805	810	810
Urban Area (Square Kilometers)	932	932	932	932	945	958	971	971	984	984
Registered Vehicles	-	-	-	-	443,940	450,000	457,390	460,230	461,150	463,050
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.27	0.29	0.33	0.35	0.34
Total VKT (000)	20,772	22,947	23,604	24,863	25,544	27,283	28,086	27,845	28,455	29,970
Total Kilometers	3,991	4,131	4,254	4,250	4,283	4,262	4,313	4,320	4,324	4,323

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-26. Mobility and Congestion Variables in Memphis TN

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	4,911	4,830	4,854	4,911	5,007	6,005	6,360	6,851	6,987	7,084
Lane-kilometers	483	523	547	588	588	612	612	612	628	628
VKT/Lane-kilometer	10,167	9,231	8,868	8,356	8,521	9,816	10,395	11,197	11,128	11,282
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	10	10	10	10	10	10	10	10	10	15
Percent of Moderate Congestion	23.1	100.0	64.7	80.0	100.0	100.0	100.0	100.0	87.0	88.9
Percent of Heavy Congestion	76.9	-	35.3	20.0	-	-	-	-	13.0	11.1
Percent of Severe Congestion	-	-	-	-	-	-	-	-	-	-
Principal Arterial Streets										
Daily VKT (000)	5,635	5,474	5,337	5,667	6,054	6,327	6,521	6,633	6,818	6,762
Lane-kilometers	1,079	1,095	1,111	1,159	1,183	1,216	1,296	1,296	1,304	1,296
VKT/Lane-kilometer	5,224	5,000	4,804	4,889	5,116	5,205	5,031	5,118	5,228	5,217
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	30	30	30	30	35	35	35	35	35	35
Percent of Moderate Congestion	47.1	85.7	100.0	46.0	62.5	52.0	40.0	28.8	21.7	29.0
Percent of Heavy Congestion	41.2	-	-	29.7	16.1	22.0	24.0	39.0	43.3	38.7
Percent of Severe Congestion	11.8	14.3	-	24.3	21.4	26.0	36.0	32.2	35.0	32.3
Population (000)	810	770	770	775	800	815	830	850	860	865
Urban Area (Square Kilometers)	907	78	78	932	984	1,036	1,088	1,088	1,101	1,088
Registered Vehicles	-	-	-	-	470,784	596,797	605,840	620,440	626,650	628,700
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.27	0.30	0.33	0.36	0.35
Total VKT (000)	18,657	20,175	17,559	20,540	21,213	23,108	24,097	25,135	25,971	26,127
Total Kilometers	3,114	3,450	3,476	4,977	4,877	4,957	4,964	4,988	5,002	5,009

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-27. Mobility and Congestion Variables in Miami FL

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	9,580	10,087	10,417	11,447	11,230	11,946	12,695	13,444	13,798	14,136
Lane-kilometers	829	829	845	869	869	894	926	934	974	990
VKT/Lane-kilometer	11,553	12,165	12,324	13,167	12,917	13,369	13,713	14,397	14,165	14,276
Incident Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	45	45	50	50	50	60	60	60	60
Percent of Moderate Congestion	14.8	42.9	40.0	55.3	42.0	42.9	23.3	19.1	30.8	33.5
Percent of Heavy Congestion	63.0	26.2	27.5	10.6	22.0	26.2	26.7	25.5	14.1	16.5
Percent of Severe Congestion	22.2	31.0	32.5	34.0	36.0	31.0	50.0	55.3	55.1	49.9
Principal Arterial Streets										
Daily VKT (000)	19,111	19,803	19,320	20,447	19,803	20,930	22,121	23,836	25,446	25,760
Lane-kilometers	3,019	3,059	3,099	3,156	3,180	3,220	3,252	3,276	3,341	3,349
VKT/Lane-kilometer	6,331	6,474	6,234	6,480	6,228	6,500	6,802	7,275	7,617	7,692
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	60	60	70	70	70	70	70	70	70
Percent of Moderate Congestion	2.5	14.1	24.7	16.3	17.8	16.1	1.1	2.2	3.3	3.8
Percent of Heavy Congestion	16.5	37.2	6.8	4.3	31.1	5.4	25.8	12.0	10.9	13.9
Percent of Severe Congestion	81.0	48.7	68.5	79.3	51.1	78.5	73.1	85.9	85.9	82.3
Population (000)	1,730	1,720	1,750	1,775	1,780	1,785	1,810	1,840	1,850	1,880
Urban Area (Square Kilometers)	1,062	1,062	1,140	1,140	1,166	1,191	1,217	1,230	1,243	1,256
Registered Vehicles	-	-	-	-	1,431,385	1,336,087	1,350,750	1,411,820	1,425,930	1,431,400
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.34	0.36	0.35
Total VKT (000)	39,120	38,423	38,648	41,240	40,739	42,209	53,996	56,471	53,977	54,418
Total Kilometers	4,907	4,920	4,965	4,965	5,022	5,047	9,027	9,027	9,019	9,030

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-28. Mobility and Congestion Variables in Milwaukee WI

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	9,016	9,338	9,467	9,765	10,167	10,980	11,487	12,099	12,381	12,574
Lane-kilometers	869	869	877	886	886	886	942	950	958	966
VKT/Lane-kilometer	10,370	10,741	10,789	11,027	11,482	12,400	12,197	12,737	12,924	13,017
Incident Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	25	25	25	30	30	30	30	30
Percent of Moderate Congestion	71.4	83.3	70.8	29.4	25.8	23.8	20.5	32.1	27.8	28.6
Percent of Heavy Congestion	28.6	16.7	29.2	70.6	67.7	47.6	36.4	30.4	33.3	35.7
Percent of Severe Congestion	-	-	-	-	6.5	28.6	43.2	37.5	38.9	35.7
Principal Arterial Streets										
Daily VKT (000)	6,907	6,891	7,495	7,760	7,567	7,470	7,607	7,511	7,696	7,937
Lane-kilometers	1,497	1,513	1,513	1,546	1,562	1,578	1,594	1,610	1,618	1,626
VKT/Lane-kilometer	4,613	4,553	4,952	5,021	4,845	4,735	4,773	4,665	4,756	4,881
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	30	30	35	35	35	35	35	35	35	35
Percent of Moderate Congestion	18.8	17.0	36.8	8.6	3.4	25.4	33.9	34.5	34.0	31.5
Percent of Heavy Congestion	59.4	70.2	52.6	69.0	67.8	54.0	44.6	41.8	26.4	25.9
Percent of Severe Congestion	21.9	12.8	10.5	22.4	28.8	20.6	21.4	23.6	39.6	42.6
Population (000)	1,210	1,210	1,210	1,210	1,215	1,220	1,225	1,225	1,230	1,225
Urban Area (Square Kilometers)	1,425	1,425	1,425	1,425	1,425	1,425	1,425	1,425	1,425	1,425
Registered Vehicles	-	-	-	-	806,687	521,262	521,550	533,670	539,000	539,300
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.27	0.30	0.33	0.36	0.35
Total VKT (000)	33,081	33,757	37,531	39,107	41,129	42,504	44,772	45,212	46,141	47,413
Total Kilometers	7,454	7,461	7,490	7,515	7,559	7,620	7,668	7,718	7,709	7,794

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-29. Mobility and Congestion Variables in Minn-St. Paul MN

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	18,032	19,586	20,930	22,033	23,442	25,148	26,436	27,145	28,642	29,318
Lane-kilometers	1,900	1,900	1,980	2,045	2,077	2,238	2,310	2,335	2,383	2,407
VKT/Lane-kilometer	9,492	10,309	10,569	10,776	11,287	11,237	11,443	11,628	12,020	12,181
Incident Ratio	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	20	20	25	30	30	30	30	30
Percent of Moderate Congestion	63.6	50.0	53.3	31.3	38.9	16.7	22.2	22.2	24.1	27.1
Percent of Heavy Congestion	36.4	41.7	26.7	31.3	38.9	25.0	25.9	25.9	20.7	21.4
Percent of Severe Congestion	-	8.3	20.0	37.5	22.2	58.3	51.8	51.8	55.2	51.4
Principal Arterial Streets										
Daily VKT (000)	6,923	7,165	7,487	7,873	8,211	8,372	8,533	8,678	9,080	9,209
Lane-kilometers	1,787	1,803	1,819	1,835	1,852	1,868	1,884	1,908	1,932	1,948
VKT/Lane-kilometer	3,874	3,973	4,115	4,289	4,435	4,483	4,530	4,549	4,700	4,727
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	50	50	55	55	50	55	55	55	55	55
Percent of Moderate Congestion	23.2	12.7	16.0	24.4	21.7	26.9	25.0	30.0	25.3	20.0
Percent of Heavy Congestion	36.2	53.5	30.7	30.2	13.0	11.5	14.3	10.0	7.6	11.3
Percent of Severe Congestion	40.6	33.8	53.3	45.3	65.2	61.5	60.7	60.0	67.1	68.7
Population (000)	1,750	1,750	1,750	1,800	1,845	1,885	1,925	1,970	2,010	2,060
Urban Area (Square Kilometers)	2,072	2,072	2,072	2,409	2,486	2,577	2,629	2,629	2,642	2,642
Registered Vehicles	-	-	-	-	1,142,655	1,574,410	1,604,170	1,631,810	1,662,000	1,698,000
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.29	0.31	0.34	0.36	0.35
Total VKT (000)	48,150	51,451	53,919	57,274	61,476	64,382	66,696	66,445	69,528	70,727
Total Kilometers	13,613	13,588	13,526	13,753	14,300	14,395	14,252	14,368	14,411	14,952

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-30. Mobility and Congestion Variables in Nashville TN

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	5,233	5,313	5,868	6,303	6,843	7,245	7,712	7,905	8,050	8,388
Lane-kilometers	564	564	604	684	684	692	708	773	789	813
VKT/Lane-kilometer	9,286	9,429	9,720	9,212	10,000	10,465	10,886	10,229	10,204	10,317
Incident Ratio	-	-	-	-	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	20	15	15	20	25	25	25	25
Percent of Moderate Congestion	26.3	55.6	50.0	50.0	61.5	75.0	37.5	58.3	70.0	70.4
Percent of Heavy Congestion	57.9	11.1	-	50.0	38.5	16.7	40.6	29.2	20.0	22.2
Percent of Severe Congestion	15.8	33.3	50.0	-	-	8.3	21.9	12.5	10.0	7.4
Principal Arterial Streets										
Daily VKT (000)	5,233	5,466	6,915	7,382	7,736	7,913	8,670	8,694	8,758	8,791
Lane-kilometers	1,272	1,304	1,369	1,417	1,449	1,457	1,473	1,505	1,513	1,530
VKT/Lane-kilometer	4,114	4,191	5,053	5,210	5,339	5,431	5,885	5,775	5,787	5,747
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	40	40	40	40	40	40	40	40	40	40
Percent of Moderate Congestion	17.2	13.6	12.1	20.5	8.1	18.0	10.8	13.6	10.0	13.1
Percent of Heavy Congestion	65.5	47.7	29.7	32.5	26.4	15.7	16.1	11.4	22.2	24.1
Percent of Severe Congestion	17.2	38.6	58.2	47.0	65.5	66.3	73.1	75.0	67.8	62.8
Population (000)	560	520	520	485	500	520	540	550	565	575
Urban Area (Square Kilometers)	855	855	855	1,140	1,178	1,217	1,256	1,282	1,295	1,295
Registered Vehicles	-	-	-	-	353,718	479,085	495,410	504,590	512,160	514,700
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.27	0.30	0.33	0.36	0.35
Total VKT (000)	16,852	16,504	16,527	17,594	21,031	22,361	24,237	24,702	25,127	24,799
Total Kilometers	2,822	2,824	2,835	2,776	4,229	4,236	4,408	4,437	4,466	4,543

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-31. Mobility and Congestion Variables in New Orleans LA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	6,279	6,440	6,682	6,891	6,963	7,487	7,664	7,825	8,002	8,114
Lane-kilometers	523	531	531	531	531	531	547	564	580	588
VKT/Lane-kilometer	12,000	12,121	12,576	12,970	13,106	14,091	14,000	13,886	13,806	13,808
Incident Ratio	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	40	45	45	50	50	50	50	50	50
Percent of Moderate Congestion	91.8	83.0	15.9	20.0	23.6	48.6	36.0	7.7	7.8	6.8
Percent of Heavy Congestion	-	9.4	31.8	30.0	30.6	7.1	13.3	40.0	59.4	57.4
Percent of Severe Congestion	8.2	7.5	52.4	50.0	45.8	44.3	50.7	52.3	32.8	32.7
Principal Arterial Streets										
Daily VKT (000)	5,313	5,514	5,812	6,295	6,504	6,529	6,537	6,545	6,601	6,657
Lane-kilometers	910	910	902	918	934	998	998	998	1,006	1,006
VKT/Lane-kilometer	5,841	6,062	6,446	6,860	6,966	6,540	6,548	6,556	6,560	6,616
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	45	45	50	50	50	50	50	50	50	50
Percent of Moderate Congestion	28.8	42.2	23.6	20.0	10.6	17.0	9.8	29.8	23.2	19.9
Percent of Heavy Congestion	11.9	6.2	12.7	10.0	8.5	4.3	4.9	5.3	20.3	23.4
Percent of Severe Congestion	59.3	51.6	63.6	70.0	80.8	78.7	85.4	64.9	56.5	56.8
Population (000)	1,080	1,080	1,075	1,070	1,070	1,060	1,055	1,050	1,080	1,095
Urban Area (Square Kilometers)	881	881	894	894	907	907	932	932	932	932
Registered Vehicles	-	-	-	-	817,320	825,200	829,920	848,820	874,280	881,000
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.31	0.32	0.37	0.36
Total VKT (000)	18,901	20,811	22,110	22,625	20,395	20,413	27,512	24,429	26,924	24,754
Total Kilometers	4,745	4,772	4,772	4,825	4,809	4,807	4,803	4,799	4,801	4,801

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-32. Mobility and Congestion Variables in New York NY

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	101,704	103,434	105,157	106,349	115,268	118,520	125,588	130,273	133,501	133,646
Lane-kilometers	8,436	8,557	9,064	9,080	9,097	9,322	9,354	9,443	9,499	9,531
VKT/Lane-kilometer	12,055	12,087	11,601	11,712	12,672	12,714	13,426	13,796	14,054	14,022
Incident Ratio	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	55	55	55	55	55	55	55	60	60	60
Percent of Moderate Congestion	51.7	36.4	57.7	35.5	40.5	37.5	40.0	42.6	47.2	45.9
Percent of Heavy Congestion	17.2	36.4	15.4	38.7	40.5	32.5	26.7	13.0	17.0	21.8
Percent of Severe Congestion	31.0	27.3	26.9	25.8	18.9	30.0	33.3	44.4	35.8	32.3
Principal Arterial Streets										
Daily VKT (000)	71,379	74,141	74,688	75,187	76,403	78,069	80,033	81,836	83,809	85,362
Lane-kilometers	10,787	10,948	10,948	10,948	10,980	11,109	11,447	11,834	12,172	12,268
VKT/Lane-kilometer	6,617	6,772	6,822	6,868	6,958	7,028	6,992	6,916	6,886	6,958
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	75	75	75	75	75	75	80	80	80	80
Percent of Moderate Congestion	29.6	25.0	33.3	27.5	29.4	21.8	16.1	19.3	18.0	18.9
Percent of Heavy Congestion	38.0	36.1	43.6	25.0	11.8	16.7	19.5	13.6	21.4	18.9
Percent of Severe Congestion	32.4	38.9	23.1	47.5	58.8	61.5	64.4	67.0	60.7	62.2
Population (000)	16,660	16,660	15,340	15,340	15,340	16,000	16,320	16,420	16,780	16,830
Urban Area (Square Kilometers)	8,236	8,159	8,184	8,184	8,184	8,184	8,249	8,223	8,249	8,252
Registered Vehicles	-	-	-	-	-	5,727,055	5,849,460	5,920,380	6,009,180	6,065,000
Fuel Cost ($/Liter)	-	-	-	-	-	0.26	0.29	0.33	0.38	0.36
Total VKT (000)	295,997	302,656	310,551	311,966	330,073	338,494	356,507	363,076	362,266	362,609
Total Kilometers	56,207	56,517	56,252	53,808	56,442	56,463	56,529	56,640	56,794	56,899

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-33. Mobility and Congestion Variables in Norfolk VA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	6,231	6,271	6,722	7,197	7,978	8,316	8,420	8,589	8,775	8,960
Lane-kilometers	660	676	692	708	716	725	733	741	749	757
VKT/Lane-kilometer	9,439	9,274	9,709	10,159	11,135	11,478	11,495	11,598	11,720	11,840
Incident Ratio	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	40	40	40	45	45	45	45	45	45
Percent of Moderate Congestion	90.7	90.9	29.1	13.3	36.4	17.3	7.8	7.7	7.7	8.0
Percent of Heavy Congestion	7.0	6.8	69.1	85.0	19.7	30.8	39.2	36.5	36.5	39.1
Percent of Severe Congestion	2.3	2.3	1.8	1.7	43.9	51.9	52.9	55.8	55.8	52.9
Principal Arterial Streets										
Daily VKT (000)	5,265	5,160	5,152	5,651	5,844	6,207	6,376	6,569	6,851	7,132
Lane-kilometers	1,071	1,079	1,087	1,087	1,119	1,127	1,143	1,167	1,183	1,208
VKT/Lane-kilometer	4,917	4,784	4,741	5,200	5,223	5,507	5,577	5,628	5,789	5,907
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	30	30	30	30	30	35	35	35	35	35
Percent of Moderate Congestion	-	-	-	22.2	10.8	16.7	26.0	31.8	28.6	28.0
Percent of Heavy Congestion	29.4	27.8	29.4	7.4	13.5	23.8	28.0	13.6	24.5	25.0
Percent of Severe Congestion	70.6	72.2	70.6	70.4	75.7	59.5	46.0	54.5	46.9	47.0
Population (000)	770	780	790	800	840	870	895	920	925	950
Urban Area (Square Kilometers)	2,059	2,059	2,072	2,072	2,085	2,085	2,098	2,098	2,111	2,111
Registered Vehicles	-	-	-	-	743,360	769,910	791,150	815,930	824,080	830,000
Fuel Cost ($/Liter)	-	-	-	-	-	0.27	0.30	0.32	0.36	0.35
Total VKT (000)	20,344	20,334	21,626	25,515	26,873	28,586	29,316	32,232	32,640	33,124
Total Kilometers	4,722	4,807	5,022	5,152	5,252	5,340	5,406	5,514	5,603	5,682

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-34. Mobility and Congestion Variables in Oklahoma City OK

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	9,378	9,563	9,757	9,620	9,306	10,191	10,658	10,996	11,165	11,310
Lane-kilometers	1,071	1,087	1,095	1,103	1,111	1,127	1,135	1,159	1,159	1,167
VKT/Lane-kilometer	8,759	8,800	8,912	8,723	8,377	9,043	9,390	9,486	9,632	9,690
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	5	5	5	5	5	5	10	10	10	10
Percent of Moderate Congestion	50.0	50.0	50.0	50.0	50.0	50.0	53.8	68.0	65.4	68.0
Percent of Heavy Congestion	50.0	50.0	50.0	50.0	50.0	50.0	46.1	32.0	34.6	32.0
Percent of Severe Congestion	-	-	-	-	-	-	-	-	-	-
Principal Arterial Streets										
Daily VKT (000)	4,428	4,669	5,361	5,394	5,329	5,579	5,546	5,772	5,772	6,070
Lane-kilometers	926	974	1,014	1,038	1,038	1,055	1,055	1,095	1,095	1,111
VKT/Lane-kilometer	4,783	4,793	5,286	5,194	5,132	5,290	5,260	5,272	5,272	5,464
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	30	30	35	35	35	35	35	35	35	35
Percent of Moderate Congestion	10.0	10.0	10.0	10.0	10.0	-	2.9	20.6	25.0	22.9
Percent of Heavy Congestion	30.0	30.0	30.0	30.0	30.0	40.0	31.4	32.3	31.3	28.6
Percent of Severe Congestion	70.0	70.0	70.0	70.0	70.0	60.0	65.7	47.1	43.7	48.6
Population (000)	640	640	640	730	735	725	720	730	735	740
Urban Area (Square Kilometers)	1,036	1,036	1,036	1,295	1,295	1,295	1,295	1,295	1,295	1,295
Registered Vehicles	-	-	-	-	447,705	467,912	467,950	482,770	487,590	491,300
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.27	0.29	0.31	0.35	0.34
Total VKT (000)	25,915	25,836	28,283	28,070	27,014	28,283	28,975	29,998	29,866	31,405
Total Kilometers	6,388	6,173	6,366	6,360	6,368	6,374	5,939	5,951	5,947	5,951

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-35. Mobility and Congestion Variables in Orlando FL

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	6,955	7,261	7,487	8,420	8,557	8,919	9,314	9,370	9,580	9,732
Lane-kilometers	757	765	789	845	853	877	894	926	950	966
VKT/Lane-kilometer	9,191	9,495	9,490	9,962	10,028	10,165	10,423	10,122	10,085	10,075
Incident Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	25	25	30	30	35	35	35	40	40	40
Percent of Moderate Congestion	-	100.0	82.8	70.6	74.3	68.6	71.4	74.1	64.7	62.2
Percent of Heavy Congestion	-	-	6.9	-	5.7	5.7	5.7	5.2	16.2	15.2
Percent of Severe Congestion	-	-	10.3	29.4	20.0	25.7	22.9	20.7	19.1	22.5
Principal Arterial Streets										
Daily VKT (000)	5,579	5,796	5,538	5,691	5,756	5,788	5,796	5,997	6,199	6,400
Lane-kilometers	2,278	2,302	2,367	2,415	2,455	2,463	2,496	2,512	2,528	2,544
VKT/Lane-kilometer	2,449	2,517	2,340	2,357	2,344	2,350	2,323	2,388	2,452	2,516
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	75	75	80	80	80	80	80	80	80	80
Percent of Moderate Congestion	3.2	26.6	12.9	23.4	4.7	9.6	13.5	5.0	5.2	6.1
Percent of Heavy Congestion	26.9	10.6	32.3	22.3	37.2	17.0	20.8	24.0	15.6	11.1
Percent of Severe Congestion	69.9	62.8	54.8	54.3	58.1	73.4	65.6	71.0	79.2	82.8
Population (000)	610	630	650	670	690	760	785	800	850	880
Urban Area (Square Kilometers)	984	984	1,010	1,010	1,023	1,023	1,036	1,036	1,062	1,062
Registered Vehicles	-	-	-	-	562,450	622,040	642,450	721,630	734,500	743,800
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.34	0.36	0.35
Total VKT (000)	17,135	17,618	19,742	20,935	21,080	21,642	27,451	28,516	28,545	30,210
Total Kilometers	2,508	1,829	2,526	2,537	2,542	1,887	5,065	4,833	4,838	4,878

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-36. Mobility and Congestion Variables in Philadelphia PA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	19,924	21,655	21,952	22,226	22,741	24,351	26,847	29,423	29,503	29,624
Lane-kilometers	2,013	2,045	2,045	2,069	2,093	2,149	2,254	2,423	2,431	2,439
VKT/Lane-kilometer	9,900	10,591	10,736	10,743	10,865	11,330	11,911	12,143	12,136	12,145
Incident Ratio	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	20	25	25	25	25	25	25	25
Percent of Moderate Congestion	42.4	43.5	51.5	73.1	71.0	60.5	62.7	54.7	49.1	47.8
Percent of Heavy Congestion	18.2	17.4	18.2	11.5	12.9	27.9	27.5	28.3	22.6	20.6
Percent of Severe Congestion	39.4	39.1	30.3	15.4	16.1	11.6	9.8	17.0	28.3	31.7
Principal Arterial Streets										
Daily VKT (000)	30,590	31,427	31,886	32,852	34,494	36,306	35,605	34,035	34,438	34,808
Lane-kilometers	4,347	4,444	4,508	6,327	4,750	5,184	5,200	5,224	5,233	5,249
VKT/Lane-kilometer	7,037	7,072	7,073	5,192	7,263	7,003	6,847	6,515	6,582	6,632
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	70	70	70	75	75	75	75	75	75	75
Percent of Moderate Congestion	24.7	35.6	19.7	10.5	18.8	17.4	14.3	18.3	17.3	15.2
Percent of Heavy Congestion	14.3	26.0	35.2	35.5	17.6	16.3	13.1	12.2	18.7	26.6
Percent of Severe Congestion	61.0	38.4	45.1	54.0	63.5	66.3	72.6	69.5	64.0	58.2
Population (000)	4,070	4,070	4,070	4,070	4,070	4,085	4,130	4,220	4,220	4,225
Urban Area (Square Kilometers)	2,512	2,512	2,849	2,849	2,849	2,888	2,901	2,914	2,927	2,940
Registered Vehicles	-	-	-	-	-	2,687,670	2,717,110	2,776,310	2,782,300	2,790,500
Fuel Cost ($/Liter)	-	-	-	-	-	0.26	0.29	0.32	0.36	0.35
Total VKT (000)	82,881	85,515	86,982	91,293	95,230	101,074	103,438	105,656	105,872	107,506
Total Kilometers	16,960	16,987	17,019	17,328	17,328	17,399	17,502	17,222	17,412	17,451

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-37. Mobility and Congestion Variables in Phoenix AZ

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	4,589	4,685	5,072	5,683	7,438	7,374	8,936	11,351	12,349	13,138
Lane-kilometers	338	338	451	467	499	547	837	974	1,006	1,030
VKT/Lane-kilometer	13,571	13,857	11,250	12,172	14,903	13,471	10,673	11,653	12,272	12,750
Incident Ratio	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	50	55	60	70	70	70	60	60	60	60
Percent of Moderate Congestion	87.9	87.7	-	-	5.7	4.5	38.5	30.3	12.1	15.9
Percent of Heavy Congestion	12.1	12.3	80.5	24.1	5.7	36.0	15.4	13.6	53.0	49.9
Percent of Severe Congestion	-	-	19.5	75.9	88.5	59.5	46.1	56.1	34.8	34.2
Principal Arterial Streets										
Daily VKT (000)	24,037	24,094	24,641	25,285	25,502	26,525	26,855	26,798	28,352	29,004
Lane-kilometers	3,993	4,009	4,025	4,057	4,089	4,130	4,637	4,589	5,023	5,184
VKT/Lane-kilometer	6,020	6,010	6,122	6,232	6,236	6,423	5,792	5,840	5,644	5,595
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	65	65	65	70	70	70	80	75	75	75
Percent of Moderate Congestion	46.3	51.9	51.9	44.9	44.4	45.3	21.9	26.0	36.8	38.1
Percent of Heavy Congestion	25.9	23.1	23.1	28.6	18.5	26.4	24.7	24.7	32.3	25.4
Percent of Severe Congestion	27.8	25.0	25.0	26.5	37.0	28.3	53.4	49.3	30.9	36.5
Population (000)	1,410	1,410	1,410	1,650	1,735	1,820	1,830	1,875	1,895	1,930
Urban Area (Square Kilometers)	1,425	1,425	1,425	2,137	2,214	2,305	2,512	2,512	2,525	2,551
Registered Vehicles	-	-	-	-	1,107,502	1,166,899	1,173,080	1,184,700	1,200,316	1,240,600
Fuel Cost ($/Liter)	-	-	-	-	0.28	0.30	0.32	0.33	0.36	0.35
Total VKT (000)	28,103	28,523	28,957	29,676	30,244	49,699	61,275	60,092	63,843	66,689
Total Kilometers	9,183	9,191	9,183	10,595	10,800	11,246	11,597	13,777	15,123	14,445

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-38. Mobility and Congestion Variables in Pittsburgh PA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	8,887	9,853	10,401	10,715	11,109	11,576	11,882	12,478	13,194	13,283
Lane-kilometers	1,248	1,369	1,393	1,417	1,465	1,505	1,530	1,578	1,610	1,634
VKT/Lane-kilometer	7,123	7,200	7,468	7,563	7,582	7,690	7,768	7,908	8,195	8,128
Incident Ratio	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	15	15	15	15	20	20	20	20	20	20
Percent of Moderate Congestion	100.0	57.1	50.0	36.4	18.2	14.3	50.0	60.0	20.0	20.0
Percent of Heavy Congestion	-	42.9	16.7	18.2	36.4	42.9	16.7	-	30.0	27.8
Percent of Severe Congestion	-	-	33.3	45.5	45.5	42.9	33.3	40.0	50.0	52.2
Principal Arterial Streets										
Daily VKT (000)	14,257	14,385	14,619	15,206	15,786	15,947	17,114	17,332	17,565	17,831
Lane-kilometers	2,455	2,552	2,673	2,657	2,705	2,737	2,842	2,850	2,930	2,987
VKT/Lane-kilometer	5,807	5,637	5,470	5,724	5,836	5,826	6,023	6,082	5,995	5,970
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	50	55	55	60	60	60	60	60	60	60
Percent of Moderate Congestion	39.0	34.1	33.3	35.7	35.0	32.7	11.1	14.5	23.5	27.3
Percent of Heavy Congestion	26.8	29.6	21.4	42.9	33.3	21.1	17.5	14.5	14.7	22.7
Percent of Severe Congestion	34.1	36.4	45.2	21.4	31.7	46.1	71.4	71.0	61.8	50.0
Population (000)	1,810	1,810	1,810	1,810	1,810	1,810	1,845	1,850	1,865	1,865
Urban Area (Square Kilometers)	2,538	2,538	1,839	1,839	1,839	1,852	1,878	1,891	1,917	1,930
Registered Vehicles	-	-	-	-	-	1,192,234	1,213,820	1,220,000	1,234,100	1,238,600
Fuel Cost ($/Liter)	-	-	-	-	-	0.26	0.29	0.32	0.36	0.35
Total VKT (000)	42,985	44,227	45,700	46,680	48,099	48,244	49,095	50,106	52,270	53,400
Total Kilometers	12,389	12,254	12,220	12,201	12,201	11,864	11,974	12,011	12,180	12,181

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-39. Mobility and Congestion Variables in Portland OR

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	7,631	8,654	8,968	9,539	10,183	10,787	11,431	12,027	12,027	12,107
Lane-kilometers	708	805	821	829	845	869	869	886	894	902
VKT/Lane-kilometer	10,773	10,750	10,922	11,505	12,048	12,407	13,148	13,582	13,459	13,429
Incident Ratio	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	30	25	30	30	30	35	40	40	40	45
Percent of Moderate Congestion	53.3	66.7	68.0	51.8	40.6	48.1	50.0	47.1	46.0	46.7
Percent of Heavy Congestion	13.3	14.3	16.0	33.3	50.0	32.7	27.4	15.7	22.4	23.0
Percent of Severe Congestion	33.3	19.1	16.0	14.8	9.4	19.2	22.6	37.1	31.6	30.3
Principal Arterial Streets										
Daily VKT (000)	4,468	4,387	4,500	4,774	5,055	5,152	5,281	5,426	5,973	6,166
Lane-kilometers	829	829	829	837	845	845	845	877	934	934
VKT/Lane-kilometer	5,388	5,291	5,427	5,702	5,981	6,095	6,248	6,183	6,397	6,603
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	60	60	60	60	60	60	60	60	60
Percent of Moderate Congestion	54.2	48.3	61.5	60.3	48.6	19.7	17.6	16.2	11.9	10.3
Percent of Heavy Congestion	10.2	12.1	7.7	17.8	33.3	39.4	42.6	41.2	43.3	42.4
Percent of Severe Congestion	35.6	39.7	30.8	21.9	18.1	40.9	39.7	42.6	44.8	47.3
Population (000)	1,010	1,000	1,010	1,030	1,040	1,045	945	1,010	1,030	1,040
Urban Area (Square Kilometers)	907	907	907	984	1,036	1,062	1,062	1,062	1,088	1,101
Registered Vehicles	-	-	-	-	595,240	615,537	617,650	660,130	679,940	684,300
Fuel Cost ($/Liter)	-	-	-	-	0.24	0.26	0.28	0.35	0.37	0.36
Total VKT (000)	21,204	22,817	23,957	25,000	26,623	26,117	29,857	31,015	31,231	32,181
Total Kilometers	6,619	6,377	6,438	6,427	6,500	6,532	6,801	7,488	6,168	7,113

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-40. Mobility and Congestion Variables in Sacramento CA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	8,533	9,338	10,433	11,109	11,914	12,969	13,556	14,249	14,909	15,520
Lane-kilometers	1,014	1,014	1,030	1,030	1,047	1,063	1,087	1,175	1,208	1,224
VKT/Lane-kilometer	8,413	9,206	10,125	10,781	11,385	12,205	12,474	12,123	12,347	12,684
Incident Ratio	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	25	25	25	30	30	35	45	45	45	45
Percent of Moderate Congestion	-	-	71.4	90.0	94.7	54.4	47.5	46.7	50.8	50.0
Percent of Heavy Congestion	100.0	100.0	28.6	-	-	42.1	49.1	40.0	36.5	40.0
Percent of Severe Congestion	-	-	-	10.0	5.3	3.5	3.4	13.3	12.7	10.0
Principal Arterial Streets										
Daily VKT (000)	8,042	8,372	8,726	9,097	9,475	9,877	10,715	10,964	11,262	11,270
Lane-kilometers	1,336	1,369	1,449	1,513	1,562	1,610	1,691	1,739	1,771	1,795
VKT/Lane-kilometer	6,018	6,118	6,022	6,011	6,067	6,135	6,338	6,306	6,359	6,278
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	40	40	45	45	40	45	50	50	50	50
Percent of Moderate Congestion	-	-	37.9	1.6	4.3	15.8	22.2	5.9	3.3	8.7
Percent of Heavy Congestion	-	-	34.8	21.9	82.6	52.6	44.4	33.3	26.2	20.7
Percent of Severe Congestion	100.0	100.0	27.3	76.6	13.0	31.6	33.3	60.8	70.5	70.7
Population (000)	830	830	830	910	955	995	1,040	1,055	1,095	1,165
Urban Area (Square Kilometers)	725	725	725	829	855	881	907	919	932	945
Registered Vehicles	-	-	-	-	1,095,641	1,198,574	1,253,010	1,271,090	1,263,500	1,280,400
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.35	0.38	0.36
Total VKT (000)	24,441	26,847	29,056	30,706	31,105	33,248	35,362	36,772	38,027	38,555
Total Kilometers	4,589	4,648	4,687	4,703	4,774	4,917	5,163	5,371	5,627	5,833

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-41. Mobility and Congestion Variables in Salt Lake City UT

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	4,621	4,790	4,862	5,184	5,555	6,134	6,561	8,179	8,581	8,828
Lane-kilometers	644	676	676	676	716	757	773	821	821	829
VKT/Lane-kilometer	7,175	7,083	7,190	7,667	7,753	8,106	8,490	9,961	10,451	10,647
Incident Ratio	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	10	10	10	10	10	15	15	15	15	20
Percent of Moderate Congestion	37.5	14.3	64.7	54.5	33.3	28.6	53.3	38.9	45.0	37.8
Percent of Heavy Congestion	37.5	85.7	35.3	18.2	51.5	59.5	40.0	19.4	42.5	42.8
Percent of Severe Congestion	25.0	-	-	27.3	15.2	11.9	6.7	41.7	12.5	19.4
Principal Arterial Streets										
Daily VKT (000)	2,343	2,455	2,697	2,890	2,938	3,003	3,075	3,140	3,276	3,349
Lane-kilometers	451	467	483	531	539	555	564	572	572	572
VKT/Lane-kilometer	5,196	5,259	5,583	5,439	5,448	5,406	5,457	5,493	5,732	5,859
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	35	35	40	40	45	40	40	40	40	40
Percent of Moderate Congestion	48.7	22.2	50.0	58.7	66.7	40.4	42.5	44.7	45.1	54.1
Percent of Heavy Congestion	5.1	14.8	17.5	10.9	9.3	36.2	38.3	36.2	27.5	24.6
Percent of Severe Congestion	46.1	63.0	32.5	30.4	24.1	23.4	19.1	19.1	27.5	21.3
Population (000)	680	680	680	750	760	765	785	785	800	840
Urban Area (Square Kilometers)	932	932	932	958	932	984	1,191	1,191	1,217	1,217
Registered Vehicles	-	-	-	-	620,550	653,020	670,940	698,520	698,400	702,000
Fuel Cost ($/Liter)	-	-	-	-	0.26	0.29	0.31	0.33	0.38	0.36
Total VKT (000)	17,993	18,946	19,254	20,157	20,973	21,891	22,769	23,461	24,422	25,644
Total Kilometers	4,097	4,114	4,109	4,130	4,286	4,318	4,313	4,564	4,572	4,598

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-42. Mobility and Congestion Variables in San Antonio TX

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	12,236	12,824	13,605	14,619	15,215	14,168	14,571	14,772	14,941	15,094
Lane-kilometers	1,224	1,248	1,264	1,288	1,304	1,312	1,320	1,328	1,328	1,336
VKT/Lane-kilometer	10,000	10,277	10,764	11,350	11,667	10,798	11,037	11,121	11,248	11,295
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	35	35	35	40	40	40	40	40	40	40
Percent of Moderate Congestion	-	-	56.7	38.5	14.6	13.9	20.0	15.0	14.6	12.5
Percent of Heavy Congestion	-	-	-	-	-	8.3	15.0	40.0	43.9	40.0
Percent of Severe Congestion	100.0	100.0	43.3	61.5	85.4	77.8	65.0	45.0	41.5	47.5
Principal Arterial Streets										
Daily VKT (000)	5,675	5,933	6,311	6,899	7,382	7,728	8,034	8,340	8,436	8,775
Lane-kilometers	1,513	1,554	1,578	1,642	1,658	1,691	1,723	1,739	1,755	1,795
VKT/Lane-kilometer	3,750	3,819	4,000	4,201	4,451	4,571	4,664	4,796	4,807	4,888
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	5	10	10	15	15	20	15	15	15	15
Percent of Moderate Congestion	77.3	39.4	23.1	41.5	38.5	29.3	36.0	33.3	33.3	28.3
Percent of Heavy Congestion	18.2	12.1	-	-	23.1	8.6	8.0	8.8	13.7	22.1
Percent of Severe Congestion	4.5	48.5	76.9	58.5	38.5	62.1	56.0	57.9	52.9	49.6
Population (000)	950	950	950	945	950	1,050	1,165	1,165	1,170	1,180
Urban Area (Square Kilometers)	907	1,140	1,140	1,166	1,140	1,217	1,230	1,243	1,256	1,256
Registered Vehicles	-	-	-	-	800,255	808,811	896,150	862,325	870,950	873,500
Fuel Cost ($/Liter)	-	-	-	-	0.25	0.28	0.30	0.32	0.35	0.34
Total VKT (000)	28,677	30,273	30,518	33,767	35,914	36,417	36,890	39,007	40,760	41,459
Total Kilometers	6,632	6,868	7,139	7,515	7,802	8,795	9,109	10,805	10,835	8,019

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-43. Mobility and Congestion Variables in San Bernardino-Riv CA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	18,869	19,079	19,513	19,723	20,399	20,689	21,816	21,928	23,474	24,102
Lane-kilometers	1,304	1,312	1,320	1,344	1,352	1,377	1,401	1,417	1,441	1,457
VKT/Lane-kilometer	14,469	14,540	14,780	14,671	15,083	15,029	15,575	15,477	16,291	16,541
Incident Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	70	70	70	70	75	75	75	80	80	80
Percent of Moderate Congestion	100.0	100.0	48.3	72.3	26.7	16.7	9.1	6.4	18.8	16.3
Percent of Heavy Congestion	-	-	51.7	27.7	53.3	62.1	16.7	19.2	12.5	17.7
Percent of Severe Congestion	-	-	-	-	20.0	21.2	74.2	74.4	68.7	66.0
Principal Arterial Streets										
Daily VKT (000)	12,365	13,299	13,927	14,104	14,281	14,329	14,732	15,086	16,342	17,147
Lane-kilometers	2,447	2,512	2,689	2,705	2,705	2,769	2,866	2,938	3,445	3,679
VKT/Lane-kilometer	5,053	5,295	5,180	5,214	5,280	5,174	5,140	5,134	4,743	4,661
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	60	60	65	65	65	65	65	65	65
Percent of Moderate Congestion	100.0	100.0	66.7	55.9	38.5	41.5	41.5	40.6	46.2	45.7
Percent of Heavy Congestion	-	-	33.3	-	30.8	27.7	28.3	37.7	30.8	31.0
Percent of Severe Congestion	-	-	-	44.1	30.8	30.8	30.2	21.7	23.1	23.3
Population (000)	945	950	965	970	990	1,015	1,040	1,100	1,170	1,235
Urban Area (Square Kilometers)	1,036	1,114	1,166	1,217	1,243	1,256	1,256	1,243	1,269	1,269
Registered Vehicles	-	-	-	-	678,320	709,090	725,870	768,530	780,060	796,500
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.35	0.38	0.36
Total VKT (000)	21,143	24,008	27,925	28,288	30,601	32,128	34,673	38,096	40,329	43,491
Total Kilometers	4,978	5,012	5,152	5,216	5,274	5,434	5,856	6,099	6,038	7,517

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-44. Mobility and Congestion Variables in San Diego CA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	24,271	26,525	29,753	31,637	33,842	37,280	40,306	43,084	44,581	44,597
Lane-kilometers	2,447	2,496	2,536	2,568	2,616	2,640	2,729	2,769	2,777	2,777
VKT/Lane-kilometer	9,918	10,629	11,733	12,320	12,935	14,119	14,770	15,558	16,052	16,058
Incident Ratio	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	35	35	35	35	40	45	45	45	45	45
Percent of Moderate Congestion	66.7	72.7	34.3	37.8	58.2	28.4	26.7	26.0	28.8	26.4
Percent of Heavy Congestion	33.3	27.3	40.0	13.5	9.1	41.9	20.0	15.1	24.7	26.4
Percent of Severe Congestion	-	-	25.7	48.6	32.7	29.7	53.3	58.9	46.6	47.2
Principal Arterial Streets										
Daily VKT (000)	9,869	10,449	11,407	12,075	12,639	13,170	14,240	14,377	15,037	15,295
Lane-kilometers	2,302	2,335	2,383	2,415	2,463	2,512	2,608	2,689	2,753	2,785
VKT/Lane-kilometer	4,287	4,476	4,787	5,000	5,131	5,244	5,460	5,347	5,462	5,491
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	25	25	30	30	30	30	30	30	30	30
Percent of Moderate Congestion	-	100.0	100.0	-	42.9	17.4	15.4	12.1	26.7	24.7
Percent of Heavy Congestion	-	-	-	100.0	57.1	82.6	65.4	81.8	66.7	63.6
Percent of Severe Congestion	-	-	-	-	-	-	19.2	6.1	6.7	11.7
Population (000)	1,780	1,780	1,780	1,890	1,980	2,070	2,175	2,220	2,295	2,350
Urban Area (Square Kilometers)	1,580	1,580	1,580	1,684	1,722	1,761	1,800	1,826	1,839	1,839
Registered Vehicles	-	-	-	-	1,095,641	1,318,168	1,385,350	1,414,610	1,394,680	1,407,500
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.35	0.38	0.36
Total VKT (000)	49,672	54,397	60,005	63,677	65,986	71,022	76,440	80,960	83,086	83,293
Total Kilometers	8,024	8,047	8,203	8,298	8,386	8,567	8,876	8,910	9,174	9,396

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-45. Mobility and Congestion Variables in San Fran-Oak CA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	46,473	48,300	51,866	55,811	59,449	63,724	64,988	67,572	68,570	67,620
Lane-kilometers	3,542	3,558	3,558	3,655	3,679	3,711	3,743	3,784	3,848	3,848
VKT/Lane-kilometer	13,120	13,575	14,577	15,271	16,160	17,171	17,361	17,860	17,820	17,573
Incident Ratio	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	65	70	75	75	75	80	80	80	80	80
Percent of Moderate Congestion	26.5	16.4	6.5	7.7	9.1	9.6	11.9	13.8	17.1	13.8
Percent of Heavy Congestion	19.1	30.1	28.6	20.5	7.8	4.8	6.0	5.7	10.2	16.1
Percent of Severe Congestion	54.4	53.4	64.9	71.8	83.1	85.5	82.1	80.5	72.7	70.1
Principal Arterial Streets										
Daily VKT (000)	15,593	16,462	17,372	18,322	19,320	20,399	21,799	22,073	22,532	22,588
Lane-kilometers	2,954	2,979	3,059	3,123	3,180	3,228	3,292	3,413	3,687	3,703
VKT/Lane-kilometer	5,278	5,527	5,679	5,866	6,076	6,319	6,621	6,467	6,111	6,100
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	55	60	60	60	60	60	60	60	60
Percent of Moderate Congestion	59.1	27.6	9.3	13.6	21.2	15.7	14.8	10.1	6.7	10.2
Percent of Heavy Congestion	4.2	29.3	29.3	27.2	14.1	18.1	4.9	5.1	15.6	11.4
Percent of Severe Congestion	36.6	43.1	61.3	59.3	64.7	66.3	80.2	84.8	77.8	78.4
Population (000)	3,330	3,330	3,330	3,350	3,435	3,520	3,610	3,620	3,675	3,725
Urban Area (Square Kilometers)	2,072	2,072	2,072	2,072	2,098	2,124	2,150	2,163	2,189	2,266
Registered Vehicles	-	-	-	-	2,684,433	2,942,879	3,008,330	3,061,060	3,015,144	3,036,000
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.35	0.38	0.36
Total VKT (000)	84,691	90,785	99,667	107,099	110,201	115,757	120,415	125,250	123,890	123,136
Total Kilometers	13,479	13,812	13,796	13,827	13,809	13,952	14,371	14,408	14,503	14,757

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-46. Mobility and Congestion Variables in San Jose CA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	19,425	20,053	21,316	22,427	22,959	23,490	24,078	25,019	25,406	26,597
Lane-kilometers	1,739	1,763	1,803	1,819	1,827	1,835	1,852	1,868	1,868	1,892
VKT/Lane-kilometer	11,171	11,374	11,821	12,327	12,564	12,798	13,004	13,397	13,603	14,060
Incident Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	60	60	60	65	65	70	70	70	70	70
Percent of Moderate Congestion	14.5	4.6	14.8	16.9	6.2	11.8	17.1	14.3	19.4	20.0
Percent of Heavy Congestion	39.1	18.5	6.6	9.2	20.3	13.2	14.5	22.1	18.1	18.6
Percent of Severe Congestion	46.4	76.9	78.7	73.8	73.4	75.0	68.4	63.6	62.5	61.4
Principal Arterial Streets										
Daily VKT (000)	8,443	8,710	9,266	9,749	9,966	10,207	10,465	10,876	10,908	10,827
Lane-kilometers	2,061	2,101	2,149	2,165	2,174	2,190	2,206	2,230	2,246	2,254
VKT/Lane-kilometer	4,097	4,146	4,311	4,502	4,585	4,662	4,745	4,877	4,857	4,804
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	65	65	65	70	70	75	75	75	75
Percent of Moderate Congestion	92.5	92.4	74.2	64.9	14.3	17.1	16.8	15.5	22.2	20.0
Percent of Heavy Congestion	4.5	4.5	-	-	21.4	14.3	7.4	11.3	8.9	5.0
Percent of Severe Congestion	3.0	3.0	25.8	35.1	64.3	68.6	75.8	73.2	68.9	75.0
Population (000)	1,200	1,250	1,275	1,300	1,340	1,355	1,370	1,390	1,410	1,500
Urban Area (Square Kilometers)	1,049	1,062	1,075	1,088	1,101	1,114	1,127	1,153	1,166	1,166
Registered Vehicles	-	-	-	-	967,510	979,060	991,340	1,005,050	1,015,100	1,021,000
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.35	0.38	0.36
Total VKT (000)	35,494	38,658	41,672	44,064	44,555	47,716	50,058	51,826	52,236	52,930
Total Kilometers	5,756	5,809	5,881	5,905	5,939	5,947	5,994	6,020	5,980	5,933

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km} \times \text{Freeway VKT} + \text{Prin. Art. St. VKT/Ln-km} \times \text{Prin. Art. VKT}}{13{,}000 \times \text{Freeway VKT} + 5{,}000 \times \text{Prin. Art. VKT}}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-47. Mobility and Congestion Variables in Seattle-Everett WA

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	19,755	21,083	22,403	23,909	24,955	26,726	27,676	29,302	30,461	30,590
Lane-kilometers	1,618	1,666	1,715	1,771	1,787	1,835	1,835	1,868	1,948	1,964
VKT/Lane-kilometer	12,209	12,652	13,066	13,500	13,964	14,561	15,079	15,690	15,636	15,574
Incident Ratio	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	40	45	50	50	55	65	70	70	70	70
Percent of Moderate Congestion	58.3	28.6	28.9	40.0	32.2	37.2	30.1	12.2	15.7	11.8
Percent of Heavy Congestion	22.2	50.0	34.6	22.0	37.3	29.5	34.9	50.0	54.2	51.8
Percent of Severe Congestion	19.4	21.4	36.5	38.0	30.5	33.3	34.9	37.8	30.1	36.5
Principal Arterial Streets										
Daily VKT (000)	11,004	11,785	12,542	12,977	13,403	14,410	14,192	14,587	14,699	15,810
Lane-kilometers	2,157	2,198	2,270	2,318	2,335	2,375	2,375	2,431	2,536	2,576
VKT/Lane-kilometer	5,101	5,363	5,525	5,597	5,741	6,068	5,976	6,000	5,797	6,138
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	50	55	55	55	55	55	55	55	55	55
Percent of Moderate Congestion	17.6	23.6	19.3	21.8	30.6	20.6	19.4	24.6	18.2	18.6
Percent of Heavy Congestion	41.2	27.3	35.1	20.0	8.1	32.3	26.4	13.9	15.2	20.0
Percent of Severe Congestion	41.2	49.1	45.6	58.2	61.3	47.1	54.2	61.5	66.7	61.4
Population (000)	1,440	1,480	1,520	1,540	1,565	1,595	1,625	1,680	1,730	1,802
Urban Area (Square Kilometers)	1,684	1,684	1,684	1,761	1,800	1,826	1,852	1,852	1,878	1,878
Registered Vehicles	-	-	-	-	1,047,852	1,145,372	1,169,070	1,265,390	1,290,690	1,330,700
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.28	0.31	0.32	0.37	0.36
Total VKT (000)	41,631	47,785	47,928	49,697	51,885	56,846	62,838	65,675	65,752	69,388
Total Kilometers	9,354	9,750	9,861	10,367	10,370	10,586	10,686	10,735	10,420	10,798

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-48. Mobility and Congestion Variables in St. Louis MO

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	19,376	20,986	23,200	23,852	25,148	26,227	27,990	30,139	30,783	30,671
Lane-kilometers	1,948	1,996	2,206	2,278	2,286	2,302	2,391	2,713	2,729	2,729
VKT/Lane-kilometer	9,946	10,512	10,518	10,470	11,000	11,392	11,707	11,110	11,280	11,239
Incident Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	25	30	20	20	20	20	15	20	20	20
Percent of Moderate Congestion	42.9	36.1	52.6	26.7	56.0	42.9	46.4	37.8	50.0	50.0
Percent of Heavy Congestion	57.1	63.9	23.7	60.0	36.0	33.3	-	21.6	10.0	10.6
Percent of Severe Congestion	-	-	23.7	13.3	8.0	23.8	53.6	40.5	40.0	39.4
Principal Arterial Streets										
Daily VKT (000)	14,418	14,949	15,689	16,519	17,332	18,056	18,467	19,658	20,866	20,528
Lane-kilometers	2,705	2,705	2,753	2,785	2,785	2,809	2,809	2,890	2,898	2,914
VKT/Lane-kilometer	5,330	5,527	5,699	5,931	6,223	6,427	6,573	6,802	7,200	7,044
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	65	65	65	65	65	65	55	60	60	60
Percent of Moderate Congestion	37.8	39.6	30.4	25.0	28.1	35.1	25.5	13.6	21.1	19.9
Percent of Heavy Congestion	15.6	20.8	16.1	21.1	26.3	17.5	23.6	28.8	49.1	45.3
Percent of Severe Congestion	46.7	39.6	53.6	53.8	45.6	47.4	50.9	57.6	29.8	34.8
Population (000)	1,850	1,850	1,850	1,925	1,930	1,940	1,950	1,955	1,960	1,950
Urban Area (Square Kilometers)	1,684	1,813	1,813	1,800	1,813	1,839	1,865	1,878	1,891	1,797
Registered Vehicles	-	-	-	-	1,375,682	939,484	946,600	952,820	1,041,260	1,020,000
Fuel Cost ($/Liter)	-	-	-	-	1.02	0.26	0.28	0.32	0.32	0.31
Total VKT (000)	46,191	52,703	55,761	57,340	59,879	62,560	65,662	72,239	72,914	72,899
Total Kilometers	10,405	11,296	11,375	11,394	11,415	11,594	11,632	11,508	11,534	11,571

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-49. Mobility and Congestion Variables in Tampa FL

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	3,188	3,131	4,089	4,580	4,733	5,313	5,538	5,522	5,844	5,877
Lane-kilometers	306	306	354	419	435	451	467	475	483	491
VKT/Lane-kilometer	10,421	10,237	11,545	10,942	10,889	11,786	11,862	11,627	12,100	11,967
Incident Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	20	20	20	20	20	20	25	25	25	25
Percent of Moderate Congestion	-	14.3	6.7	14.9	19.6	35.8	38.1	30.4	17.7	16.3
Percent of Heavy Congestion	57.1	24.3	-	85.1	45.1	3.0	11.9	47.8	33.3	34.3
Percent of Severe Congestion	42.9	61.4	93.3	-	35.3	61.2	50.0	21.7	49.0	49.4
Principal Arterial Streets										
Daily VKT (000)	5,136	4,935	5,885	6,182	5,877	6,247	6,545	6,730	7,020	7,084
Lane-kilometers	877	877	918	958	966	982	1,006	1,014	1,063	1,079
VKT/Lane-kilometer	5,853	5,624	6,412	6,454	6,083	6,361	6,504	6,635	6,606	6,567
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	60	60	65	65	65	65	60	65	65	65
Percent of Moderate Congestion	19.2	15.8	22.5	20.9	16.7	18.0	12.4	31.4	28.1	36.4
Percent of Heavy Congestion	74.0	30.3	28.8	15.1	31.0	22.5	8.6	12.8	13.5	16.7
Percent of Severe Congestion	6.8	54.0	48.7	64.0	52.4	59.5	79.0	55.8	58.4	56.8
Population (000)	540	560	570	580	615	645	665	670	700	710
Urban Area (Square Kilometers)	907	907	1,010	1,010	1,062	1,101	1,127	1,127	1,153	1,166
Registered Vehicles	-	-	-	-	683,618	583,144	599,100	637,420	638,700	640,500
Fuel Cost ($/Liter)	-	-	-	-	0.27	0.29	0.31	0.34	0.36	0.35
Total VKT (000)	16,034	17,523	17,995	18,729	18,172	19,694	23,649	23,738	25,322	26,163
Total Kilometers	2,731	2,787	2,813	2,822	2,853	2,985	5,223	5,223	5,221	5,297

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

Table E-50. Mobility and Congestion Variables in Washington DC

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freeway										
Daily VKT (000)	25,897	26,002	29,085	32,015	36,072	36,885	37,996	40,282	40,789	41,466
Lane-kilometers	1,996	1,996	2,209	2,238	2,325	2,367	2,397	2,447	2,455	2,463
VKT/Lane-kilometer	12,972	13,024	13,167	14,306	15,516	15,585	15,850	16,461	16,613	16,833
Incident Ratio	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Pct of Congested Freeway DVKT										
(ADT/Lane Greater Than 15,000)	60	60	65	65	65	65	65	65	65	65
Percent of Moderate Congestion	63.3	36.4	30.6	50.0	38.2	32.9	30.3	16.0	17.8	12.2
Percent of Heavy Congestion	16.7	45.5	47.2	19.2	36.8	38.4	40.9	44.0	30.1	33.8
Percent of Severe Congestion	20.0	18.2	22.2	30.8	25.0	28.8	28.8	40.0	52.0	54.0
Principal Arterial Streets										
Daily VKT (000)	20,286	21,896	23,828	25,599	28,014	29,624	30,268	30,799	31,492	31,637
Lane-kilometers	3,140	3,188	3,220	3,397	3,574	3,606	3,671	3,679	3,703	3,735
VKT/Lane-kilometer	6,462	6,869	7,400	7,536	7,838	8,214	8,246	8,372	8,504	8,470
Incident Ratio	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Pct of Congested Prin. Art. DVKT										
(ADT/Lane Greater Than 5,000)	80	80	80	80	80	85	85	85	85	85
Percent of Moderate Congestion	11.4	11.6	15.2	12.4	15.9	15.1	11.0	9.5	7.1	8.8
Percent of Heavy Congestion	31.4	15.9	19.0	29.6	25.6	20.9	25.6	23.8	30.6	24.1
Percent of Severe Congestion	57.1	72.5	65.8	58.0	58.5	64.0	63.4	66.7	62.4	67.1
Population (000)	3,440	2,780	2,810	2,860	2,920	2,980	3,040	3,080	3,100	3,280
Urban Area (Square Kilometers)	2,124	1,917	1,917	1,917	2,124	2,124	2,150	2,163	2,176	2,383
Registered Vehicles	-	-	-	-	-	1,609,072	1,643,240	1,664,870	1,673,190	1,688,200
Fuel Cost ($/Liter)	-	-	-	-	-	0.28	0.31	0.33	0.38	0.36
Total VKT (000)	78,824	73,163	78,681	86,272	93,808	97,553	98,978	101,398	103,560	104,766
Total Kilometers	13,860	11,540	12,186	12,614	13,128	13,276	13,442	13,608	13,775	13,899

(1) Congestion Indicator Levels - Interstate and Expressway = 13,000 VKT/Lane
Principal Arterial = 5,000 VKT/Lane

$$\text{Roadway Congestion Index} = \frac{\text{Freeway VKT/Ln-km}}{13{,}000} \times \text{Freeway VKT} + \frac{\text{Prin. Art. St. VKT/Ln-km}}{5{,}000} \times \text{Prin. Art. VKT}$$

Note: A Congestion Index value above 1.0 indicates an undesirable level of congestion.
"-" denotes data unavailable

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