




**U.S. Department of
Transportation**

Office of the Secretary
of Transportation

Memorandum

Subject **ACTION**: Departmental Guidance for
the Valuation of Travel Time in Economic Analysis

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Transportation Policy

Reply to PBelenky
Attn of x65421

To Secretarial Officers
Modal Administrators

The attached document, "The Value of Travel Time: Departmental Guidance for Conducting Economic Evaluations," is intended to provide DOT staff with the best currently available procedures and empirical estimates for calculating the value of time saved or lost by users of our transportation system. The values of time and procedures set forth in this document should be used for future DOT cost-benefit and cost-effectiveness analyses that employ measures of the value of travel time lost or saved. They will replace the mode-specific methods for valuing travel time now being used with a consistent set of monetary values of time applicable to all modes. (The guidance document addresses only the costs of travel time savings to individuals; it does not deal with the impact of travel time delays or improvements on vehicle operating costs or inventory and spoilage costs.)

Since we circulated the draft guidance document for review (October 16), members of my staff have worked to reconcile remaining differences in approaches and to accommodate concerns that were raised by one or more operating administrations. The changes we have made to the document have improved it, although, of course, we were not able to accommodate every suggested change.

We recognize that there are large gaps in our knowledge of how travel time should be valued. More research is needed on this important issue, and we will work with the operating administrations to sponsor such research. My staff will continue to monitor the theoretical and empirical literature on the value of travel time and will periodically revise the guidance document as appropriate. I believe that the use of a consistent set of values of time will improve the quality of DOT cost-benefit and regulatory analyses. Thank you for your assistance.

Attachment

The Value of Saving Travel Time: Departmental Guidance for Conducting Economic Evaluations

Executive Summary

The purpose of this document is to establish consistent procedures to be followed by agencies within the Department of Transportation when evaluating savings or losses of travel time that result from investments in transportation facilities or regulatory actions. These values are to be used in all cost-benefit and cost-effectiveness analyses prepared by DOT. They are not intended for use in predicting demand when a major improvement to an existing mode or development of a new mode is likely to alter travel patterns. Ridership forecasts should rely on studies that derive estimates from local conditions.

While travel time is not traded directly in the market, its value is revealed by the choices travelers make (or say they would make) and has been the object of extensive theoretical and empirical research. The values of time currently employed by modal administrations were derived from recommendations by experts in this area of investigation who had surveyed the relevant literature. To update these values and place them on a consistent basis, we consulted a group of experts, several of whom had contributed to earlier studies. These consultants have reviewed and approved the recommendations made in this guidance document.

Economic theory predicts that time saved from travel will have value for two reasons. First, it may be devoted instead to other activities preferred by travelers or their employers, that is, remunerative work or recreation. Second, if travel is associated with unpleasant conditions of crowding, exposure to weather, risk, effort, or boredom, cutting the time it requires will be beneficial. Thus the value of saving time may vary, depending on both the purpose of travel, which affects the possible alternative uses of time, and the conditions under which it occurs.

When a trip is undertaken during work or when the traveler is free to vary his or her work hours, an important measure of the value of time (to the employer in the first case and to the traveler in the second) is the wage paid for the productive work that is sacrificed to travel. Although there are few studies that specifically investigate the value of “on-the-clock” travel time, the ones that do generally support researchers’ assumption that this value can be represented by travelers’ before-tax wage rates, including fringe benefits. When evaluating time saved for personal activities, travelers are likely to regard some fraction of their wage rate as an approximate standard of what they are willing and able to pay for time, even if they have no opportunity to use the time for work. Thus, the hourly income of the subjects of each empirical study is treated as a standard against which their estimated value of time is measured, and researchers consider the relationship between value of time and income as stable enough to be transferred (with caution) across time periods and national boundaries.

Available research into local travel choices does not reliably identify the effect of the mode employed or that of the income of the population group affected. This guidance document

has therefore adopted a single measure of income and a single value of time applicable to all local personal travel. For intercity travel, however, we use values of time that recognize differences between modes in travelers' incomes and willingness to pay to save time.

Some parties have argued that monetary values of time estimated for modes used disproportionately by lower-income populations understate the psychological benefits of time savings. It must be emphasized that the primary purpose of conducting economic evaluations of government decisions is to improve the efficiency of resource allocation, not to distribute subjective benefits equitably. Moreover, the low values of time displayed by lower-income travelers may imply that benefits other than time savings would give them more satisfaction. Nevertheless, it may be appropriate to call the attention of decision-makers to the impact of their actions on individuals who possess limited alternatives.

Besides distinctions based on transportation mode, trip purpose (business or personal), and income, a major source of variation in the value of time is distance, particularly the large differences between local and intercity trips. Because intercity travel is usually consumed jointly with expensive services such as hotel rooms, restaurant meals, and entertainment, travel time saved is freed for purposes that travelers value highly. Constraints on the total time available (e.g., school vacations or allowed leave) also increase the value of time savings. Intercity travel time is, therefore, likely to be more valuable than time spent in local travel.

Several other factors have been investigated in the research literature as potentially influencing the value of travel time. These include the distinction between auto drivers and passengers, commuting versus other local personal travel, driving in congested versus free-flowing traffic conditions, the need to stand on crowded transit vehicles, and out-of-vehicle parts of a transit trip (i.e., access, waiting, and transfer time) versus in-vehicle time. The only one of these distinctions that has been consistently supported by recent research is that between walking access, waiting and transfer time required by transit trips and time spent aboard the transit vehicle.

Another subject of investigation has been whether values of time savings per hour are constant over all sizes of the increment of time saved. Some analysts have argued that larger blocks of time can be put to alternative uses while uses for small savings are limited. Research attempting to measure such differences in value, however, has probably been unable to isolate small time changes from the range of uncertainty in expected trip time. In addition, a constant value has decisive practical advantages in evaluating the cumulative effect of a number of simultaneous governmental actions. In the absence of strong evidence to the contrary, the assumption of a constant value per hour for large and small time savings is probably appropriate.

One issue that must be resolved is the level of detail to be used in defining the wage rate of the population affected by an action. Many studies are unclear in stating the incomes of their subjects, and accuracy is also sacrificed when the estimated values are applied to new times and places. We consider it desirable to use regularly reported nationwide statistics for the income/wage rates of the traveling population. Distinctions are made for the wages

of truck drivers, which are reported separately by Federal agencies, and for air travelers, who have higher average incomes. Where reliable, well-documented survey information on the wage rates of affected travelers is available, it may occasionally be appropriate to substitute such data for the figures employed here. It is, however, the responsibility of analysts to demonstrate the need to employ different data to improve the accuracy of the analysis.

Briefly, the values adopted herein are: 50 percent of the wage for all local personal travel, regardless of the mode employed, 70 percent of the wage for all intercity personal travel, and 100 percent of the wage (plus fringe benefits) for all local and intercity business travel, including travel by truck drivers. These figures are a synthesis of mode-specific and distance-specific values and are broadly consistent with the empirical research. In special cases where out-of-vehicle time (access, waiting, and transfer time) on transit trips is isolated as an object of analysis, the value of 100 percent of the wage is adopted.

The hourly wages to which they are applied are derived from several sources. For personal travel by surface modes, the standard adopted is median annual household income, as reported by the Bureau of the Census, divided by 2,000 hours. This figure amounted to \$17.00 in 1995. For business travel, the source employed was employee compensation figures supplied by the Bureau of Labor Statistics. For all surface travelers on business except truck drivers, the hourly wage figure, including the hourly value of fringe benefits, was \$18.80. Truck drivers received combined wages and benefits of \$16.50. Because air travel is a higher-cost service used by higher-income passengers, incomes were based on a survey by the Air Transport Association yielding figures of \$27.80 for personal travel and \$34.50 for business travel. In special cases where general aviation travelers represent a large share of the affected traffic, a weighted average income may be used, incorporating the wage of \$37.50 for these travelers. This figure is derived from a survey of its members by the Aircraft Owners and Pilots Association (AOPA).

The hourly values of time corresponding to these percentages and hourly wage rates are: \$8.50 for personal local travel by all modes, \$11.90 for personal intercity surface travel; \$18.80 for business surface travel; \$16.50 for truck drivers; \$19.50 for personal air travel; and \$34.50 for business air travel. The Office of the Assistant Secretary for Transportation Policy will publish periodic revisions of these figures, based on income data from the Bureau of the Census, the Bureau of Labor Statistics and the Air Transport Association.

This guidance document recommends specific procedures for recognizing the uncertainty that characterizes empirical research in this area. Because it is important that decision-makers be aware that their actions have a range of plausible outcomes rather than a single, most-probable outcome, ranges of travel time values are specified in each category for sensitivity testing. These ranges are intended to reflect the degree of uncertainty in the empirical estimates and to be useful in highlighting the implications of alternative assumptions.

The Value of Saving Travel Time: Departmental Guidance for Conducting Economic Evaluations

Many actions by the Department of Transportation and other governmental agencies are designed to benefit travelers by reducing the time spent traveling. Actions in pursuit of other goals such as improved safety may also have the intended or unavoidable consequence of slowing travel. The purpose of this document is to establish procedures to be followed by all agencies within DOT when evaluating savings or losses of travel time that result from such actions. The values of travel time so derived are to be used in DOT cost-benefit or cost-effectiveness analyses.

To ensure that their investment and regulatory actions will encourage the most advantageous use of society's resources, governments have sought to implement a more systematic approach to decision-making through cost-benefit analysis. Doing so often requires assigning monetary values to an increasing variety of resources that are affected by government actions but that do not have a value clearly established through market transactions. As one of the most important of these non-market resources, travel time has been the subject of extensive research in many countries over three decades. This document draws on that body of research to establish procedures for use in valuing travel time consistently -- although not necessarily uniformly -- throughout DOT.

Another purpose for studying the value of travel time savings is to predict the demand for new or improved transportation modes that travelers must compare with those previously employed. Values of time and other modal attributes estimated for travelers who already have selected a given mode do not necessarily represent the factors that will motivate other travelers to switch to that mode. Ridership forecasts will consequently have to rely on studies that derive estimates from local conditions. Market research techniques may be necessary for estimation of demand functions when historical data do not exist.

Why is Travel Time Valuable?

The fact that travel time is valuable stems from two underlying principles. First, time itself is valuable to people because they can dedicate it to earning income or use it to engage in leisure activities. Since traveling requires people to sacrifice some time they would otherwise spend in one of these ways, it imposes an opportunity cost equal to the individual's value of time in the activity forgone. Second, travel time can have an additional cost because it may be spent in circumstances travelers find undesirable, such as walking, waiting, riding aboard a crowded or uncomfortable vehicle, or driving in traffic.

The value of travel time includes both the opportunity cost or "resource value" of time itself and whatever unpleasantness people experience in traveling. Reducing the amount of time entailed in making trips or improving the circumstances in which they are made thus provides value to the traveling public, which should be counted among the benefits of public investments or government regulations. Symmetrically, actions that increase

the amount of time required by trips or cause them to be made under less desirable conditions (aboard more crowded vehicles or on more congested roads, for example) impose sacrifices on travelers that should be included in an accounting of their total costs. While the remainder of this paper generally refers to the value of saving travel time, it should be understood that the discussion applies equally to the valuation of increases in travel time that result from government actions.

The Value of Time in Personal Travel

The economic theory underlying the value of personal travel time to individuals (as distinguished from the value their employers attach to their use of paid working time for business travel) is a direct extension of the usual model of consumer utility-maximizing behavior.¹ In order to derive a theory of the value of travel time, the conventional model is extended to incorporate three additional ideas: (1) the activities in which individuals engage, including working, consumption, leisure, and travel, consume time; (2) the time spent in each activity represents a source of potential utility (or disutility in the case of activities like traveling and working); and (3) like the income available to purchase goods and services, the total amount of time available to an individual is constrained, in this case by the number of hours in the day, and by the fact that certain activities (such as sleeping or working) require some minimum amount of time. In this extended model, individuals maximize their personal welfare by allocating not only their limited incomes but also their available time among working, consumption activities, travel, and leisure.

This extended model leads to an expression for the value of travel time that includes two components: (1) the value of having additional time to allocate between work and non-work activities (say, by needing less sleep) -- sometimes termed the "resource value" of time itself -- and (2) the value of the utility or disutility derived from spending time traveling. In turn, the resource value of time consists of several different elements: the hourly value of the individual's after-tax earnings, including any effect of working extra hours on the wage rate (e.g., an overtime pay premium); the monetary value of any utility or disutility derived from additional time spent working; and the value of relaxing any constraint that exists on the minimum or maximum number of hours spent working (such as a minimum-length work day or week or the unavailability of overtime work).

Extending the economic theory of individual behavior to recognize the role played by time thus implies that the value of spending it traveling is related to the individual's hourly wage or earnings rate, the conditions associated with time spent working and traveling, whether there is a binding constraint on the number of hours worked, and the effect of additional work time on hourly earnings.

¹ There are many published discussions of the theory underlying the value of travel time, but two particularly useful ones are The MVA Consultancy *et al.*, "The Value of Travel Time Savings," *Policy Journals*, 1987, Chapter 3; and Kenneth A. Small, *Urban Transportation Economics*, Philadelphia, Harwood Academic Publishers, 1992, pp. 36-45.

Although average wages and hours can be measured with reasonable precision, we cannot observe directly the value an individual places on having more free time or spending time in one way, rather than another. If a person is indifferent between spending his or her time working and spending it traveling and if the individual is free to choose the number of hours worked, the value of travel time would equal his or her (after-tax) hourly rate of earnings. More commonly, working and time spent traveling represent sources of utility or disutility, and the work day is not varied at the worker's discretion. In addition, income from investments or other family members raises the amount people are willing to spend to save time but imposes no sacrifice of time to earn it. Thus, the hourly wage rate provides important clues to the value of travel time but cannot establish it alone.

Analysts resort to a variety of research techniques to estimate travelers' willingness to pay to save time, but they never have enough information to differentiate all of the contributing factors. They use travelers' hourly wage rates or incomes to judge the reasonableness of their estimates and commonly express estimated values of travel time as percentages of travelers' wage rates, both in recognition of their theoretical relationship to income and in order to establish a consistent procedure for applying conclusions to new situations. In fact, most of the research literature has yielded estimates grouped fairly closely about the wage. Nevertheless, the relationship between wages and values of time must be recognized as a practical expedient and working hypothesis, rather than as a demonstrable and stable relationship.

The Distributional Equity Question

Objections are sometimes raised against adoption of empirical estimates of the value of time that are a smaller percentage of wages for travel on transport modes used disproportionately by lower-income individuals. On grounds of distributional equity, it is often argued that emphasizing strictly monetary measures of benefits to the public will cause these modes to receive a smaller share of investments that improve travel speeds or conditions, even if the psychological satisfaction derived from time savings is just as great for low-income as for high-income travelers. Although this argument may be attractive, it is difficult to justify in the context of evaluating public investment choices.

First, the primary purpose of conducting economic evaluations of government decisions is to improve the efficiency of resource allocation within the nation's economy. Influencing the distribution of income among individuals or groups is an explicit goal of certain government programs (such as those that provide services directly to low-income groups), but the central purpose of public investments is to deliver maximum benefits to society as a whole from the resources withdrawn from the private economy to finance them. Measuring the travel time savings and other benefits from government expenditures by the dollar values their recipients attach to them is the only way to ensure that the investments chosen make the largest possible improvement to economy-wide welfare.

Moreover, low estimated values of time may indicate that time savings are not the form in which lower-income people would prefer to receive benefits. Other purposes of transportation-related expenditures, such as more comfortable vehicles or, in particular, subsidies for lower fares, could provide more utility per dollar spent. It is certainly appropriate for project evaluations to bring to the attention of decision-makers cases where public expenditures are intended to support services on which lower-income individuals may be especially dependent. It is important, however, to avoid distorting investment decisions by using time savings as a proxy for other private and social benefits.

We have not found adequate empirical evidence to justify distinctions in the values of time according to the modes used in local travel or the incomes of specific population groups. Therefore, a single value is adopted for all local personal travel. For intercity travel, however, we use values of time that recognize differences between modes in travelers' incomes and willingness to pay to save time.

The Value of Time in Business Travel

In the case of travel undertaken by employees in the course of their work -- where travel time is "on the clock" from the employer's point of view -- the same underlying theory applies: the value of travel time consists of the resource value of time itself, plus the monetary equivalent of whatever utility or disutility results from spending time traveling. Assuming time spent traveling would otherwise be spent working and that no productive use could be made of travel time, the employee's pre-tax wage rate plus the monetary value of fringe benefits represents the resource value of time.²

However, if part of the time spent traveling would otherwise be used for non-work activities or if productive use could be made of some time spent in travel, the gross earnings rate will tend to overstate the resource value of time. And if time spent traveling is viewed by the employee as less enjoyable than time spent working, then the value of business travel time may be higher than an employee's gross earnings rate. In sum, as with personal travel, the hourly earnings rate -- including taxes and fringe benefits -- provides a useful reference point for valuing travel time but cannot by itself establish the correct value.

Implications of the Theory

The underlying economic theory has two important implications for the likely magnitude of the value of travel time and its variation among different types of trips. First, factors that affect the opportunity cost or resource value of time itself can cause the value of travel time to vary. These include variation in travelers' hourly wage or earnings rates,

² In addition, this result assumes that labor and product markets are competitive, that capital and labor are substitutable for each other, and that there are no positive or negative externalities in production. While these at first appear to be highly restrictive assumptions, they are probably met sufficiently closely for an average economy-wide earnings rate to be used as a yardstick for valuing travel time.

since these establish the opportunity cost of dedicating time to travel that could otherwise be spent working, as well as travelers' valuations of leisure and other non-work activities that may be sacrificed in order to travel.

The higher opportunity cost of sacrificing work time to personal travel when hourly earnings rates are higher is one obvious reason why travel time is presumed to vary with income. But higher-income individuals are also likely to attach higher values to non-work activities that must be forgone in order to make time available for personal travel. This hypothesis would apply even to higher-income people who are not employed.

The common assumption that the value of travel time varies with trip purpose also stems largely from differences in the opportunity cost or resource value of the time used to make different types of trips. These differences, in turn, stem from the fact that different activities may have to be curtailed to make time available for specific travel purposes. In salaried employment, additional paid time is usually unavailable, even as an extension of the work day, and distance from work prevents the use of small amounts of free time to earn additional income.

The absence of a remunerative alternative use for time is one reason why the value of personal time is expected to be lower than that of work time. Hence the value of travel time is usually assumed to be highest for work-related or "on-the-job" travel, which consumes paid working time; somewhat lower for commuting time, which may also entail sacrifice of some working time, but not necessarily on an hour-for-hour basis; and lower still for personal business and recreational travel, since these trips presumably require travelers to forgo the least valuable alternative uses of their time. Recent empirical research, however, casts doubt on whether commuting time is actually valued more highly than that spent in other forms of personal travel.

The second implication of the underlying theory is that factors affecting the disutility of time spent traveling are also likely to introduce variation into travel time values. These factors include conditions travelers encounter aboard different types of vehicles, such as comfort, privacy, and personal security, as well as conditions they experience in phases of their trips not spent aboard vehicles, including accessing terminals or parking facilities (whether by walking or other means), boarding, waiting for departures, and transferring from one vehicle to another. Other factors that may influence the disutility of time spent in these various aspects of trip-making include exposure to adverse weather, crowding in terminals or aboard vehicles, and vehicle congestion on transportation facilities such as roads or airports. Systematic differences in the extent to which these factors arise are one reason why the value of travel time may vary by mode.³

³ Because travelers invariably include in their decisions factors that are omitted by researchers, differences in travel time values derived from statistical models will be only partly explained by identifiable characteristics of a mode or its users. Thus these values of time will be specific to individual modes and the travelers who have already chosen them. More detailed information is necessary to construct models that predict travelers' choices among modes for use in forecasting patronage on new or improved travel alternatives. The values of time adopted in this guidance document are not suitable for this purpose.

Average Travel Time Versus its Variability

Many governmental actions that change average travel times for particular types of trips are also likely to affect the day-to-day variation in actual trip times about their average duration, although the combination of these two effects seems likely to vary widely among the many individual government investment decisions or regulatory activities that affect travel speeds. While economic theory suggests that reductions in both average travel times for particular trips and day-to-day variation of actual travel times about their average duration will be valued by travelers, it provides little guidance regarding the likely relative valuation of these two effects.

A given saving in the average time required to make a particular trip will be valued more highly if it occurs on every repetition of that trip rather than only occasionally, since travelers can plan productive uses of the time made available. When trip length is uncertain, travelers may have to schedule extra travel time as insurance against delay. However, economic theory does not clarify this issue, and empirical research has so far contributed little to its resolution; accordingly, this guidance focuses on procedures for valuing changes in average or expected travel times.

The Value of Small Time Savings

There has been considerable debate about the appropriate unit value to be applied to travel time savings of different magnitudes, focusing particularly on whether small travel time savings -- those of a few minutes or less -- should be evaluated at the same hourly rate as larger savings. Arguments for lower hourly valuation of small time savings usually emphasize the difficulties travelers experience in making effective use of small increases in available time, particularly when they are unanticipated. As this reasoning suggests, however, much of the debate about whether small time savings should be valued at a lower hourly rate may actually reflect confusion between the value of reductions in expected trip times and reductions in their variability. As argued above, small but predictable increases in available time can be employed productively by at least some travelers as they reschedule their daily activities; equally sized time savings that occur only on some trips may be more difficult to use productively.

Although economic theory provides some support for the idea that the hourly value of small travel time savings should differ from average values per hour over larger changes in trip duration, it provides insufficient guidance for estimating the magnitude of any such differences, or even for anticipating their direction.⁴ At the same time, empirical evidence on the relative unit valuations of large and small time savings implied by

⁴ For a discussion of this issue, see Small, op. cit., p. 38.

traveler behavior is mixed, and the lower hourly values for small time savings that appear to be supported by a few early studies are no longer believed to be reliable.⁵

Finally, neither the underlying theory nor empirical evidence provides reliable guidance for identifying a threshold to distinguish between small and large time savings. Thus, the present state of knowledge does not appear to support valuing small time savings at lower hourly rates than larger savings.

Definition and Measurement Issues

Values of travel time are usually expressed per person-hour of travel in order to facilitate their comparison and use. Since estimates of travel time benefits resulting from many transportation investments are likely to be constructed in terms of vehicle-hours of time saved, it is often necessary to convert them to person-hours by multiplying by average passenger occupancy for vehicles likely to use the facility in question. Under varying circumstances, a group of riders in a single vehicle may have different values of time. A family with a common trip purpose and source of income may have a joint value of time, while a commuting car pool or transit vehicle will have independent values. It is generally impossible to distinguish these circumstances, either in the data from which estimates are derived or in potential applications. Similarly, different values for conditions encountered during travel or for different phases of a trip require identification of the circumstances in both the empirical data and in the environment affected by governmental actions.

Travel Time Values in Relation to Wage Rates

The resulting values per person-hour for travel time in vehicles and during other phases of the trip are usually expressed as fractions of travelers' wage rates. This practice partly reflects the theoretical role of the hourly earnings rate in determining individuals' values of travel time but also serves two other purposes: to allow comparison of travel time values estimated for different types of travel in different times or geographic locations, and to facilitate the transfer of values estimated in one setting to other similar applications.

Travel time values expressed as fractions of travelers' wage or earnings rates, however, must be converted to hourly dollar values for use in estimating economic benefits from investments or regulations that produce savings in travel time. This calculation requires wage or hourly earnings rates of travelers to be measured consistently with their definition in the original source of the estimated values, including considerations such as whether the original source employed actual wage rates or the estimated hourly equivalent of annual income, individual traveler versus household earnings, and so on.

⁵ For a review of such studies and an evaluation of their reliability, see Gellman Research Associates, Inc., *The Value of Time in Benefit-Cost Analysis of FAA Investment Decisions*, Volume I, report to Federal Aviation Administration, undated.

Where travel time values are inferred from underlying theory, the implied percentages should be applied to an earnings measure that is defined consistently with the one to which those values are theoretically linked.

Expressing travel time values as percentages of a wage rate or other income measure is not necessarily intended to imply that they vary in exact proportion to differences in earnings across the entire income spectrum. Both underlying theory and empirical evidence suggest that the value of time in any single type of travel expressed as a fraction of hourly earnings is likely to decline as earnings rise, meaning that higher-income travelers probably value travel time at lower percentages of their earnings rates (although still at higher dollar values) than do lower-income users of the same mode, facility, or service. Across the more limited range of incomes exhibited by travelers using the same travel mode to make trips with identical or similar characteristics (purpose, length, geographic setting, etc.), we may accept the convention that the hourly value of travel time is an approximately constant percentage of the wage rate.

Measuring the “Wage Rate”

As the preceding discussion indicated, the theory of travel time valuation stresses its linkage to some measure of travelers’ hourly income or wage rates, although other factors also influence individuals’ values. The most common practice in reporting empirical research is to express estimated values of personal (and sometimes business) travel time as percentages of travelers’ estimated average hourly incomes, usually derived by dividing travelers’ reported annual household incomes by an estimated number of hours worked per year, commonly 2,000.

While the theoretical relationship of estimated travel time values to such measures is imprecise, this practice is useful as long as such estimates are multiplied by a similar measure of travelers’ incomes when they are reconverted to dollar values or transferred to different settings. The remainder of this guidance document adheres to the conventional practice. Values of personal travel time, expressed as percentages of “wages,” are converted to hourly dollar figures by multiplying by the hourly equivalent of annual household incomes, before taxes. Values of business travel time are obtained as 100 percent of hourly employee compensation rates before taxes, including the hourly value of fringe benefits. The resulting dollar-denominated values of travel time are assumed to represent all travelers within each category, regardless of their age, employment status, or relationship to other travelers in the party.

Finally, there remains the question of how precisely analysts should attempt to define earnings rates to reflect the income of the specific traveling population affected by the infrastructure investment or regulatory action being evaluated. The sources of the empirical estimates of the value of time savings often use unclear or inconsistent definitions of the wage. In addition, many estimates were based on data generated in foreign countries or at different points in time, which makes it difficult to update values. Moreover, where information on the incomes of travelers on different modes or in different locations is not obtainable with comparable definition and accuracy, specificity

in one case will lead to a distortion of comparisons between applications, one of the chief purposes of cost-benefit analysis.

The most defensible procedure is therefore to employ nationwide average figures as we do in this guidance document. Where reliable, well-documented information on the wage or earnings rates of likely users of a particular investment or subjects of a regulatory action is available and is very different from nationwide averages, it may occasionally be appropriate to substitute such data for the figures employed here. It is, however, the responsibility of analysts using such information to demonstrate how it would improve the accuracy of the analysis, as well as to indicate clearly where it has been substituted for the nationwide norms used in this guidance document.

Categories for Differentiating Travel Time Values

While many factors are known to affect travel time, neither empirical research nor practical application is capable of identifying and quantifying all of them. A necessary simplification is to distinguish among types of trips that seem likely a priori to entail different average values of travelers' time. Travel time values would be anticipated to differ among these categories on the basis of differences in the incomes of typical users, in the alternative uses of time likely to be forgone in making specific types of trips, and in the desirability of circumstances experienced aboard vehicles and during other phases of travel (e.g., access or waiting).

The distinction among travel modes is likely to be among the most important of those investigated. Data are usually gathered for a sample defined by mode. Each mode represents a combination of properties -- cost, speed, safety, privacy, and comfort -- that will be more suitable for some purposes than for others and will be valued differently by populations of varying income levels. Therefore, we would expect to observe values of travel time that differ systematically by mode, and in fact some research has yielded higher values of time for expensive, high-speed modes, particularly air travel.

Nevertheless, we must observe that the research literature displays as much variation among estimates for a single mode as between those pertaining to different modes. This is particularly true of the comparison between the values of time estimated for private automobiles and for public transit, the two modes of local travel that have been most extensively studied. Although some analysts have perceived somewhat different average values for automobiles and transit, we do not believe that the evidence is reliable enough to justify the distinction at this time.

Most recent empirical research consistently identifies only two travel purposes for which significant differences in the value of travel time can be isolated: (1) travel in the course of work or business ("on-the-clock" travel); and (2) personal travel of all types, including commuting to and from work, conducting personal business, shopping, and social or recreational travel.⁶ This guidance document also distinguishes between local and

⁶ Although there is a long-standing tradition of assuming higher travel values for commuting than for other personal travel (such as personal business or shopping), most recent empirical research fails to support this distinction; see Miller (1996).

intercity travel, since local and intercity travelers' values of time are likely to vary in response to many factors, including the specific opportunities for use of the time forgone, the longer duration of intercity trips, and different conditions encountered in traveling (such as varying levels of congestion).

Cautions in Transferring Values

In transferring estimated values of travel time from their original setting to another, it is important to recall that such estimates reflect the typical circumstances that prevailed in the data used to derive or measure them. This means that these values will reflect the crowding levels normally experienced by travelers aboard public vehicles, including the typical duration of time spent standing versus seated, the average mix of access and waiting time comprising total out-of-vehicle time in the original study, and the frequency and reliability of scheduled service. In addition, estimated values of savings in travel time will implicitly incorporate the severity of crowding in terminals, typical levels of traffic congestion, and the influence of prevailing weather and road conditions on the onerousness of traveling.

Ideally, any adjustments made to travel time values as part of their transfer to a different setting should reflect differences in these factors from their measured values in the original data. We do not possess such information about populations studied, and we have no reliable estimates of the impact of each factor on the value of time. The only acceptable course, therefore, is to treat the estimated values of time adopted in this guidance document as applicable to all conditions prevailing on a given mode, under the assumption that the sources of the estimates embodied similar conditions.

Research into values of time in public transit has commonly distinguished on-vehicle time from other portions of the trip. Therefore, where a specific governmental action affects only walking, waiting, or transfer time on public transit, we have recommended a separate value of time to be used in analyses.

Recommended Procedures for Valuing Travel Time

There are several sources for estimated values of travel time, including published research on the subject itself, empirical models of mode choice and other aspects of travel demand, application of the underlying theory to empirical data on travelers' wage rates, and the efforts of other nations to standardize the practice of valuing travel time for public investment evaluation. In developing proposed values of travel time to support investment and regulatory evaluation within DOT, each of these sources was drawn upon, although greater emphasis was placed on surveys of published estimates of travel time values conducted expressly for the purpose and recently developed empirical models of travel behavior. In some cases these proposed values differ from current practice within DOT, although these differences are generally not large.

Proposed Values for Departmental Use

Table 1 presents recommended values of travel time for use in DOT investment evaluations and regulatory studies. These values are expressed as fractions of travelers' hourly income in the case of personal travel and of earnings plus the value of fringe benefits in the case of business travel and travel by truck drivers. A common value of local travel time is given for automobile drivers and passengers, public transit passengers, pedestrians, and bicyclists. A separate value is stated for truck drivers. For intercity travel, a common value is recommended for auto, bus, and rail travelers. Separate values are defined for air travelers and for truck drivers. In both the local and intercity travel categories, separate values are specified for personal travel (including commuting, shopping, conducting personal business, and social and recreational travel) and travel in the course of work or business. A supplementary value is adopted for walking access, waiting and transfer time on public transit when the analysis deals with these trip components in isolation.

The principal source of values for local travel is the literature survey and summary of recommendations prepared by Ted R. Miller, "The Value of Time and the Benefit of Time Saving," May 1996. This paper updates Miller's 1989 survey that provided time values for use in the FHWA HERS model. In his 1989 paper, Miller recommended a value of 60 percent of the wage for auto drivers and 45 percent for auto and transit passengers on personal travel.

After reviewing new research, Miller now recommends a downward adjustment to 55 percent for auto drivers and 40 percent for auto and transit passengers. Considering the small number of studies that distinguish automobile drivers from passengers, and the fact that we are uncertain in many cases whether drivers' responses represented passengers' values as well, we think it most appropriate to adopt a single value of 50 percent of the wage for all auto travelers. The 50 percent figure is also extremely close to an average of the 55 percent figure for drivers and the 40 percent figure for passengers, weighted by vehicle occupancy observed in local travel.

We also believe it is appropriate to value travel time savings experienced by transit passengers at this same 50 percent figure, since the characteristics of travelers using the two modes are increasingly similar. While many travelers select automobiles for their greater speed, many others are equally likely to choose automobiles for other reasons in spite of lower speed. Although the on-board conditions of public transit may be less desirable than those offered by automobile travel, transit riders are free from the responsibility of driving and may be able to make productive use of their travel time. There is thus no clear-cut difference between the disutility of spending time traveling in an automobile and in a transit vehicle that would justify differing values of travel time for the two modes, relative to income. In addition, investments in new and expanded transit facilities that are likely to be evaluated using this figure increasingly serve travel for the same purposes and under the same time constraints as automobile trips, which also suggests that is appropriate to value savings in auto and transit travel time identically.

The value of time saved in walking access, waiting, and transfer components of personal travel by public transit has been a separate object of study. Where transit improvements affect walking, waiting, and access time exclusively, we value the time saved at 100 percent of the wage. Some studies reviewed by Miller attempted to differentiate values of time by conditions encountered en route, such as standing on transit vehicles. While these conditions yielded a high value of time, the results were not always credible. Moreover, most of the studies did not make such distinctions, so the reported values must be considered representative of the average conditions of a transit trip, including waiting and standing. Adjustment of values of on-vehicle time to reflect specific differences in these conditions would amount to double counting. For governmental actions affecting transit trips in their entirety, only the value of 50 percent of the wage should be used.

Evaluation of time spent in travel by foot or bicycle is complicated by the heterogeneity of motives involved in the choice of these modes. Travelers may walk for pleasure or because it is necessary to connect trip segments performed on faster and more expensive modes. Other modes may also be too costly or inaccessible for short trips. Because it is impossible to isolate the factors generating demand for pedestrian or bicycle travel, we assume that the value of time saved in these modes is also 50 percent of the wage.

Values of time in intercity, personal travel were not distinguished by Miller. The most specific source of information in this area is "The Values of Time Savings for Intercity Air and Auto Travelers for Trips under 500 Miles in the U.S.," June 1, 1996, by Daniel Brand. This paper summarizes research conducted by Charles River Associates in several interurban corridors. The values are scattered over a fairly wide range for both air and auto travel, but 70 percent of the wage is a fair representation of the central tendency in both modes. Intercity rail travel is not included in the Charles River report, but where it is important it is a close substitute for either air or auto; accordingly, it seems advisable to use 70 percent of the wage on this mode as well.

The values of time currently used by the FAA were derived from a 1988 report by Gellman Research Associates Inc., which surveyed the research literature and recommended values for use. The three studies that formed the principal basis for these recommendations all applied logit analysis to data from the 1977 Census of Transportation National Travel Survey. A 1987 study by Pickrell estimated the value of time in business travel across all modes at 164 percent of the after-tax wage and that in personal travel at 21 percent of the wage. Research published in 1985 by Steven A. Morrison and Clifford Winston yielded a value for business travel by all modes of 85 percent of the before-tax wage, while the value for personal travel by air was stated at 149 percent. A later review by Morrison found that this figure was incorrectly derived and should have been 130 percent. A third study by Alan Grayson in 1981 found a value of 61 percent of the pre-tax wage rate for business air travel and 214 percent for personal travel. Subsequently, it was noted that this figure was applicable to the entire traveling party and should have been 112 percent or less for a single traveler.

The Gellman report, supplemented by a later estimate of 170 percent of the wage by Morrison and Winston, led the FAA to endorse a value of 150 percent of the wage for personal air travel. Although the Morrison and Winston figure seemed to be bracketed

by higher and lower estimates, even the corrected figure of 130 percent is now seen as considerably higher than other estimates (including a recent estimate of 19 percent of the wage by the same authors). In sum, the studies reviewed by the FAA have not yielded coefficients that are stable and replicable, and the underlying data are now two decades old. Therefore, we believe that the 70 percent figure is the best point estimate, a view endorsed by our consultants. We will adopt 70 percent of the wage as the standard for future analyses of the value of time in personal air travel.

As discussed above, 100 percent of the wage, including fringe benefits, is generally accepted as the value of time in business travel. Even though the theoretical and empirical support of this number is less than compelling, no strong evidence has emerged to justify abandoning it. This is the value recommended by Miller. Morrison has reviewed the literature in this area (“The Value of Business Travel Time,” May 1996) and concludes that the value of 100 percent should be used but that its uncertainty should be recognized by testing higher and lower alternatives as well. In the Brand paper, values for business travel by both air and auto in several corridors range above and below the 100 percent figure. We have therefore adopted this value for all business travel.

The values reported in Table 1 should not be interpreted as implying that saving time in business travel is always more valuable than reducing the time required by personal travel. On some personal trips -- such as those for medical emergencies or certain family and personal business -- travelers’ willingness to pay to save time may far exceed that of typical business travelers. Similarly, some business travelers may be willing to pay much higher rates than those reported in the table to reduce their travel time, as evidenced by their use of high-cost modes such as taxis, limousines, and corporate or private aircraft. Travelers with the same purpose aboard the same vehicle will differ among themselves in the values they attach to saving time on a particular trip. On balance, however, the average values of personal travel time reported in the table, which already reflect individuals’ high willingness to pay for faster travel on a small fraction of their trips, remain consistently below the corresponding average values of time savings for business travelers.

Uncertainty in the Recommended Values

The values reported in Table 1 are derived from surveys of recent travel demand research conducted for the purpose of developing this guidance. These values represent the best single figures for use in conducting economic evaluations of infrastructure investments, regulations, or enforcement actions that affect the use of travel time. As with most other parameters of travel behavior, however, uncertainty surrounds the exact values of time in different types of travel. Table 2 summarizes this range of uncertainty for each of the trip categories employed in the previous table, in the form of plausible ranges of travel time values implied by recent empirical research. Note that in some cases, the point estimates for the value of travel time reported in Table 1 do not lie at the center of the range of uncertainty surrounding them, since the probability of alternative values is not symmetrically distributed about the recommended point figures.

While the values reported in Table 1 should be used to conduct initial evaluations of investment and regulatory decisions or policies, analysts should test the sensitivity of analyses to the ranges of uncertainty specified in Table 2. In particular, it is often important to test whether the specific investment or regulatory decision that would be supported by an economic evaluation would differ in response to variation in the assumed values of travel time within the ranges specified in Table 2. Where this proves to be the case, extreme caution obviously needs to be used in developing a recommended course of action on the basis of economic analysis employing the Table 1 values, and the sensitivity of the recommended decision to remaining uncertainty should be clearly reported.

Applying the Recommended Values

The travel time values reported in Tables 1 and 2 are expressed as percentages of hourly earnings rates. In order to convert them to dollar values for use in conducting economic analyses, we must multiply them by an appropriate estimate of hourly earnings for typical travelers. Table 3 reports estimates of appropriately defined average hourly earnings measures for travelers. The figures for personal travel represent annual household income before taxes, converted to an hourly basis by dividing by 2,000. This is the earnings measure most commonly used to express travel time values in published empirical research. The source, as stated on the table, is the Census Current Population Reports, Series P-60. For most surface business travel, the data series employed is from a quarterly survey of average hourly earnings in private, non-agricultural employment published by the Bureau of Labor Statistics in “News: Employer Costs for Employee Compensation.” The same survey provides estimates of hourly employer-paid fringe benefits that are added to the wage.

The truck driver wage rate is computed by dividing Median Weekly Earnings for Truck Drivers, from Table 39 of the BLS monthly report “Employment and Earnings”, by Average Hours per Week for all workers (full- and part-time) in the Transportation and Materials Moving occupations, from Table 23 in the same publication. Separate estimates are not available for truck drivers in local and intercity trucking. Fringe benefits are added, using the average figures for business travel derived above from the quarterly survey.

Air travelers on both personal and business trips typically have higher incomes than users of other modes, and Table 3 specifies correspondingly higher hourly earnings rates for use in valuing their travel time. These figures reflect the average incomes of air travelers reported in the annual Air Travel Survey by the Air Transport Association. As published, the Air Travel Survey’s income figures for business and personal travel combine data on domestic and international travelers. While the result may not represent the ideal average of domestic and international traffic for every analysis, international passengers are broadly enough distributed over domestic airline flights to permit the assumption that any FAA action will affect the two categories in constant proportions.

Where significant numbers of general aviation passengers are present, the incomes of airline passengers will probably understate the average income of the affected population. Nevertheless, the impacts of many, different FAA actions can not be assumed to fall on the various user groups in proportion to their shares in some prior, nationwide traffic measure. Therefore, we consider it inappropriate in most cases to use a weighted average wage that reflects the higher incomes of general aviation travelers. The wages of airline passengers should be used unless the composition of the traffic affected by the FAA's action can be shown to include an unusually large share of general aviation. For such cases, we publish an estimated wage of general aviation passengers that analysts can use to construct an appropriately weighted average. This figure is based on the median income, estimated by survey, of members of the Aircraft Owners and Pilots Association (AOPA). The weights used should correspond to the proportion of time saved or lost by each user group as a result of the action under consideration, not to their shares of total trips or flight hours.

Table 4 applies the point estimates for the value of travel time from Table 1, stated as percentages of the appropriate earnings measures, to the dollar-denominated earnings rates reported in Table 3, producing dollar estimates of the hourly value of travel time savings. Table 4 presents hourly travel time values for each combination of travel mode and trip purpose shown in Tables 1-3, as well as composite values for all trip purposes for each travel mode.

These composite values of travel time savings represent weighted averages of those recommended for personal and business travel, using the proportions of travel on each mode for the stated purposes that are reported in nationwide travel surveys such as the 1990 Nationwide Personal Transportation Survey (NPTS) and the annual Air Transport Association survey of airline passengers.

Table 5 repeats this procedure, using the low and high values of travel time as percentages of earnings reported in Table 2 in conjunction with the dollar earnings rates from Table 3 to produce a range of dollar-denominated values of travel time for each mode and trip purpose category. Where more detailed or recent information on the use of each mode for different travel purposes is available, it may be used in conjunction with the specified values for personal and business travel to develop substitute estimates of the composite values reported in Tables 4 and 5.

Updating the Estimated Values

The Office of the Assistant Secretary for Transportation Policy will publish periodic updates of the values of travel time to be used in DOT economic analyses. This updating will be performed using the data sources cited previously, including those published by the Bureau of the Census, the Bureau of Labor Statistics, and the Air Transport Association. This updating process will automatically "index" the values to reflect increases in hourly earnings throughout the nation's economy, although the timeliness of the process will be limited by the time lag in the Census Bureau's publication of updated household income figures. In the meantime, analysts should not update the values recommended in this guidance using economy-wide measures of general price inflation such as the Consumer Price Index or GDP deflator.

In contrast, regular updating of the percentages of these earnings rates that are applied to convert them to hourly values of travel time is not required. Instead, these figures will only be updated as the accumulation of continuing research on travel behavior suggests that revised multiples of hourly earnings have become appropriate for valuing travel time savings. The Office of the Assistant Secretary for Transportation Policy will monitor and interpret newly available research on travel behavior and will issue revisions to the figures reported in Tables 1 and 2 as it becomes appropriate to do so.

A Numerical Example

Suppose a major improvement to a segment of an urban highway is under study, and traffic-flow simulations indicate that the improvement would reduce total travel time on that segment by a total of 400 vehicle-hours per day. Assume further that information on current usage of that segment reveals that total vehicle-hours of travel on the segment before its improvement consist of 50 percent local automobile travel, 25 percent intercity automobile trips passing through the urban area, 20 percent a combination of local and intercity trucks, and the remaining 5 percent transit buses. Assuming that the 400 hours of travel time savings is distributed identically to current usage, Table 6 illustrates the computation and valuation of travel time savings by mode and trip purpose category and in total for the project.⁷ As the table indicates, the first step in the computation is to distribute the total number of vehicle-hours saved among mode and trip purpose categories using the percentage distribution of current usage of the facility.

Next, travel time savings are converted to person-hours by multiplying the number of vehicle-hours of time saved in each mode/trip purpose category by an appropriate vehicle occupancy factor. Nationwide average occupancy factors of 1.6 and 2.3 persons per vehicle for local and intercity auto travel imply 1.6 hours of driver and passenger time for

⁷ Automobile occupancy factors were obtained from Federal Highway Administration, *1990 Nationwide Personal Transportation Survey*, Databook Volume 2, Tables 7.7 and 8.15.

each vehicle-hour of local auto travel time saved and 2.3 hours of driver and passenger time per vehicle-hour of intercity auto travel time saved. Assuming an average occupancy of 25 persons for transit vehicles, the 20 daily transit vehicle-hours (5 percent of 400 total vehicle-hours) saved by the project imply a savings of 500 person-hours of transit passenger time; trucks are assumed to be occupied by only a driver. The resulting estimates of person-hours of travel time saved in each category are multiplied by the corresponding estimate of their hourly dollar value from Table 4 to produce the total dollar values shown in the last column of Table 6.

Following an identical procedure, the dollar values reported in Table 6 can be re-estimated using the low and high ranges for travel time values shown in Table 5 and the estimated number of person-hours of travel time saved in each mode/trip purpose category used in the example. The resulting range for the daily total value of time savings from proceeding with the project extends from a low of \$8,960 (Table 7) to a high of \$13,705 (Table 8); however, the figure of \$11,424 shown in Table 6 should be considered the most likely estimate of the total daily value of travel time savings from the project in question. For use in a benefit-cost evaluation of such a project, the low, most likely, and high figures would each require annualization and appropriate discounting over the future period during which the predicted time savings were expected to continue.

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Table 1

(per person-hour as a % of wage rate)			
Category	Surface Modes *	Air Travel	Truck Drivers
Local Travel Personal Business	50% 100%	-- --	-- 100%
Intercity Travel Personal Business	70% 100%	70% 100%	-- 100%

* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time should be valued at 100% of the wage rate when actions affect only these elements of transit time.

Sources: local personal travel, Miller (1996); local business travel, Miller (1996) and Morrison (1996); intercity personal travel, Brand (1996) and Miller (1996); intercity business travel, Morrison (1996) and Brand (1996); truck driver travel, Morrison (1996) and Miller (1996).

Table 2

Plausible Ranges for Values of Travel Time Savings (per person-hour as a % of wage rate)			
Category	Surface Modes *	Air Travel	Truck Drivers
Local Travel Personal Business	35-60% 80-120%	-- --	-- 100%
Intercity Travel Personal Business	60-90% 80-120%	60-90% 80-120%	-- 100%

* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time should be valued at 100% of the wage rate when actions affect only these elements of transit time.

Sources: local personal travel, Miller (1996); local business travel, Miller (1996) and Morrison (1996); intercity personal travel, Brand (1996) and Miller (1996); intercity business travel, Morrison (1996) and Brand (1996); truck driver travel, Morrison (1996) and Miller (1996).

Table 3

Recommended Hourly Earnings Rates			
(1995 U.S. \$ per person-hour)			
Category	Surface Modes	Air Travel *	Truck Drivers
Local Travel			
Personal	\$17.00	--	--
Business	\$18.80	--	\$16.50
Intercity Travel			
Personal	\$17.00	\$27.80	--
Business	\$18.80	\$34.50	\$16.50

* Hourly earnings of \$37.50 are to be used for general aviation passengers when they are included as a separate category.

Table 3 (continued)

Sources:

- (1) Local and intercity personal travel by surface modes: median income for all U.S. households during 1995 (\$34,076), reported in Bureau of the Census, Current Population Reports, *Money Income of Households, Families, and Persons in the United States*, Series P-60, Number 99627, divided by 2,000 hours per year.
- (2) Local and intercity business travel by surface modes: reported in Bureau of Labor Statistics, *News: Employer Costs for Employee Compensation*,
- (3) Intercity personal travel by airline: weighted average of annual incomes for "visit friends," "sightseeing," and "other" travel (\$50,975) from Air Transport Association of America, *Air Travel Survey*, 1993, Table 18, page 20, divided by 2,000 hours per year; escalated by increase in median annual income of U.S. households from 1993 to 1995 (9.1%) computed from Bureau of the Census, Current Population Reports, *Money Income of Households, Families, and Persons in the United States*, Series P-60, various issues.
- (4) Intercity personal travel by airline: annual income for "business" travel from Air Transport Association of America, *Air Travel Survey*, 1993, Table 18, page 20, divided by 2,000 hours per year; escalated by increase in median annual income of U.S. households from 1993 to 1995 (9.1%) computed from Bureau of the Census, Current Population Reports, *Money Income of Households, Families, and Persons in the United States*, Series P-60, various issues.
- (5) Truck drivers in local and intercity travel: equal to median weekly earnings of full-time truck drivers for 1995 (\$481) divided by average weekly hours for full-time operators in transportation and material moving occupations (45.9 hours per week), from Bureau of Labor Statistics, *Employment and Earnings*, January 1996, Table 39, page 209, and Table 23, page 191; plus average hourly value of employer-paid fringe benefits (\$5.34 per hour), from Bureau of Labor Statistics, *News: Employer Costs for Employee Compensation*, March 1996, Table 1, page 5.

Table 4

Recommended Hourly Values of Travel Time Savings (1995 U.S. \$ per person-hour)			
Category	Surface Modes *	Air Travel **	Truck Drivers
Local Travel			
Personal	\$8.50	--	--
Business	\$18.80	--	\$16.50
All Purposes***	\$8.90	--	--
Intercity Travel			
Personal	\$11.90	\$19.50	--
Business	\$18.80	\$34.50	\$16.50
All Purposes***	\$12.20	\$26.70	--

* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time should be valued at \$17.00 per hour for personal travel and \$18.80 per hour for business travel when actions affect only these elements of transit time.

** When a weighted average value for air travel must be constructed, the value of \$26.30 should be used for general aviation passengers on personal travel and that of \$37.50 for general aviation passengers on business travel.

Table 4 (continued)

*** Weighted averages using distributions of travel on various modes by trip purpose. Distribution for local travel by surface modes (95.8% personal, 4.2% business) reported in FHWA, *1990 Nationwide Personal Transportation Survey Databook, Volume I*, Table 4.41, page 4-72. Distribution for intercity travel by surface modes (95.0% personal, 5.0% business) reported in FHWA, *1990 Nationwide Personal Transportation Survey Databook, Volume II*, Table 8.13, page 8-22. Distribution for intercity airline travel (52% personal, 48% business) reported in Air Transport Association of America, *Air Travel Survey*, 1993, Table 9, page III-18.

Table 5

Plausible Ranges for Hourly Values of Travel Time Savings (1995 U.S. \$ per person-hour)					
Category	Surface Modes *		Air Travel **		Truck Drivers
	Low	High	Low	High	
Local Travel Personal Business All Purposes***	\$6.00	\$10.20	--	--	--
	\$15.00	\$22.60	--	--	\$16.50
	\$6.40	\$10.70	--	--	--
Intercity Travel Personal Business All Purposes***	\$10.20	\$15.30	\$16.70	\$25.00	--
	\$15.00	\$22.60	\$27.60	\$41.40	\$16.50
	\$10.40	\$15.70	\$21.90	\$32.90	--

* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time should be valued at \$17.00 per hour for personal travel and \$18.80 per hour for business travel when actions affect only these elements of transit time.

** When a weighted average value for air travel must be constructed, the value of \$26.30 should be used for general aviation passengers on personal travel and that of \$37.50 for general aviation passengers on business travel.

Table 5 (continued)

*** Weighted averages using distributions of travel on various modes by trip purpose. Distribution for local travel by surface modes (95.8% personal, 4.2% business) reported in FHWA, *1990 Nationwide Personal Transportation Survey Databook, Volume I*, Table 4.41, page 4-72. Distribution for intercity travel by surface modes (95.0% personal, 5.0% business) reported in FHWA, *1990 Nationwide Personal Transportation Survey Databook, Volume II*, Table 8.13, page 8-22. Distribution for intercity airline travel (52% personal, 48% business) reported in Air Transport Association of America, *Air Travel Survey*, 1993, Table 9, page III-18.

Table 6

Category	Hours of Travel Time Saved:		Dollar Value	
	Vehicle-Hrs.	Person-Hrs.	per Hour	Total
Local Auto	200	320	\$8.90	\$2,848
Intercity Auto	100	230	\$12.20	\$2,806
Transit Passengers	20	500	\$8.90	\$4,450
Truck Drivers	80	80	\$16.50	\$1,320
TOTAL	400	1,030	\$11.09	\$11,424

Table 7

Sample Computation Using Low Values of Travel Time Savings			
Category	Hours of Travel Time Saved:		Dollar Value
	Vehicle-Hrs.	Person-Hrs.	per Hour Total
Local Auto	200	320	\$6.40 \$2,048
Intercity Auto	100	230	\$10.40 \$2,392
Transit Passengers	20	500	\$6.40 \$3,200
Truck Drivers	80	80	\$16.50 \$1,320
TOTAL	400	1,030	\$8.70 \$8,960

Table 8

Sample Computation Using High Values of Travel Time Savings			
Category	Hours of Travel Time Saved:		Dollar Value
	Vehicle-Hrs.	Person-Hrs.	per Hour Total
Local Auto	200	320	\$10.70 \$3,424
Intercity Auto	100	230	\$15.70 \$3,611
Transit Passengers	20	500	\$10.70 \$5,350
Truck Drivers	80	80	\$16.50 \$1,320
TOTAL	400	1,030	\$13.31 \$13,705