# Fare-Free Mass Transit: A Case Study of What Is Now, and What Can Be In Any Large Metropolitan Region of the USA

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***If a frog is placed in a pot of water that is slowly brought to a boil in such a way that the imperceptible heat change is not noticed by the frog, then it will not jump out of the pot. If a frog is dropped into a pot of boiling water, it will immediately jump out. In which state are we traffic-choked, urbanite frogs?***

**Abstract.**

Urban transportation problems overwhelm every urban region on Earth. A list of the many existing problems associated with each of the current urban transportation systems includes:

- enormous waste and a staggering exhaustion of the rapidly diminishing non-renewable petroleum resources on Earth;
- unhealthful air quality, resulting in death and impaired health for tens of thousands;
- pervasive and constantly increasing daily gridlock traffic conditions extending well beyond rush hour time frames of 15 or more hours, resulting in millions of wasted hours daily by millions of passengers;
- high accident occurrences, resulting in death and injury and extensive, expensive property damage and medical costs for thousands;
- staggeringly expensive vehicle insurance, maintenance, operational and acquisition costs for the millions of licensed drivers who own millions of vehicles;
- enormous road/street maintenance costs;
- ubiquitous parking space/parking lot congestion and expense for millions;
- unhealthful high and constant noise pollution, especially damaging to those in the vicinity of freeways and main roads.

In particular, most of the petroleum consumption on Earth comes from these wasteful urban transportation systems. A concrete example of a region having the worst record on Earth relating to these problems is provided by the six county Southern California Region (SCR: Los Angeles, Orange, Ventura, San Bernardino, Riverside and Imperial counties, consisting of 188 cities, with a population of over 16.84 million [7/1/2001]). In this paper, we identify and analyze all of these problems and describe a solution for SCR, for the entire set of California urban regions, and, indeed, for the entire set of urban regions in the USA.

The core of the solution involves the creation of a ***fare-free mass public transit system***. We show how such a system provides an optimum model for any large urban region.

In the urban regions of the USA, there is next to zero public transit: only 2% of the millions and millions of daily trips are made by public transit. Bus service is jammed and continues to deteriorate. For example, the bus fleet of the largest segment of SCR, the Metropolitan Transit Authority (MTA) of Los Angeles, has declined from a mere 2,600 in 1984 to a pitiful 1,800 in 1998! The rider ship on the few miles of the exorbitant $300 million per mile subway is minuscule.

Almost all of the annual urban vehicle-miles and passenger-miles traveled (95.1%) in SCR occurs on the collection of interstate, other freeways and expressways, other principle arterials, minor arterial and collector roads (i.e., all roads except local; see Table 2 for a functional description of these types of roads) that comprises only 34.8% of the total urban road mileage in SCR; for California, the figures are 91.03% and 34.13%, respectively; and for the USA, the figures are 85.71% and 30.08%, respectively. Furthermore, in the USA, 95% of all urban vehicle-miles traveled emanates from personal vehicles (=all vehicles except commercial trucks).

**The analysis to follow will show that this set of numbers is of utmost importance because it enables the creation of a fare-free all-bus system whose use will yield the required urban passenger miles at a very substantially lower cost and will solve all the problems listed at the outset (see Tables 3, 4, and 5).**

The establishment of a mass transit, ***fare-free***, system for urban regions can be financed easily by a method that literally involves ***no cost to 99% of the citizens.*** The proposed method for financing a ***fare-free*** mass transit system for SCR and, indeed, for all large urban regions in California and the USA, is simple and effective. The source of income is to come from a minuscule annual tax on the net wealth of the ***wealthiest one percent of the appropriate adult population***. In California, the wealthiest one percent of the California adult population has over $2.5 trillion in net wealth. An annual tax of only 0.42% on this amount would yield over $10.5 billion annually; this is more than enough to finance a ***fare-free*** all-bus system that would yield the annual California passenger miles traveled for all urban regions in the state! (See Table 4). For the entire USA, the wealthiest one percent has over $25 trillion in net wealth! An annual tax of only 0.28% on this amount would yield $71 billion annually; this is more than enough to finance a ***fare-free*** all-bus system that would yield the annual USA passenger miles traveled for all urban regions in the USA! (See Table 5). Such minuscule assessments would pose little, if any, hindrance at undermining the staggering magnitude of this wealth. Even though a ***fare-free*** mass transit system may not sit well with the major reapers of profit (the petroleum, auto and insurance industries) in our drastically antiquated current mode of transportation, the enormity of our common, long-standing and exponentially worsening traffic problems demands a solution for the many rather than a status-quo subjugation to the powerful few.

No magical technology is required for the ***fare-free*** system to function right now! Current technology will do all of what is analyzed and proposed herein. The God of ever newer and more exotic technology can not possibly solve our horrendous transportation problems without the use of a mass transit system.

**ONE THING IS ABSOLUTE**: if the multi millions of personal vehicles in any urban region were instantaneously replaced by pollution-free vehicles, say electric or fuel cell powered vehicles, we would **not** eliminate the problems listed above, except to help with pollution!! **Ever-increasing gridlock is ever-increasing gridlock, enormous petroleum and energy waste is enormous petroleum and energy waste, enfeebling wasted time is enfeebling wasted time, and staggeringly expensive costs are staggeringly expensive costs by any other euphemisms.**

The proposed system allows the super wealthy to be the benefactors of urban mass transportation. The immediate and long term results will personally benefit everyone, including the super wealthy.

> ***If we rigorously use our human reason both to discover and acknowledge the facts about our current transportation quagmire, and if we follow the logical implications for effective human action that such knowledge entails, then we can free ourselves of our plight. Failing this, we are doomed by mindless apathy, irrationality, ignorance and the stranglehold of the powerfully entrenched corporate interests to suffer our endlessly worsening transportation afflictions.***

**Analysis and Solution.**

The solution to the aforementioned problems is to design a long range public transit system that **almost everyone** uses (except those who need use of a vehicle for commercial purposes, or for a long distance vacation, or for emergency purposes, and the like), leaving their personal vehicles at home most of the time while doing all or most of their trips on public transit. Though 100% use of public transit for non-commercial passengers may never happen, one can hope to create a system that enables and induces a substantial number (perhaps 80%, 90%, ...) to make their trips via public transit, and this in turn will eliminate or make inconsequential the aforementioned problems.

A transit system that enables and induces almost everyone to use it must have the following attributes:

- all must have quick access to it;
- for most passengers, the time required for each trip must be the same or **less than** that required by using one's private vehicle;
- the net cost to each public transit user should be much less than the cost incurred by using his/her private vehicle for trips;
- all of the problems described at the outset should be substantially alleviated or eliminated.

**A public transit system that is *fare-free for every user*** induces and enables everyone to use public transit for most or all of their trips. Its use eliminates the nuisance and unnecessary bureaucracy of fare transactions, transfers, and the other impediments of fare-based systems. As already mentioned above, the financial resources available in California and in the United States for this type of system, as well as the savings that would accrue to the body of all passengers (see Table 1), are staggering. Yet another mind-boggling example of enormous wealth will drive home the point. ***In 1999, Forbes published the list of the 400 richest Americans; their net worth is $1.1 trillion (led by Bill Gates $132.6 billion on 23 December, 1999); in 2000, this figure jumped to over $1.2 trillion!! The latter sum would finance a fare-free all-bus system (cost: $71 billion annually - see Table 5) for the urban residents of the USA (=95% of the population) for 16.9 years; if only 5.92% of this sum were to be assessed annually, then that would finance this system for the indefinite future!***
For SCR, urban California, and urban USA, we give the analysis that compares the costs, fuel consumption and pollution output of the proposed all-bus system with the current (nearly)all-auto system (see Tables 3, 4, and 5).

The average all-inclusive cost for non-commercial vehicles (fuel, oil, maintenance, tires, insurance, depreciation, finance charges, license/registration/taxes) is 50 cents per mile, and the average fuel consumption is 20 miles per gallon (source: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics). The all-inclusive cost of running a diesel bus (administrative, labor, capital, fuel, oil, maintenance, tires, insurance, depreciation, finance charges, license/registration/taxes) is $93 per hour (we round this out to $100 per hour), and the average fuel consumption is 4.649 miles per gallon (source: analysis section of the Metropolitan Transit Authority (MTA)). The following Table 1 summarizes the analysis in Tables 3 to 5:

**Table 1**

**Comparison of Modes of Urban Transportation:**
**All auto* versus all fare-free bus modes**

**Annual cost**

| Urban region(s) | All auto mode | All fare-free bus mode | Ratio: bus cost to auto cost | For every $1 of bus cost, auto cost is: | Annual Cost Savings: annual auto cost minus annual bus cost |
|---|---|---|---|---|---|
| SCR | $ 52,815,967,200 | $ 5,562,309,692 | 10.53% | $9.50 | $ 47,253,657,508 |
| California | $ 99,833,340,000 | $ 10,531,553,253 | 10.55% | $9.48 | $ 89,301,786,747 |
| USA | $ 640,696,740,000 | $ 70,936,082,388 | 11.07% | $9.03 | $ 569,760,657,612 |

**Annual fuel concumption (gallons)**

| Urban region(s) | All auto mode | All fare-free bus mode | Ratio: bus fuel use to auto fuel use | For every gallon of bus fuel use, auto fuel use is: | Annual Fuel Savings: annual bus use minus auto use | Equivalent savings in barrels of crude*** |
|---|---|---|---|---|---|---|
| SCR | 5,740,866,000 | 500,764,044 | 8.72% | 11.464 | 5,240,101,956 | 275,794,840 |
| California | 9,983,334,000 | 946,197,938 | 9.48% | 10.551 | 9,037,136,062 | 475,638,740 |
| USA | 64,069,674,000 | 6,109,602,297 | 9.54% | 10.487 | 57,960,071,703 | 3,050,530,090 |

*Here, "auto" means "non-commercial vehicle"

***1 barrel crude yields 19 gals gasoline

**Annual pollution comparison**

| Urban region(s) | Annual bus miles | Annual auto miles | Ratio** |
|---|---|---|---|
| SCR | **2,328,052,039** | 114,817,320,000 | 10.14% |
| California | **4,398,874,215** | 217,029,000,000 | 10.13% |
| USA | **28,403,541,077** | 1,392,819,000,000 | 10.20% |

**Assumes a bus pollutes 5 times as much as an auto per mile; the ratio of the annual bus pollution to the annual auto pollution is 5 x #annual bus miles traveled / #annual auto miles travelled

***The comparison between the two modes of transportation is mind-boggling:***

**For the SCR, California and USA urban cases:**

**1). The annual cost of the all-bus mode is only 10.53% to 11.07% of the annual cost of the current all-auto mode! For every $1 spent for the all-bus mode, the average motorist spends $9.03 to $9.50!**

**2). The annual fuel consumption for the all-bus mode is only 8.72% to 9.54% of that of the all-auto mode! For every one gallon of fuel used in the all-bus mode, the all-auto mode requires 10.487 to 11.464 gallons!**

**3). For SCR, California and the USA, respectively, the annual fuel savings that accrue by use of the all-bus system are 5.24 billion, 9.04 billion, and 56.96 billion gallons, respectively; the annual savings in equivalent barrels of crude petroleum are 276 million, 476 million, and 3.05 billion barrels, respectively; the 10 year savings are 2.76 billion, 4.76 billion, and 30.5 billion barrels, respectively! The last figure for the USA far exceeds the wildest, most optimistic estimation of petroleum reserves in the Arctic National Wildlife Refuge!!**

**4). The annual pollutants from the all-bus mode are 10.14% to 10.20% of those for the all auto mode! If natural gas buses are used instead of diesel, then the ratio drops to near zero!**

**Clearly, the all-bus system is far superior to the current (nearly) all-auto system of transportation because its use would result in far lower costs for the entire body of passengers (especially vehicle owners), far lower fuel consumption and consequent fuel conservation, far less wasted energy, far lower pollution (noise and environmental), far less wasted travel time for almost everyone (see next paragraph and Tables 6 to 7), and a substantial alleviation or elimination of all of the problems described at the outset.**

It will now be shown that the all-bus system greatly reduces the travel time for the vast majority of the population. (See also the hypothetical example given at the end of the list of **Mathematical Relations** below).

Consider a frequently encountered scenario on any of our freeways during the usual extended time frame (at least 15 hours daily) of gridlock conditions. Suppose there are four lanes (one direction) and that the all-auto mode prevails; suppose further that a 20 mile one-way stretch contains 16,896 autos (4,224 each lane) traveling 20mph with an ***unsafe*** separation of only 10 feet (safe separation requires at least 30 feet). There will, of course, be frequent stops followed by the accordion/wave phenomenon inherent in such unsafe traffic conditions. It will take each of the 16,896 passengers (average auto occupancy is only slightly more than one per auto) ***one hour*** to travel the 20 mile distance. The fuel used will be 16,896 gallons (assuming the average fuel consumption is 20 m/gal for each auto) and the cost for each motorist (@ $0.50 per mile) will be $10.00! Let us examine the consequences of the requirement that the travel time for transporting 16,896 passengers in the all-bus mode (50 per bus) for the 20 mile stretch shall be ***only 20 minutes*** (not one hour!). This will require only 338 buses, each traveling 60mph with a safe separation of 262.5 feet (more than the safe separation amount of 1.5 x 60 = 90 feet), with a total fuel consumption of only 1,454 gallons (4.649 m/gal average) – only 8.6% of the fuel used by the fleet of 16,896 autos– and with a cost for each of the 16,896 bus passengers of only $0.62 – 6.3% of what it would cost if each passenger used an auto!! The waiting time for each bus is 3 seconds.

Tables 6 and 7 give cost comparisons for various cases of both modes traveling at the same speed and carrying the same number of passenger miles per hour. **Note the many cases where it is impossible for the all auto mode to carry large amounts of passenger miles per hour but always possible for the all bus mode to do so for any speed from 10 to 70 mph and for any passenger mile per hour amount from 1,000 to 25,000! Also notice the short waiting times between buses for every case!**

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## Mathematical Relations

$p_c$ = number of passengers per car
$p_b$ = number of passengers per bus
$s_c$ = speed of each car in miles per hour (mph)
$s_b$ = speed of each bus in miles per hour (mph)
$t_c$ = average number of hours each car operates
$t_b$ = average number of hours each bus operates
$l_c$ = average distance each car travels = $s_c\ t_c$
$l_b$ = average distance each bus travels = $s_b\ t_b$
$d_p$ = average distance each passenger travels
$L_c$ = length of each car (feet)
$L_b$ = length of each bus (feet)
$S_c$ = separation between each car (feet)
$S_b$ = separation between each bus (feet)
$d_c$ = density per unit of length for all-car mode (number of passengers per mile for all-car mode)
$d_b$ = density per unit of length for all-bus mode (number of passengers per mile for all-bus mode)
$N_c$ = number of passengers passing by a fixed point per hour in the all-car mode
$N_b$ = number of passengers passing by a fixed point per hour in the all-bus mode
$V_c$ = number of cars passing by a fixed point in one hour
$V_b$ = number of buses passing by a fixed point in one hour
$P_c$ = number of passenger miles carried by each car at speed, $s_c$, with $p_c$ passengers, and operating for $t_c$ hours = $s_c\ t_c\ p_c$
$P_b$ = number of passenger miles carried by each bus at speed, $s_b$, with $p_b$ passengers, and operating for $t_b$ hours = $s_b\ t_b\ p_b$

**The following equations (1) through (7') hold for one lane of a thoroughfare in one direction.**

**The safe separation rule requires that the distance, S, between vehicles must satisfy**

**(1) S > 1.5s, where s is the vehicle speed in mph.**

We have the following relations:

(2) $d_c = 5280p_c/(L_c + S_c)$
(3) $d_b = 5280p_b/(L_b + S_b)$.

**Note that $S_c$ and $S_b$ must satisfy (1) if there is to be safe separation.**

The maximum density under safe separation occurs when equality holds in (1), and so we have

(2') $d_{cMAX} = 5280p_c/(L_c + 1.5s_c)$
(3') $d_{bMAX} = 5280p_b/(L_b + 1.5s_b)$.

We further have:

(4) $N_c = d_c s_c = 5280s_c p_c/(L_c + S_c) = V_c p_c$
(5) $N_b = d_b s_b = 5280s_b p_b/(L_b + S_b) = V_b p_b$
(6) $V_c = 5280s_c/(L_c + S_c)$
(7) $V_b = 5280s_b/(L_b + S_b)$.

The maximum number of passengers (respectively, vehicles) passing by a fixed point in one hour under the safe separation rule occurs when equality holds in (1), and so we have

(4') $N_{cMAX} = d_{cMAX}s_c = 5280s_c p_c/(L_c + 1.5s_c) = V_{cMAX}p_c$
(5') $N_{bMAX} = d_{bMAX}s_b = 5280s_b p_b/(L_b + 1.5s_b) = V_{bMAX}p_b$
(6') $V_{cMAX} = 5280s_c/(L_c + 1.5s_c)$
(7') $V_{bMAX} = 5280s_b/(L_b + 1.5s_b)$.

Now let $T_c$ be the total daily number of passengers in the all-car mode, each traveling an average distance, $a_c$, and all to be carried by C cars with each traveling at speed, $s_c$, each with $p_c$ passengers, and each operating for $t_c$ hours. Then

(8) $T_c = C\ p_c$
(8') $(TPM)_c$ = total number of passenger miles in all-car mode = $T_c\ a_c = C\ P_c = C\ s_c\ t_c\ p_c$.

Analogously, let $T_b$ be the total daily number of passengers in the all-bus mode, each traveling an average distance, $a_b$, and all to be carried by B buses with each traveling at speed, $s_b$, each with $p_b$ passengers, and each operating for $t_b$ hours. Then

(9) $T_b = B\ p_b$
(9') $(TPM)_b$ = total number of passenger miles in all-bus mode = $T_b\ a_b = B\ P_b = B\ s_b\ t_b\ p_b$.

If we assume $T_c = T_b$ and $a_c = a_b$, then we obtain (see (8') and (9')) **the ratio of buses to cars**

(10) $B/C = (s_c\ t_c\ p_c)/(s_b\ t_b\ p_b)$.

**For a hypothetical example, let $p_c = 1$ and $p_b = 50$ and assume the conditions in (10). This means one passenger per car, fifty passengers per bus, the total number of daily passengers are the same for both modes, and the average distance for each passenger is the same for both modes. If $s_c = 30$ mph (average car speed), $t_c = 1$ hr (average time of car travel), $s_b = 60$ mph (average bus speed), $t_b = 3$ hrs (average bus time of travel), then B/C = 1/300. Furthermore, if C = 10,000,000 cars, then B = 33,333 buses.**

**Summarizing this hypothetical example, only 33,333 buses, each traveling at 60 mph for 3 hours, and each with 50 passengers, produces 300,000,000 passenger miles, but it takes 10,000,000 cars, each traveling at only 30 mph for 1 hour, and each with only one passenger, to produce the same!! In such a hypothetical scenario, the travel time for each of the 10,000,000 people would be one-half as much in the all-bus mode as it would be in the all-car mode!**

## Table 2

### FEDERAL HIGHWAY ADMINISTRATION [FHWA] FUNCTIONAL SYSTEM

The functional classification of public streets and highways is grouped into systems according to the services they provide.

#### PRINCIPAL ARTERIALS (PA)

**RURAL**: A road classified as Principal Arterial (PA) serves corridor movements having trip length and travel density characteristics of statewide or interstate travel. A PA Rural route provides an integrated network without stub connections except under certain conditions such coastal city or international boundary connections.
**URBAN**: A PA Urban route carries the major portion of trips entering and leaving urban areas as well as the majority of through movements bypassing the central city. PA serves intra-area travel (such as between major inner-city communities, between central business districts and residential areas or between major suburban centers).

#### MINOR ARTERIALS (MA)

**RURAL**: Rural MA roads link cities, larger towns and other important traffic generators such as resort areas into an integrated network of arterial highways. This network provides intrastate and inter-county service connecting to rural collector or local roads.
**URBAN**: Urban MA streets and roads interconnect and expand the PA system and provide service for moderate distance and lower mobility travel. The MA system distributes travel to smaller geographic areas than the PA system. The Urban MA system may carry local bus routes and provide intra-community continuity but does not penetrate neighborhoods.

#### COLLECTORS

**RURAL**: Rural Collector routes generally serve travel of primarily intra-county importance rather than statewide importance. Predominant travel distances are shorter than on Arterial routes.
**RURAL MAJOR COLLECTORS (MJC)**: Rural MJC routes provide service to county seats and larger towns not served by Arterials. Rural MJC routes also link other important intra-county traffic generators such as consolidated schools, shipping points, county parks and important mining and agricultural areas.
**RURAL MINOR COLLECTORS (MNC)**: Rural MNC routes serve the more important intra-county corridors and developed areas within a reasonable distance of a major collector road. Rural MNC routes also link the locally important traffic generators in the rural areas.
**URBAN COLLECTORS (COL)**: Urban COL routes provide land access service and traffic circulation within residential neighborhoods, commercial and industrial areas.

#### LOCAL STREETS AND ROADS

Local Streets and Roads are technically not functionally classified.
**RURAL LOCAL (LOC)**: Rural LOC routes provide access to adjacent land and provide service to short distance travel.
**URBAN LOCAL (LOC)**: Urban LOC routes provide access to neighboring land or to functionally classified routes. These routes offer the lowest level of mobility and usually contain no bus routes. Through traffic movement is usually discouraged.

#### POPULATION GROUPS

The United States Bureau of Census divides communities into groups by volume of population. These groupings are used for further analysis by many agencies such as the Environmental Protection Agency (EPA) and are an important part of HPMS (Highway Performance Monitoring System) data items and analysis.
**RURAL ( R ) AREAS** are those areas outside the boundaries of small urban and urbanized areas. The Bureau of Census defines rural areas as having a population of less than 5,000.

**SMALL URBAN (S)** areas are defined by the Bureau of Census as having a population of 5,000 to 49,999.
**URBANIZED (U)** areas are defined as having a population of 50,000 to 199,999.
**LARGE URBANIZED (L)** areas pertain to larger urban areas having a population of over 200,000.

| RURAL | URBAN |
|---|---|
| **(PAI)**Principal Arterial Interstate | **(PAI)**Principal Arterial Interstate |
| **(OPA)**Other Principal Arterial | **(OFE)**Principal Arterial – Other FWY / EXP |
| **(MA)**Minor Arterial | **(OPA)**Other Principal Arterial |
| **(MJC)**Major Collector | **(MA)**Minor Arterial |
| **(MNC)**Minor Collector | **(COL)**Collector |
| **(LOC)**Local | **(LOC)**Local |

# Table 3

| MT = miles travelled; V = vehicle; P = passenger; D = daily; A = annual | | | | | | |
|---|---|---|---|---|---|---|
| **BUS CARRYING CAPACITY AND COST FOR SCR URBAN ROADS EXCLUDING LOCAL (50 PASSENGERS PER BUS)** | | | | | | |
| **18 HOUR OPERATING PERIOD: 5AM TO 11PM** | | | | | | |
| **Hourly capacity (i.e., passenger miles per hour), C, at v mph (each bus), b buses per mile:** | | | | | | |
| **C = 50 x b x # bi-directional road miles x v** | | | | | | **TOTALS** |
| | **Int** | **OFE** | **OPA** | **MA** | **Col** | |
| **Total miles** | 525.915 | 451.325 | 3,196.137 | 5,226.955 | 4,553.461 | 13,953.793 |
| **Bi-directional road miles** | 1,051.830 | 902.650 | 6,392.274 | 10,453.910 | 9,106.922 | 27,907.586 |
| **v (mph)** | 55 | 55 | 40 | 30 | 30 | |
| **b** | 1.75 | 1.36 | 0.37 | 0.23 | 0.069 | |
| **C** | 5,061,932 | 3,375,911 | 4,730,283 | 3,606,599 | 942,566 | |
| **18 hour (=daily) capacity** | **91,114,774** | **60,766,398** | **85,145,090** | **64,918,781** | **16,966,196** | **318,911,238** |
| **Wait time between buses in minutes** | 0.62 | 0.80 | 4.05 | 8.70 | 28.99 | |
| **#buses operating for 18 hrs** | 1,841 | 1,228 | 2,365 | 2,404 | 628 | 8,466 |
| **#buses operating in 6 hour segments (three shifts)** | 5,522 | 3,683 | 7,095 | 7,213 | 1,885 | 25,399 |
| **#bus hours over 18 hour period** | 33,133 | 22,097 | 42,573 | 43,279 | 11,311 | 152,392 |
| **18 hour cost at $100/hr** | $ 3,313,264 | $ 2,209,687 | $ 4,257,254 | $ 4,327,919 | $ 1,131,080 | $ 15,239,205 |
| **Annual cost** | $ 1,209,341,542 | $ 806,535,828 | $ 1,553,897,887 | $ 1,579,690,340 | $ 412,844,095 | **$ 5,562,309,692** |
| 1998 URBAN SCR ALL VEHICLE DATA | | | | | | |
| DVMT = DPMT (approximately) | **90,876,300** | **60,419,100** | **83,945,800** | **62,603,000** | **16,723,800** | **314,568,000** |
| AVMT = APMT (approximately) | 33,169,849,500 | 22,052,971,500 | 30,640,217,000 | 22,850,095,000 | 6,104,187,000 | 114,817,320,000 |
| **Annual bus travel =365 x v x #buses operating 18 hrs x 18** | 665,137,848 | 443,594,705 | 621,559,155 | 473,907,102 | 123,853,229 | **2,328,052,039** |
| **Annual bus fuel concumption (gallons) =annual bus travel/4.649mpg** | 143,071,165 | 95,417,231 | 133,697,388 | 101,937,428 | 26,640,832 | **500,764,044** |

| | | | |
|---|---|---|---|
| 92% of all-vehicle URBAN VMT is from non-commercial vehicles; $0.50 per mile is average cost for non-commercial vehicle; **Annual non-commercial vehicle cost = 0.92xAVMTx$0.50 = $52,815,967,200** | **Fare-free bus system costs:** | Average annual cost per SCR capita (16.84 million): | **$330.30** |
| | | Average daily cost per capita: | **$0.90** |
| Urban non-commercial vehicles average 20 miles per gallon; **Annual urban non-commercial fuel consumption=0.92xAVMT/20 =5,740,866,000 gallons** | | Annual cost as a percentage of the $2.5 trillion of net wealth held by the richest 1% of Californians | **0.22%** |

# Table 4

| **BUS CARRYING CAPACITY AND COST FOR CA URBAN ROADS EXCLUDING LOCAL (50 PASSENGERS PER BUS)** | | | | | | |
|---|---|---|---|---|---|---|
| **18 HOUR OPERATING PERIOD: 5AM TO 11PM** | | | | | | |
| **Hourly capacity (i.e., passenger miles per hour), C, at v mph (each bus), b buses per mile:** | | | | | | |
| **C = 50 x b x # bi-directional road miles x v** | | | | | | **TOTALS** |
| | **Int** | **OFE** | **OPA** | **MA** | **Col** | |
| **Total centerline miles (1998)** | 1,069.184 | 1,397.345 | 5,843.989 | 10,235.916 | 9,973.415 | 28,519.849 |
| **Bi-directional road miles** | 2,138.368 | 2,794.690 | 11,687.978 | 20,471.832 | 19,946.830 | 57,039.698 |
| **v (mph)** | 55 | 55 | 40 | 30 | 30 | |
| **b** | 1.57 | 0.93 | 0.34 | 0.22 | 0.08 | |
| **C** | 9,232,404 | 7,147,420 | 7,947,825 | 6,755,705 | 2,393,620 | |
| **18 hour capacity (=daily capacity)** | **166,183,269** | **128,653,554** | **143,060,851** | **121,602,682** | **43,085,153** | **602,585,509** |
| **Wait time between buses in minutes** | 0.69 | 1.17 | 4.41 | 9.09 | 25.00 | |
| **#buses operating for 18 hrs** | 3,357 | 2,599 | 3,974 | 4,504 | 1,596 | 16,030 |
| **#buses operating in 6 hour segments (three shifts)** | 10,072 | 7,797 | 11,922 | 13,511 | 4,787 | 48,089 |
| **#bus hours over 18 hour period** | 60,430 | 46,783 | 71,530 | 81,068 | 28,723 | 288,536 |
| **18 hour cost (=daily cost) at $100/hr** | $ 6,043,028 | $ 4,678,311 | $ 7,153,043 | $ 8,106,845 | $ 2,872,344 | $ 28,853,571 |
| **Annual cost** | $ 2,205,705,208 | $ 1,707,583,537 | $ 2,610,860,526 | $ 2,958,998,597 | $ 1,048,405,385 | **$ 10,531,553,253** |
| 1999 URBAN CALIFORNIA ALL VEHICLE DATA: | | | | | | |
| DVMT = DPMT (approximately) | **165,575,342** | **127,517,808** | **141,920,548** | **120,057,534** | **39,528,767** | **594,600,000** |
| AVMT = APMT (approximately) | 60,435,000,000 | 46,544,000,000 | 51,801,000,000 | 43,821,000,000 | 14,428,000,000 | 217,029,000,000 |
| **Annual bus travel =365 x v x #buses operating 18 hrs x 18** | 1,213,137,865 | 939,170,945 | 1,044,344,210 | 887,699,579 | 314,521,615 | **4,398,874,215** |
| **Annual bus fuel concumption (gallons) =annual bus travel/4.649mpg** | 260,945,981 | 202,015,691 | 224,638,462 | 190,944,199 | 67,653,606 | **946,197,938** |

| | | | |
|---|---|---|---|
| 92% of all-vehicle URBAN VMT is from non-commercial vehicles; $0.50 per mile is average cost for a non-commercial vehicle; **Annual urban non-commercial vehicle cost = 0.92xAVMTx$0.50 = $99,833,340,000** | **Fare-free bus system costs:** | Average annual cost per capita (34 million): | **$309.75** |
| | | Average daily cost per capita: | **$0.85** |
| Urban non-commercial vehicles average 20 miles per gallon; **Annual urban non-commercial fuel consumption=0.92xAVMT/20 =9,983,334,000 gallons** | | Annual cost as a percentage of the $2.5 trillion of net wealth held by the richest 1% of Californians | **0.42%** |

# Table 5

| BUS CARRYING CAPACITY AND COST FOR USA URBAN ROADS EXCLUDING LOCAL (50 PASSENGERS PER BUS)<br>18 HOUR OPERATING PERIOD: 5AM TO 11PM<br>Hourly capacity (i.e., passenger miles per hour), C, at v mph (each bus), b buses per mile:<br>C = 50 x b x # bi-directional road miles x v | | | | | | TOTALS |
|---|---|---|---|---|---|---|
| | Int | OFE | OPA | MA | Col | |
| **Total miles** | 13,343.000 | 9,125.000 | 53,206.000 | 89,399.000 | 88,008.000 | 253,081.000 |
| **Bi-directional road miles** | 26,686.000 | 18,250.000 | 106,412.000 | 178,798.000 | 176,016.000 | 506,162.000 |
| **v (mph)** | 55 | 55 | 40 | 30 | 30 | |
| **b** | 0.8 | 0.53 | 0.29 | 0.18 | 0.079 | |
| **C** | 58,709,200 | 26,599,375 | 61,718,960 | 48,275,460 | 20,857,896 | |
| **18 hour (=daily) capacity** | **1,056,765,600** | **478,788,750** | **1,110,941,280** | **868,958,280** | **375,442,128** | **3,890,896,038** |
| **Wait time between buses in minutes** | 1.36 | 2.06 | 5.17 | 11.11 | 25.32 | |
| **#buses operating for 18 hrs** | 21,349 | 9,673 | 30,859 | 32,184 | 13,905 | 107,970 |
| **#buses operating in 6 hour segments (three shifts)** | 64,046 | 29,018 | 92,578 | 96,551 | 41,716 | 323,909 |
| **#bus hours over 18 hour period** | 384,278 | 174,105 | 555,471 | 579,306 | 250,295 | 1,943,454 |
| **18 hour cost at $100/hr** | $ 38,427,840 | $ 17,410,500 | $ 55,547,064 | $ 57,930,552 | $ 25,029,475 | $ 194,345,431 |
| **Annual cost** | $ 14,026,161,600 | $ 6,354,832,500 | $ 20,274,678,360 | $ 21,144,651,480 | $ 9,135,758,448 | **$ 70,936,082,388** |
| 1998 URBAN USA ALL VEHICLE DATA | | | | | | |
| DVMT = DPMT (approximately) | **1,049,276,712** | **470,035,616** | **1,075,947,945** | **860,098,630** | **360,583,562** | **3,815,942,466** |
| AVMT = APMT (approximately) | 382,986,000,000 | 171,563,000,000 | 392,721,000,000 | 313,936,000,000 | 131,613,000,000 | 1,392,819,000,000 |
| **Annual bus travel =365 x v x #buses operating 18 hrs x 18** | 7,714,388,880 | 3,495,157,875 | 8,109,871,344 | 6,343,395,444 | 2,740,727,534 | **28,403,541,077** |
| **Annual bus fuel concumption (gallons) =annual bus travel/4.649mpg** | 1,659,365,214 | 751,808,534 | 1,744,433,501 | 1,364,464,496 | 589,530,552 | **6,109,602,297** |

| | | |
|---|---|---|
| 92% of all-vehicle URBAN VMT is from non-commercial vehicles;<br>$0.50 per mile is average cost for non-commercial vehicle;<br>**Annual non-commercial vehicle cost = 0.92xAVMTx$0.50 = $640,696,740,000** | **Fare-free bus system costs:** | Average annual cost per USA capita (285 million): **$248.90**<br>Average daily cost per capita: **$0.68** |
| Urban non-commercial vehicles average 20 miles per gallon;<br>**Annual urban non-commercial fuel consumption=0.92xAVMT/20 =64,069,674,000 gallons** | | Annual cost as a percentage of the $25 trillion of net wealth held by the richest 1% of the US population: **0.28%** |

# Table 6

**One way, 4 lane roadway: number of autos, $N_A$ , per lane-mile, equally spaced in each of the 4 lanes, and the number of buses, $N_B$, per lane-mile, equally spaced in one lane, needed to carry P passengers past a fixed point in one hour, the maximum waiting time between each bus, and the cost comparison (one passenger per auto, 50 passengers per bus, auto length 15 feet, bus length 50 feet; buses and autos at the same speed)**

| | | | | all auto mode | | | all bus mode | | maximum | total cost for one hour | total cost for one hour | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P number of passengers per hr | s speed (mph) | safe separation in feet: =1.5 x s | actual separation in feet | $N_A$ | total number of autos in a one mile sgment of 4 lanes | actual separation in feet | $N_B$ | waiting time between each bus (minutes) | of all auto operation ( $0.50 per mile per auto) | of all bus operation ( $100 per hour per bus) | for one hour of operation, ratio of all bus cost to all auto cost |
| | 1,000 | 10 | 15 | 196.2 | 25.00 | 100.00 | 2,590.0 | 2.00 | 3.00 | $ 5,000.00 | $ 2,000.00 | 40.00% |
| | 1,000 | 20 | 30 | 407.4 | 12.50 | 50.00 | 5,230.0 | 1.00 | 3.00 | $ 10,000.00 | $ 2,000.00 | 20.00% |
| | 1,000 | 30 | 45 | 618.6 | 8.33 | 33.33 | 7,870.0 | 0.67 | 3.00 | $ 15,000.00 | $ 2,000.00 | 13.33% |
| | 1,000 | 40 | 60 | 829.8 | 6.25 | 25.00 | 10,510.0 | 0.50 | 3.00 | $ 20,000.00 | $ 2,000.00 | 10.00% |
| | 1,000 | 50 | 75 | 1,041.0 | 5.00 | 20.00 | 13,150.0 | 0.40 | 3.00 | $ 25,000.00 | $ 2,000.00 | 8.00% |
| | 1,000 | 60 | 90 | 1,252.2 | 4.17 | 16.67 | 15,790.0 | 0.33 | 3.00 | $ 30,000.00 | $ 2,000.00 | 6.67% |
| | 1,000 | 70 | 105 | 1,463.4 | 3.57 | 14.29 | 18,430.0 | 0.29 | 3.00 | $ 35,000.00 | $ 2,000.00 | 5.71% |
| | 2,000 | 10 | 15 | 90.6 | 50.00 | 200.00 | 1,270.0 | 4.00 | 1.50 | $ 10,000.00 | $ 4,000.00 | 40.00% |
| | 2,000 | 20 | 30 | 196.2 | 25.00 | 100.00 | 2,590.0 | 2.00 | 1.50 | $ 20,000.00 | $ 4,000.00 | 20.00% |
| | 2,000 | 30 | 45 | 301.8 | 16.67 | 66.67 | 3,910.0 | 1.33 | 1.50 | $ 30,000.00 | $ 4,000.00 | 13.33% |
| | 2,000 | 40 | 60 | 407.4 | 12.50 | 50.00 | 5,230.0 | 1.00 | 1.50 | $ 40,000.00 | $ 4,000.00 | 10.00% |
| | 2,000 | 50 | 75 | 513.0 | 10.00 | 40.00 | 6,550.0 | 0.80 | 1.50 | $ 50,000.00 | $ 4,000.00 | 8.00% |
| | 2,000 | 60 | 90 | 618.6 | 8.33 | 33.33 | 7,870.0 | 0.67 | 1.50 | $ 60,000.00 | $ 4,000.00 | 6.67% |
| | 2,000 | 70 | 105 | 724.2 | 7.14 | 28.57 | 9,190.0 | 0.57 | 1.50 | $ 70,000.00 | $ 4,000.00 | 5.71% |
| | 5,000 | 10 | 15 | 27.2 | 125.00 | 500.00 | 478.0 | 10.00 | 0.60 | $ 25,000.00 | $ 10,000.00 | 40.00% |
| | 5,000 | 20 | 30 | 69.5 | 62.50 | 250.00 | 1,006.0 | 5.00 | 0.60 | $ 50,000.00 | $ 10,000.00 | 20.00% |
| | 5,000 | 30 | 45 | 111.7 | 41.67 | 166.67 | 1,534.0 | 3.33 | 0.60 | $ 75,000.00 | $ 10,000.00 | 13.33% |
| | 5,000 | 40 | 60 | 154.0 | 31.25 | 125.00 | 2,062.0 | 2.50 | 0.60 | $ 100,000.00 | $ 10,000.00 | 10.00% |
| | 5,000 | 50 | 75 | 196.2 | 25.00 | 100.00 | 2,590.0 | 2.00 | 0.60 | $ 125,000.00 | $ 10,000.00 | 8.00% |
| | 5,000 | 60 | 90 | 238.4 | 20.83 | 83.33 | 3,118.0 | 1.67 | 0.60 | $ 150,000.00 | $ 10,000.00 | 6.67% |
| | 5,000 | 70 | 105 | 280.7 | 17.86 | 71.43 | 3,646.0 | 1.43 | 0.60 | $ 175,000.00 | $ 10,000.00 | 5.71% |
| # | 10,000 | 10 | 15 | 6.1 | 250.00 | 1,000.00 | 214.0 | 20.00 | 0.30 | $ 50,000.00 | $ 20,000.00 | 40.00% |
| # | 10,000 | 20 | 30 | 27.2 | 125.00 | 500.00 | 478.0 | 10.00 | 0.30 | $ 100,000.00 | $ 20,000.00 | 20.00% |
| | 10,000 | 30 | 45 | 48.4 | 83.33 | 333.33 | 742.0 | 6.67 | 0.30 | $ 150,000.00 | $ 20,000.00 | 13.33% |
| | 10,000 | 40 | 60 | 69.5 | 62.50 | 250.00 | 1,006.0 | 5.00 | 0.30 | $ 200,000.00 | $ 20,000.00 | 10.00% |
| | 10,000 | 50 | 75 | 90.6 | 50.00 | 200.00 | 1,270.0 | 4.00 | 0.30 | $ 250,000.00 | $ 20,000.00 | 8.00% |
| | 10,000 | 60 | 90 | 111.7 | 41.67 | 166.67 | 1,534.0 | 3.33 | 0.30 | $ 300,000.00 | $ 20,000.00 | 6.67% |
| | 10,000 | 70 | 105 | 132.8 | 35.71 | 142.86 | 1,798.0 | 2.86 | 0.30 | $ 350,000.00 | $ 20,000.00 | 5.71% |
| # | 15,000 | 10 | 15 | -0.9 | 375.00 | 1,500.00 | 126.0 | 30.00 | 0.20 | $ 75,000.00 | $ 30,000.00 | 40.00% |
| # | 15,000 | 20 | 30 | 13.2 | 187.50 | 750.00 | 302.0 | 15.00 | 0.20 | $ 150,000.00 | $ 30,000.00 | 20.00% |
| # | 15,000 | 30 | 45 | 27.2 | 125.00 | 500.00 | 478.0 | 10.00 | 0.20 | $ 225,000.00 | $ 30,000.00 | 13.33% |
| # | 15,000 | 40 | 60 | 41.3 | 93.75 | 375.00 | 654.0 | 7.50 | 0.20 | $ 300,000.00 | $ 30,000.00 | 10.00% |
| # | 15,000 | 50 | 75 | 55.4 | 75.00 | 300.00 | 830.0 | 6.00 | 0.20 | $ 375,000.00 | $ 30,000.00 | 8.00% |
| # | 15,000 | 60 | 90 | 69.5 | 62.50 | 250.00 | 1,006.0 | 5.00 | 0.20 | $ 450,000.00 | $ 30,000.00 | 6.67% |
| # | 15,000 | 70 | 105 | 83.6 | 53.57 | 214.29 | 1,182.0 | 4.29 | 0.20 | $ 525,000.00 | $ 30,000.00 | 5.71% |
| # | 20,000 | 10 | 15 | -4.4 | 500.00 | 2,000.00 | 82.0 | 40.00 | 0.15 | $ 100,000.00 | $ 40,000.00 | 40.00% |
| # | 20,000 | 20 | 30 | 6.1 | 250.00 | 1,000.00 | 214.0 | 20.00 | 0.15 | $ 200,000.00 | $ 40,000.00 | 20.00% |
| # | 20,000 | 30 | 45 | 16.7 | 166.67 | 666.67 | 346.0 | 13.33 | 0.15 | $ 300,000.00 | $ 40,000.00 | 13.33% |
| # | 20,000 | 40 | 60 | 27.2 | 125.00 | 500.00 | 478.0 | 10.00 | 0.15 | $ 400,000.00 | $ 40,000.00 | 10.00% |
| # | 20,000 | 50 | 75 | 37.8 | 100.00 | 400.00 | 610.0 | 8.00 | 0.15 | $ 500,000.00 | $ 40,000.00 | 8.00% |
| # | 20,000 | 60 | 90 | 48.4 | 83.33 | 333.33 | 742.0 | 6.67 | 0.15 | $ 600,000.00 | $ 40,000.00 | 6.67% |
| # | 20,000 | 70 | 105 | 58.9 | 71.43 | 285.71 | 874.0 | 5.71 | 0.15 | $ 700,000.00 | $ 40,000.00 | 5.71% |
| # | 25,000 | 10 | 15 | -6.6 | 625.00 | 2,500.00 | 55.6 | 50.00 | 0.12 | $ 125,000.00 | $ 50,000.00 | 40.00% |
| # | 25,000 | 20 | 30 | 1.9 | 312.50 | 1,250.00 | 161.2 | 25.00 | 0.12 | $ 250,000.00 | $ 50,000.00 | 20.00% |
| # | 25,000 | 30 | 45 | 10.3 | 208.33 | 833.33 | 266.8 | 16.67 | 0.12 | $ 375,000.00 | $ 50,000.00 | 13.33% |
| # | 25,000 | 40 | 60 | 18.8 | 156.25 | 625.00 | 372.4 | 12.50 | 0.12 | $ 500,000.00 | $ 50,000.00 | 10.00% |
| # | 25,000 | 50 | 75 | 27.2 | 125.00 | 500.00 | 478.0 | 10.00 | 0.12 | $ 625,000.00 | $ 50,000.00 | 8.00% |
| # | 25,000 | 60 | 90 | 35.7 | 104.17 | 416.67 | 583.6 | 8.33 | 0.12 | $ 750,000.00 | $ 50,000.00 | 6.67% |
| # | 25,000 | 70 | 105 | 44.1 | 89.29 | 357.14 | 689.2 | 7.14 | 0.12 | $ 875,000.00 | $ 50,000.00 | 5.71% |

**#Impossible or very unsafe cases for the all auto mode because actual separation is less than safe separation; but possible in ALL CASES for the all bus mode because the actual separation exceeds the safe separation by at least a factor of 3.7**

# Table 7

**One way, 2 lane roadway: number of autos, $N_A$ , per lane-mile, equally spaced in each of the 2 lanes, and the number of buses, $N_B$, per lane-mile, equally spaced in one lane, needed to carry P passengers past a fixed point in one hour, the maximum waiting time between each bus, and the cost comparison (one passenger per auto, 50 passengers per bus, auto length 15 feet, bus length 50 feet; buses and autos at same speed)**

| | | | | all auto mode | | | all bus mode | | maximum | total cost for one hour | total cost for one hour | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P number of passengers per hr | s speed (mph) | safe separation in feet: =1.5 x s | actual separation in feet | $N_A$ | total number of autos in a one mile sgment of 2 lanes | actual separation in feet | $N_B$ | waiting time between each bus (minutes) | of all auto operation ( $0.50 per mile per auto) | of all bus operation ( $100 per hour per bus) | for one hour of operation, ratio of all bus cost to all auto cost |
| | 1,000 | 10 | 15 | 90.6 | 50.00 | 100.00 | 2,590.0 | 2.00 | 3.00 | $ 5,000.00 | $ 2,000.00 | 40.00% |
| | 1,000 | 20 | 30 | 196.2 | 25.00 | 50.00 | 5,230.0 | 1.00 | 3.00 | $ 10,000.00 | $ 2,000.00 | 20.00% |
| | 1,000 | 30 | 45 | 301.8 | 16.67 | 33.33 | 7,870.0 | 0.67 | 3.00 | $ 15,000.00 | $ 2,000.00 | 13.33% |
| | 1,000 | 40 | 60 | 407.4 | 12.50 | 25.00 | 10,510.0 | 0.50 | 3.00 | $ 20,000.00 | $ 2,000.00 | 10.00% |
| | 1,000 | 50 | 75 | 513.0 | 10.00 | 20.00 | 13,150.0 | 0.40 | 3.00 | $ 25,000.00 | $ 2,000.00 | 8.00% |
| | 1,000 | 60 | 90 | 618.6 | 8.33 | 16.67 | 15,790.0 | 0.33 | 3.00 | $ 30,000.00 | $ 2,000.00 | 6.67% |
| | 1,000 | 70 | 105 | 724.2 | 7.14 | 14.29 | 18,430.0 | 0.29 | 3.00 | $ 35,000.00 | $ 2,000.00 | 5.71% |
| | 2,000 | 10 | 15 | 37.8 | 100.00 | 200.00 | 1,270.0 | 4.00 | 1.50 | $ 10,000.00 | $ 4,000.00 | 40.00% |
| | 2,000 | 20 | 30 | 90.6 | 50.00 | 100.00 | 2,590.0 | 2.00 | 1.50 | $ 20,000.00 | $ 4,000.00 | 20.00% |
| | 2,000 | 30 | 45 | 143.4 | 33.33 | 66.67 | 3,910.0 | 1.33 | 1.50 | $ 30,000.00 | $ 4,000.00 | 13.33% |
| | 2,000 | 40 | 60 | 196.2 | 25.00 | 50.00 | 5,230.0 | 1.00 | 1.50 | $ 40,000.00 | $ 4,000.00 | 10.00% |
| | 2,000 | 50 | 75 | 249.0 | 20.00 | 40.00 | 6,550.0 | 0.80 | 1.50 | $ 50,000.00 | $ 4,000.00 | 8.00% |
| | 2,000 | 60 | 90 | 301.8 | 16.67 | 33.33 | 7,870.0 | 0.67 | 1.50 | $ 60,000.00 | $ 4,000.00 | 6.67% |
| | 2,000 | 70 | 105 | 354.6 | 14.29 | 28.57 | 9,190.0 | 0.57 | 1.50 | $ 70,000.00 | $ 4,000.00 | 5.71% |
| # | 5,000 | 10 | 15 | 6.1 | 250.00 | 500.00 | 478.0 | 10.00 | 0.60 | $ 25,000.00 | $ 10,000.00 | 40.00% |
| # | 5,000 | 20 | 30 | 27.2 | 125.00 | 250.00 | 1,006.0 | 5.00 | 0.60 | $ 50,000.00 | $ 10,000.00 | 20.00% |
| | 5,000 | 30 | 45 | 48.4 | 83.33 | 166.67 | 1,534.0 | 3.33 | 0.60 | $ 75,000.00 | $ 10,000.00 | 13.33% |
| | 5,000 | 40 | 60 | 69.5 | 62.50 | 125.00 | 2,062.0 | 2.50 | 0.60 | $ 100,000.00 | $ 10,000.00 | 10.00% |
| | 5,000 | 50 | 75 | 90.6 | 50.00 | 100.00 | 2,590.0 | 2.00 | 0.60 | $ 125,000.00 | $ 10,000.00 | 8.00% |
| | 5,000 | 60 | 90 | 111.7 | 41.67 | 83.33 | 3,118.0 | 1.67 | 0.60 | $ 150,000.00 | $ 10,000.00 | 6.67% |
| | 5,000 | 70 | 105 | 132.8 | 35.71 | 71.43 | 3,646.0 | 1.43 | 0.60 | $ 175,000.00 | $ 10,000.00 | 5.71% |
| # | 10,000 | 10 | 15 | -4.4 | 500.00 | 1,000.00 | 214.0 | 20.00 | 0.30 | $ 50,000.00 | $ 20,000.00 | 40.00% |
| # | 10,000 | 20 | 30 | 6.1 | 250.00 | 500.00 | 478.0 | 10.00 | 0.30 | $ 100,000.00 | $ 20,000.00 | 20.00% |
| # | 10,000 | 30 | 45 | 16.7 | 166.67 | 333.33 | 742.0 | 6.67 | 0.30 | $ 150,000.00 | $ 20,000.00 | 13.33% |
| # | 10,000 | 40 | 60 | 27.2 | 125.00 | 250.00 | 1,006.0 | 5.00 | 0.30 | $ 200,000.00 | $ 20,000.00 | 10.00% |
| # | 10,000 | 50 | 75 | 37.8 | 100.00 | 200.00 | 1,270.0 | 4.00 | 0.30 | $ 250,000.00 | $ 20,000.00 | 8.00% |
| # | 10,000 | 60 | 90 | 48.4 | 83.33 | 166.67 | 1,534.0 | 3.33 | 0.30 | $ 300,000.00 | $ 20,000.00 | 6.67% |
| # | 10,000 | 70 | 105 | 58.9 | 71.43 | 142.86 | 1,798.0 | 2.86 | 0.30 | $ 350,000.00 | $ 20,000.00 | 5.71% |
| # | 15,000 | 10 | 15 | -8.0 | 750.00 | 1,500.00 | 126.0 | 30.00 | 0.20 | $ 75,000.00 | $ 30,000.00 | 40.00% |
| # | 15,000 | 20 | 30 | -0.9 | 375.00 | 750.00 | 302.0 | 15.00 | 0.20 | $ 150,000.00 | $ 30,000.00 | 20.00% |
| # | 15,000 | 30 | 45 | 6.1 | 250.00 | 500.00 | 478.0 | 10.00 | 0.20 | $ 225,000.00 | $ 30,000.00 | 13.33% |
| # | 15,000 | 40 | 60 | 13.2 | 187.50 | 375.00 | 654.0 | 7.50 | 0.20 | $ 300,000.00 | $ 30,000.00 | 10.00% |
| # | 15,000 | 50 | 75 | 20.2 | 150.00 | 300.00 | 830.0 | 6.00 | 0.20 | $ 375,000.00 | $ 30,000.00 | 8.00% |
| # | 15,000 | 60 | 90 | 27.2 | 125.00 | 250.00 | 1,006.0 | 5.00 | 0.20 | $ 450,000.00 | $ 30,000.00 | 6.67% |
| # | 15,000 | 70 | 105 | 34.3 | 107.14 | 214.29 | 1,182.0 | 4.29 | 0.20 | $ 525,000.00 | $ 30,000.00 | 5.71% |
| # | 20,000 | 10 | 15 | -9.7 | 1,000.00 | 2,000.00 | 82.0 | 40.00 | 0.15 | $ 100,000.00 | $ 40,000.00 | 40.00% |
| # | 20,000 | 20 | 30 | -4.4 | 500.00 | 1,000.00 | 214.0 | 20.00 | 0.15 | $ 200,000.00 | $ 40,000.00 | 20.00% |
| # | 20,000 | 30 | 45 | 0.8 | 333.33 | 666.67 | 346.0 | 13.33 | 0.15 | $ 300,000.00 | $ 40,000.00 | 13.33% |
| # | 20,000 | 40 | 60 | 6.1 | 250.00 | 500.00 | 478.0 | 10.00 | 0.15 | $ 400,000.00 | $ 40,000.00 | 10.00% |
| # | 20,000 | 50 | 75 | 11.4 | 200.00 | 400.00 | 610.0 | 8.00 | 0.15 | $ 500,000.00 | $ 40,000.00 | 8.00% |
| # | 20,000 | 60 | 90 | 16.7 | 166.67 | 333.33 | 742.0 | 6.67 | 0.15 | $ 600,000.00 | $ 40,000.00 | 6.67% |
| # | 20,000 | 70 | 105 | 22.0 | 142.86 | 285.71 | 874.0 | 5.71 | 0.15 | $ 700,000.00 | $ 40,000.00 | 5.71% |
| # | 25,000 | 10 | 15 | -10.8 | 1,250.00 | 2,500.00 | 55.6 | 50.00 | 0.12 | $ 125,000.00 | $ 50,000.00 | 40.00% |
| # | 25,000 | 20 | 30 | -6.6 | 625.00 | 1,250.00 | 161.2 | 25.00 | 0.12 | $ 250,000.00 | $ 50,000.00 | 20.00% |
| # | 25,000 | 30 | 45 | -2.3 | 416.67 | 833.33 | 266.8 | 16.67 | 0.12 | $ 375,000.00 | $ 50,000.00 | 13.33% |
| # | 25,000 | 40 | 60 | 1.9 | 312.50 | 625.00 | 372.4 | 12.50 | 0.12 | $ 500,000.00 | $ 50,000.00 | 10.00% |
| # | 25,000 | 50 | 75 | 6.1 | 250.00 | 500.00 | 478.0 | 10.00 | 0.12 | $ 625,000.00 | $ 50,000.00 | 8.00% |
| # | 25,000 | 60 | 90 | 10.3 | 208.33 | 416.67 | 583.6 | 8.33 | 0.12 | $ 750,000.00 | $ 50,000.00 | 6.67% |
| # | 25,000 | 70 | 105 | 14.6 | 178.57 | 357.14 | 689.2 | 7.14 | 0.12 | $ 875,000.00 | $ 50,000.00 | 5.71% |

**#Impossible or very unsafe cases for the all auto mode because actual separation is less than safe separation, but possible in ALL CASES for the all bus mode because the actual separation exceeds the safe separation by at least a factor of 3.7**

# Table 8

| | U.S. Public Road and Street Mileage by Functional System* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
| **Urban mileage** | | | | | | | | | | |
| INT | 11,527 | 11,602 | 12,516 | 12,877 | 13,126 | 13,164 | 13,217 | 13,247 | 13,312 | 13,343 |
| OFE | 7,668 | 7,709 | 8,491 | 8,841 | 8,994 | 8,970 | 9,027 | 9,063 | 9,127 | 9,125 |
| OPA | 51,968 | 52,515 | 51,900 | 52,708 | 53,110 | 52,796 | 52,983 | 53,223 | 53,132 | 53,206 |
| MA | 74,659 | 74,795 | 80,815 | 86,821 | 87,857 | 88,510 | 89,020 | 89,185 | 89,496 | 89,399 |
| COL | 78,254 | 77,102 | 82,784 | 84,854 | 86,089 | 87,331 | 87,790 | 88,049 | 88,071 | 88,008 |
| LOC | 520,568 | 526,139 | 548,560 | 559,776 | 564,609 | 568,935 | 574,728 | 583,973 | 588,504 | 592,978 |
| **Total** | 744,644 | 749,862 | 785,066 | 805,877 | 813,785 | 819,706 | 826,765 | 836,740 | 841,642 | 846,059 |
| **Rural mileage** | | | | | | | | | | |
| INT | 33,547 | 33,677 | 32,951 | 32,631 | 32,457 | 32,580 | 32,820 | 32,817 | 32,813 | 32,974 |
| OPA | 83,802 | 86,747 | 94,947 | 96,770 | 97,175 | 97,948 | 98,131 | 98,257 | 98,852 | 98,856 |
| MA | 144,774 | 141,795 | 137,685 | 137,577 | 138,120 | 137,151 | 137,359 | 137,497 | 137,308 | 137,463 |
| MJC | 436,352 | 436,746 | 434,072 | 432,222 | 431,115 | 431,712 | 432,117 | 432,714 | 432,408 | 432,954 |
| MNC | 293,922 | 293,511 | 284,504 | 282,182 | 282,011 | 274,081 | 273,198 | 272,362 | 272,140 | 271,690 |
| LOC | 2,129,885 | 2,141,582 | 2,131,856 | 2,117,952 | 2,111,932 | 2,119,048 | 2,119,262 | 2,135,485 | 2,091,127 | 2,097,244 |
| **Total** | 3,122,282 | 3,134,058 | 3,116,015 | 3,099,334 | 3,092,810 | 3,092,520 | 3,092,887 | 3,109,132 | 3,064,648 | 3,071,181 |
| **TOTAL urban and rural mileage** | 3,866,926 | 3,883,920 | 3,901,081 | 3,905,211 | 3,906,595 | 3,912,226 | 3,919,652 | 3,945,872 | 3,906,290 | 3,917,240 |

*Includes the 50 states and the District of Columbia. When states did not submit reports, data were estimated by the U.S. Department of Transportation, Federal Highway Administration.

| | Distribution of U.S. Public Road and Street Mileage by Functional System* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
| **Urban mileage** | | | | | | | | | | |
| INT | 1.55% | 1.55% | 1.59% | 1.60% | 1.61% | 1.61% | 1.60% | 1.58% | 1.58% | 1.58% |
| OFE | 1.03% | 1.03% | 1.08% | 1.10% | 1.11% | 1.09% | 1.09% | 1.08% | 1.08% | 1.08% |
| OPA | 6.98% | 7.00% | 6.61% | 6.54% | 6.53% | 6.44% | 6.41% | 6.36% | 6.31% | 6.29% |
| MA | 10.03% | 9.97% | 10.29% | 10.77% | 10.80% | 10.80% | 10.77% | 10.66% | 10.63% | 10.57% |
| COL | 10.51% | 10.28% | 10.54% | 10.53% | 10.58% | 10.65% | 10.62% | 10.52% | 10.46% | 10.40% |
| LOC | 69.91% | 70.16% | 69.87% | 69.46% | 69.38% | 69.41% | 69.52% | 69.79% | 69.92% | 70.09% |
| **Total** | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| **Rural mileage** | | | | | | | | | | |
| INT | 1.07% | 1.07% | 1.06% | 1.05% | 1.05% | 1.05% | 1.06% | 1.06% | 1.07% | 1.07% |
| OPA | 2.68% | 2.77% | 3.05% | 3.12% | 3.14% | 3.17% | 3.17% | 3.16% | 3.23% | 3.22% |
| MA | 4.64% | 4.52% | 4.42% | 4.44% | 4.47% | 4.43% | 4.44% | 4.42% | 4.48% | 4.48% |
| MJC | 13.98% | 13.94% | 13.93% | 13.95% | 13.94% | 13.96% | 13.97% | 13.92% | 14.11% | 14.10% |
| MNC | 9.41% | 9.37% | 9.13% | 9.10% | 9.12% | 8.86% | 8.83% | 8.76% | 8.88% | 8.85% |
| LOC | 68.22% | 68.33% | 68.42% | 68.34% | 68.29% | 68.52% | 68.52% | 68.68% | 68.23% | 68.29% |
| **Total** | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

# Table 9

**ANNUAL VEHICLE - MILES OF TRAVEL, 1980 - 1995 1/**
**BY FUNCTIONAL SYSTEM**
**NATIONAL SUMMARY 2/**

(MILLIONS)

| | RURAL | | | | | | | URBAN | | | | | | | TOTAL RURAL & URBAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | INT | OPA | MA | MJC | MNC | LOC | TOTAL | INT | OFE | OPA | MA | COL | LOC | TOTAL | |
| 1980 | 135,084 | 132,958 | 129,816 | 150,186 | 39,282 | 84,704 | 672,030 | 161,242 | 79,690 | 229,469 | 175,030 | 83,043 | 126,791 | 855,265 | 1,527,295 |
| 1981 | 139,304 | 135,029 | 132,191 | 152,428 | 41,080 | 88,276 | 688,308 | 166,479 | 81,454 | 231,610 | 170,220 | 80,598 | 136,639 | 867,000 | 1,555,308 |
| 1982 | 142,546 | 134,042 | 135,979 | 154,476 | 40,582 | 81,601 | 689,226 | 175,879 | 90,054 | 242,138 | 182,195 | 83,726 | 131,792 | 905,784 | 1,595,010 |
| 1983 | 145,250 | 140,104 | 133,304 | 156,913 | 43,736 | 81,210 | 700,517 | 192,470 | 87,299 | 256,914 | 188,791 | 86,827 | 139,970 | 952,271 | 1,652,788 |
| 1984 | 149,139 | 144,056 | 136,761 | 158,956 | 42,922 | 86,298 | 718,132 | 204,304 | 93,810 | 271,403 | 195,400 | 87,893 | 149,327 | 1,002,137 | 1,720,269 |
| 1985 | 154,357 | 145,881 | 136,922 | 163,297 | 43,372 | 86,899 | 730,728 | 216,188 | 97,408 | 279,121 | 201,741 | 89,578 | 160,062 | 1,044,098 | 1,774,826 |
| 1986 | 159,498 | 149,405 | 140,724 | 164,852 | 43,123 | 90,178 | 747,780 | 232,017 | 105,480 | 287,660 | 208,728 | 89,967 | 163,240 | 1,087,092 | 1,834,872 |
| 1987 | 170,493 | 155,446 | 146,543 | 174,301 | 44,535 | 89,132 | 780,450 | 244,836 | 109,961 | 304,684 | 224,144 | 95,970 | 161,159 | 1,140,754 | 1,921,204 |
| 1988 | 181,315 | 160,244 | 151,749 | 183,541 | 47,023 | 93,662 | 817,534 | 258,695 | 116,983 | 319,344 | 231,802 | 99,211 | 182,393 | 1,208,428 | 2,025,962 |
| 1989 | 191,085 | 165,859 | 156,646 | 187,195 | 48,714 | 97,726 | 847,225 | 270,735 | 122,024 | 327,173 | 234,769 | 101,871 | 192,690 | 1,249,262 | 2,096,487 |
| 1990 | 200,173 | 175,133 | 155,733 | 190,512 | 49,948 | 97,379 | 868,878 | 278,901 | 127,465 | 335,543 | 236,225 | 106,297 | 191,053 | 1,275,484 | 2,144,362 |
| 1991 | 205,011 | 179,202 | 155,553 | 193,998 | 51,632 | 98,157 | 883,553 | 285,325 | 128,220 | 339,954 | 239,344 | 107,281 | 188,373 | 1,288,497 | 2,172,050 |
| 1992 | 205,557 | 196,816 | 147,246 | 184,845 | 50,065 | 99,568 | 884,097 | 303,265 | 138,312 | 345,047 | 262,259 | 116,065 | 198,106 | 1,363,054 | 2,247,151 |
| 1993 | 208,308 | 203,113 | 146,454 | 178,170 | 48,126 | 102,535 | 886,706 | 317,399 | 142,063 | 354,976 | 276,939 | 117,887 | 200,408 | 1,409,672 | 2,296,378 |
| 1994 | 215,568 | 207,569 | 149,760 | 182,000 | 48,529 | 104,915 | 908,341 | 330,577 | 147,534 | 364,200 | 286,165 | 120,088 | 200,683 | 1,449,247 | 2,357,588 |
| 1995 | 223,382 | 215,567 | 153,028 | 186,212 | 49,936 | 105,164 | 933,289 | 341,528 | 151,560 | 370,338 | 293,272 | 126,929 | 205,907 | 1,489,534 | 2,422,823 |

1/ Data are based on State highway agency estimates reported for the various functional systems.

2/ Includes the 50 States and the District of Columbia

**DISTRIBUTION OF ANNUAL VEHICLE-MILES BY FUNCTIONAL SYSTEM**

| | RURAL | | | | | | | URBAN | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | INT | OPA | MA | MJC | MNC | LOC | TOTAL | INT | OFE | OPA | MA | COL | LOC | TOTAL |
| 1980 | 20.10% | 19.78% | 19.32% | 22.35% | 5.85% | 12.60% | 100.00% | 18.85% | 9.32% | 26.83% | 20.47% | 9.71% | 14.82% | 100.00% |
| 1981 | 20.24% | 19.62% | 19.21% | 22.15% | 5.97% | 12.83% | 100.00% | 19.20% | 9.39% | 26.71% | 19.63% | 9.30% | 15.76% | 100.00% |
| 1982 | 20.68% | 19.45% | 19.73% | 22.41% | 5.89% | 11.84% | 100.00% | 19.42% | 9.94% | 26.73% | 20.11% | 9.24% | 14.55% | 100.00% |
| 1983 | 20.73% | 20.00% | 19.03% | 22.40% | 6.24% | 11.59% | 100.00% | 20.21% | 9.17% | 26.98% | 19.83% | 9.12% | 14.70% | 100.00% |
| 1984 | 20.77% | 20.06% | 19.04% | 22.13% | 5.98% | 12.02% | 100.00% | 20.39% | 9.36% | 27.08% | 19.50% | 8.77% | 14.90% | 100.00% |
| 1985 | 21.12% | 19.96% | 18.74% | 22.35% | 5.94% | 11.89% | 100.00% | 20.71% | 9.33% | 26.73% | 19.32% | 8.58% | 15.33% | 100.00% |
| 1986 | 21.33% | 19.98% | 18.82% | 22.05% | 5.77% | 12.06% | 100.00% | 21.34% | 9.70% | 26.46% | 19.20% | 8.28% | 15.02% | 100.00% |
| 1987 | 21.85% | 19.92% | 18.78% | 22.33% | 5.71% | 11.42% | 100.00% | 21.46% | 9.64% | 26.71% | 19.65% | 8.41% | 14.13% | 100.00% |
| 1988 | 22.18% | 19.60% | 18.56% | 22.45% | 5.75% | 11.46% | 100.00% | 21.41% | 9.68% | 26.43% | 19.18% | 8.21% | 15.09% | 100.00% |
| 1989 | 22.55% | 19.58% | 18.49% | 22.10% | 5.75% | 11.53% | 100.00% | 21.67% | 9.77% | 26.19% | 18.79% | 8.15% | 15.42% | 100.00% |
| 1990 | 23.04% | 20.16% | 17.92% | 21.93% | 5.75% | 11.21% | 100.00% | 21.87% | 9.99% | 26.31% | 18.52% | 8.33% | 14.98% | 100.00% |
| 1991 | 23.20% | 20.28% | 17.61% | 21.96% | 5.84% | 11.11% | 100.00% | 22.14% | 9.95% | 26.38% | 18.58% | 8.33% | 14.62% | 100.00% |
| 1992 | 23.25% | 22.26% | 16.65% | 20.91% | 5.66% | 11.26% | 100.00% | 22.25% | 10.15% | 25.31% | 19.24% | 8.52% | 14.53% | 100.00% |
| 1993 | 23.49% | 22.91% | 16.52% | 20.09% | 5.43% | 11.56% | 100.00% | 22.52% | 10.08% | 25.18% | 19.65% | 8.36% | 14.22% | 100.00% |
| 1994 | 23.73% | 22.85% | 16.49% | 20.04% | 5.34% | 11.55% | 100.00% | 22.81% | 10.18% | 25.13% | 19.75% | 8.29% | 13.85% | 100.00% |
| 1995 | 23.93% | 23.10% | 16.40% | 19.95% | 5.35% | 11.27% | 100.00% | 22.93% | 10.17% | 24.86% | 19.69% | 8.52% | 13.82% | 100.00% |

# Table 10

| December 31, 1998 Six County (SCAG) Mileage Summary and Travel Estimate (NHS = National Highway System; DVMT = Daily Vehicle-Miles Traveled) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **INT** | **OFE** | **OPA** | **MA** | **COL** | **LOC** | **TOTALS** |
| **URBAN TOTALS** | NHS Miles | 525.915 | 409.701 | 165.232 | 6.836 | 2.000 | 0.000 | 1,109.684 |
| | DVMT | 90,876,300 | 58,496,500 | 3,083,800 | 121,700 | 6,200 | 0 | 152,584,500 |
| | Other Miles | 0.000 | 41.624 | 3,030.905 | 5,220.119 | 4,551.461 | 25,663.027 | 38,507.136 |
| | DVMT | 0 | 1,922,600 | 80,862,000 | 62,481,300 | 16,717,600 | 27,562,300 | 189,545,800 |
| | Total Miles | 525.915 | 451.325 | 3,196.137 | 5,226.955 | 4,553.461 | 25,663.027 | 39,616.820 |
| | DVMT | 90,876,300 | 60,419,100 | 83,945,800 | 62,603,000 | 16,723,800 | 27,562,300 | 342,130,300 |
| **RURAL & URBAN** | NHS Miles | 1,091.854 | 820.061 | 191.449 | 26.574 | 2.000 | 0.000 | 2,131.938 |
| **TOTALS** | DVMT | 105,793,900 | 66,123,300 | 3,412,300 | 216,000 | 6,200 | 0 | 175,551,700 |
| | Other Miles | 0.000 | 79.796 | 4,213.871 | 7,803.490 | 5,972.773 | 31,130.316 | 49,200.246 |
| | DVMT | 0 | 2,249,800 | 85,256,200 | 67,500,100 | 17,630,400 | 28,664,300 | 201,300,800 |
| | Total Miles | 1,091.854 | 899.857 | 4,405.320 | 7,830.064 | 5,974.773 | 31,130.316 | 51,332.184 |
| | DVMT | 105,793,900 | 68,373,100 | 88,668,500 | 67,716,100 | 17,636,600 | 28,664,300 | 376,852,500 |
| **RURAL TOTALS** | NHS Miles | 565.939 | 410.360 | 26.217 | 19.738 | 0.000 | 0.000 | 1,022.254 |
| | DVMT | 14,917,600 | 7,626,800 | 328,500 | 94,300 | 0 | 0 | 22,967,200 |
| | Other Miles | 0.000 | 38.172 | 1,182.966 | 2,583.371 | 1,421.312 | 5,467.289 | 10,693.110 |
| | DVMT | 0 | 327,200 | 4,394,200 | 5,018,800 | 912,800 | 1,102,000 | 11,755,000 |
| | Total Miles | 565.939 | 448.532 | 1,209.183 | 2,603.109 | 1,421.312 | 5,467.289 | 11,715.364 |
| | DVMT | 14,917,600 | 7,954,000 | 4,722,700 | 5,113,100 | 912,800 | 1,102,000 | 34,722,200 |
| **RURAL & URBAN** | NHS Miles | 1,091.854 | 820.061 | 191.449 | 26.574 | 2.000 | 0.000 | 2,131.938 |
| **TOTALS** | DVMT | 105,793,900 | 66,123,300 | 3,412,300 | 216,000 | 6,200 | 0 | 175,551,700 |
| | Other Miles | 0.000 | 79.796 | 4,213.871 | 7,803.490 | 5,972.773 | 31,130.316 | 49,200.246 |
| | DVMT | 0 | 2,249,800 | 85,256,200 | 67,500,100 | 17,630,400 | 28,664,300 | 201,300,800 |
| | Total Miles | 1,091.854 | 899.857 | 4,405.320 | 7,830.064 | 5,974.773 | 31,130.316 | 51,332.184 |
| | DVMT | 105,793,900 | 68,373,100 | 88,668,500 | 67,716,100 | 17,636,600 | 28,664,300 | 376,852,500 |
| **URBAN** | NHS Miles | 47.39% | 36.92% | 14.89% | 0.62% | 0.18% | 0.00% | 100.00% |
| **DISTRIBUTION** | DVMT | 59.56% | 38.34% | 2.02% | 0.08% | 0.00% | 0.00% | 100.00% |
| **(ACROSS)** | Other Miles | 0.00% | 0.11% | 7.87% | 13.56% | 11.82% | 66.64% | 100.00% |
| | DVMT | 0.00% | 1.01% | 42.66% | 32.96% | 8.82% | 14.54% | 100.00% |
| | Total Miles | 1.33% | 1.14% | 8.07% | 13.19% | 11.49% | 64.78% | 100.00% |
| | DVMT | 26.56% | 17.66% | 24.54% | 18.30% | 4.89% | 8.06% | 100.00% |
| **RURAL** | NHS Miles | 55.36% | 40.14% | 2.56% | 1.93% | 0.00% | 0.00% | 100.00% |
| **DISTRIBUTION** | DVMT | 64.95% | 33.21% | 1.43% | 0.41% | 0.00% | 0.00% | 100.00% |
| **(ACROSS)** | Other Miles | 0.00% | 0.36% | 11.06% | 24.16% | 13.29% | 51.13% | 100.00% |
| | DVMT | 0.00% | 2.78% | 37.38% | 42.70% | 7.77% | 9.37% | 100.00% |
| | Total Miles | 4.83% | 3.83% | 10.32% | 22.22% | 12.13% | 46.67% | 100.00% |
| | DVMT | 42.96% | 22.91% | 13.60% | 14.73% | 2.63% | 3.17% | 100.00% |
| **RURAL & URBAN** | NHS Miles | 51.21% | 38.47% | 8.98% | 1.25% | 0.09% | 0.00% | 100.00% |
| **DISTRIBUTION** | DVMT | 60.26% | 37.67% | 1.94% | 0.12% | 0.00% | 0.00% | 100.00% |
| **(ACROSS)** | Other Miles | 0.00% | 0.16% | 8.56% | 15.86% | 12.14% | 63.27% | 100.00% |
| | DVMT | 0.00% | 1.12% | 42.35% | 33.53% | 8.76% | 14.24% | 100.00% |
| | Total Miles | 2.13% | 1.75% | 8.58% | 15.25% | 11.64% | 60.64% | 100.00% |
| | DVMT | 28.07% | 18.14% | 23.53% | 17.97% | 4.68% | 7.61% | 100.00% |