Executive Summary

This is the first Federal Highway Cost Allocation Study (HCAS) since 1982. There are two key reasons for conducting this study. The first is to determine how changes in the Federal highway program and user fees which support that program have affected the equity of Federal highway user fees. The second is to coordinate this effort with the concurrent U.S. Department of Transportation Comprehensive Truck Size and Weight (1997 U.S. DOT TS&W) Study. The 1997 U.S. DOT TS&W Study uses analytical tools developed for this HCAS in estimating impacts of TS&W scenarios on infrastructure, environmental, and other costs and in estimating changes in user fees on various vehicle classes that would reflect changes in highway program costs associated with those scenarios.

Study Objectives and Scope

The primary objective of this study is to analyze highway-related costs attributable to different highway users as a basis for evaluating the equity and efficiency of current Federal highway user charges. The principal basis for evaluating the equity of the Federal highway user fee structure in this study, as in previous Federal HCASs, is to compare the responsibility of different vehicle classes for highway program costs paid from the Federal Highway Trust Fund (HTF) to the user fees paid into the HTF by the different vehicle classes. The closer that user fee payments match the cost responsibility for a particular vehicle class, the more equitable the user fee structure is for that class. This study also extends the analysis of highway cost responsibility to examine environmental, social, and other costs associated with the use of the highway system that are not reflected in highway improvement budgets. Marginal costs of highway use by different vehicle classes are compared with user fees they pay to evaluate the efficiency of the highway user fee structure. Estimates of air pollution and global climate change costs could not be developed in time to be included in this report. Estimates of highway-related air pollution costs will be submitted in an addendum to this report.

The base period for this study is 1993 to 1995, which covers the most up-to-date information available on Federal highway expenditure patterns since the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was enacted. The analysis year is 2000. A 3-year average of highway costs and revenues is used to represent the base period (1993 to 1995) to reduce the effects of annual variations in costs and revenues.

Summary of Highway Cost Allocation Study Methods

Overall, methods used in this study are similar to methods used in the 1982 Federal HCAS. More detailed data on travel and operating weight distributions for different vehicle classes have been developed than were available in 1982, and more detail on the composition of the highway program is available from FHWA's Fiscal Management Information System (FMIS). Methods for allocating various types of costs among vehicle classes have been refined, especially for pavement, bridge, and capacity-related costs, but the study retains the overall cost-occasioned approach used in the 1982 Federal HCAS for allocating transportation agency costs. New methods have been developed for the allocating

transit-related costs and other multi-modal transportation costs that were not considered in the 1982 Federal HCAS. The analysis of social costs associated with highway transportation has been expanded to include not only marginal costs but total social costs of highways as well. Social costs that can be quantified and attributed to different vehicle classes are considered in equity and efficiency analyses. Costs that cannot easily be quantified are discussed in qualitative terms.

Vehicle Travel Characteristics and Population by Different Vehicle Classes

Table ES-1 shows total estimated 2000 vehicle miles of travel (VMT) by different groups of vehicles. Passenger vehicles account for about 93 percent of total VMT in the United States. Single unit and combination trucks account for 3 and 4 percent of total travel, respectively.

Table ES-1. 2000 Travel and Number of Vehicles by Vehicle Class

	Travel (millions of miles)		Number of Vehicles	
Passenger Vehicles	**Total**	**Percent**	**Total**	**Percent**
Autos	1,818,461	67.5%	167,697,897	70.0%
Pickups/Vans	669,198	24.8%	63,259,330	26.4%
Buses	7,397	0.2%	754,509	0.3%
All Passenger Vehicles	2,495,049	92.6%	231,711,736	96.7%
Single Unit Trucks	83,100	3.1%	5,970,431	2.5%
Combination Trucks	115,689	4.3%	1,971,004	0.8%
All Trucks	198,789	7.4%	7,941,435	3.3%
Total All Vehicles	2,693,845	100.0%	239,653,170	100.0%

Data on VMT and the population of vehicles are organized by operating and registered weight distributions for 20 different vehicle classes (see Chapter II). Vehicle classes include automobiles, pickups and vans, buses, three types of single unit trucks, six types of tractor-semi trailer combinations, three types of truck-trailer combinations, four types of twin-trailer combinations, and a triple trailer combination. Data needs of the 1997 U.S. DOT TS&W Study were important considerations in selecting configurations to be included in the 1997 Federal HCAS. Truck travel and operating/registered weight distributions on each of 12 highway functional classes are estimated for each vehicle configuration.

2000 Federal-aid Highway Program Costs

The distribution of Federal obligations by improvement type and highway functional class has a strong influence on the relative cost responsibility of different vehicle classes.

Obligations for new capacity constitute about one-fifth of total Federal obligations for highways under the Federal-aid highway program. System preservation represents about 40 percent of total obligations, system enhancement about 15 percent, obligations from the Mass Transit Account (MTA) of the HTF one-eighth, and other miscellaneous costs about 9 percent. Figure ES-1 summarizes the estimated 2000 distribution of HTF obligations by improvement type.

For purposes of simplifying the analysis, the Federal highway obligations in 2000 are assumed to equal

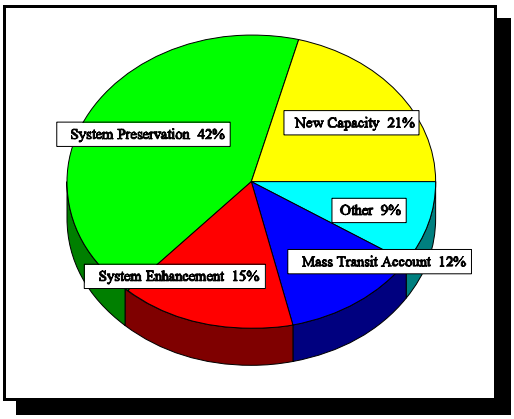

Figure ES-1. 2000 Distribution of Federal Highway-Related Obligations by Function

total highway user revenues (HUR) paid into the HTF in that year. Actual obligation levels are determined by Congress and may be below, equal to, or above revenues to the HTF. The assumption has no effect on the analysis of user fee equity since that analysis compares shares of user fees paid by each vehicle class to shares of highway cost responsibility. As long as the composition of the program is assumed to remain constant, the shares of cost responsibility will remain the same under any absolute investment level used in the analysis.

Figure ES-2 shows the projected distribution of Federal-aid obligations by location and type of highway. The distribution of obligations by highway functional class is assumed to be the same in 2000 as in the 1993 to 1995 base period. Approximately two-thirds of Federal obligations are on urban highways and one-third on rural highways. In both urban and rural areas more Federal monies are obligated for improvements on higher order highway systems (Interstate and other principal arterial highways) than on lower order systems.

The distribution of program expenditures by highway type can significantly influence the relative cost responsibilities of different vehicle classes. The distribution of travel on different types of highways varies substantially by vehicle class, and other physical and operational characteristics of highways that can affect cost responsibility also vary by highway type. Significant changes in the composition of the highway program that may result from new surface transportation authorizing legislation in 1997 could affect how Federal highway and transit funds are spent and the highway systems upon which highway funds are expended.

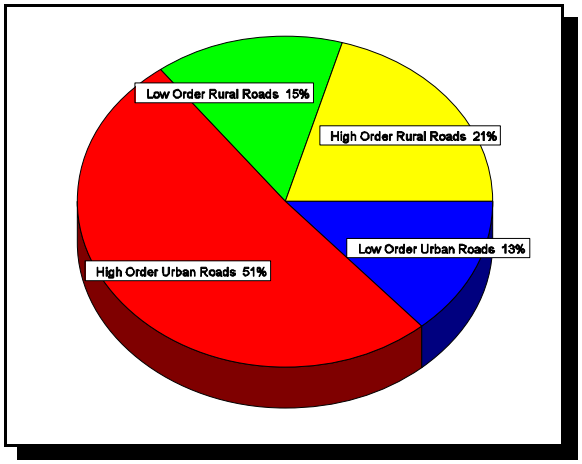

Figure ES-2. 2000 Distribution of Federal Obligations by Location and Highway Type

Allocation of 2000 Federal Highway Program Costs

Federal highway program costs are divided into several cost categories, each of which is allocated among vehicle classes in a different manner:

- Pavement costs associated with constructing new lanes on new location are divided into base facility costs related to providing added capacity to safely accommodate future traffic volumes and load related costs required to accommodate the expected axle loadings from future traffic. Base facility costs are allocated to vehicles on the basis to each vehicle's VMT weighted by its passenger car equivalents (PCEs), a measure used by traffic engineers to compare the influence of different types of vehicles on highway capacity.

Costs for the additional pavement thickness needed to accommodate anticipated traffic are allocated based on the latest American Association of State Highway and Transportation Officials (AASHTO) pavement design procedures.

- Costs for pavement reconstruction, rehabilitation, and resurfacing (3R), which are estimated to represent 25 percent of total Federal obligations in 2000, are allocated to different vehicle classes on the basis of each vehicle's estimated contribution to pavement distresses that necessitate the improvements. The same general approach is used as in the 1982 Federal HCAS, but new pavement distress models were developed for this study that reflect the latest theoretical advances in understanding factors that influence pavement distress.

- Costs of constructing new bridges are allocated to vehicles using an incremental approach similar to that used in the 1982 Federal HCAS. As with new pavements, costs for constructing the base facility of a new bridge are allocated to all vehicle classes in proportion to their PCE-VMT. Incremental costs to provide the additional strength needed to support heavier vehicles are assigned to vehicle classes on the basis of the additional strength required on account of their weight and axle spacings.

- System enhancement costs neither increase the number of lane-miles of highway capacity nor improve the physical condition of the highway system. These costs include (1) transportation system management (TSM) projects; (2) safety improvement projects; (3) Intelligent Transportation System (ITS) projects; (4) transit facilities; (5) bicycle and pedestrian facilities; (6) environmentally-related costs including costs of mitigate adverse environmental impacts during planning, design, right-of-way, and construction; and (7) other system enhancements. Several different factors are used to allocate system enhancement costs among vehicle classes. Many of these costs were so small in the 1982 Federal HCAS that they were not treated explicitly, and new allocators had to be selected.

- Other attributable costs include grading and drainage; pavement width; ridesharing programs and facilities; and special truck facilities such as weigh stations. These costs are allocated on the basis of the relationships between the cost element and specific vehicle characteristics, and are allocated to only the vehicle classes responsible for the costs.

Figure ES-3 shows the estimated distribution of 2000 Federal cost responsibility by broad groups of vehicles. Automobiles which account for 70 percent of all vehicles and about two-thirds of all travel are responsible for 44 percent of Federal program costs followed by combination trucks, pick-ups and vans, and single unit trucks.

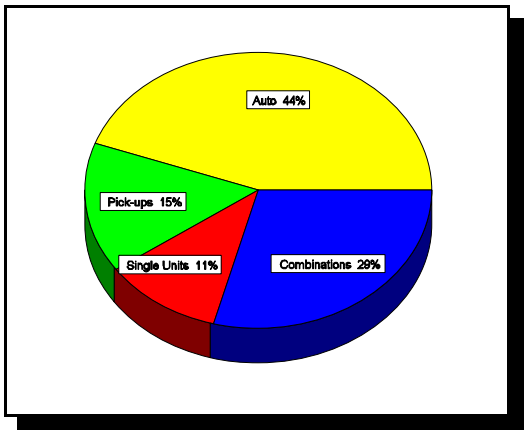

Figure ES-3. Distribution of 2000 Federal Program Cost Responsibility Among Vehicle Classes

Life Cycle Cost Analysis

The potential for more widespread use of life cycle cost analysis (LCCA) to reduce overall system preservation costs was evaluated on a preliminary basis in this study. The LCCA of infrastructure investment decisions is intended to identify alternatives that have the lowest cost over their entire life, not just alternatives with the lowest initial costs. Many States apply LCCA principles to varying degrees in pavement and bridge management systems, but there is a widespread belief that greater use of LCCA could reduce long-term program costs. The implications of LCCA for highway cost allocation (HCA) are that if long-term infrastructure costs could be reduced, those costs would represent a smaller share of the overall program and vehicle classes responsible for the greatest share of infrastructure costs would have lower cost responsibility and improved equity ratios.

A preliminary analysis suggests large potential benefits from the adoption of LCCA, especially in reducing vehicle operating costs associated with traveling on deteriorated pavements and delay around work zones where highway maintenance and rehabilitation is being performed. Estimates of nationwide savings in construction and maintenance costs resulting from the use of LCCA are not as large, although the analytical tools used for this analysis may not capture the full range of potential agency benefits believed to accrue from use of LCCA. Further research to improve estimates of potential benefits of LCCA is planned, not only for cost allocation but for investment analyses conducted for the Department's Condition and Performance (C&P) Report.

Estimates of 2000 Federal Highway User Revenues

Figure ES-4 shows the estimated share of Federal highway user fees that will be paid by broad vehicle groups in 2000. Federal highway user taxes include taxes on various highway fuels, an excise tax on the sale of heavy trucks, a graduated tax on tires weighing over 40 pounds, and a heavy vehicle use tax (HVUT) on trucks with registered weights over 55,000 pounds. Each of these taxes has been in place for many years, although rates and the specific equipment that is taxed have changed from time to time. Historically, the primary purpose for imposing highway user fees at both the Federal and State levels has been to raise revenues to finance highway improvement programs. The linkage between highway user fees and highway program financing is central to HCASs which seek to determine whether fees paid by each vehicle class cover infrastructure and other transportation agency costs occasioned by those vehicles.

Federal HURs projected to be paid by the 20 vehicle classes in 2000 were estimated assuming the Federal highway user fee structure remains unchanged. As Figure ES-4 indicates, passenger vehicles, which account for 93 percent of total highway travel, pay 64 percent of total Federal highway user fees. Combination trucks, on the other hand, pay over 25 percent of total highway user fees even though they travel less than 5 percent of total mileage.

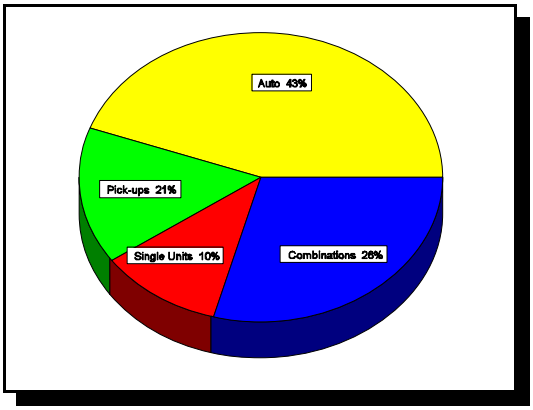

Figure ES-4. 2000 Federal User Fee Distribution by Vehicle Class

2000 Federal Highway User Charge Equity Ratios

The equity of highway user charges typically is measured in HCASs as the ratio of the shares of revenues contributed by each vehicle class to the shares of highway costs that vehicle class occasions. This ratio is often called a revenue/cost ratio or an "equity ratio." An equity ratio greater than 1.0 means overpayment; less than 1.0 means underpayment of Federal highway user fees.

Table ES-2 shows estimated equity ratios in 2000 assuming the current highway user charge structure and the same highway program composition as during the ISTEA base period. As a class, automobiles pay the same share of Federal highway user fees as their share of highway costs, but pickups and vans pay substantially more than their share of highway costs. This difference is primarily attributable to the automobiles' better fuel economy which means they pay less fuel tax per mile of travel than pickups and vans.

Table ES-2. Ratios of 2000 Federal User Charges to Allocated Costs by Vehicle Class

Vehicle Class/Registered Weight	Ratio
Autos	1.0
Pickups/Vans	1.4
Buses	0.1
Passenger Vehicles	1.1
Single Unit Trucks	
≤25,000 pounds GVW	1.5
25,001 - 50,000 pounds GVW	0.7
> 50,001 pounds GVW	0.5
Total Single Unit	0.9
Combination Trucks	
≤50,000 pounds GVW	1.6
50,001 - 70,000 pounds GVW	1.1
70,001 - 75,000 pounds GVW	1.0
75,001 - 80,000 pounds GVW	0.9
80,001 - 100,000 pounds GVW	0.6
>100,001 pounds GVW	0.5
Total Combinations	0.9
Total All Vehicles	1.0

User fee equity for single unit and combination trucks is highly dependent on the weight of the vehicles. As a class single units will pay less than their share of highway costs, but the lightest single units will pay more than their share of highway costs. Combination trucks as a group will pay 90 percent of their highway cost responsibility in 2000, but like single units, there is large variation depending on the weight of the vehicle. Combination trucks registered at less than 50,000 pounds will pay 60 percent more in user fees than their share of highway costs while combinations registered over 80,000 pounds will pay on average only about 60 percent of their highway cost responsibility. As the discussion in Chapter V shows, there is significant variation even among combinations in the same weight group largely because of differences in the cost responsibility of different vehicle configurations. In general the more axles a vehicle has, the lower its cost responsibility at any given weight and the more nearly it comes to paying its share of highway costs.

Tables ES-3 and ES-4 show the absolute overpayment or underpayment (represented by negative numbers) of highway cost responsibility by different vehicle classes. Pickups and vans have the largest over or underpayment of any vehicle class; as a group those vehicles pay $1.6 billion more in highway user fees than their highway cost responsibility. Other vehicle classes that in the aggregate pay more than their highway cost responsibility are 2-axle single unit trucks, all truck-trailer combinations, and 5- and 6-axle twin-trailer combinations. Five-axle tractor-semitrailers have the largest underpayment of any vehicle

Table ES-3. 2000 Federal Over and Underpayments by 20 Vehicle Classes	
Vehicle Class	**Total Over or (Underpayment) (000s)**
Automobiles	($323,330)
Pickups and Vans	$1,613,410
2-axle single units	$270,007
3-axle single units	($306,739)
4+ axle single units	($275,845)
3-axle tractor-semitrailers	($12,414)
4-axle tractor-semitrailers	($76,229)
5-axle tractor-semitrailers (tandem)	($651,480)
5-axle tractor-semitrailers (split tandems)	($41,162)
6-axle tractor-semitrailers	($134,212)
7-axle tractor-semitrailers	($29,767)
3-, 4-axle truck trailers	$128,304
5-axle truck trailers	$30,362
6+ axle truck trailers	$4,460
5-axle twin trailers	$3,499
6-axle twin trailers	$11,188
7-axle twin trailers	($17,063)
8-axle twin trailers	($22,659)
7-axle triple trailer	($2,141)
Buses	($169,478)

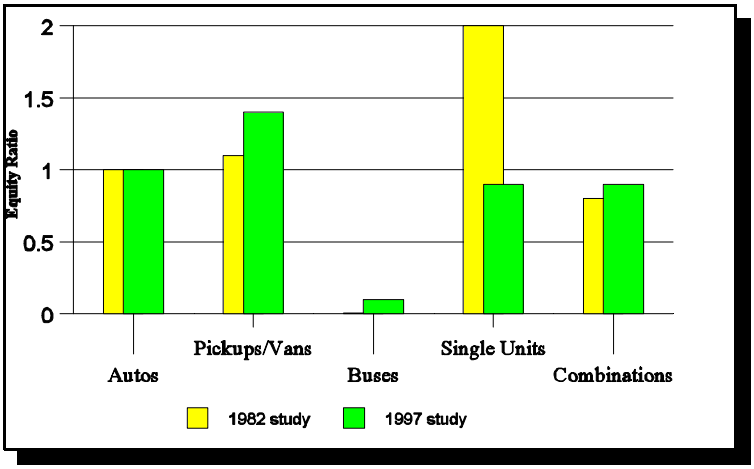

Figure ES-5. Comparison of 2000 Equity Ratios for 1982 and 1997 Federal HCASs

class, followed by automobiles and 3- and 4-axle single unit trucks. These classes account for 32 percent, 16 percent, 15 percent and 13 percent respectively of underpayments by all vehicle classes.

Table ES-4 shows the expected overpayment or underpayment by vehicles in different registered weight groups in 2000 for selected vehicle classes along with the average over or underpayment per vehicle at each weight. Over or underpayments clearly vary substantially with weight. At lighter weights vehicles in each class pay more than their share of highway costs while at heavier weights they all pay less than their share of highway costs. The number of vehicles in each weight category varies widely for different vehicle classes. The per vehicle overpayment or underpayment for the weight group with the most vehicles in each class is underlined in Table ES-4.

Figure ES-5 compares 2000 equity ratios estimated for various vehicle classes in this study with equity ratios estimated in the 1982 Federal HCAS. The most notable differences are that equity ratios for single unit trucks will be much closer to 1.0 than in 1982 and that pickups and vans will be paying substantially more than their share of highway costs. Much of the change in equity ratios for single unit trucks is attributable to changes in Federal highway user fees enacted in the STAA of 1982 following the 1982 Federal HCAS. That study found most single units to be overpaying Federal user fees and recommended reductions in user fees levied on those vehicles. Equity ratios for single units are now much closer to 1.0, but on average single

Table ES-4. 2000 Federal Over and Underpayment by Selected Vehicles								
Registered Weight	3-axle Single Units		4+ axle Single Units		5-axle Semitrailer		6-axle Semitrailer	
	Total (000s)	Per Vehicle	Total (000s)	Per Vehicle	Total (000s)	Per Vehicle	Total (000s)	Per Vehicle
20,000	$204	$244						
30,000	$7,956	$236	$29	$1,229				
40,000	$8,803	$151	$1,189	$1,122				
50,000	($32,519)	($116)	$307	$220	$12,945	$1,811	$235	$2,132
60,000	($164,588)	($634)	($18,448)	($816)	$43,594	$1,538	$1,414	$2,104
70,000	($119,386)	($2,059)	($88,205)	($2,039)	$20,372	$603	$2,732	$1,508
80,000	($7,207)	($3,260)	($143,292)	($2,966)	($591,971)	($561)	$27,370	$342
90,000			($18,367)	($3,672)	($109,044)	($3,864)	($21,286)	($2,188)
100,000			($9,057)	($4,193)	($17,987)	($5,176)	($41,391)	($4,985)
110,000					($9,389)	($6,022)	($33,239)	($7,746)
120,000							($67,497)	($10,710)
Total	($306,739)		($275,845)		($651,480)		($134,212)	

units now underpay whereas they had been substantially overpaying in 1982. The most common over-the-road combination truck, the 5-axle tractor-semitrailer registered at 80,000 pounds, pays about 90 percent of its cost responsibility, but the heaviest combinations pay only 60 percent or less of their highway costs.

Highway Cost Allocation for All Levels of Government

Evaluating relationships between Federal user fees and Federal highway cost responsibility is essential for evaluating the equity of the Federal highway user fee structure. However, comparisons of total user fee payments and total highway cost responsibility for all levels of government are important in evaluating overall subsidies to various classes of vehicles that might give them a competitive advantage over other modes of transportation. In fact, State and local governments collect three-quarters of total HURs and the equity of their user fee structures is a very important component of overall user fee equity.

An important fact is the prominence of fuel taxes in the Federal highway user fee structure compared to State and local user fees. Fuel taxes account for almost 90 percent of Federal user fees compared to only half of State HURs and only one-third of local HURs. Vehicle registration fees account for one-third of State HURs and over 40 percent of local highway user revenue, compared to less than 3 percent for the Federal counterpart to the registration fee, the HVUT. While fuel taxes vary by extent of use and registration fees do not, truck registration fees generally are graduated by weight and can reflect the large differences in cost responsibility of heavy trucks compared to lighter trucks.

Table ES-5 shows estimated ratios of user fee payments to highway cost responsibility by vehicle class for all levels of government in 2000. It is important to note that these results represent an average for revenues

and expenditures for all State and local governments. Results for individual States could vary substantially from those shown in this table. It is also important to note that unlike other ratios of revenues and costs in this report, total revenues and costs for all vehicle classes are not equal. At the State level total user fee collections are approximately equal to total expenditures, but total local user fee payments are only about 10 percent of local highway expenditures. At the Federal level expenditures on highways on Federal lands that are paid from general funds rather than from user fees paid into the HTF are included in this table, but not in other tables.

Table ES-5. Ratios of 2000 User Fee Payments to Allocated Costs for All Levels of Government

Vehicle Class	Federal	State	Federal and State	Local	All Levels of Government
Autos	0.9	1.0	1.0	0.1	0.7
Pickups and Vans	1.2	1.2	1.2	0.1	0.9
Buses	0.1	0.8	0.5	0.0	0.4
All Passenger Vehicles	1.0	1.0	1.0	0.1	0.8
Single Unit Trucks					
#25,000 pounds	1.4	2.2	1.9	0.1	1.5
25,001 - 50,000 pounds	0.6	1.0	0.8	0.0	0.6
>50,001 pounds	0.5	0.5	0.5	0.0	0.4
All Single Unit Trucks	0.8	1.2	1.1	0.1	0.8
Combination Trucks					
#50,000 pounds	1.4	1.7	1.6	0.1	1.3
50,001 - 70,000 pounds	1.0	1.3	1.1	0.1	0.9
70,001 - 75,000 pounds	0.9	1.1	1.0	0.1	0.8
75,001 - 80,000 pounds	0.9	0.9	0.9	0.1	0.8
>80,000 pounds	0.6	1.0	0.9	0.0	0.7
All Combinations	0.9	1.0	0.9	0.1	0.8
All Trucks	0.9	1.1	1.0	0.1	0.8
All Vehicles	0.9	1.0	1.0	0.1	0.8

NOTE: These ratios are based on total revenues and expenditures nationwide. Ratios for individual States and local governments are expected to vary from these ratios. Federal ratios include obligations not financed from the HTF, and thus vary from equity ratios presented in other tables.

Other Highway-Related Costs

In recent years there has been increasing interest in estimating the total costs of highway transportation, not just the direct agency costs. Executive Order 12893, "Principles for Federal Infrastructure Investments," requires that Federal infrastructure investment and management plans be based upon a systematic analysis of expected benefits and costs. Among the social costs of greatest interest to HCA and highway pricing decisions are congestion, air pollution, noise, and crash costs.

Data and analytical tools developed in other studies were adequate to assess costs associated with safety, noise, congestion, and many other social costs of highways, but published studies on air pollution costs were not available in time to be used for this report. Because air pollution costs are so important in assessing both total and marginal costs of vehicle emissions, the Department currently is working closely with the Environmental Protection Agency (EPA) to estimate air pollution costs of highway travel. The

Department will present those costs in an addendum to this report. The Intergovernmental Panel on Climate Change (IPCC) concluded that it could not endorse any particular range of values for the marginal damage of CO_2 emissions on climate change, because of limited knowledge of impacts, uncertain future technological and socio-economic developments, and the possibility of catastrophic events or surprises. Because of the tremendous uncertainty in climate change costs, no estimates of costs related to highway transportation are developed for this study.

Detailed estimates of the benefits of highway use and highway investment are beyond the scope of this study although there were many comments that benefits should be included. As noted above, Executive Order 12893 requires that benefits as well as costs be considered in highway investment and regulatory decisions, and substantial research has been conducted in recent years to improve estimates of both the user benefits of highway investment as well as broader benefits of highways to the economic productivity of different industries. This research is summarized in Appendix D.

Social costs may be evaluated in different ways that each provide their own perspectives on policy issues surrounding the costs of highway transportation. One perspective is to examine marginal costs of travel by different vehicles. Marginal costs represent the added costs associated with an additional trip, and are particularly relevant for questions about prices that should be charged to improve economic efficiency.

Marginal Highway Costs

The 1982 Federal HCAS also estimated how highway costs would be allocated among vehicles to promote economic efficiency. In general, the closer the price of travel is to the total cost of that travel, the greater the efficiency. There are certain costs that highway users normally do not consider when deciding whether to make a trip, including government-borne costs of infrastructure deterioration and traffic services that vary with the amount of travel; user-borne costs, especially congestion and other costs that are imposed on other users when a user makes a trip; and community-borne costs, principally air pollution, noise, global warming, and crash costs that vary with the amount of travel. For the system to operate efficiently, users should pay those costs they do not otherwise consider when deciding to make a trip.

Table ES-6 shows current estimates of marginal pavement, congestion, crash, and noise costs for selected vehicles operating under different conditions. Marginal costs on rural and urban Interstate highways represent weighted averages of marginal costs estimated for a broad cross section of highways on those two systems. Estimates of air pollution costs reflecting the latest EPA research could not be completed in time to be included in this report, but will be included in an addendum to this report.

Total Costs of Highways

In addition to the interest in estimating marginal costs of highway use to estimate economically efficiency highway user fee levels, there is considerable interest in estimating total costs associated with highway transportation. This information is useful for several purposes, including (1) estimating the relative magnitude of various costs associated with highway transportation; (2) estimating how costs are changing over time, particularly in response to programs aimed at reducing environmental congestion and safety-related costs; and (3) evaluating overall costs and benefits of alternative public policies such

Table ES-6. 2000 Marginal Pavement, Congestion, Crash, Air Pollution, and Noise Costs for Illustrative Vehicles Under Specific Conditions

Vehicle Class/Highway Class	Marginal Costs (cents per mile)					
	Pavement	Congestion	Crash	Air Pollution	Noise	Total
Autos/Rural Interstate	0	0.78	0.98	TBD	0.01	1.77
Autos/Urban Interstate	0.1	7.70	1.19	TBD	0.09	9.08
40 kip 4-axle S.U. Truck/Rural Interstate	1.0	2.45	0.47	TBD	0.09	4.01
40 kip 4-axle S.U. Truck/Urban Interstate	3.1	24.48	0.86	TBD	1.50	29.94
60 kip 4-axle S.U. Truck/Rural Interstate	5.6	3.27	0.47	TBD	0.11	9.45
60 kip 4-axle S.U. Truck/Urban Interstate	18.1	32.64	0.86	TBD	1.68	53.28
60 kip 5-axle Comb/Rural Interstate	3.3	1.88	0.88	TBD	0.17	6.23
60 kip 5-axle Comb/Urban Interstate	10.5	18.39	1.15	TBD	2.75	32.79
80 kip 5-axle Comb/Rural Interstate	12.7	2.23	0.88	TBD	0.19	16.00
80 kip 5-axle Comb/Urban Interstate	40.9	20.06	1.15	TBD	3.04	65.15

NOTE: (1) S.U. = Single Unit, Comb. = Combination; (2) Costs reflect middle range.
(3) TBD - To be determined. Air pollution costs will be estimated in an addendum to this report.
(4) Total excludes air pollution costs.

as investment, regulatory, and pricing policies. Estimates of noise, congestion, and crash costs total $406 billion for 2000. Crash costs represent 84 percent of these social costs, congestion 15 percent, and noise 1 percent. About 88 percent of these social costs are borne in the first instance by highway users including congestion costs and most crash costs. While social costs that are not borne by users are a relatively small percentage of the total, they nevertheless are significant -- $50 billion in 2000. Estimates of total air pollution costs will be included in an addendum to this report and will increase the total social costs borne by non-users.

Potential User Fee Changes to Improve Equity

A number of general user fee options designed to improve Federal user fee equity as traditionally defined without considering social costs were analyzed in this study. Four options involving changes to existing user fees and two changes that would require imposing new fees are summarized in this report. Options involving existing user fees include raising the diesel differential by 1 cent and 6 cents per gallon, eliminating the cap on the HVUT, and adjusting the rate schedule on the HVUT along with lifting the cap. New user fee options include imposing a weight distance tax (WDT) and an axle-WDT. Table ES-7 shows the alternative Federal user change structures for 2000. These alternatives offer

Table ES-7. 2000 Ratios of User Charges to Allocated Costs by Vehicle Class Under Alternative Federal User Charge Structures							
Vehicle Class	**Current Structure**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**
Autos	1.0	1.0	0.9	1.0	0.9	0.9	0.9
Pickups/Vans	1.4	1.4	1.3	1.4	1.3	1.3	1.3
Total Single Unit	0.9	0.9	1.0	0.9	1.2	0.9	1.0
Total Combinations	0.9	0.9	1.0	0.9	1.0	1.0	1.0
Total All Vehicles	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Scenario 1 -- Increase diesel differential by 1 cent
Scenario 2 -- Increase diesel differential by 6 cents
Scenario 3 -- Eliminate cap on HVUT
Scenario 4 -- More progressive HVUT rate structure
Scenario 5 -- WDT and motor fuel in place of other truck taxes
Scenario 6 -- Axle-WDT and motor fuel in place of other truck taxes

varying flexibility in addressing the cost responsibility issues of vehicle weight and VMT outlined in the following scenarios:

- Scenario 1: Adding 1 cent per gallon to the diesel differential would reduce the underpayment of heavy trucks, but is not sufficient to be reflected in improved equity ratios for those vehicles.

- Scenario 2: Adding 6 cents per gallon to the diesel differential would reduce underpayment and improve the equity ratios for trucks, but it would not eliminate the underpayment by heavier trucks.

- Scenario 3: Eliminating the cap on the HVUT for all vehicles registered above 75,000 pounds would reduce underpayment by the heaviest vehicles reduce underpayment by the heaviest vehicles but would do nothing to improve equity ratios for trucks registered at weights less than 75,000 pounds.

- Scenario 4: Creating a two-tier HVUT structure for single units and combinations with more progressive rates for the heaviest trucks could reduce underpayment by trucks as a group, but it increases inequities between low mileage and high mileage vehicles.

- Scenario 5: Introducing a WDT can better address the vehicle weight and mileage problem than the above-mentioned tax scenarios and the current Federal user fee structure. A weight and distance oriented highway tax structure provides more flexibility to the current tax structure. The equity ratios for trucks, including heavier/high mileage trucks, improves as compared to current user-fee structure.

- Scenario 6: Imposing an axle-WDT provides more flexibility to address vehicle weight and mileage factors, and improves the equity ratios of trucks, including heavier/high mileage trucks as

compared to the current Federal structure.

While a Federal WDT could not account for every factor that affects heavy vehicle cost responsibility, it could account for the major influences, vehicle weight and distance traveled. In its 1994 study, *Highway User Fees: Updated Data Needed to Determine Whether All Users Pay Their Fair Share*, the General Accounting Office recommended, "If the results of FHWA's (highway cost allocation) study indicate that certain highway users underpay their share of highway costs, the Congress should consider examining policy options, including a national weight-distance user fee, that would increase equity and promote a more efficient use of the nation's highways."

Federal WDTs were examined in the Department's 1984 Report to Congress, *Alternatives to Tax on Use of Heavy Trucks and in the 1988 Report, The Feasibility of a National Weight-Distance Tax*. The latter study concluded that "...administrative and compliance costs for a national WDT would not be prohibitive, nor would there be significant adverse impacts on interstate commerce or on other industries." Overall administrative and compliance costs would depend on exactly how a WDT were administered and how many vehicles were subject to the tax. The study concluded that acceptable levels of compliance could be achieved if a proof-of-payment system similar to the existing system for the HVUT were implemented, and noted that mileage records that most carriers already maintain should be adequate to comply with a WDT. While WDTs have been very controversial at the State level and only five States currently impose such taxes, there is no reason to believe that the basic conclusions about the administrative feasibility of a Federal WDT have changed since the 1988 report was completed.
A Federal WDT would have to be considered within the context of major revisions to the Federal highway user fee structure. The 1988 study assumed that existing Federal truck taxes would be eliminated if a WDT were imposed, and the illustrative tax rates developed for this study were based on the same assumption. Current budgetary environment is not conducive to user fee increases. Revenue-neutral changes in Federal user fees could be developed that would improve overall equity, while this would necessitate reducing Federal fuel tax rates.

Study Conclusions

Many factors that affect the equity and efficiency of the highway user fee structure have changed since the last 1982 Federal HCAS. User fees have been modified several times, the composition of the highway program has changed, and the use of the highway system for personal and freight transportation has changed. These changes are reflected in equity ratios estimated for the various classes of vehicles analyzed in this study. In general, the overall equity of highway user fees as measured by ratios of Federal user fees paid by different vehicle classes to their shares of Federal HTF obligations, has improved since 1982. However, improvements within and among vehicle classes could be realized with changes to the current user fee structure.

Decisions that could significantly affect estimates of future highway cost responsibility will be made soon. The first decision is the reauthorization of surface transportation programs. This study has assumed that the distribution of program costs will be similar to the current distribution, but if major changes were made in reauthorization, these assumptions would no longer be valid and future distributions of highway cost responsibility could change significantly. The second factor that could significantly affect decisions regarding potential Federal user fee changes to improve equity is the uncertainty regarding future TS&W

policy. If any changes in TS&W policy were proposed, cost recovery issues should be examined, and if any significant changes in TS&W limits are implemented, user fee options, including the potential for significantly improving user fee equity through a national WDT, could be evaluated. Table ES-8 summarizes key findings in this 1997 Federal HCAS.

More frequent cost allocation studies in the future would provide valuable information not only about user fee equity but also intermodal subsidy issues, changes in social costs of highway transportation, and other policy issues. Several States routinely update their HCASs, and the same will be done for Federal cost allocation. Periodic updates would allow emerging issues to be analyzed in a timely fashion, much in the same way that the Department's C&P Report has considered emerging issues in recent years. Further, additional research is planned to refine estimates of social costs of highways, the economic efficiency of alternative user fee structures, continuation of improvements to pavement distress analyses, and other technical improvements to various aspects of HCA that will allow continuous improvement in estimates of highway-related costs and user fee payments by different vehicle classes that can inform user fee and other policy decisions.

Table ES-8. Summary of Key Findings in the 1997 Federal HCAS

- Passenger vehicles (autos, pick-ups, vans) travel 93 percent of all VMT, account for 96 percent of all vehicles and will pay about 64 percent of all Federal highway user fees in 2000. Trucks on average pay almost 10 times more Federal highway user fees per mile of travel than passenger vehicles.

- Overall, the Federal user fee structure is more equitable today than it was in 1982. Changes in the composition of the Federal highway program and changes in Federal user fees account for most of the difference.

- Passenger vehicles are expected to overpay Federal user fees by about 10 percent, while single unit and combination trucks will underpay by about 10 percent in 2000. These averages, however, mask inequities among vehicles. For example, while automobiles pay their share of highway costs, pickups and vans overpay. In virtually all truck classes the lightest vehicles pay more than their share of highway costs and the heaviest vehicles pay considerably less than their share of costs.

- In general, the more axles under heavy vehicles, the lower their highway cost responsibility at any given weight and the more closely they come to paying their highway cost responsibility.

- State governments collect over two-thirds of total HURs and the equity of their user fee structures strongly affects the overall equity of user fees collected by all levels of government. Federal user fees are somewhat more equitable than average State user fees for lighter vehicles, but State user fees on average come somewhat closer to capturing the cost responsibility of the heaviest truck classes.

- Increasing the diesel differential or eliminating the $550 cap on the HVUT could result in incremental improvements to user fee equity. Modifications to the HVUT rate schedule or new taxes such as a WDT or axle-WDT could result in larger gains in equity.

- Safety, congestion, environmental, and other social costs of highway use remain large despite significant progress in reducing those costs through regulatory and highway improvement programs. Imposing charges to reduce those costs holds promise, but many social costs are highly localized and are more amenable to local pricing rather than pricing at the Federal level.