Highway Cost Allocation Study

2025-2027 Biennium

CORRECTED ON MAY 28, 2025

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SUMMARY OF MAJOR FINDINGS AND RECOMMENDATIONS

THE 2025 OREGON HIGHWAY COST ALLOCATION STUDY CONCLUDES THAT:

- For the 2025-27 biennium and under existing, current-law tax rates, full-fee-paying light vehicles will contribute 63.4 percent of state highway user revenues, and full-fee-paying heavy vehicles (those weighing more than 10,000 pounds), as a group, will contribute 36.6 percent.
- For the 2025-27 biennium and under existing, current-law tax rates, full-fee-paying light vehicles are responsible for 70.9 percent of state highway user costs, and full-fee-paying heavy vehicles (those weighing more than 10,000 pounds), as a group, are responsible for 29.1 percent.
- Equity ratios for full-fee-paying vehicles, the ratio of projected payments to responsibilities for vehicles in each class, are **0.8935** for light vehicles and **1.2595** for heavy vehicles. Under existing tax rates and fees, light vehicles are projected to underpay their responsibility by 10.7 percent. Heavy vehicles are projected to overpay by 26.0 percent during the next biennium.
- The Legislature recently enacted incremental rate increases for tax rates and fees between 2018 and 2024, which are now fully accounted for in this study. These rate increases have increased the share of revenues collected from heavy vehicles and impacted equity ratios between light and heavy vehicles.
- Should the Legislature choose to modify user fee rates for other reasons beyond the scope of this study, the HCAS model can be used to design those rates to ensure those rates produce revenues in proportion to expected costs imposed by light and heavy vehicles.
- For light-duty vehicles the tax on motor fuels would need to be increased from $0.40 per gallon to $0.46 per gallon and the registration fees would need to increase by 7 percent.
- To achieve equity for the medium duty vehicles (10,001 and 26,000 pounds) registration rates for these vehicles would need to be reduced to 80 percent of their current rates.
- To achieve equity within heavy vehicle classes, several rate schedules would need to be changed. Specific rates are recommended in Chapter 8.

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INTRODUCTION

For almost 80 years, Oregon has based the financing of its highways on the principle of cost responsibility. Cost responsibility is the principle that those who use the public roads should pay for them and, more specifically, that users should pay in proportion to the road costs for which they are responsible. Cost responsibility requires each category of highway users to contribute to highway revenues in proportion to the costs they impose on the highway system. The State of Oregon uses the cost allocation process to apportion costs of highway work to vehicles that impose those costs.

This tradition has served Oregon well by ensuring that the state's highway taxes and fees are levied in a fair and equitable manner. The State of Oregon commissions periodic studies to determine the "fair share" that each class of road users should pay for the maintenance, operation, and improvement of the state's highways, roads, and streets. Prior to the present study, 22 such studies had been completed; the first in 1937, the most recent in 2023.

Oregon voters ratified the principle of cost responsibility in the November 1999 special election by voting to add the following language to Article IX, Section 3a (3) of the Oregon Constitution:

"Revenues that are generated by taxes or excises imposed by the state shall be generated in a manner that ensures that the share of revenues paid for the use of light vehicles, including cars, and the share of revenues paid for the use of heavy vehicles, including trucks, is fair and proportionate to the costs incurred for the highway system because of each class of vehicle. The Legislative Assembly shall provide for a biennial review and, if necessary, adjustment, of revenue sources to ensure fairness and proportionality."

May 2025 Corrections

This report is a corrected version of the 2025-2027 Highway Cost Allocation Study. The original version was published in January of 2025. Since that publication ODOT staff identified some changes to the planned transportation projects for the upcoming biennium listed in the HCAS model. These changes in planned expenditures correct for two separate issues identified by Legislative Revenue Office and ODOT staff. This revised report reflects those changes.

First, the original project list contained some projects that are not eligible for State Highway Fund dollars. Since they are not eligible for State Highway Fund dollars, these projects are not supported by highway user fees and should be excluded from the HCAS expenditure accounting. And, since local match dollars cannot come from the highway fund, the federal dollars dedicated to these projects are also excluded from HCAS.

Second, the original project list provided by ODOT did not identify projects that will be funded with bond proceeds. The HCAS model has a method for treating bond funded projects, but these projects need to be identified specifically so that current biennium bond repayment costs are allocated to highway users instead of the entire project cost, as is otherwise done with projects that are funded with pay-as-you-go dollars.

Once ODOT staff identified these issues a revised project list was prepared for inclusion in the HCAS model. This list excludes the projects that are not eligible for highway fund dollars and properly identifies bond funded projects. The rest of this addendum describes the changes to the project list in more detail and then summarizes the corrected results of the HCAS analysis.

The original project list has three categories of project funding, federal, state, and other (typically local jurisdictions). In the corrected list, ODOT relied upon additional programming-level information to make judgments about funding eligibility. As a result, there are two types of projects that have been removed from the project list.

The first set of projects are transit related projects that make use of Federal Transit Administration funds. These projects are not eligible for State Highway Fund dollars and both state and federal expenditures need to be excluded from HCAS. Twenty-five projects that meet this criterion were removed from the list. The total cost for these projects is $131.5 million.

The second set of projects relate to state investments that support the development of electric vehicle infrastructure. These projects are also not eligible for highway fund dollars. Twenty-two projects that meet this criterion were removed from the list. The total cost for these projects is $31.2 million.

In addition to the above referenced projects ODOT identified a single line item in non-project costs that required a correction. In the original analysis there was a total of $195 million in planned expenditures for Transportation Program Development. ODOT revised this estimate downward by $83.4 million, resulting in a corrected value of $111.6 million.

Changes to bonded projects were also identified. Projects slated for bond funding get assigned bond funding as their principal funding source. The model then assigns a cost responsibility for each project but only attributes a portion of the total project cost to the current HCAS analysis. The amount of project cost that is included in the current HCAS is the financing costs the state must pay in the upcoming biennium. The remainder of the costs are passed on to future HCAS studies in a manner that is consistent with the state's future obligations.

Bond sales and project financing is an ODOT programming-level function that responds to the immediate needs the state has in meeting its project delivery responsibilities. The original HCAS project list did not contain information about the state's expected bonding program for the upcoming biennium. ODOT is currently planning to use a new bond program (GARVEE) in addition to the traditional state program for bond financing.

For the upcoming biennium ODOT plans to use their traditional bond funding program to support the implementation of six projects totaling $196.3 million in costs. And for the first time the state plans to make use of a federal program (GARVEE) to support delivery of fourteen projects totaling $243.2 million.

The corrections to the expenditure inputs described above change the total costs allocated to highway users in Oregon. This, in turn, alters the equity ratios produced by the HCAS model. This 2025-2027 Highway Cost Allocation Study Report has been revised to reflect these corrections.

Purpose of Study

The purpose of this 2025 Oregon Highway Cost Allocation Study (HCAS) is to:

(1) determine the share that each class of road users should pay based on their respective share of costs for maintenance, operation, and improvement of Oregon's highways, roads, and streets; and

(2) if necessary, recommend adjustments to existing tax rates and fees to bring about a closer match between payments and responsibilities for each vehicle class.

ORGANIZATION OF THIS REPORT

This volume of the 2025 study provides an overview of the study issues, methodology, and results, as well as recommendations for future studies. There are several exhibits throughout this report to illustrate specific data. Please note that amounts shown are rounded and may not total exactly.

This chapter has provided an introductory discussion of the purpose, scope, and process of the 2025 study as well as a brief background discussion of the history of Oregon highway cost allocation studies by the federal government and other states, and the evolution of Oregon road user taxation.

- **Chapter 2** briefly summarizes the basic structure and parameters of the 2025 study, including the analysis periods, road (highway) systems, revenues attributed to vehicle classes, and expenditures allocated to those vehicle classes.
- **Chapter 3** presents the general methodology and approach used for the study. It includes a description of the special analyses conducted for the study and discussion of the major methodological and procedural changes from previous Oregon studies.
- **Chapter 4** summarizes the data and forecasts used in the study and compares them to the data and forecasts used in recent studies.
- **Chapter 5** presents the study expenditure allocation and revenue attribution procedures and results and compares the methods and results to those of previous Oregon studies.
- **Chapter 6** brings together the expenditure allocation and revenue attribution results from the previous chapter to develop ratios of projected payments to cost responsibilities for light vehicles and the detailed heavy vehicle weight classes. It also compares these ratios with those from the 2015-2023 Oregon studies.
- **Chapter 7** contains recommendations for changes in existing tax rates and fees to bring about a closer match between revenues contributed and cost responsibilities for each vehicle class.

The appendices to this study are presented in a separate document because of their size. The appendices include:

[1] "Oregon Cost Responsibility Studies Compared to Other States," Legislative Revenue Office Research Report #4-96, September 10, 1996.

Appendix A. **Glossary of terms**

Appendix B. **Summary of highway cost allocation studies in other states**

Appendix C. **The minutes of each SRT meeting**

Appendix D. **HCAS model user guide**

Appendix E. **HCAS model reference guide**

Appendix F. **2025 input data and assumptions**

BACKGROUND

Past Oregon Highway Cost Allocation Studies

Oregon, more than any other state, has a long history of conducting highway cost allocation or responsibility studies and basing its system of road user taxation on the results of these studies. The State of Oregon completed studies in 1937, 1947, 1963, 1974, 1980, 1984, 1986, 1990, 1992, 1994, and 1999-2023. As noted above, the Oregon Constitution requires that a study is conducted biennially and highway user tax rates adjusted, if necessary, to ensure fairness and proportionality between light and heavy vehicles.

Prior to 1999, Oregon used the term cost responsibility studies, whereas the federal government and most other states called their studies cost allocation studies. Oregon has now adopted the more conventional terminology, although the two terms are equivalent and used interchangeably in this report.[1]

In this study and all prior studies, highway users and other interested parties have been given the opportunity to offer their input in an open and objective process. During the 1986 study, for example, three large public meetings were held to provide information on the study and solicit the input of all user groups.

As part of the 1994 study process, a Policy Advisory Committee was formed to address several cost responsibility issues that arose during the 1993 legislative session. This committee consisted of 12 members, including a representative of AAA Oregon and five representatives of the trucking industry. The committee held six meetings devoted to understanding and recommending policies for the 1994 study as well as future Oregon studies.

In 1996, the Oregon Department of Transportation (ODOT) formed the Cost Responsibility Blue Ribbon Committee to evaluate the principles and methods of the Oregon cost responsibility studies and, if warranted, recommend improvements to the existing methodology. This 11-member committee was chaired by the then Chairman of the Oregon Transportation Commission and included representatives of the trucking industry, AAA Oregon, local governments, academia, and Oregon business interests. The committee held a total of seven meetings and reached agreement on several recommendations for future studies. Because the trucking industry, in some cases, did not agree with the full committee recommendations, it was given the opportunity and elected to file a Minority Report that was included in the committee report.

All studies prior to 1999 were conducted by ODOT staff. In February 1998, the ODOT and Oregon Department of Administrative Services (DAS) Directors reached agreement to transfer responsibility for the study from ODOT to DAS. The 1999, 2001, and 2005 through 2023 studies, as well as the current study, were conducted by consultants to the DAS Office of Economic Analysis. ODOT's role in these studies was to provide technical assistance and most of the data and other required information. In 2003, ODOT conducted the study using the model developed for the 2001 study.

The Oregon studies prior to 1999 relied on an internal technical advisory committee to provide the expertise and some of the many data elements required for the studies. As noted, highway users and other interested parties were also provided the opportunity to offer their input as the studies were being conducted. For the 1999 and subsequent studies, DAS formed a Study Review Team (SRT) to provide overall direction for the studies. The SRT's role has been to provide policy guidance and advisory input on all study methods and issues.

The SRT for the 2001 study consisted of ten members and the SRTs for the 2003 and 2005 studies had eight members. The SRT for the 2007 through

[2] "Oregon Cost Responsibility Studies Compared to Other States," Legislative Revenue Office Research Report #4-96, September 10, 1996.
[3] It should be noted, however, that the results of the federal studies are not directly comparable to those of state studies for two reasons: highway maintenance is a state-funded activity and thus is not included in the federal studies, and the heavy vehicle responsibility share is generally lower for most maintenance activities than for construction, particularly major rehabilitation projects. Therefore, the responsibility for federal expenditures will typically be more weighted toward heavy vehicles than is the case for state expenditures.

2021 consisted of ten members, and the present study consisted of nine members. The composition of the SRTs has changed from study to study, but all have included motorist, trucking industry, and Oregon business representatives; academics; and state officials. All SRTs have been chaired by the State Economist. ODOT did not have a representative on the 1999 SRT but was represented on subsequent SRTs.

Other Highway Cost Allocation Studies

Although Oregon has the longest history of conducting highway cost allocation studies, several other states have also conducted such studies, the majority of which have been completed over the past two decades. Since the first HCAS, 32 states have performed at least 88 cost allocation studies. Since the late 1970s, 30 states have conducted such studies.

The interest of other states in undertaking these studies has in many cases been sparked by the completion of similar studies by the federal government. Several states undertook studies following the release of the 1982 Federal HCAS. With the release of the 1997 Federal HCAS and the Federal Highway Administration's (FHWA) interest in helping states do their own studies, there was again a renewed interest among the states. Upon completion of the 1997 Federal study, FHWA formed a state representatives' Steering Committee to assist the states in adopting the research and methods employed in that study.

A 1996 Oregon Legislative Revenue Office report concluded that most of the differences in study results among states can be explained by differences in the types of expenditures that are allocated.[2] Oregon, for example, does not include state police expenditures in its studies because, since 1980, state police do not receive Highway Fund monies. California, on the other hand, includes large Highway Patrol expenditures in its studies. Since policing expenditures are typically viewed as a common responsibility of all highway users and are assigned to all vehicle classes based on each class's relative travel, they are primarily the responsibility of automobiles and other light vehicles. Therefore, it is not surprising that the California studies find a higher light vehicle responsibility and lower heavy vehicle responsibility share than the Oregon studies.

A review of state studies conducted in connection with the 1997 Federal study found that those studies attempting to clearly allocate costs between light and heavy vehicle classes have found heavy vehicles to be responsible for 30 to 40 percent of total highway expenditures. Until recently Oregon studies have produced results in this range. The results for 2025-2027 project heavy vehicles to be responsible for 27 percent of expenditures. Both the 1982 and 1997 Federal HCASs found trucks and other heavy vehicles to be responsible for 41 percent of federal highway expenditures.[3]

OREGON ROAD USER TAXATION

Oregon governs the State Highway Fund using the concept of cost responsibility. The State collects a fair share of revenue from each highway user class through three highway user taxes. The three taxes are: **vehicle registration fees**, **motor vehicle fuel taxes** (primarily the gasoline tax), and **motor carrier fees** (primarily the weight-mile tax).

Registration Fee

The registration fee is levied on a biennial basis for all road users, based on the type and weight of the vehicle being registered. The registration fee is considered payment for the fixed or non-use related costs of providing a highway system. These costs include minimal maintenance of facilities and equipment along with certain administrative functions necessary to keep the system accessible. Since these costs account for a small portion of total highway costs, registration fees in Oregon have traditionally been low (for both cars and trucks) in comparison to the corresponding fees in most other states.

Road user taxes were initially levied against motor vehicles to cover the cost of registration. A one-time fee of $3.00 was instituted in 1905. Because this proved to be a productive source of revenue, the state soon annualized the fee and began to increase the rates and use the proceeds to finance highways.

From 1990 to 2003, the two-year registration fee for automobiles and other vehicles weighing 8,000 pounds or less was $30, and in 2004, it was increased to $54. This shift to higher registration fees represents a change in philosophy away from the "user pays" approach and toward the use of fixed fees to cover more of the variable costs of road construction and maintenance. In 2018, the legislature increased the biennial registration rates for automobiles from $86 to $112. Starting in 2020, additional registration fees were based on the fuel efficiency of registered vehicles, with increasing fees for high-efficiency vehicles.

Fuel Tax

The fuel tax applies to gasoline or diesel fuel purchased from an authorized seller who collects the taxes at the time of sale. In 1919, Oregon became the first state in the nation to enact a fuel tax on gasoline. It was regarded as a “true” road user tax because those who used the roads more paid more. The fuel tax came to be viewed as the most appropriate means of collecting the travel-related share of costs for which cars and other light vehicles are responsible.

The state fuel tax was extended to diesel and other fuels in 1943. Since that time, the tax on diesel and other fuels, referred to as a “use fuel” tax, has been at the same rate per gallon as the tax on gasoline. On January 1, 2022 the Oregon Legislature increased the fuel tax and use tax rates to $0.38. The rates increased by an additional $0.02 in 2024, bringing these taxes to their current rate of $0.40.

Motor Carrier Fees

The primary motor carrier fee is the weight-mile tax, which applies to all commercial motor vehicles with declared gross weights of more than 26,000 pounds. It is based on the declared weight of the vehicle and the distance it travels in Oregon. The weight-mile tax is a use-tax that takes the place of the fuel tax on heavy vehicles. Vehicles subject to the weight-mile tax are not subject to the state fuel tax.

The Oregon weight-mile tax system consists of a set of schedules and alternate flat fee rates. There are separate schedules for vehicles with declared weights of 26,001 to 80,000 pounds and those over 80,000 pounds. Additionally, log, sand and gravel, and wood chip haulers have the option to pay flat monthly fees in lieu of the mileage tax.

Since 1947, the State has adjusted the weight-mile rates 15 times based on the results of updated cost responsibility studies or the passage of transportation funding packages. Another adjustment occurred on January 1, 2024, when HB 2017 took full effect and increased weight-mile rates by an average of 53 percent across all weight classes as compared with pre-HB 2017 rates.

Other recent revisions to the weight-mile rates include:

- October 1, 2010, when weight-mile rates increased by an average of 24.5 percent because of the 2009 Jobs and Transportation Act (JTA).
- January 1, 2004, when the 2003 Legislature increased weight-mile rates by 9.9 percent when enacting the third phase of the Oregon Transportation Investment Act (OTIA III).
- On September 1, 2000, rates were reduced across the board by 12.3 percent to reflect the results of the 1999 study.
- On January 1, 1996, the rates were also reduced by 6.2 percent based on the results of the 1994 study.
- Rates were also increased on January 1, 1992, to maintain equivalency with the fuel tax increases enacted by the 1991 Legislature.

The 1999 Oregon Legislature repealed the weight-mile tax and replaced it with a 29 cent per gallon diesel fuel tax and higher heavy truck registration fees. This measure, House Bill 2082, was subsequently referred to the voters and defeated in the May 2000 primary election.

After the May 2000 vote, the trucking industry challenged the Oregon tax in the courts. The primary focus of the legal action was the feature that allows haulers of logs, sand and gravel, and wood chips to pay alternate flat fees in lieu of the mileage tax. The industry argued that these fees are, from a practical standpoint, available only to Oregon intrastate motor carriers, and this provision of the Oregon system therefore unfairly discriminates against non-Oregon based interstate firms. In February 2002, the Third District Circuit Court ruled in favor of the State in the lawsuit. The ruling was reversed in the Court of Appeals in 2003. The Oregon Supreme Court affirmed the original Circuit Court decision in December 2005.

For carriers hauling divisible-load commodities at gross weights between 80,001 and 105,500 pounds pay a weight-mile tax (statutory Table B) based on the vehicle’s declared weight and number of axles. There are separate schedules for five, six, seven, eight, and nine or more axle vehicles, with each schedule graduated by declared weight. The rates are structured so that, at any declared weight, carriers can qualify for a lower per-mile rate by utilizing additional axles.

[4] An ESAL is equivalent to a single axle carrying 18,000 pounds.

Carriers hauling non-divisible loads at gross weights greater than 98,000 pounds under special, single-trip permits pay a per-mile road use assessment fee. Non-divisible (or "heavy haul") permits are issued for the transportation of very heavy loads that cannot be broken apart, such as construction equipment, bridge beams, and electrical transformers.

The road use assessment fees are expressed in terms of permit gross weight and number of axles and are based on a charge of 10.3 cents per equivalent single axle load (ESAL)[4] mile of travel as of January 1, 2022. As with the Table B rates, carriers are assessed a lower per-mile charge the greater the number of axles used at any given gross weight. The road use assessment fee takes the place of the weight-mile tax for the loaded, front-haul portion of non-divisible load trips. With rare exceptions, empty back haul miles continue to be subject to the weight-mile tax and taxed at the vehicle's regular declared weight.

Each biennium, ODOT conducts a study to test for the revenue neutrality of flat-fee rates and recommends adjustments to those rates as necessary to treat intrastate and interstate carriers equitably.

CHAPTER 2: SUMMARY OF THE BASIC STRUCTURE & PARAMETERS OF STUDY

The underlying approach and methods used in this highway cost allocation study are, with a few major exceptions, like those used in the last six Oregon studies. The analytical framework and basic parameters of the 2025 study are briefly summarized below.

STUDY APPROACH

This study uses the cost-occasioned approach, employing an incremental, design-based allocation methodology for bridges and the 2010 version of the National Pavement Cost Model (NAPCOM) for pavement costs. This is the same general approach that was used in previous Oregon studies and virtually all studies conducted by the federal government and other states.

GENERAL METHODOLOGY

This section describes key assumptions and data sources for the analysis.

Analysis Periods

- **Base Year:** Calendar year 2023, the most recent full year for which data were available when the study was undertaken.
- **Forecast Year:** Calendar year 2026, the middle 12 months of the 24-month study biennium.
- **Study Period:** The 2025-27 State Fiscal Biennium, or July 1, 2025 to June 30, 2027.

The expenditures allocated in this study are those projected for the 2025-27 biennium using ODOT's Cash Flow Forecast model. All traffic data used in the study were first developed from data for the 2023 base year (with the exception of FHWA data on publicly-owned vehicles, for which the most recent available data was from 2022), and then projected forward to the 2026 forecast year using weight-class-specific growth rates.

Road (Highway) Systems

This study uses the Federal Highway Administration's classification system for highway functional classes. Every public road in Oregon is assigned to one of 14 functional classes, which are defined as combinations of urban or rural and seven classifications based on the purpose of the road:

1. Interstate Freeways
2. Other Freeways and Expressways
3. Other Principal Arterials
4. Minor Arterials
5. Major Collectors
6. Minor Collectors
7. Local Streets and Roads

Each roadway segment is also assigned to one of four ownership categories: state, county, city, or federal. Note that U.S. Highways and Interstates are owned by the state; federal ownership consists mostly of Forest Service and Bureau of Land Management roads.

In addition to the 14 federal functional classes, we developed three other categories to facilitate the allocation of costs for projects on multiple functional classes. The additional categories are: all roads, all state-owned roads, and all locally-owned roads.

Vehicle Classes

Light vehicles include all vehicles up to 10,000 pounds gross weight, consistent with Oregon law and registration fee schedules. In studies prior to 2007, light vehicles were defined as vehicles up to 8,000 pounds.

Vehicles weighing more than 10,000 pounds are divided into 2,000-pound vehicle classes. All vehicles over 200,000 pounds are in the top weight class. Those over 80,000 pounds are further divided into subclasses based on the number of axles on the vehicle. The five subclasses are five, six, seven, eight, and nine or more axles.

Vehicles over 26,000 pounds are assigned to weight classes based on their declared weight, which may be different from their registered gross weight. For example, a given tractor may operate with different configurations (number and type of trailers) at various times and may have different declared weights for different configurations.

For modeling purposes, each weight class up to 80,000 pounds is assigned a distribution of numbers of axles, and each combination of weight class and number of axles is assigned a distribution of operating weights. For vehicles over 26,000 pounds, these distributions are obtained from Weigh-In-Motion data, which are collected and supplied by ODOT.

For reporting purposes, the expenditure allocation and revenue attribution results reported in Chapters 5 and 6 are presented in terms of the following seven summary-level vehicle weight groups:

- 1 to 10,000 pounds
- 10,001 to 26,000 pounds
- 26,001 to 78,000 pounds
- 78,001 to 80,000 pounds
- 80,001 to 104,000 pounds
- 104,001 to 105,500 pounds
- 105,501 pounds and up

The study team determined the various weight classes based on the characteristics of the vehicles in each group, logical divisions in the tax structure, and the number of vehicles and miles in each group. Operators of vehicles in the 10,001 to 26,000-pound group, for example, pay the state fuel tax and higher registration fees rather than the weight-mile tax. Additionally, most of these vehicles are two-axle, single-unit trucks or buses used in local commercial delivery operations or passenger transport. Thus, they have similar characteristics with respect to their cost responsibility and tax payments. It is, therefore, logical to combine them for reporting purposes.

Similarly, it makes sense to combine the individual weight classes above 105,500 pounds because these vehicles are (a) operated under special, single-trip, non-divisible load permits, (b) operated with multiple axles and legally allowed higher axle weights than regular commercial trucks, (c) subject to the road use assessment fee rather than the weight-mile tax for their loaded front haul miles, and (d) typically used for short-mileage hauls (e.g., transporting heavy equipment from one construction site to another) and so account for a very small proportion of total truck miles in the state.

The weight classes of 78,001-to-80,000 and 104,001-to-105,500 pounds are the largest two truck classes by miles of travel. These two classes alone account for a majority of the total commercial truck miles in Oregon. Because of the dominant role of these two classes in terms of miles of travel, cost responsibilities, and revenue contributions, it is logical they be kept as separate groups.

EXPENDITURES ALLOCATED

State Expenditures

All state expenditures of highway user fee revenues are allocated to vehicle weight classes, as are all state expenditures of federal highway funds (e.g., matching funds). Federal funds are included because they are interchangeable with state user fee revenues. Any differences in the way they are spent are arbitrary and subject to change.

State expenditures of bond revenues are included because the bonds are repaid from state user fees. Such expenditures are, however, reduced to the amount that will be repaid in the study period before these expenditures are allocated. The remaining expenditures will be included in future studies using the allocation to vehicle classes applied in this study, consistent with the approach taken in the 2005 through 2023 studies. Thus, expenditures of bond revenues that were allocated in the most recent prior study will be included in this and the next eight studies.

Local Government Expenditures

The study allocates all expenditures by local governments of state highway user fees and federal highway funds. Federal funds are included because, again, they are interchangeable with state user-fee revenues.

Some local-government own-source revenues are allocated because they are interchangeable with state highway user fees. The study excludes local-government own-source revenues reported as coming from locally issued bonds, property taxes (including local improvement districts), systems development charges, and traffic impact fees (also called system development charges). These revenue sources must be spent on certain projects or certain types of projects and are not considered interchangeable with state highway user fees.

In studies prior to 2003, only the expenditures of state highway user fee revenues were allocated. This approach failed to account for the interchangeability of funds from other sources and required local governments to estimate how state funds were spent because their accounting systems do not track expenditures by funding source.

In the 2003 study, all expenditures by local governments were allocated. The 2005 study refined the approach taken in the 2003 study by excluding certain categories of own-source revenue that are not interchangeable. This approach has been used to allocate local government expenditures since the 2005 study.

Expenditure Categories

The four major expenditure categories used for the 2025 study are:

- **Modernization (new construction or reconstruction).** Examples include adding lanes and straightening curves. Modernization adds to the capacity of a roadway either directly or by improving throughput. A replacement bridge with more lanes than the bridge it replaces is considered modernization.
- **Preservation (rehabilitation).** Most preservation projects involve repaving existing roads. Preservation projects extend the useful life of a facility but does not add to its capacity. A replacement bridge that does not add capacity is considered preservation.
- **Maintenance and Operations.** Examples of maintenance include pothole patching, pavement striping, snow and ice removal, and bridge maintenance. Examples of operations include traffic signals, signage, and lighting.
- **Administration, Revenue Collection, Planning, and Other Costs.** Within each of these major categories, expenditures are further broken down into several individual work types. A separate allocation is performed for the expenditures in each individual work type. Chapter 3 contains a full listing of these work categories and the allocators used for each.

REVENUES ATTRIBUTED TO VEHICLES

The revenues attributed to vehicles are based on forecasted collections for the 2025-27 biennium by major state revenue source under the existing tax structure and current-law tax rates (i.e., current registration and title fees, fuel tax, weight-mile tax, flat fee, and road use assessment fee rates).

Because non-state funding sources are included as expenditures, the total expenditures allocated is larger than the amount of total revenues attributed. This difference in absolute size does not, however, affect the calculation of equity ratios, which are ratios of ratios (each vehicle class's share of attributed revenues divided by its share of allocated expenditures).

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CHAPTER 3: GENERAL METHODOLOGY & STUDY APPROACH

This chapter presents the general methodology and approach used in the 2025 Oregon Highway Cost Allocation Study.

COST-OCCASIONED APPROACH

All Oregon highway cost allocation studies, as well as the studies conducted by the federal government and most other states, use what is called the cost-occasioned approach. The basic premise of this approach is that each class of road user should pay for the system of roads in proportion to the costs associated with road use by that class. The equity of a road tax system may then be judged by how well shares of payments by different classes of road users match their shares of costs resulting from their use of the road system.

The principal alternative to the cost-occasioned approach is the benefits approach, in which an attempt is made to identify and measure the benefits received by both users and nonusers of the system. The benefits approach begins with the recognition that the purpose of a highway system is to provide benefits, both directly to highway users and indirectly to the rest of society. Basing user fees on the value of benefits received, rather than on the costs imposed, would promote both fairness (people pay in proportion to the value they receive) and efficiency (agencies would have less incentive to build facilities where the costs exceed the benefits).

The benefits approach has two major drawbacks: benefits are not directly measurable, and the benefits associated with traveling a mile on a given road can vary between identical-appearing vehicles or individuals and for the same vehicle or person at various times. Additionally, such an approach assumes that the benefits would not otherwise, and more economically, be realized through non-road-based modes of transportation.

A long-running debate about the proper balance of cost responsibility and tax burden between highway users and nonusers continues at both the state and federal levels, fueled over the years by numerous studies. Arguments that support charging nonusers for highways are based on the societal benefits attributable to the highway system, including increased mobility, safety, and economic development.

There are, however, some serious conceptual problems in quantifying benefits and deciding which accrue to users and which accrue to nonusers. In many cases, highway improvements benefit individuals or businesses simultaneously as both users and nonusers. Additionally, the more readily understood economic impacts of highway improvements often reflect a transfer of user benefits to nonusers—the clearest example being reduced shipping costs, which are passed to businesses and consumers in the form of lower product prices.

Because of these problems, and because of the inherent advantages of user fees in promoting an economically efficient allocation of scarce resources, the federal government and most states conducting cost allocation studies now rely on a cost-occasioned approach to determine responsibility for highways. The Oregon studies continue to use a cost-occasioned approach.

Incremental Method

Within the cost-occasioned approach, different methods may be used to allocate costs or expenditures to the various vehicle classes. Virtually every recent study, including Oregon's, has used some version of what is referred to as the incremental method. This method divides selected aspects of highway costs into increments, allocating the costs of successive increments to only those vehicles needing the higher cost increment. The design, considered adequate for light vehicles only, is viewed as a common responsibility of all highway users and is shared by all vehicle classes. Each group of successively larger and heavier vehicles also shares in the incremental costs they occasion.

In Oregon, the incremental method is used directly in the allocation of bridge costs. The first increment for a new bridge, for example, identifies the cost of building the bridge to support its own weight, withstand other non-load-related stresses (e.g., stream flow, high winds, and potential seismic forces), and carry light vehicle traffic only.[5] This cost is a common responsibility of all vehicles and is assigned to all classes based on each class's share of total vehicle miles traveled (VMT).

[5] The factors influencing the design requirements, and therefore costs, of bridges, are sometimes expressed by the terms dead load, live load, and total load. Bridges need to be designed to support their own weight and the other non-load-related forces such as stream flow, wind, and seismic forces (the dead load) plus the traffic loadings anticipated to be applied to the bridge (the live load). The total design load is the sum of the dead and live loads. Although the precise relationships differ by the type and location of the bridge under consideration, as a rule, the longer the span length, the greater the relative importance of the non-load-related factors in determining the total cost of the bridge.

The second increment identifies the additional cost of building the bridge to accommodate trucks and other heavy vehicles weighing up to 50,000 pounds. This cost is assigned to all vehicles with gross weights exceeding 10,000 pounds based on the relative VMT of each class over 10,000 pounds. Similarly, the additional cost of the third increment is assigned to all vehicles with gross weights over 50,000 pounds, the cost of the fourth increment to vehicles having gross weights over 80,000 pounds, and the cost of the fifth and final increment to vehicles having gross weights over 105,500 pounds.

National Pavement Cost Model (NAPCOM)

In the past, highway cost allocation studies typically used an incremental methodology to allocate pavement costs as well. Increased depth and strength of pavement surface and base is required to support increases in the number, and particularly weight, of the vehicles anticipated to use the pavement during its design life.

For the 1997 federal study, Roger Mingo adapted the National Pavement Cost Model (NAPCOM) for use in highway cost allocation. The model had two increments: non-load-related costs and load-related costs, with the load-related costs allocated using results from detailed engineering models of several different pavement degradation mechanisms that consider the effects of climate, traffic levels, mix of vehicle types, and the interactions between different mechanisms.

Roger Mingo adapted the pavement model to use Oregon's special weighing data[6] and to use 2,000-pound increments of declared vehicle weight for data input and results reporting. The allocation of costs in the second increment used the detailed results of the Oregon-specific pavement cost model, which provides allocation factors by weight class and number of axles for each combination of functional class and pavement type (flexible or rigid).

An updated version of NAPCOM was completed in 2010. This version of the model is different from the earlier versions in several ways, though the fundamental idea of incremental allocation of non-load-related and load-related costs is the same. Among the main differences in the newest version of NAPCOM are the new pavement distress models and equations for load-related costs, which have been updated to reflect the current accepted pavement damage models and theories. Load-related costs are allocated using results from newer detailed, empirical engineering models that have been calibrated to pavement distress data.

The 2010 NAPCOM model was used to develop the pavement factors for the 2011 through 2023, and 2025 Oregon Studies. Like the development of pavement factors for past studies, pavement factors were developed by 2,000-pound increments of declared vehicle weight. Weigh-in-motion (WIM) data were also used to construct distributions of configurations and declared weights by operating weight. The 2011 Oregon Highway Cost Allocation Study was the first study to use the updated version of NAPCOM to generate pavement factors for highway cost allocation.

THE CHOICE OF APPROPRIATE COST ALLOCATORS

Some quantifiable measure, or allocator, must be used to distribute each category of cost, or each increment within a category where the incremental approach is used, to the individual vehicle classes. For many costs, there are logical relationships that suggest which allocator is most appropriate.

Wear-related costs are a direct, empirically established consequence of use by vehicles, and are the easiest cost to allocate. The amount of wear a vehicle imposes per mile of travel relates closely to measurable attributes of the vehicle. Two approaches may be used for choosing allocators for wear-related costs:

- Results from a detailed model that predicts costs imposed by individual vehicles are used to develop allocation factors that produce the same attribution of costs as the model. That is how pavement costs are handled in this study.
- When a detailed model for attributing wear-related costs does not exist, this analysis uses allocation factors based on how wear is expected to vary in proportion to the wear imposed per unit of use by the vehicles in each category. For example, striping costs are allocated according to axle-miles of travel because it is expected that stripes wear in proportion to the number of axles that pass over them.

[6] Special weighings, which are no longer conducted, record the weight of every truck passing the scale, even if empty. Weights were reported for each axle grouping, along with the number of axles in the group. These data replaced the more generalized assumed distributions of operating weight and vehicle configurations used in the national model. The 2010 version of NAPCOM, and Oregon HCAS studies since 2011 use weigh-in-motion data, which record the weight on each axle and the distances between axles for every truck passing each of many sensors around the state.

For structures and, to a lesser extent, roadways, the cost of constructing a facility with a given capacity will vary with the maximum weight and size of vehicle expected to use it. Part of the difference in construction costs, however, may be offset by increased useful life of a sturdier facility. If one attributes capital costs based on differences in the size or strength of the structure required to accommodate several types of vehicles, then the incremental approach may be used.

The incremental approach, by itself, does not account for the capacity demand that drove the decision to build the facility. For bridges and structures, projects that added capacity were identified so that the base increment of the structure cost could be allocated using the peak-period passenger-car-equivalent VMT allocator (peak PCE-VMT). The incremental approach may be modified to consider the expected effects of structure design on useful life, as was done in the allocation of bridge costs in recent Oregon studies.

All other approaches to capital-cost allocation are theoretically arbitrary and thus inherently second best. However, other approaches may be selected because of their convenience, despite the lack of a compelling underlying logic. One such second-best approach to allocating capacity-enhancing capital costs was used in the most recent Oregon studies. The non-wear-related portion of capital costs were allocated in proportion to passenger-car-equivalent vehicle-miles traveled during the peak hour (peak PCE-VMT), which varies in proportion to each vehicle's contribution to congestion on existing facilities but does not consider the full relationship between volume and capacity-related costs on existing facilities. The approach also assumes that the value of time is equal across all vehicle types, trip types, and vehicle occupancies.

If the benefits resulting from a given expenditure vary with vehicle use, the cost may be allocated in proportion to the level of benefit. For example, if the occupants of every vehicle passing a safety improvement benefit from reduced risk of death or injury, the cost could be attributed based on occupant-miles traveled or, if occupancy is assumed to be the same across all vehicles, vehicle-miles traveled. Other costs may not vary at all with vehicle use but must still be allocated to vehicles. If one allocates costs that do not vary with use, any allocator that seems "fair" may be chosen. In these cases, there is no single right allocator to use.

In general, an allocator that varies more closely with costs imposed should be selected over one that varies less closely. The degree of correlation may be measurable given enough data, but the necessary data usually do not exist, so one must calculate the expected relationship based on engineering and economic theory. A strong statistical correlation does not necessarily indicate a good allocator, as there is no reason to believe that an accidental correlation will persist. An allocator must also vary with measurable (and measured) attributes of vehicles, such as miles traveled, weight, length, number of axles, or some combination of those.

Allocators Used In This Study

As noted above, there are several cost allocators available for use in a cost allocation study. Allocators may be applied on either a per-vehicle or per-vehicle-mile-traveled basis. Because it is vehicle use, rather than the existence of vehicles, that imposes costs on the highway system, many costs in the current Oregon study are allocated using some type of weighted vehicle-miles traveled (VMT). Exhibit 3-1 shows the allocators applied to each expenditure category for this study.

EXHIBIT 3-1: ALLOCATORS APPLIED TO EACH WORK TYPE

Work Type Description	Work Type	Allocator 1	Share 1	Allocator 2	Share 2
Preliminary and Construction Engineering (and etc.)	1	CongestedPCE	0.5595	Other_Construction	0.4405
Right of Way (and Utilities)	2	CongestedPCE	0.7375	Other_Construction	0.2625
Grading and Drainage	3	CongestedPCE	1.0000	None	0.0000
New Pavements-Rigid	4	CongestedPCE	0.0410	Rigid	0.9590
New Pavements-Flexible	5	CongestedPCE	0.0548	Flex	0.9452
New Shoulders-Rigid	6	CongestedPCE	1.0000	None	0.0000
New Shoulders-Flexible	7	CongestedPCE	1.0000	None	0.0000
Pavement and Shoulder Reconstruction-Rigid	8	CongestedPCE	0.0410	Rigid	0.9590
Pavement and Shoulder Reconstruction-Flexible	9	CongestedPCE	0.0548	Flex	0.9452
Pavement and Shoulder Rehab-Rigid	10	All_VMT	0.0410	Rigid	0.9590
Pavement and Shoulder Rehab-Flexible	11	All_VMT	0.0548	Flex	0.9452
Culverts	12	All_VMT	0.8752	Flex	0.1248
New Structures	13	None	1.0000	None	0.0000
Replacement Structures	14	None	1.0000	None	0.0000
Structures Rehabilitation	15	None	1.0000	None	0.0000
Climbing Lanes	16	UphillPCE	1.0000	None	0.0000
Truck Weight/Inspection Facilities	17	Over_26_VMT	1.0000	None	0.0000
Truck Escape Ramps	18	Over_26_VMT	1.0000	None	0.0000
Interchanges	19	None	1.0000	None	0.0000
Roadside Improvements	20	All_VMT	1.0000	None	0.0000
Safety Improvements	21	CongestedPCE	1.0000	None	0.0000
Traffic Service Improvements	22	CongestedPCE	1.0000	None	0.0000
Other Construction (modernization)	23	Other_Construction	1.0000	None	0.0000
Other Construction (preservation)	24	Other_Construction	1.0000	None	0.0000
Surface and Shoulder Maintenance-Rigid	25	All_VMT	0.0410	Rigid	0.9590
Surface and Shoulder Maintenance-Flexible	26	All_VMT	0.0548	Flex	0.9452
Surface and Shoulder Maintenance-Other	27	All_AMT	1.0000	None	0.0000
Drainage Facilities Maintenance	28	All_VMT	1.0000	None	0.0000
Structures Maintenance	29	All_VMT	1.0000	None	0.0000
Roadside Items Maintenance	30	All_VMT	1.0000	None	0.0000
Safety Items Maintenance	31	All_VMT	1.0000	None	0.0000
Traffic Service Items Maintenance	32	CongestedPCE	1.0000	None	0.0000
Pavement Striping and Marking (maintenance)	33	All_AMT	1.0000	None	0.0000
Sanding and Snow and Ice Removal (maintenance)	34	All_VMT	1.0000	None	0.0000
Extraordinary Maintenance	35	All_VMT	1.0000	None	0.0000
Truck Scale Maintenance-Flexible	36	Over_26_VMT	1.0000	None	0.0000
Truck Scale Maintenance-Rigid	37	Over_26_VMT	1.0000	None	0.0000
Truck Scale Maintenance-Buildings and Grounds	38	Over_26_VMT	1.0000	None	0.0000
Studded Tire Damage	39	Basic_VMT	1.0000	None	0.0000
Miscellaneous Maintenance	40	All_VMT	1.0000	None	0.0000
Bike/Pedestrian Projects	41	All_VMT	1.0000	None	0.0000
Railroad Safety Projects	42	All_VMT	1.0000	None	0.0000
Transit and Rail Support Projects	43	CongestedPCE	1.0000	None	0.0000

EXHIBIT 3-1: ALLOCATORS APPLIED TO EACH WORK TYPE (CONTINUED)

Work Type Description	Work Type	Allocator 1	Share 1	Allocator 2	Share 2
Fish and Wildlife Enabling Projects	44	All_VMT	1.0000	None	0.0000
Highway Planning	45	All_VMT	1.0000	None	0.0000
Transportation Demand & Transportation System Management	46	CongestedPCE	1.0000	None	0.0000
Multimodal	47	CongestedPCE	1.0000	None	0.0000
Reserve Money, Fund Exchange, Immediate Opportunity Fund	48	All_VMT	1.0000	None	0.0000
Seismic Retrofits on Structures	49	All_VMT	1.0000	None	0.0000
Other Common Costs	50	All_VMT	1.0000	None	0.0000
Other-Over 26,000 Only	55	Over_26_VMT	1.0000	None	0.0000
Other-Basic Only	56	Basic_VMT	1.0000	None	0.0000
Other-Over 8,000 Only	57	Over_10_VMT	1.0000	None	0.0000
Other-Under 26,000 Only	58	Under_26_VMT	1.0000	None	0.0000
Other Administration	59	All_VMT	1.0000	None	0.0000
Bridge-All Vehicles Share (no added capacity)	60	All_VMT	1.0000	None	0.0000
Bridge-Over 8,000 Vehicles Share	61	Over_10_VMT	1.0000	None	0.0000
Bridge-Over 50,000 Vehicles Share	62	Over_50_VMT	1.0000	None	0.0000
Bridge-Over 80,000 Vehicles Share	63	Over_80_VMT	1.0000	None	0.0000
Bridge-Over 106,000 Vehicle Share	64	Over_106_VMT	1.0000	None	0.0000
Bridge-All Vehicles Share (added capacity)	65	CongestedPCE	1.0000	None	0.0000
Other Bridge	66	Other_Bridge	1.0000	None	0.0000
Interchange Modernization	67	None	1.0000	None	0.0000
Bridge Replacement with Capacity	68	None	1.0000	None	0.0000

Unweighted VMT is the most general measure of system use and is considered a fair way to assign many types of common costs, that is, costs considered to be the joint responsibility of all highway users. VMT represent a reasonable and accepted measure to assign costs among the members of a subgroup (e.g., the individual vehicle classes within a cost increment), especially when members of the subgroup have similar characteristics or when an investment is made to provide a safer highway facility. Unweighted VMT are used for many traffic-oriented services, such as the provision of lighting, signs, and traffic signals since these services are related to traffic volumes.

Weighted VMT, with an appropriate vector of zeros and ones, will produce an allocator that restricts the allocation to a corresponding subset of weight classes. Such allocators are used to implement the incremental approach for bridge costs and for other costs allocated on VMT for a subset of all vehicles. One example is the allocation of Motor Carrier Transportation Division administrative costs only to vehicles over 26,000 pounds.

Other VMT weighting factors may also be used to allocate certain costs more appropriately. VMT can be weighted to account for the effective roadway space occupied by several types of vehicles relative to a standard passenger car. This is accomplished by using passenger-car equivalence (PCE) factors to weight VMT, producing PCE-VMT. Because trucks are larger and heavier than cars and require greater acceleration and braking distances, they occupy more effective roadway space and therefore have higher PCE factors.

A variety of PCE factors were developed for the 1997 federal study, including factors for different functional classes and traffic congestion, as well as uphill factors for steep grades. The uphill factors are used in this study to allocate the costs of climbing lanes.

Congested (or peak-period) PCE-VMT is peak-period VMT weighted by the PCE factors for congested traffic conditions. It is used in this study for the common cost portion of projects undertaken to add capacity to the highway system.

VMT can also be weighted to reflect the amount of pavement wear imposed by vehicles of various weights and axle configurations. The factors used for this weighting are produced from the results of the pavement model described above.

Costs not accounted for as a part of specific construction projects but that are expected to vary with the overall level of construction are allocated with special factors developed during the allocation process. These factors allocate costs in proportion to the construction costs that were allocated from specific projects. Separate "other construction" factors are calculated and applied for work performed by the state and by local governments.

Prospective View

The costs or expenditures allocated in a cost allocation study can be those for a past period, those anticipated for a future period, or a combination of past and future costs. Some studies conducted by the federal government and other states have allocated both historical and planned expenditures.

The Oregon studies have traditionally used a prospective approach in which the expenditures allocated are those planned for a future period, specifically, the next fiscal biennium. Similarly, the traffic data used in these studies are those projected for a future year. This is done to allow for changes in expenditure levels and traffic volumes, and so that the study results will be applicable for the period for which legislation is enacted to implement the study recommendations.

There are some disadvantages associated with allocating only projected future expenditures. Specifically, it requires relying on forecasts, which are subject to greater error than historical data.

The 1996 Cost Responsibility Blue Ribbon Committee recommended that the Oregon studies continue allocating only projected future expenditures. The current Oregon study again follows that recommendation, except for incorporating study-period expenditures on the repayment of bonds issued in the prior study periods, allocated in the same proportions as in the prior studies.

Exclusion of External (Social) Costs

The Oregon studies, as well as studies conducted by most other states have chosen to allocate direct governmental expenditures and exclude external costs associated with highway use. For example, these external costs include costs of congestion, greenhouse gases, and public health amongst others. The proponents of a cost-based approach argue that to be consistent, a HCAS should include all costs that result from use of the highway system. They further argue that economically efficient pricing of highways requires the inclusion of all costs and that failure to do so encourages an over-utilization of highways. Including external costs adds to the breadth and completeness of the analysis and helps determine appropriate user charges necessary to reflect these costs.

However, there are several disadvantages associated with including external costs. Although these costs represent actual costs to society, they are decidedly more difficult to quantify and incorporate in the analysis than are direct highway costs. Inclusion of external costs therefore increases the data requirements and complexity of the studies and could reduce their overall accuracy.

The 1996 Blue Ribbon Committee recommended that the Oregon studies continue to exclude social costs until the state implements explicit user charges to capture these costs. Both the 1982 and 1997 federal HCASs included some social costs in supplementary analyses. The 1999 Oregon study recommended that future studies include "a separate assessment of the impacts of proposed changes in highway user taxes on the total costs of highway use including all major external costs." The 2001 and 2003 studies made this same recommendation.

In 2009, the State Legislature directed the Oregon Department of Administrative Services to prepare a second highway cost allocation study based on the concept of the efficient pricing of highways, in addition to the traditional study. ORS 366.506 Section 30 in House Bill 2001 specifically required that an efficient fee study "consider the actual costs users impose on the highway system, including but not limited to highway replacement costs, traffic congestion costs and the cost of greenhouse gas emissions." Additionally, the efficient fee study report needed to "include recommendations for legislation to implement the efficient fee method of cost allocation." The results of the 2011 Oregon Efficient Fee Highway Cost Allocation Study were presented in a separate report.

EXPENDITURE ALLOCATION

The Oregon studies allocate expenditures of road-related user fees, rather than costs. Over the long run, expenditures must cover the full direct costs being imposed on the system or the system will deteriorate. Over any shorter period, however, expenditures will exceed or fall short of the costs imposed. Additionally, local governments spend money from sources other than user fees on local roads and bridges. Oregon's highway cost allocation process includes the expenditure of the portion of local governments' own-source revenues that are fungible with state user fees but excludes the expenditure of own-source funds that are dedicated to specific projects or purposes. In this study, 18.5 percent of local government expenditures (6.0 percent of all expenditures) were excluded.

Some past Oregon studies, including a special analysis in the 2001 study, attempted to estimate and allocate a full-cost budget in addition to a base-level (actual expenditure) budget. The intent was to approximate costs by estimating the level of expenditures required to preserve service levels and pavement conditions at existing levels. In these studies, heavy vehicles were found to be responsible for a greater share of the preservation level budget than of the base-level budget. This was because most unmet needs at that time involved pavement rehabilitation and maintenance, items for which heavy vehicles have the predominant responsibility.

There are convincing arguments for moving toward a full cost-based approach in highway cost allocation studies. Recognizing the benefit of moving toward a financing system based on efficient fees, a full 2011 Efficient Fee Highway Cost Allocation Study was performed in addition to the traditional study. "True" costs are still more difficult to quantify and incorporate in the analysis than are direct highway expenditures. Some of these problems are theoretical in nature or are limited by our knowledge of such costs, and data limitations also plague the calculation of many of these costs. As a practical matter, therefore, highway cost allocation studies, including this study, continue to focus on the allocation of expenditures rather than costs.

Treatment of Debt-Financed Expenditures and Debt Service

Oregon has traditionally relied much less on debt financing of its highway program than have other states. This has changed since the enactment of the Oregon Transportation Investment Act (OTIA) by the 2001 Legislature. The first OTIA authorized the issuance of $400 million in new debt for projects to be completed across Oregon. It provided $200 million for projects that add lane capacity or improve interchanges and $200 million for bridge and pavement rehabilitation projects. Automobile and truck title fees were increased to finance the repayment of construction bonds for OTIA projects.

Favorable bond-rate conditions allowed the 2002 Special Legislative Session to authorize an additional $100 million in debt without needing to further increase revenues. The original OTIA projects became known as OTIA I and the additional projects as OTIA II.

The 2003 Legislature authorized an additional $2.46 billion in new debt and increased title, registration, and other DMV fees to produce the additional revenue necessary to repay the bonds. The OTIA III money was to be spent as follows:

- $1.3 billion to repair or replace 365 state bridges
- $300 million to repair or replace 141 locally owned bridges
- $361 million for local-government maintenance and preservation
- $500 million for modernization

The issue of how to treat OTIA project expenditures and the associated debt service was discussed at some length by the Study Review Teams for both the 2003 and 2005 studies. Debt finance introduces a disconnect between study-period revenues and expenditures because the period in which the revenues are received differs from the period in which the funds are expended. Care needs to be taken to avoid double counting, which would occur if both the debt-financed project expenditures and full debt service expenditures (including interest and repayment of principal) were included.

While not all the funds expended on OTIA projects come from bonds, the bonded amounts are easily identifiable, as are the associated debt service expenses. The dollar amount allocated in the model is the study-period debt service expenditure, given the bond rate and amortization period, in this case 20 years. The expenditures associated with each bond-financed project are scaled down by a bond factor to one study-period worth of debt service expenditure before allocation. This method retains the project detail necessary to assign expenditure shares by vehicle class. The dollar amounts allocated to each vehicle class for bonded projects are recorded and carried forward to each of the next nine studies.

This approach has two disadvantages: the choice of which projects get bond financing can affect the results of the study, as well as the next nine studies, and the allocation of those expenditures in future studies remains based on traffic conditions expected for the first two years of the 20-year repayment period. The Study Review Team considered several alternative approaches and decided that the advantages of simplicity and limited data requirements for the chosen approach outweighed its disadvantages. They also noted that the failure to update the allocation in future studies was consistent with the treatment of cash-financed projects, which are completely ignored in all future studies.

Treatment of Alternative-Fee-Paying Vehicles

Under Oregon's existing highway taxation structure, some types of vehicles are exempt from certain fees or qualify to pay according to alternative-fee schedules. These types of vehicles are collectively referred to in this report as "alternative-fee-paying" vehicles. The two main types of such vehicles are publicly owned vehicles and farm trucks. Publicly owned vehicles pay a nominal registration fee and are not subject to the weight-mile tax. Most types of publicly owned vehicles are now subject to the state fuel tax, but many diesel-powered publicly owned vehicles are not. Operators of farm trucks pay lower annual registration fees than operators of regular commercial trucks, and most pay fuel taxes, rather than weight-mile taxes when operated on public roads.

The reduced rates paid by certain types of vehicles mean they are paying less per mile than comparable vehicles subject to full fees. The difference between what alternative-fee-paying vehicles is projected to pay and what they would pay if they were subject to full fees is the alternative-fee difference. The approach used in past Oregon studies was to calculate this difference for each weight class and sum these amounts. The total alternative-fee difference (subsidy amount) was then reassigned to all other, full-fee-paying vehicles on a per-VMT basis, that is, this amount was treated as a common cost to be shared proportionately by all full-fee-paying vehicles.

The rationale for this approach was that the granting of these reduced fees represents a public policy decision, and most vehicles paying reduced fees are providing some public service that should be paid for by all taxpayers in relation to their use of the system. Because the heavy vehicle share of the total alternative-fee difference is greater than their share of total statewide travel, reassigning this amount based on relative vehicle miles had the effect of increasing the light vehicle responsibility share and reducing the heavy vehicle share.

Beginning with the 2013 study, the Study Review Team recommended that the alternative-fee difference be reported, but that the results be calculated for full-fee paying vehicles only, without any adjustment related to alternative-fee paying vehicles.

Treatment of Tax Avoidance and Evasion

When vehicles subject to Oregon's fuel tax purchase fuel in another state and then drive in Oregon, they avoid the Oregon fuel tax. The reverse is also true, so if the number of miles driven in Oregon on out-of-state fuel equaled the number of miles driven outside Oregon on in-state fuel, the net avoidance would be zero. The net avoidance is specifically accounted for in the highway cost allocation study by assuming that 3.5 percent of VMT by fuel-tax paying vehicles do not result in fuel-tax collections for Oregon.

The International Fuel Tax Agreement sorts out the payments of state fuel taxes and the use of fuel in other states for interstate truckers. If truckers pay fuel tax in California, for example, and then use that fuel in Oregon while paying the weight-mile tax, IFTA provides a mechanism for California to reimburse them. If truckers then buy fuel in Oregon, paying no fuel tax, and drive in Washington, IFTA provides a mechanism for them to pay what they owe to Washington.

The avoidance of the weight-mile tax by vehicles that are not legally required to pay it is treated as described above, under alternative-fee paying vehicles, rather than as avoidance.

Virtually any tax is subject to some evasion. While it is generally agreed that evasion of the state gasoline tax and vehicle registration fees is quite low, there is more debate concerning evasion of the weight-mile and use fuel (primarily diesel) taxes. For this study, we assume that evasion of the weight-mile tax is equal to 9.4 percent of what would be collected if all that is due were paid.[7] This study also assumes that an additional 1.0 percent of the use-fuel tax on diesel (beyond the 3.5 percent gas tax avoidance) is successfully evaded.

[7] The weight-mile tax evasion percentage is based on a 2021 report commissioned by ODOT, which measured the rate of weight-mile tax evasion in Oregon.

TYPES OF DATA

Five major types of data are required to conduct a highway cost allocation study:

- **Traffic data.** The miles of travel by vehicle weight and type on each of the road systems used in the study.
- **Expenditure data.** Projected expenditures on construction projects by work type category, road system, and funding source, and projected expenditures in other categories by funding source.
- **Revenue data.** Projected revenues by revenue source or tax instrument.
- **Allocation factors.** Factors used to allocate costs to individual vehicle classes, including passenger-car equivalence (PCE) factors, pavement factors, and bridge increment shares.
- **Conversion factors and distributions.** Examples include distributions used to convert VMT by declared weight class to VMT by operating weight class or to VMT by registered weight class.

The allocation factors used in this study are described in Chapter 3 and the development and use of conversion factors is described in Appendix E: Model Reference Guide.

The remainder of this chapter presents the traffic, expenditure, and revenue data used in the 2025 study and compares them with the data used in the previous Oregon studies.

Traffic Data and Forecasts

VMT by road system, by vehicle weight class and number of axles, and by vehicle tax class are important throughout the cost allocation and revenue attribution processes. VMT estimates and projections are used in both the allocation of expenditures and the attribution of revenues to detailed vehicle classes. Additionally, as explained in Chapter 3, VMT weighted by factors such as PCEs or pavement factors is used to assign several of the individual expenditure categories allocated in the study.

For this study, the required traffic data were first collected for the 2023 base year, the latest year for which complete historical data were available. These data were then projected forward to calendar year 2026, the middle 12 months of the 2025-27 fiscal biennium, which is the study period.

The base year traffic data were obtained from several sources. These include ODOT Motor Carrier Transportation Division (MCTD) weight-mile tax information, Highway Performance Monitoring System (HPMS) submittals, MCTD and Driver & Motor Vehicle Services vehicle registrations data, and the Weigh-In-Motion data. For each road system used in the study, travel estimates are developed for light vehicles and each 2,000-pound heavy vehicle weight class.

Information from state economic forecasts and from ODOT's revenue forecasting model is used to forecast projected study year traffic from the base year data. Data from Weigh-In-Motion are used to convert truck miles of travel by declared weight class to miles of travel by operating weight class and to obtain detailed information on vehicle configurations and axle counts for each weight class. HPMS and FHWA Highway Statistics data are used to spread VMT to functional classifications.

EXHIBIT 4-1: CURRENT AND FORECASTED VMT BY WEIGHT GROUP (MILLIONS OF MILES)

Declared Weight in Pounds			2023 VMT (estimate)	2026 VMT (forecast)	Avg. Annual Growth Rate
1	to	10,000	33,605	32,594	-1.0%
10,001	to	26,000	1,031	948	-2.7%
26,001	to	78,000	531	612	4.9%
78,001	to	80,000	1,358	1,420	1.5%
80,001	to	104,000	221	216	-0.7%
104,001	to	105,500	304	312	0.9%
105,501	and	up	4	4	1.9%
		Total	**37,053**	**36,107**	**-0.9%**
Total by Weight Range					
1	to	10,000	33,605	32,594	-1.0%
10,001	and	up	3,448	3,513	0.6%
1	to	26,000	34,636	33,542	-1.1%
26,001	and	up	2,417	2,565	2.0%
% of Total by Weight Range					
1	to	10,000	91%	90%	
10,001	and	up	9%	10%	
1	to	26,001	93%	93%	
26,001	and	up	7%	7%	

Exhibit 4-1 shows that total vehicle travel in Oregon is projected to decrease from 37.1 billion miles in 2023 to 36.1 billion miles in 2026. This decrease represents an average annual decline of about 0.9 percent. Other periods of recent decline in total vehicle travel include the economic downturn in 2010-2011 and the Covid pandemic of 2019-2020. Light-vehicle travel is projected to decline from 33.6 billion miles in 2023 to 32.6 billion miles in 2026, which represents an average annual decline of 1.0 percent. Total heavy-vehicle travel (10,001 pounds or greater) is forecasted to increase from 3.4 billion miles in 2023 to 3.5 billion miles in 2026, for an average annual increase of 0.6 percent. These projections are based on the projections from ODOT's revenue forecast model.

While these traffic projections are based on accepted practices and the best available data, VMT has, in recent years, become more difficult to forecast accurately. The current decline in VMT is primarily related to the COVID-19 pandemic, which led to a change in economic activity. During the pandemic truck volumes increased while passenger vehicle use declined. Post-pandemic, these changes have begun to revert themselves. The final distribution of VMT during the next biennium will depend on how commuting patterns, preferences for travel modes, and reliance on delivery trucks for e-commerce continue to evolve over time. Given the rapid changes in behavior during and after 2020, expectations about future preferences may not be clearly represented in the underlying data.

Exhibit 4-1 also shows that the change in projected VMT for heavy vehicle travel varies by weight group. While the 26,001-to-78,000-pound weight class group is expected to grow by an average of 4.9 percent each year, the 10,001-to-26,001-pound group is expected to contract by 2.7 percent each year.

Exhibit 4-2 shows the distribution of projected 2026 travel between light and heavy vehicles for different combinations of road system and ownership. Although light vehicles are projected to account for 90.3 percent and heavy vehicles 9.7 percent of total statewide VMT, the mix of traffic varies significantly among the different road systems. Within that distribution of total VMT, heavy vehicles are expected to account for 12.4 percent of the overall travel on state roads and 5.5 percent of the travel on local roads.

Exhibit 4-3 illustrates the separate distributions of projected VMT by road system for light vehicles, heavy vehicles, and all vehicles. As shown, 61.3 percent of total travel in the state is expected to be on state highways and 38.6 percent on local roads and streets. The distribution of VMT, however, differs significantly for light versus heavy vehicles across road systems.

Rural interstate highways, for example, are projected to handle 11.3 percent of total VMT in 2026 but 27.3 percent of heavy vehicle VMT. At the other extreme, 20.8 percent of light vehicle travel, but only 8.9 percent of heavy

EXHIBIT 4-2: PROJECTED 2026 VMT BY ROAD SYSTEM (MILLIONS OF MILES)

		VMT by VC		Percent of Total VMT	
Road System	**Total VMT**	**Light**	**Heavy**	**Light**	**Heavy**
State Roads	22,124	19,375	2,749	87.6%	12.4%
Urban Interstate	5,523	4,901	622	88.7%	11.3%
Rural Interstate	4,077	3,117	960	76.5%	23.5%
Urban Other	6,298	5,921	377	94.0%	6.0%
Rural Other	6,226	5,436	790	87.3%	12.7%
Local Roads	13,934	13,174	760	94.5%	5.5%
County Roads	6,833	6,387	446	93.5%	6.5%
City Streets	7,101	6,787	314	95.6%	4.4%
State & Local Roads	36,058	32,549	3,509	90.3%	9.7%
Federal Roads	49	45	4	92.2%	7.8%
Total All Roads	**36,107**	**32,594**	**3,513**	**90.3%**	**9.7%**

Note: Light includes all vehicles 10,000 pounds & under. Heavy includes all vehicles over 10,000 pounds.

EXHIBIT 4-3: DISTRIBUTION OF PROJECTED 2026 VMT BY ROAD SYSTEM

		Percent of Total VMT	
Road System	**Percent of Total VMT**	**Light**	**Heavy**
State Roads	61.3%	59.4%	78.2%
Urban Interstate	15.3%	15.0%	17.7%
Rural Interstate	11.3%	9.6%	27.3%
Urban Other	17.4%	18.2%	10.7%
Rural Other	17.2%	16.7%	22.5%
Local Roads	38.6%	40.4%	21.6%
County Roads	18.9%	19.6%	12.7%
City Streets	19.7%	20.8%	8.9%
State & Local Roads	99.9%	99.9%	99.9%
Federal Roads	0.1%	0.1%	0.1%
Total All Roads	**100.0%**	**100.0%**	**100.0%**

EXHIBIT 4-4: COMPARISON OF FORECAST VMT USED IN PRIOR OR HCASs (BILLIONS OF MILES)

	2015 Study		2017 Study		2019 Study		2021 Study		2023 Study		2025 Study	
Road System	**2016 VMT**	**% of Total**	**2018 VMT**	**% of Total**	**2020 VMT**	**% of Total**	**2022 VMT**	**% of Total**	**2024 VMT**	**% of Total**	**2026 VMT**	**% of Total**
State Roads	21.3	59.4%	21.6	60.5%	22.4	60.1%	21.5	61.3%	21.8	60.5%	22.1	61.4%
Urban Interstate	4.9	13.6%	5.4	15.0%	5.8	15.6%	5.6	16.1%	5.4	15.0%	5.5	15.3%
Rural Interstate	4.5	12.7%	4.1	11.3%	4.0	10.8%	4.0	11.3%	4.1	11.3%	4.1	11.3%
Urban Other	5.0	14.0%	6.0	16.8%	6.6	17.6%	6.0	17.0%	6.0	16.8%	6.3	17.5%
Rural Other	6.9	19.2%	6.2	17.4%	6.1	16.2%	5.9	16.9%	6.3	17.4%	6.2	17.3%
Local Roads	14.6	40.6%	14.1	39.5%	14.9	39.9%	13.6	38.7%	14.2	39.5%	13.9	38.6%
County Roads	7.3	20.2%	7.1	19.9%	8.5	22.7%	6.5	18.5%	7.2	19.9%	6.8	19.0%
City Streets	7.3	20.4%	7.0	19.6%	6.4	17.2%	7.1	20.2%	7.1	19.6%	7.1	19.7%
Total All Roads	**35.9**	**100.0%**	**35.7**	**100.0%**	**37.3**	**100.0%**	**35.0**	**100.0%**	**36.9**	**100.0%**	**36.1**	**100.0%**

Note: VMT on Federally-owned roads not included in Totals.

vehicle travel, is forecast to be on city streets. State highways are expected to handle about 59.4 percent of total travel by light vehicles and 78.2 percent of travel by heavy vehicles.

Exhibit 4-4 compares the VMT projections by road system used in the 2015 through 2023 studies. The systems projected to account for the largest shares of total statewide travel are Local City Streets and Local County Roads.

Expenditure Data

Until the 2001 study, Oregon highway cost allocation studies allocated only expenditures of Oregon highway user fees by state and local-government agencies. Because federal funds are in many cases interchangeable with state funds, and because the proportion of federal funds used for any project is arbitrary and subject to change between the time of the study and the time the money is spent, excluding federal funds can introduce arbitrary bias and inaccuracy into the study results.

The 2001 study included the expenditure of federal funds by the state and reported their allocation both separately and in combination with state funds.

The 2003 study, for the first time ever, included all expenditures on roads and streets in the state. In addition to state-funded expenditures, expenditures (both state and local) funded from federal highway revenues and locally generated revenues were also included. This change increased the level and breadth of expenditures allocated in the 2003 study as compared to previous studies.

Since 2005, Oregon highway cost allocation studies have included expenditures of state, federal, and local revenues but exclude certain categories of local revenues determined to not be interchangeable with state user fees. Those sources are locally issued bonds, property taxes (including local improvement districts), systems development charges, and traffic impact fees.

The expenditure data for this study were obtained from several sources. Data from ODOT's monthly Budget and Cash Flow Forecast were used to develop projected construction expenditures by project for 2025-27 biennium. Projected expenditures on maintenance and other programs were obtained from ODOT Financial Services and based on ODOT's Agency Request Budget.

Identifying those expenditures projected to be federally funded was straightforward and based on detailed information from the ODOT Cash Flow Forecast model and Project Control System. Local expenditures were projected from data obtained from the 2023 Local Roads and Streets Survey combined with information from ODOT's Agency Request Budget.

EXHIBIT 4-5: AVERAGE ANNUAL EXPENDITURES BY CATEGORY AND FUNDING SOURCE (THOUSANDS OF DOLLARS)

Major Expenditure Category	All Funding Sources	FUNDS BY SOURCE				PERCENT OF ALL FUNDING SOURCES			
		State	Federal	Local	Bond	State	Federal	Local	Bond
Modernization	261,839	102,980	130,065	28,766	28	39.3%	49.7%	11.0%	0.0%
Preservation	213,399	100,098	99,657	13,645	0	46.9%	46.7%	6.4%	0.0%
Maintenance	389,102	317,973	25,913	45,188	29	81.7%	6.7%	11.6%	0.0%
Bridge	180,985	100,801	64,818	3,490	11875	55.7%	35.8%	1.9%	6.6%
Other	779,199	434,426	279,068	44,071	21634	55.8%	35.8%	5.7%	2.8%
Total	**1,824,525**	**1,056,278**	**599,521**	**135,159**	**33566**	**57.9%**	**32.9%**	**7.4%**	**1.8%**

Exhibit 4-5 presents the average annual expenditures projected for the 2025-27 biennium by major category (modernization, preservation, maintenance, bridge, and other) and funding source (state, federal, local, and bond). As shown, projected expenditures total $1.8 billion. This compares to $2.1 billion annual expenditures allocated in the 2023 study.

Of the $1.8 billion total annual expenditures, $1.1 billion (57.9 percent) are projected to be state funded, $599.5 million (32.9 percent) federally funded, and $135.2 million (7.4 percent) locally funded.

The local funds column of Exhibit 4-5 includes only local expenditures from the own-source revenues that were included in this study. Local expenditures from state and federal revenues are included in the state funds and federal funds columns, respectively.

Bridge and interchange expenditures are shown separately from other modernization, preservation, and maintenance expenditures.

The "other" category in the exhibit encompasses expenditures for many activities. In addition to general administrative and tax collection costs for the state, counties, and cities, it includes expenditures for:

- Preliminary engineering
- Right of way acquisition and property management
- Safety-related projects, safety inspections, and rehabilitation and maintenance of existing safety improvements
- Pedestrian/bike projects
- Railroad safety projects
- Fish- and wildlife-enabling projects (e.g., salmon culverts)
- Transportation demand management and transportation system management projects (e.g., Traffic Operations Centers)
- Multi-modal projects
- Transportation project development and delivery
- Transportation planning, research, and analysis

The exhibit shows significant differences in the funding of different expenditure categories. Modernization, preservation, and bridge expenditures have large federal funds components. About 49.7 percent of modernization, 46.7 percent of preservation, and 35.8 percent of bridge expenditures will be federally funded. Maintenance expenditures, on the other hand, are largely state-funded, and to a lesser extent, locally funded, with a small federal-funds component.

Revenue Data and Forecasts

The revenues projected for this study include receipts from taxes and fees collected by the state from highway users, that is, revenues flowing into Oregon's dedicated State Highway Fund. Revenues from federal taxes and user fees are not estimated. Similarly, revenues generated by local governments from their own funding sources (e.g., property taxes, street assessments, system development charges, local fuel taxes) are not included.

Because the expenditures of federal and local revenues are included among the expenditures to be allocated, and because a portion of the expenditure of bond revenue in the prior biennium is included, average annual allocated expenditures exceed average annual attributed revenues in this study by $440 million.

The revenue data required for the study are obtained directly from ODOT's revenue forecasting model. The revenue forecast used for this study was the April 2024 forecast. This is a change from the 2023 study, which used the October forecast, and from previous studies that relied on the December forecast. The forecasts include the 40 percent of State Highway Fund revenues transferred to local governments for use on local roads and streets, and all state funds used for highways, including matching requirements for federal-aid highway projects.

EXHIBIT 4-6: REVENUE FORECASTS BY TAX AND FEE TYPE (THOUSANDS OF DOLLARS) AVERAGE ANNUAL AMOUNTS FOR 2025-2027 BIENNIUM

Tax or Fee Type	Forecast Revenue	Percent of Total
Fuel Tax	684,154	41.8%
Registration Fees	357,836	21.9%
Title Fees	104,223	6.4%
Other Motor Carrier Revenue	2,351	0.1%
Road Use Assessment Fees	5,124	0.3%
Weight-Mile Tax	482,691	29.5%
Total	**1,636,379**	**100.0%**

Average annual state revenues for the 2025-27 biennium are expected to total $1.6 billion. As shown in Exhibit 4-6, fuel taxes and the weight-mile tax are the two largest sources of state user-fee revenue. Revenue from the state fuel tax is projected to average $684 million per year (41.8 percent of total revenues) and weight-mile tax revenue is forecast to average $483 million (29.5 percent of total revenues). These two sources account for 71.3 percent of highway user revenues, illustrating that Oregon's system of highway finance is based heavily on taxes and fees related to use of the system.

Revenue from registration and title fees is anticipated to average $358 million annually (21.9 percent of total revenues), consistent with recent prior studies. Other revenue sources bring in smaller amounts of revenue.

Exhibit 4-7 compares the forecasts of average annual total revenues used in the 1999 through 2025 studies. The increase between the 2021 and 2023 studies reflects the increases in the fuel tax, weight-mile tax, and registration fees enacted as by the Oregon Legislature in 2017.

EXHIBIT 4-7: COMPARISON OF FORECAST REVENUE (MILLIONS OF DOLLARS) USED IN PRIOR OR HCASs

Year of Study	Average Annual Forecast Revenue
1999	691
2001	690
2003	713
2005	826
2007	879
2009	870
2011	1,126
2013	1,096
2015	1,123
2017	1,186
2019	1,482
2021	1,530
2023	1,619
2025	1,636

Caution should be used in comparing these forecasts, however, because they were made at various times for different biennia, and they used different assumptions regarding the treatment of ODOT beginning and ending balances. Additionally, title fees were not identified as a revenue source in studies prior to 2003 because they did not produce net revenue.

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CHAPTER 5: EXPENDITURE ALLOCATION & REVENUE ATTRIBUTION RESULTS

This chapter presents the expenditure allocation and revenue attribution results of the 2025 study and compares them to the results of previous Oregon studies. The following chapter reports equity ratios for each vehicle group and weight class based on the expenditure allocation and revenue attribution results.

EXPENDITURE ALLOCATION RESULTS

The 2003 study was the first to base expenditure allocation results on all highway expenditures, including those financed by federal, state, and local revenues. This approach was considered necessary to address the impacts of the federal advance construction program on expenditures. This change in approach meant the expenditure allocation results for the 2003 study were not directly comparable to those of the earlier Oregon studies.

For the 2005 and later studies, the approach used in the 2003 study was modified to exclude the expenditure of certain local-government, own-source revenues that were not considered to be interchangeable with State Highway Fund monies. The excluded categories were property taxes (including local improvement districts), local bond revenues, systems development charges, and traffic impact fees. The 2025 study uses the same methodology as the 2005 through 2021 studies. As a result, the expenditure allocations in this study are comparable to the 2005 and later studies, but not directly comparable to those in the 2003 or earlier studies.

Exhibit 5-1 presents the expenditure allocation results by major expenditure category and vehicle weight group. Light (up to 10,000 pound) and heavy (over 10,000 pound) vehicles are projected to be responsible for 68.3 percent and 31.7 percent (respectively) of average annual total expenditures for the 2025-27 biennium.

As shown in the exhibit, the responsibility shares vary significantly among the major expenditure categories. Heavy vehicles, as a group, are projected to be responsible for much of the preservation expenditure (74.3 percent).

EXHIBIT 5-1: AVERAGE ANNUAL COST RESPONSIBILITY BY EXPENDITURE CATEGORY AND WEIGHT CLASS (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Expenditure Categories						Total
			Modernization	Preservation	Maintenance	Bridge	Other	Prior Bonds	
1	to	10,000	225,068	54,747	242,269	115,835	641,173	139,462	1,418,554
10,001	to	26,000	4,866	11,604	17,753	12,588	15,437	12,900	75,148
26,001	to	78,000	10,102	31,705	41,963	7,713	27,797	10,444	129,725
78,001	to	80,000	16,838	93,777	70,181	21,830	68,909	42,148	313,683
80,001	to	104,000	3,035	13,864	12,588	5,507	10,667	21,693	67,354
104,001	to	105,500	1,475	252	2,235	7,636	12,904	22,432	46,933
105,501	and	up	456	7,451	2,113	9,875	2,312	2,742	24,949
		Total	**261,839**	**213,399**	**389,102**	**180,985**	**779,199**	**251,822**	**2,076,346**
Total by Weight Range									
1	to	10,000	225,068	54,747	242,269	115,835	641,173	139,462	1,418,554
10,001	and	up	36,772	158,652	146,833	65,150	138,026	112,359	657,792
1	to	26,001	229,933	66,351	260,022	128,423	656,610	152,363	1,493,702
26,001	and	up	31,906	147,048	129,080	52,562	122,589	99,459	582,644
% of Total by Weight Range									
1	to	10,000	86.0%	25.7%	62.3%	64.0%	82.3%	55.4%	68.3%
10,001	and	up	14.0%	74.3%	37.7%	36.0%	17.7%	44.6%	31.7%
1	to	26,001	87.8%	31.1%	66.8%	71.0%	84.3%	60.5%	71.9%
26,001	and	up	12.2%	68.9%	33.2%	29.0%	15.7%	39.5%	28.1%

That group is responsible for smaller shares of modernization, general maintenance, bridge, and other expenditures (14.0 percent, 37.7 percent, 36.0 percent, and 17.7 percent, respectively); this illustrates the point made previously that the mix of expenditures allocated can have a significant impact on the overall results.

Both the state and local governments spend funds from state user fees and from the federal government. Exhibit 5-2 shows the funds received from each revenue source and by whom they are expended. The difference between the funds received and the expenditures allocated is due to the allocation of bond expenditures. The upper part of the table shows the full expenditure of bond revenues, and the lower part shows the portions of current and prior expenditures of bond revenues that are allocated to vehicles in this study. In the exhibits that follow, where allocated expenditures are broken down into state, federal, local, and bond, the categories correspond to rows in the lower part of Exhibit 5-2.

EXHIBIT 5-2: SOURCES AND EXPENDITURES OF FUNDS (THOUSANDS OF ANNUAL DOLLARS)

Expenditures of Funds	Source of Funds				All Sources
	State Revenues	Bond Revenues	Federal Revenues	Local Revenues	
State Government	788,848	0	551,340	0	1,340,188
Local Governments	267,430	0	48,181	135,159	450,770
Expenditure of Bond Revenue	0	218,314	0	0	218,314
Total Expenditures	**1,056,278**	**218,314**	**599,521**	**135,159**	**2,009,272**
Allocated State Expenditures	788,848	0	551,340	0	1,340,188
Allocated Local Expenditures	267,430	0	48,181	135,159	450,770
Allocated Current Bond	0	33,566	0	0	33,566
Allocated Prior Bond	0	251,822	0	0	251,822
Total Allocated Expenditures	**1,056,278**	**285,388**	**599,521**	**135,159**	**2,076,346**

EXHIBIT 5-3: EXPENDITURE ALLOCATION RESULTS FOR WEIGHT GROUPS BY FUNDING SOURCE (THOUSANDS OF DOLLARS)

Funding Source	Avg. Annual Total Expenditures Allocated	Allocation to Vehicles			
		Under 10,001 Pounds	Over 10,000 Pounds	Under 26,001 Pounds	Over 26,000 Pounds
State (Highway Fund)	788,848	567,016 71.9%	221,832 28.1%	590,478 74.9%	198,371 25.1%
Federal	551,340	400,647 72.7%	150,693 27.3%	416,862 75.6%	134,478 24.4%
Local	450,770	282,482 62.7%	168,288 37.3%	304,012 67.4%	146,758 32.6%
Bond	33,566	28,946 86.2%	4,620 13.8%	29,988 89.3%	3,578 10.7%
Current	1,824,525	1,279,092 70.1%	545,432 29.9%	1,341,339 73.5%	483,185 26.5%
Prior Bond	251,822	139,462 55.4%	112,359 44.6%	152,363 60.5%	99,459 39.5%
Total	**2,076,346**	**1,418,554** **68.3%**	**657,792** **31.7%**	**1,493,702** **71.9%**	**582,644** **28.1%**

The responsibility amounts for state, federal, local, and bond expenditures are broken out separately in Exhibit 5-3. In this exhibit, the expenditure of state and federal monies by local governments are counted under the state and federal categories. The local category contains only the expenditure by local governments of their own revenues.

Light vehicles are projected to be responsible for 71.9 percent of state, 72.7 percent of federal, and 86.2 percent of local bond expenditures. Heavy vehicles are projected to be responsible for 28.1 percent of state, 27.3 percent of federal, and 37.3 percent of local expenditures. Overall, state-funded expenditures are expected to average $789 million annually over the 2025-27 biennium. Comparable annual amounts for federal and local expenditures are $551 million and $451 million, respectively.

The allocation results for state, federal, local, and bond expenditures are further broken out by major category in Exhibit 5-4 through Exhibit 5-7.

EXHIBIT 5-4: AVERAGE ANNUAL COST RESPONSIBILITY, STATE HIGHWAY FUND DETAIL (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Modernization	Preservation	Maintenance	Bridge	Other	Total
1	to	10,000	42,710	18,085	179,942	58,958	267,321	567,016
10,001	to	26,000	434	3,523	7,034	6,556	5,914	23,461
26,001	to	78,000	452	8,860	7,535	3,910	16,801	37,558
78,001	to	80,000	1,742	34,539	26,764	12,140	41,696	116,880
80,001	to	104,000	260	4,760	3,754	2,914	6,309	17,998
104,001	to	105,500	372	81	2,028	4,005	8,647	15,133
105,501	and	up	94	3,164	1,575	5,411	557	10,801
		Total	**46,064**	**73,012**	**228,631**	**93,895**	**347,247**	**788,848**
Total by Weight Range								
1	to	10,000	42,710	18,085	179,942	58,958	267,321	567,016
10,001	and	up	3,354	54,927	48,689	34,937	79,926	221,832
1	to	26,000	43,144	21,608	186,976	65,514	273,236	590,478
26,001	and	up	2,920	51,404	41,655	28,381	74,011	198,371
% of Total by Weight Range								
1	to	10,000	93%	25%	79%	63%	77%	72%
10,001	and	up	7%	75%	21%	37%	23%	28%
1	to	26,000	94%	30%	82%	70%	79%	75%
26,001	and	up	6%	70%	18%	30%	21%	25%

EXHIBIT 5-5: AVERAGE ANNUAL COST RESPONSIBILITY, FEDERAL DETAIL (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Modernization	Preservation	Maintenance	Bridge	Other	Total
1	to	10,000	110,640	22,768	8,337	39,676	219,226	400,647
10,001	to	26,000	956	4,730	306	4,355	5,867	16,214
26,001	to	78,000	1,336	11,608	219	2,598	7,129	22,890
78,001	to	80,000	5,117	45,184	716	8,065	22,593	81,676
80,001	to	104,000	730	6,229	102	2,244	3,471	12,776
104,001	to	105,500	782	160	105	3,083	3,364	7,494
105,501	and	up	249	4,115	19	3,552	1,708	9,643
		Total	**119,811**	**94,793**	**9,804**	**63,574**	**263,358**	**551,340**
Total by Weight Range								
1	to	10,000	110,640	22,768	8,337	39,676	219,226	400,647
10,001	and	up	9,171	72,025	1,467	23,897	44,132	150,693
1	to	26,000	111,596	27,498	8,643	44,032	225,093	416,862
26,001	and	up	8,215	67,295	1,161	19,542	38,265	134,478
% of Total by Weight Range								
1	to	10,000	92%	24%	85%	62%	83%	73%
10,001	and	up	8%	76%	15%	38%	17%	27%
1	to	26,000	93%	29%	88%	69%	85%	76%
26,001	and	up	7%	71%	12%	31%	15%	24%

EXHIBIT 5-6: AVERAGE ANNUAL COST RESPONSIBILITY, LOCAL GOVERNMENT DETAIL (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Modernization	Preservation	Maintenance	Bridge	Other	Total
1	to	10,000	71,690	13,895	53,965	7,538	135,395	282,482
10,001	to	26,000	3,475	3,351	10,412	1,216	3,076	21,529
26,001	to	78,000	8,314	11,237	34,209	930	3,516	58,207
78,001	to	80,000	9,979	14,055	42,699	771	3,526	71,029
80,001	to	104,000	2,045	2,874	8,732	161	730	14,542
104,001	to	105,500	320	12	101	290	675	1,397
105,501	and	up	113	172	520	735	43	1,583
		Total	**95,936**	**45,595**	**150,638**	**11,641**	**146,960**	**450,770**
Total by Weight Range								
1	to	10,000	71,690	13,895	53,965	7,538	135,395	282,482
10,001	and	up	24,246	31,700	96,673	4,103	11,565	168,288
1	to	26,000	75,165	17,245	64,377	8,753	138,471	304,012
26,001	and	up	20,771	28,350	86,261	2,887	8,490	146,758
% of Total by Weight Range								
1	to	10,000	75%	30%	36%	65%	92%	63%
10,001	and	up	25%	70%	64%	35%	8%	37%
1	to	26,000	78%	38%	43%	75%	94%	67%
26,001	and	up	22%	62%	57%	25%	6%	33%

EXHIBIT 5-7: AVERAGE ANNUAL COST RESPONSIBILITY, BOND DETAIL (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Modernization	Preservation	Maintenance	Bridge	Other	Current	Prior	Total
1	to	10,000	28	0	25	9,663	19,230	28,946	139,462	168,408
10,001	to	26,000	0	0	1	461	580	1,042	12,900	13,943
26,001	to	78,000	0	0	1	275	350	626	10,444	11,070
78,001	to	80,000	0	0	2	854	1,093	1,949	42,148	44,097
80,001	to	104,000	0	0	0	188	158	346	21,693	22,039
104,001	to	105,500	0	0	0	258	218	477	22,432	22,909
105,501	and	up	0	0	0	176	4	180	2,742	2,922
		Total	**28**	**0**	**29**	**11,875**	**21,634**	**33,566**	**251,822**	**285,388**
Total by Weight Range										
1	to	10,000	28	0	25	9,663	19,230	28,946	139,462	168,408
10,001	and	up	1	0	4	2,212	2,403	4,620	112,359	116,980
1	to	26,000	28	0	26	10,124	19,810	29,988	152,363	182,351
26,001	and	up	1	0	3	1,751	1,823	3,578	99,459	103,037
% of Total by Weight Range										
1	to	10,000	97%	-	88%	81%	89%	86%	55%	59%
10,001	and	up	3%	-	12%	19%	11%	14%	45%	41%
1	to	26,000	98%	-	91%	85%	92%	89%	61%	64%
26,001	and	up	2%	-	9%	15%	8%	11%	39%	36%

Because of restrictions on the types of expenditures for which federal-aid highway funds can be used, federal funds tend to be concentrated on construction (i.e., modernization, preservation, and bridge) projects and other types of work for which heavy vehicles have the predominant responsibility.

Additionally, federal funds are focused on projects on interstate and other higher order highways where the heavy vehicle share of travel is highest. Hence, the inclusion of federally funded expenditures in a state HCAS will typically have the effect of reducing the light vehicle responsibility share and increasing the heavy vehicle share.

Conversely, state funds are more concentrated on maintenance, operations, administration, and other activities for which light vehicles have the largest responsibility share.

The inclusion of local expenditures in a state HCAS will, by itself, typically increase the relative responsibility of light vehicles and reduce that of heavy vehicles. This is because local streets see a higher proportion of traffic from light vehicles and many types of expenditures are allocated on a relative travel basis.

This factor, however, is partially offset by the fact that local governments spend more of their road and street funds on activities having a comparatively high heavy vehicle responsibility component, including rehabilitation, repair, and maintenance of pavements and bridges. In addition, locally owned roads often are less able to withstand the weight of heavy vehicles than are freeways and state highways.

Because pavements and bridges represent two of the largest and most important expenditure areas in a highway cost allocation study, the responsibility results for these expenditures are broken out separately in Exhibit 5-8 and Exhibit 5-9.

EXHIBIT 5-8. COMPARISON OF PAVEMENT RESPONSIBILITY RESULTS FROM PRIOR OR HCASs (THOUSANDS OF ANNUAL DOLLARS)

Expenditure Work Type	2015 Study			2017 Study			2019 Study			2021 Study			2023 Study			2025 Study		
	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility
New Pavements	48,984	7,530	41,454	37,084	3,938	33,146	31,199	5,097	26,103	27,691	3,587	24,104	28,716	5,970	22,746	30,449	8,965	21,484
	3.4%	15.4%	84.6%	2.5%	10.6%	89.4%	1.8%	16.3%	83.7%	1.5%	13.0%	87.0%	1.4%	20.8%	79.2%	1.7%	29.4%	70.6%
Pavement and Shoulder Reconstruction	28,823	4,233	24,590	4,106	384	3,722	1,988	245	1,743	306	28	278	6,022	840	5,182	3,800	658	3,142
	2.0%	14.7%	85.3%	0.3%	9.4%	90.6%	0.1%	12.3%	87.7%	0.0%	9.3%	90.7%	0.3%	13.9%	86.1%	0.2%	17.3%	82.7%
Pavement and Shoulder Rehabilitation	64,885	11,114	53,771	141,338	14,780	126,558	208,765	26,918	181,847	204,237	19,715	184,522	163,243	25,939	137,304	193,746	38,438	155,308
	4.5%	17.1%	82.9%	9.4%	10.5%	89.5%	11.7%	12.9%	87.1%	10.9%	9.7%	90.3%	7.9%	15.9%	84.1%	10.6%	19.8%	80.2%
Pavement Maintenance	221,898	54,784	167,114	227,903	29,773	198,131	211,770	36,577	175,193	183,275	22,330	160,945	166,650	35,319	131,331	168,905	46,171	122,734
	15.4%	24.7%	75.3%	15.2%	13.1%	86.9%	11.9%	17.3%	82.7%	9.8%	12.2%	87.8%	8.1%	21.2%	78.8%	9.3%	27.3%	72.7%
Other Pavement Expenditures	5,013	4,957	56	5,416	4,434	983	5,883	4,225	1,658	2,325	2,325	0	4,291	4,291	0	10,313	7,462	2,851
	0.3%	98.9%	1.1%	0.4%	81.9%	18.1%	0.3%	71.8%	28.2%	0.1%	100.0%	0.0%	0.2%	100.0%	0.0%	0.6%	72.4%	27.6%
Total Pavement Expenditures	**369,604**	**82,618**	**286,986**	**415,848**	**53,308**	**362,539**	**459,605**	**73,062**	**386,544**	**417,834**	**47,986**	**369,848**	**368,923**	**72,360**	**296,563**	**407,213**	**101,695**	**305,519**
	25.7%	**22.4%**	**77.6%**	**27.8%**	**12.8%**	**87.2%**	**25.8%**	**15.9%**	**84.1%**	**22.3%**	**11.5%**	**88.5%**	**17.8%**	**19.6%**	**80.4%**	**22.3%**	**25.0%**	**75.0%**

EXHIBIT 5-9: COMPARISON OF BRIDGE AND INTERCHANGE RESPONSIBILITY RESULTS FROM PRIOR OR HCASs (THOUSANDS OF DOLLARS)

Expenditure Work Type	2017 Study			2019 Study			2021 Study			2023 Study			2025 Study		
	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility	Expenditures Allocated	Light Vehicle Responsibility	Heavy Vehicle Responsibility
Bridge and Interchange	42,474	26,727	15,747	89,302	54,613	34,689	82,808	56,049	26,759	164,603	102,229	62,374	175,155	110,730	64,425
	2.8%	62.9%	37.1%	5.0%	61.2%	38.8%	4.4%	67.7%	32.3%	8.0%	62.1%	37.9%	9.6%	63.2%	36.8%
Bridge Maintenance	1,098	984	114	3,533	3,149	384	4,595	4,079	516	13,277	11,674	1,603	5,829	5,105	724
	0.1%	89.6%	10.4%	0.2%	89.1%	10.9%	0.2%	88.8%	11.2%	0.6%	87.9%	12.1%	0.3%	87.6%	12.4%
Total Bridge & Interchange Expenditures	**43,572**	**27,711**	**15,861**	**92,835**	**57,762**	**35,073**	**87,403**	**60,128**	**27,275**	**177,881**	**113,903**	**63,977**	**180,985**	**115,835**	**65,150**
	2.9%	**63.6%**	**36.4%**	**5.2%**	**62.2%**	**37.8%**	**4.7%**	**68.8%**	**31.2%**	**8.6%**	**64.0%**	**36.0%**	**9.9%**	**64.0%**	**36.0%**

Exhibit 5-8 shows that pavement expenditures allocated in the 2025 study total $407.2 million, 10.4 percent higher than in the 2023 study, and 2.5 percent less than the pavement expenditures allocated in the 2021 study. The share of pavement cost responsibility for heavy trucks decreased during the 2023 and 2025 studies due to updated information about the distribution of the volume of vehicles by weight class using various parts of the state highway network.

Given the substantial changes to the distress equations in the 2010 NAPCOM model (which is used to generate pavement factors for pavement expenditure allocation), the pavement expenditure allocation based on the 2011 pavement factors was compared to the pavement expenditure allocation when using the 2009 study pavement factors with the 2011 model. First, the pavement factors developed for the 2011 study for light vehicles are slightly lower than those from the 2009 study.

Pavement factors are also lower for certain heavy vehicle weight classes but are offset by increases in the pavement factors for other heavy vehicle classes. Sensitivity analyses performed using new pavement factors demonstrated that pavement expenditure allocations are sensitive to the light vehicle pavement factors. In the 2019 study, additional weigh-in-motion data was provided to the study team, which revealed information about the distribution of light vehicles in Oregon. This additional information shifted pavement expenditure allocations toward light vehicles. This same shift has occurred again in 2023 and 2025 as a result of even more detailed and accurate data from weigh-in-motion reporting.

Exhibit 5-9 compares the bridge and interchange expenditure amounts and responsibility results in the 2015 through 2025 studies. Bridge-related expenditures increased by about 1.7 percent in the 2025 study relative to the 2023 study and were higher as a share of total expenditures in the current study (9.9 percent) than in the 2023 study (8.6 percent). The expenditure amounts reported in Exhibit 5-9 do not include this study's share of prior biennia's bond expenditures.

The heavy vehicle responsibility share for total bridge plus interchange expenditures in the current study is 36.0 percent, which was the same as the 2023 study. This is compared to 31.2 percent in the 2021 study, 37.8 percent in the 2019 study, 36.4 percent in the 2017 study, 31.9 percent in the 2015 study, and 24.7 percent in the 2013 study. The change since 2011 reflects the results of a new bridge cost allocation study completed for the 2013 study.

EXHIBIT 5-10: AVERAGE ANNUAL COST RESPONSIBILITY BY WEIGHT GROUP WITH PRIOR ALLOCATED EXPENDITURES (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Total Without Prior Allocated Expenditures	Prior Allocated Expenditures	Total With Prior Allocated Expenditures
1	to	10,000	1,279,092	139,462	1,418,554
10,001	to	26,000	62,247	12,900	75,148
26,001	to	78,000	119,281	10,444	129,725
78,001	to	80,000	271,535	42,148	313,683
80,001	to	104,000	45,661	21,693	67,354
104,001	to	105,500	24,501	22,432	46,933
105,501	and	up	22,207	2,742	24,949
		Total	**1,824,525**	**251,822**	**2,076,346**

Exhibit 5-10 shows the amounts of allocated expenditures of bond revenues, including the amount that carried forward from the prior studies. These represent amounts that were spent in prior biennia and that will be repaid during the 2025-27 biennium. The 2025 study will include the same allocated expenditures from the 2013 through 2023 studies, as well as allocated bond expenditures from the current study.

EXHIBIT 5-11: COST RESPONSIBILITY DISTRIBUTIONS BY WEIGHT GROUP-COMPARISON BETWEEN CURRENT AND PRIOR OR HCAS

Declared Weight in Pounds			2023 Study	2025 Study	Change in Percentage
1	to	10,000	70.8%	68.3%	-2.4%
10,001	to	26,000	4.3%	3.6%	-0.7%
26,001	to	78,000	3.6%	6.2%	2.6%
78,001	to	80,000	12.3%	15.1%	2.8%
80,001	to	104,000	3.4%	3.2%	-0.2%
104,001	to	105,500	4.7%	2.3%	-2.5%
105,501	and	up	0.9%	1.2%	0.3%
		Total	**100.0%**	**100.0%**	
% for Vehicles Over 10,000 lbs			**29.2%**	**31.7%**	**2.4%**

For illustrative purposes, Exhibit 5-11 compares the expenditure allocation results (with prior allocated costs) for the current study with those of the previous study. As shown, the shares changed for light vehicles and heavy vehicles between the 2023 and 2025 studies: the all-vehicle responsibility shares in the 2023 study are 70.8 percent for light vehicles and 29.2 percent for heavy vehicles; the 2025 study shares are 68.3 percent for light vehicles and 31.7 percent for heavy vehicles. Some larger changes occurred in sub-categories within heavy vehicles, as well.

REVENUE ATTRIBUTION RESULTS

The attribution of revenues to the various vehicle types and weight classes is a principal element of a highway cost allocation study. Once accomplished, the shares of projected payments are compared to the shares of cost responsibility for each class to determine whether each class is paying more or less than its fair share under the existing tax structure and rates. Where significant imbalances are detected, recommendations for changes in tax rates are made to bring payments back into balance with cost responsibilities.

As noted in Chapter 4, most of the required revenue data for the study, including control totals for forecasted revenues by tax instrument (e.g., fuel taxes, registration fees, weight-mile tax), are obtained from ODOT's revenue forecasting model. Every effort is made to ensure that the data used in the HCAS are consistent with the revenue forecast upon which the Agency Request Budget is based.

Some information required for the HCAS, however, is not available from the revenue forecasting model and so must be estimated from other sources. The revenue model, for example, does not project fuel tax payments by detailed, 2,000-pound weight class. Therefore, estimated fuel efficiencies by vehicle type and weight group must be used together with control totals from the revenue model to attribute projected fuel tax payments to the detailed vehicle classes.

The revenue attribution results are summarized in Exhibit 5-12. For the next biennium, under existing tax rates and forecasted spending by ODOT, we anticipate that light vehicles will contribute 62.7 percent of State Highway Fund revenues and heavy vehicles will contribute 37.3 percent. These shares are for all vehicles and differ from the shares for full-fee paying vehicles that are used in the calculation of equity ratios.

EXHIBIT 5-12: AVERAGE ANNUAL USER-FEE REVENUE BY TAX INSTRUMENT AND WEIGHT CLASS (THOUSANDS OF DOLLARS)

Declared Weight in Pounds			Fuel Tax	Registration and Title Fees	Weight-Mile Tax	Other Motor Carrier	Flat Fee	RUAF	Total
1	to	10,000	671,241	354,835	0	0	0	0	1,026,076
10,001	to	26,000	4,296	54,564	0	0	0	0	58,860
26,001	to	78,000	8,370	11,402	36,589	330	25	0	56,716
78,001	to	80,000	140	37,140	320,430	1,500	1,909	0	361,118
80,001	to	104,000	34	3,548	42,774	194	6,576	54	53,179
104,001	to	105,500	72	372	72,829	323	1,559	39	75,194
105,501	and	up	0	198	0	5	0	5,032	5,235
		Total	**684,154**	**462,059**	**472,622**	**2,351**	**10,069**	**5,124**	**1,636,379**
Total by Weight Range									
1	to	10,000	671,241	354,835	0	0	0	0	1,026,076
10,001	and	up	12,913	107,224	472,622	2,351	10,069	5,124	610,303
1	to	26,000	675,537	409,399	0	0	0	0	1,084,936
26,001	and	up	8,617	52,660	472,622	2,351	10,069	5,124	551,443
% of Total by Weight Range									
1	to	10,000	98.1%	76.8%	0.0%	0.0%	0.0%	0.0%	62.7%
10,001	and	up	1.9%	23.2%	100.0%	100.0%	100.0%	100.0%	37.3%
1	to	26,001	98.7%	88.6%	0.0%	0.0%	0.0%	0.0%	66.3%
26,001	and	up	1.3%	11.4%	100.0%	100.0%	100.0%	100.0%	33.7%

EXHIBIT 5-13: REVENUE ATTRIBUTION DISTRIBUTIONS BY WEIGHT GROUP-COMPARISON BETWEEN CURRENT AND PRIOR OR HCAS

Declared Weight in Pounds			2023 Study	2025 Study	Change in Percentage
1	to	10,000	63.2%	62.7%	-0.5%
10,001	to	26,000	4.3%	3.6%	-0.7%
26,001	to	78,000	2.5%	3.5%	0.9%
78,001	to	80,000	21.5%	22.1%	0.6%
80,001	to	104,000	3.4%	3.2%	-0.1%
104,001	to	105,500	4.8%	4.6%	-0.2%
105,501	and	up	0.3%	0.3%	0.1%
		Total	**100.0%**	**100.0%**	
% for Vehicles Over 10,000 lbs.			**36.8%**	**37.3%**	**0.5%**

Exhibit 5-12 also illustrates how the relative payments of different vehicle weight groups vary by tax instrument. Light vehicles are projected to contribute 98.1 percent of fuel tax revenues and 76.8 percent of registration and title fee revenues. Heavy vehicles, on the other hand, contribute 100 percent of weight-mile tax, flat fee, and road use assessment fee revenues. Heavy vehicles also contribute 100 percent of the other motor carrier revenue identified in the exhibit. This category includes revenues from truck overweight/overlength permit fees, overdue payment penalties and interest, etc.

Exhibit 5-13 compares the revenue attribution results of the current study with those of the 2023 study. The projected share of revenues contributed by light vehicles has decreased from 63.2 percent in the 2023 study to 62.7 percent in the current study. Conversely, for all vehicles (both fee-paying and non-fee paying) the overall heavy vehicle share of projected payments has increased from 36.8 percent in the previous study to 37.3 percent in the current study.

CHAPTER 6: COMPARISON OF EXPENDITURES ALLOCATED TO REVENUES PAID

This chapter brings together the expenditure allocation and revenue attribution results reported in Chapter 5 to compare projected responsibilities and tax payments for each vehicle class and for broader groups of vehicles (e.g., all heavy vehicles combined).

This comparison is facilitated by the calculation of equity ratios, or the ratio of the share of revenues contributed by the vehicles in a class to the share of cost responsibility for vehicles in that class. An equity ratio greater than one indicates that the vehicles in that class are projected to pay more than their cost-responsible share of user fees. Conversely, an equity ratio less than one indicates that the vehicles in that class are projected to pay less than their cost-responsible share.

The comparison of revenue shares to cost responsibility shares in the Oregon studies is traditionally done for full-fee-paying vehicles only. This study takes the same approach, which requires some further adjustments to the numbers presented in Chapter 5. The model separately estimates the revenue contributions from full-fee-paying and alternative-fee-paying vehicles for each tax instrument. For alternative-fee-paying vehicles, the model also estimates the fees they would pay if they were full-fee-paying vehicles. The expenditures allocated to each vehicle class are apportioned among full-fee-paying and alternative-fee-paying vehicles based on the relative miles of travel of each in that class.[8]

PRESENTATION OF EQUITY RATIOS

EXHIBIT 6-1: COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Declared Weight in Pounds			Annual VMT			Percent of Annual VMT		
			All	Full-Fee	Alternative Fee	All	Full-Fee	Alternative Fee
1	to	10,000	32,594,219,914	32,377,369,141	216,850,773	90.3%	91.6%	28.3%
10,001	to	26,000	948,237,966	691,601,502	256,636,464	2.6%	2.0%	33.5%
26,001	to	78,000	611,929,451	324,106,954	287,822,497	1.7%	0.9%	37.6%
78,001	to	80,000	1,420,497,531	1,418,171,714	2,325,816	3.9%	4.0%	0.3%
80,001	to	104,000	215,813,241	215,319,277	493,964	0.6%	0.6%	0.1%
104,001	to	105,500	312,045,712	311,106,571	939,141	0.9%	0.9%	0.1%
105,501	and	up	4,409,255	4,409,255	0	0.0%	0.0%	0.0%
		Total	**36,107,153,070**	**35,342,084,414**	**765,068,656**	**100.0%**	**100.0%**	**100.0%**
10,001	and	up	3,512,933,156	2,964,715,274	548,217,882	9.7%	8.4%	71.7%
26,001	to	80,000	2,032,426,982	1,742,278,668	290,148,314	5.6%	4.9%	37.9%
80,001	to	105,500	527,858,953	526,425,848	1,433,105	1.5%	1.5%	0.2%
26,001	to	105,500	2,560,285,935	2,268,704,516	291,581,419	7.1%	6.4%	38.1%
26,001	and	up	2,564,695,190	2,273,113,772	291,581,419	7.1%	6.4%	38.1%

[8] If, for example, 80 percent of the VMT in a weight class are by full-fee-paying vehicles and 20 percent are by alternative-fee-paying vehicles, then 80 percent of the total responsibility of that class is assigned to full-fee-paying vehicles and 20 percent to alternative-fee-paying vehicles. This division is based on the reasonable assumption that two vehicles that are identical, except one is subject to full fees and the other alternative fees, have exactly the same per-mile cost responsibility.

EXHIBIT 6-1 (CONTINUED): COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Declared Weight in Pounds			Annual Cost Responsibility				Percent of Annual Cost Responsibility			
			State	Federal	Local	Full-Fee	State	Federal	Local	Full-Fee
1	to	10,000	735,424,671	400,647,140	282,482,471	1,409,116,578	68.5%	72.7%	62.7%	70.9%
10,001	to	26,000	37,403,997	16,214,404	21,529,364	52,110,710	3.5%	2.9%	4.8%	2.6%
26,001	to	78,000	48,628,541	22,889,895	58,206,599	74,079,422	4.5%	4.2%	12.9%	3.7%
78,001	to	80,000	160,977,471	81,675,630	71,029,473	313,168,973	15.0%	14.8%	15.8%	15.8%
80,001	to	104,000	40,036,996	12,775,691	14,541,593	67,194,787	3.7%	2.3%	3.2%	3.4%
104,001	to	105,500	38,041,988	7,494,099	1,397,413	46,792,403	3.5%	1.4%	0.3%	2.4%
105,501	and	up	13,722,464	9,643,163	1,583,111	24,946,474	1.3%	1.7%	0.4%	1.3%
		Total	**1,074,236,128**	**551,340,021**	**450,770,023**	**1,987,409,346**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
10,001	and	up	338,811,458	150,692,881	168,287,552	578,292,769	31.5%	27.3%	37.3%	29.1%
26,001	to	80,000	209,606,012	104,565,525	129,236,071	387,248,395	19.5%	19.0%	28.7%	19.5%
80,001	to	105,500	78,078,984	20,269,789	15,939,006	113,987,190	7.3%	3.7%	3.5%	5.7%
26,001	to	105,500	287,684,996	124,835,314	145,175,077	501,235,585	26.8%	22.6%	32.2%	25.2%
26,001	and	up	301,407,460	134,478,477	146,758,188	526,182,059	28.1%	24.4%	32.6%	26.5%

EXHIBIT 6-1 (CONTINUED): COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Declared Weight in Pounds			Annual User Fees			Annual User Fees		
			All	Full-Fee	Alternative Fee Difference	All	Full-Fee	Alternative Fee Difference
1	to	10,000	1,026,076,111	1,019,874,150	628,751	62.7%	63.4%	2.0%
10,001	to	26,000	58,859,920	47,747,966	5,502,515	3.6%	3.0%	17.8%
26,001	to	78,000	56,716,265	47,608,728	23,832,335	3.5%	3.0%	77.3%
78,001	to	80,000	361,118,136	361,059,697	533,703	22.1%	22.4%	1.7%
80,001	to	104,000	53,179,383	53,169,039	120,619	3.2%	3.3%	0.4%
104,001	to	105,500	75,193,882	75,187,685	220,690	4.6%	4.7%	0.7%
105,501	and	up	5,235,160	5,235,157	0	0.3%	0.3%	0.0%
		Total	**1,636,378,856**	**1,609,882,421**	**30,838,613**	**100.0%**	**100.0%**	**100.0%**
10,001	and	up	610,302,745	590,008,271	30,209,861	37.3%	36.6%	98.0%
26,001	to	80,000	417,834,401	408,668,425	24,366,038	25.5%	25.4%	79.0%
80,001	to	105,500	128,373,265	128,356,723	341,309	7.8%	8.0%	1.1%
26,001	to	105,500	546,207,665	537,025,148	24,707,347	33.4%	33.4%	80.1%
26,001	and	up	551,442,825	542,260,305	24,707,347	33.7%	33.7%	80.1%

EXHIBIT 6-1 (CONTINUED): COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Declared Weight in Pounds			Scaled Equity Ratio		Share of Cost	
			All	Full-Fee	All	Full-Fee
1	to	10,000	0.9178	0.8935	68.3%	70.9%
10,001	to	26,000	0.9938	1.1312	3.6%	2.6%
26,001	to	78,000	0.5548	0.7934	6.2%	3.7%
78,001	to	80,000	1.4607	1.4233	15.1%	15.8%
80,001	to	104,000	1.0018	0.9768	3.2%	3.4%
104,001	to	105,500	2.0329	1.9836	2.3%	2.4%
105,501	and	up	0.2663	0.2591	1.2%	1.3%
		Total	**1.0000**	**1.0000**	**100.0%**	**100.0%**
10,001	and	up	1.1773	1.2595	31.7%	29.1%
26,001	to	80,000	1.1957	1.3028	21.4%	19.5%
80,001	to	105,500	1.4252	1.3901	5.5%	5.7%
26,001	to	105,500	1.2427	1.3227	26.9%	25.2%
26,001	and	up	1.2009	1.2722	28.1%	26.5%

Exhibit 6-1 includes calculated equity ratios for the summary-level weight groups shown in earlier exhibits. As shown in the first table within Exhibit 6-1, projected 2026 vehicle miles traveled (VMT) for full-fee-paying vehicles are 35.3 billion, 91.6 percent of these miles being traveled by light vehicles and 8.4 percent by heavy vehicles. This compares to projected 2026 miles of travel by all vehicles of 36.1 billion, 90.3 percent by light vehicles and 9.7 percent by heavy vehicles.

Exhibit 6-2 at the end of this chapter, shows the equity ratios for each 2,000-pound weight class. **These equity ratios are for full-fee-paying vehicles only and exclude vehicles that pay on an alternative-fee basis.**

As explained in Chapter 3, alternative-fee-paying vehicles are disproportionately concentrated in the heavy vehicle classes, so excluding them will reduce the heavy vehicle share of VMT. The heavy vehicle-share of VMT, in other words, will always be lower if only full-fee-paying vehicles are considered than if all vehicles are considered.

The projected total cost responsibility of full-fee-paying vehicles is $1.99 billion per year, with responsibility shares of 70.9 percent for light vehicles and 29.1 percent for heavy vehicles. This compares to the projected total responsibility for all vehicles of $2.08 billion. The difference between these two amounts is the projected responsibility of alternative-fee-paying vehicles.

Forecasted average annual user fees paid by full-fee-paying vehicles total $1.61 billion, 63.4 percent from light vehicles and 36.6 percent from heavy vehicles. The difference between this total and the $1.64 billion for all vehicles represents projected revenues from alternative-fee-paying vehicles.

The total of the Alternative-Fee Difference column represents the average annual difference between what alternative-fee-paying vehicles are projected to pay and what they would pay if subject to full fees. This total is $30.8 million annually for the next biennium under existing tax rates.[9] Beginning with the 2013 study, equity ratios are calculated using allocated costs and attributed revenues for full-fee paying vehicles only.

Because the current study includes expenditures of funds from federal and local revenue sources, the allocated expenditures for full-fee-paying vehicles are more than the attributed state revenues for these vehicles. This does not present a problem in calculating the equity ratios.[10]

This study finds full-fee equity ratios of 0.8935 for light vehicles and 1.2595 for heavy vehicles as a group. This means that, for the 2025-27 biennium, under the existing tax structure and rates, light vehicles are expected to underpay their fair share by 10.7 percent and heavy vehicles are expected to overpay by 26.0 percent under the existing tax rates and relative to the projected distribution of project spending.

Exhibit 6-1 also shows the overall equity ratios for vehicles under and over 26,000 pounds, as well as for the summary-level weight groups shown in earlier exhibits. Full-fee vehicles with declared weights between 10,001 pounds and 26,000 pounds are projected to overpay their responsibility by 13.1 percent. Full-fee vehicles with weights between 26,001-and-78,000-pounds, as a group, underpay their fair share by 20.7 percent and those between 78,001-and-80,000-pounds overpay by 42.3 percent.

[9] These amounts represent the underpayment by alternative-fee-paying vehicles relative to what they would pay on a full-fee basis—the difference, for example, between revenues from publicly owned vehicles under the existing tax structure versus revenues from these vehicles if they were all subject to the state fuel tax or weight- mile tax and full registration fees.

[10] The calculation of equity ratios in the model is accomplished by comparing ratios of revenues attributed to ratios of expenditures allocated. For each vehicle class, the ratio of the revenues attributed to this class to the total revenues attributed to all classes is first calculated. This ratio is then divided by the ratio of the expenditures allocated to this class to the total expenditures allocated to all classes. Thus, the calculation of the equity ratios does not require scaling of either the attributed revenues or allocated expenditures when the two are not equal.

Vehicles in the 78,001-to-80,000-pound class alone account for 47.8 percent of the VMT by full-fee-paying heavy vehicles and 62.4 percent of the VMT by full-fee-paying vehicles over 26,000-pounds. These vehicles also account for 54.2 percent of the cost responsibility and 61.2 percent of the user fees paid by full-fee-paying heavy vehicles. The reason for the difference in the equity ratio between this group and the groups above and below it is that most truckers who can operate at 80,000 pounds and do not know in advance how much their loads will weigh declare at 80,000 pounds. As a result, the average operating weights of vehicles declared at 80,000 pounds are a lower fraction of their declared weight than for other declared weight classes, and the wear-related costs they impose per mile are correspondingly lower.

As a group, vehicles between 80,001-and-105,500-pounds (Schedule B vehicles) pay 39.0 percent more than their fair share. Those in the 104,001 to 105,500 range pay 98.4 percent more than their fair share.

Vehicles over 105,500 pounds all pay the road use assessment fee, as do some vehicles between 98,001 and 105,500 pounds. Those over 105,500 pounds underpay their fair share by 74.1 percent. This is consistent with underpayment levels found in previous studies. The model was changed for the 2005 study to attribute portions of vehicle registration fees to these vehicles. Since no vehicle can register above 105,500 pounds, no registration fees were attributed to these vehicles in pre-2005 studies.

COMPARISON WITH PREVIOUS OREGON STUDIES

Overall, the heavy and light equity ratios found by this study align with those ratios determined in previous Oregon studies (see Exhibit 6-2). The 2001 study found adjusted equity ratios of 1.003 for light vehicles and 0.995 for heavy vehicles as a group. This indicated a situation of near-perfect equity for the 2001-03 biennium analysis period, that is, a 0.3 percent projected overpayment by full-fee-paying light vehicles and a 0.5 percent projected underpayment by heavy vehicles. Consequently, no adjustment in tax rates was deemed necessary by the legislature to satisfy the constitutional requirement of “fairness and proportionality” between light and heavy vehicles.

The 2003 study found adjusted equity ratios of 0.9921 for light vehicles and 1.0158 for heavy vehicles. The 2003 Legislature did not change rates as a direct result of the 2003 study but did increase registration and other fees to meet the debt-service requirements of the OTIA III bond program. Those fee increases were designed to preserve light/heavy equity given the nature of the projects they would fund, and the results of subsequent studies indicate that they succeeded.

The 2011-2021 studies found adjusted equity ratios ranging between 0.9361 to 1.0076 for light vehicles and 0.9865 to 1.1148 for heavy vehicles. Over these biennia the gap between the heavy and light equity ratios ranged from 0.7 percent to 20.6 percent.

EXHIBIT 6-2: COMPARISON OF EQUITY RATIOS FROM PREVIOUS OREGON HCASs

Declared Weight in Pounds			Study Year					
			2015	2017	2019	2021	2023	2025
1	to	10,000	0.9974	1.0076	0.9882	0.9361	0.8769	0.8935
10,001	to	26,000	1.0498	1.0993	1.0818	1.0645	1.0702	1.1312
26,001	to	78,000	0.9031	0.7705	0.8255	0.7043	0.9977	0.7934
78,001	to	80,000	1.3423	1.2065	1.3184	1.4935	1.7345	1.4233
80,001	to	104,000	0.6929	0.7513	0.7812	0.9571	0.9852	0.9768
104,001	to	105,500	0.7325	0.7219	0.7199	0.9277	1.0326	1.9836
105,501	and	up	0.2406	0.3133	0.1565	0.2916	0.3013	0.2591
		Total	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**
10,001	and	up	1.0047	0.9865	1.0239	1.1418	1.3249	1.2595
26,001	to	80,000	1.2680	1.1310	1.2204	1.3155	1.6177	1.3028
80,001	to	105,500	0.7109	0.7348	0.7464	0.9397	1.0126	1.3901
26,001	to	105,500	1.0194	0.9847	1.0502	1.1776	1.4032	1.3227
26,001	and	up	0.9986	0.9712	1.0162	1.1519	1.3621	1.2722

The 2023 study found adjusted equity ratios of 0.8769 for light vehicles and 1.3249 for heavy vehicles. The gap between the heavy and light equity ratios in 2023 is partially attributable to proposed rate and fee changes made by the legislature in HB 2017. The gap in the 2023 study is larger than in the biennia preceding it and is the result of a combination of factors including the mix of highway investments, updated pavement factors and changes in tax rates. We discuss these factors in more detail below.

The 2025 study found adjusted equity ratios of 0.8935 for light vehicles and 1.2595 for heavy vehicles. This result shows a narrowing of the gap between the heavy and light equity ratios.

EXHIBIT 6-3: DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
1	0	32,745,213,630	32,471,814,564	1,635,075,258	1,621,423,552	1,022,749,288	1,016,176,696	0.8769
10,001	0	159,249,762	130,726,493	10,462,251	8,588,354	7,920,866	6,933,693	1.1296
12,001	0	85,717,760	68,212,301	6,269,753	4,989,331	4,628,612	3,984,109	1.1173
14,001	0	195,999,116	158,441,654	14,875,507	12,025,053	11,707,671	10,070,561	1.1717
16,001	0	92,483,055	81,611,002	7,880,852	6,954,400	6,566,056	6,119,900	1.2313
18,001	0	144,287,439	123,019,246	12,833,647	10,941,947	11,036,994	10,102,290	1.2918
20,001	0	24,999,071	16,437,239	2,761,154	1,815,497	1,652,615	1,303,795	1.0048
22,001	0	31,733,508	19,684,200	4,146,989	2,572,365	2,201,673	1,724,781	0.9381
24,001	0	275,308,143	205,666,940	40,477,216	30,238,209	23,736,435	19,516,797	0.9031
26,001	0	24,767,283	13,789,547	3,634,037	2,023,303	1,250,222	1,177,542	0.8143
28,001	0	16,393,542	3,370,121	2,687,963	552,581	719,313	327,509	0.8293
30,001	0	98,655,144	12,967,534	14,593,002	1,918,149	2,029,524	1,219,352	0.8894
32,001	0	29,702,173	22,040,104	5,245,724	3,892,520	2,358,414	2,191,280	0.7876
34,001	0	11,448,987	4,234,596	1,725,666	638,266	590,315	436,088	0.9560
36,001	0	5,016,504	2,359,511	987,762	464,593	298,017	251,255	0.7567
38,001	0	46,175,222	8,809,789	5,931,168	1,131,610	1,192,128	972,459	1.2024
40,001	0	3,293,446	2,478,975	548,471	412,834	329,192	296,697	1.0056
42,001	0	4,160,795	2,386,018	897,664	514,768	393,557	310,521	0.8440
44,001	0	32,294,562	26,355,412	6,197,672	5,057,886	3,906,764	3,580,681	0.9905
46,001	0	13,898,812	8,284,560	2,762,181	1,646,432	1,505,864	1,188,745	1.0102
48,001	0	19,829,194	13,517,022	4,179,890	2,849,317	2,282,286	1,936,053	0.9507
50,001	0	12,222,491	10,172,901	2,520,913	2,098,181	1,508,016	1,412,624	0.9420
52,001	0	31,330,431	26,703,698	5,969,571	5,088,012	4,127,189	3,906,442	1.0742
54,001	0	33,489,520	30,056,642	7,248,558	6,505,537	4,722,465	4,548,952	0.9784
56,001	0	13,260,965	12,962,027	3,616,033	3,534,518	1,944,531	1,932,974	0.7652
58,001	0	16,197,012	15,100,914	3,694,913	3,444,867	2,413,860	2,354,893	0.9565
60,001	0	5,006,128	4,803,045	1,221,757	1,172,195	778,074	767,930	0.9166
62,001	0	7,037,122	6,804,045	2,211,313	2,138,072	1,147,388	1,138,768	0.7452
64,001	0	9,228,832	8,919,624	2,156,909	2,084,643	1,566,840	1,557,235	1.0452
66,001	0	2,643,090	2,522,957	601,901	574,544	475,582	472,906	1.1516

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
68,001	0	9,266,012	9,109,358	1,832,415	1,801,436	1,793,857	1,788,830	1.3894
70,001	0	5,778,691	5,587,618	1,008,185	974,849	1,178,279	1,173,665	1.6845
72,001	0	2,986,677	2,814,525	455,438	429,186	628,087	621,561	2.0263
74,001	0	7,340,349	7,089,020	1,573,177	1,519,313	1,632,757	1,625,473	1.4969
76,001	0	2,273,287	1,941,330	430,630	367,747	495,747	483,630	1.8401
78,001	0	1,385,927,014	1,370,797,467	283,530,018	280,434,847	348,141,941	347,650,467	1.7345
80,001	5	4,809,221	4,729,701	1,821,175	1,791,062	1,040,776	1,041,169	0.8133
80,001	6	343,715	336,005	132,124	129,160	79,903	79,641	0.8627
80,001	7	249,908	243,766	106,675	104,053	55,027	54,798	0.7368
80,001	8	442	430	13,025	12,694	94	94	0.0103
80,001	9	310	302	1,210	1,180	63	62	0.0741
82,001	5	6,213,633	6,077,822	2,325,726	2,274,893	1,609,985	1,606,627	0.9881
82,001	6	1,508,099	1,476,233	440,577	431,267	351,140	350,362	1.1367
82,001	7	51,485	50,323	32,815	32,074	11,636	11,597	0.5059
82,001	8	40,596	39,680	19,725	19,280	8,743	8,712	0.6322
82,001	9	0	0	743	0	0	0	
84,001	5	7,871,824	7,406,691	3,126,094	2,941,378	2,062,602	2,047,929	0.9742
84,001	6	4,533,658	4,273,034	1,473,603	1,388,891	1,089,186	1,079,570	1.0875
84,001	7	498,145	469,348	156,861	147,794	111,002	109,964	1.0410
84,001	8	130,636	122,514	44,820	42,034	28,230	27,886	0.9282
84,001	9	617	579	1,278	1,199	127	125	0.1465
86,001	5	1,940,986	1,901,722	808,741	792,381	462,341	462,624	0.8169
86,001	6	13,433,795	13,170,384	5,200,301	5,098,333	2,991,469	2,988,919	0.8203
86,001	7	653,393	632,709	252,673	244,675	153,347	152,457	0.8718
86,001	8	82,445	79,794	84,674	81,951	18,564	18,442	0.3149
86,001	9	893	864	7,431	7,192	191	190	0.0369
88,001	5	5,094,656	4,964,629	1,251,911	1,219,959	1,388,094	1,385,934	1.5895
88,001	6	36,343,347	35,691,645	11,427,843	11,222,921	7,900,100	7,902,279	0.9852
88,001	7	703,478	684,722	296,263	288,364	159,372	158,826	0.7706
88,001	8	342,040	333,505	133,865	130,525	72,876	72,637	0.7786
88,001	9	3,477	3,370	2,511	2,433	754	749	0.4308

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
90,001	5	928,254	903,986	232,295	226,222	272,401	271,678	1.6803
90,001	6	4,780,806	4,677,932	2,329,261	2,279,139	1,132,943	1,131,476	0.6946
90,001	7	507,837	493,792	351,279	341,564	120,282	119,708	0.4904
90,001	8	19,759	19,199	13,025	12,656	4,517	4,491	0.4965
90,001	9	8,202	7,970	1,531	1,488	1,783	1,772	1.6671
92,001	5	1,194,531	1,135,888	325,114	309,153	371,882	369,793	1.6736
92,001	6	1,401,225	1,347,592	598,237	575,338	359,886	358,493	0.8718
92,001	7	1,675,516	1,600,108	912,692	871,615	390,267	387,879	0.6226
92,001	8	166,328	158,287	65,379	62,218	37,584	37,280	0.8384
92,001	9	248	235	451	428	54	53	0.1743
94,001	5	674,714	659,860	234,733	229,565	175,877	176,480	1.0756
94,001	6	4,737,582	4,602,720	1,440,794	1,399,780	1,229,959	1,227,952	1.2274
94,001	7	15,281,184	14,728,602	5,590,576	5,388,416	3,724,039	3,705,856	0.9623
94,001	8	580,387	560,105	271,586	262,096	133,505	132,852	0.7092
94,001	9	3,884	3,740	10,548	10,158	860	854	0.1177
96,001	5	2,269,146	2,240,871	623,683	615,912	744,707	744,341	1.6909
96,001	6	5,475,532	5,430,895	1,644,183	1,630,780	1,383,954	1,384,077	1.1875
96,001	7	26,058,248	25,712,538	9,933,312	9,801,528	6,569,361	6,557,192	0.9360
96,001	8	1,610,668	1,588,703	665,294	656,221	378,229	377,497	0.8049
96,001	9	235,036	231,831	237,323	234,087	45,035	45,023	0.2691
98,001	5	16	16	2,251	2,204	1	1	
98,001	6	1,282,093	1,263,656	382,208	376,712	341,310	341,274	1.2675
98,001	7	7,800,145	7,656,839	3,067,929	3,011,565	1,946,897	1,942,781	0.9026
98,001	8	890,067	871,663	362,856	355,353	214,667	213,985	0.8425
98,001	9	36,521	35,766	4,249	4,161	8,324	8,295	2.7893
100,001	5	4,448	4,448	1,156	1,156	862	862	
100,001	6	44,990	44,990	9,205	9,205	7,714	7,714	1.1726
100,001	7	9,193,204	9,084,290	2,986,623	2,951,240	2,375,759	2,373,133	1.1251
100,001	8	9,924,763	9,796,532	3,101,189	3,061,121	2,447,522	2,443,813	1.1170
100,001	9	15,835	15,631	2,228	2,199	3,672	3,666	2.3329

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
102,001	5	5,313	5,313	1,474	1,474	935	935	
102,001	6	4,807	4,807	2,387	2,387	2,772	2,772	1.6248
102,001	7	3,591,532	3,563,728	1,918,250	1,903,400	926,436	925,798	0.6805
102,001	8	38,073,870	37,734,457	12,413,561	12,302,899	9,577,611	9,566,314	1.0879
102,001	9	28,360	28,107	3,800	3,766	6,689	6,680	2.4817
104,001	5	78,652	78,652	39,107	39,107	11,010	11,010	0.3939
104,001	6	162,530	162,530	53,460	53,460	26,168	26,168	0.6849
104,001	7	96,046,182	92,877,244	32,908,921	31,823,127	25,573,323	25,481,255	1.1203
104,001	8	205,909,315	198,951,021	74,121,286	71,616,505	51,932,409	51,703,618	1.0101
104,001	9	3,273,528	3,164,800	2,173,916	2,101,711	736,381	733,860	0.4885
106,001	5	0	0	181	0	3	0	
106,001	6	31,234	31,234	137,157	137,157	21,743	21,743	0.2218
106,001	7	36,100	36,100	141,907	141,907	14,661	14,661	0.1446
106,001	8	5,281	5,281	21,181	21,181	1,458	1,458	0.0963
106,001	9	1,803	1,803	6,036	6,036	426	426	0.0987
108,001	5	0	0	0	0	0	0	
108,001	6	49,411	49,411	225,675	225,675	36,373	36,373	0.2255
108,001	7	99,977	99,977	398,917	398,917	44,602	44,602	0.1564
108,001	8	8,471	8,471	34,640	34,640	2,424	2,424	0.0979
108,001	9	7,535	7,535	41,506	41,506	1,779	1,779	0.0600
110,001	5	0	0	0	0	0	0	
110,001	6	22,620	22,620	115,808	115,808	19,139	19,139	0.2312
110,001	7	28,572	28,572	118,592	118,592	13,318	13,318	0.1571
110,001	8	6,213	6,213	24,053	24,053	1,902	1,902	0.1106
110,001	9	4,246	4,246	14,899	14,899	1,088	1,088	0.1021
112,001	5	0	0	0	0	0	0	
112,001	6	29,770	29,770	150,819	150,819	26,083	26,083	0.2420
112,001	7	25,695	25,695	109,761	109,761	12,491	12,491	0.1592
112,001	8	2,840	2,840	12,132	12,132	955	955	0.1101
112,001	9	869	869	3,863	3,863	240	240	0.0869

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
114,001	5	0	0	0	0	0	0	
114,001	6	36,813	36,813	188,447	188,447	33,357	33,357	0.2477
114,001	7	103,248	103,248	423,908	423,908	52,256	52,256	0.1725
114,001	8	5,348	5,348	24,860	24,860	2,119	2,119	0.1192
114,001	9	1,988	1,988	10,005	10,005	549	549	0.0768
116,001	5	0	0	0	0	0	0	
116,001	6	15,879	15,879	83,785	83,785	15,658	15,658	0.2615
116,001	7	56,791	56,791	237,987	237,987	31,015	31,015	0.1823
116,001	8	5,375	5,375	22,627	22,627	2,183	2,183	0.1350
116,001	9	2,438	2,438	9,846	9,846	697	697	0.0991
118,001	5	0	0	1,869	0	0	0	
118,001	6	41,396	41,396	221,574	221,574	44,133	44,133	0.2787
118,001	7	127,979	127,979	568,112	568,112	76,292	76,292	0.1879
118,001	8	32,863	32,863	129,085	129,085	14,661	14,661	0.1589
118,001	9	20,783	20,783	73,337	73,337	6,362	6,362	0.1214
120,001	5	0	0	0	0	0	0	
120,001	6	29,899	29,899	162,880	162,880	33,371	33,371	0.2867
120,001	7	24,808	24,808	118,453	118,453	15,781	15,781	0.1864
120,001	8	2,628	2,628	13,500	13,500	1,225	1,225	0.1270
120,001	9	1,080	1,080	5,216	5,216	363	363	0.0974
122,001	5	0	0	0	0	0	0	
122,001	6	5,946	5,946	35,555	35,555	7,052	7,052	0.2775
122,001	7	36,467	36,467	170,489	170,489	24,656	24,656	0.2023
122,001	8	4,623	4,623	20,386	20,386	2,340	2,340	0.1606
122,001	9	430	430	3,878	3,878	170	170	0.0614
124,001	5	0	0	0	0	0	0	
124,001	6	16,353	16,353	98,648	98,648	21,359	21,359	0.3029
124,001	7	121,104	121,104	540,363	540,363	86,726	86,726	0.2246
124,001	8	12,386	12,386	55,037	55,037	6,517	6,517	0.1657
124,001	9	2,394	2,394	12,528	12,528	972	972	0.1086

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
126,001	5	0	0	0	0	0	0	
126,001	6	5,391	5,391	33,654	33,654	7,364	7,364	0.3062
126,001	7	58,856	58,856	284,263	284,263	44,503	44,503	0.2190
126,001	8	11,836	11,836	52,821	52,821	6,464	6,464	0.1712
126,001	9	2,177	2,177	10,154	10,154	928	928	0.1278
128,001	5	0	0	0	0	0	0	
128,001	6	1,824	1,824	12,384	12,384	2,729	2,729	0.3083
128,001	7	143,386	143,386	701,761	701,761	118,455	118,455	0.2362
128,001	8	23,381	23,381	105,626	105,626	13,938	13,938	0.1846
128,001	9	3,785	3,785	19,058	19,058	1,688	1,688	0.1240
130,001	5	0	0	0	0	0	0	
130,001	6	0	0	372	0	0	0	
130,001	7	67,923	67,923	328,335	328,335	60,868	60,868	0.2594
130,001	8	14,852	14,852	67,415	67,415	9,448	9,448	0.1961
130,001	9	2,623	2,623	11,559	11,559	1,223	1,223	0.1480
132,001	5	0	0	0	0	0	0	
132,001	6	341	341	2,475	2,475	588	588	0.3323
132,001	7	53,647	53,647	285,954	285,954	50,757	50,757	0.2484
132,001	8	12,352	12,352	60,031	60,031	8,104	8,104	0.1889
132,001	9	740	740	4,902	4,902	345	345	0.0984
134,001	5	0	0	0	0	0	0	
134,001	6	121	121	1,888	1,888	224	224	0.1662
134,001	7	113,048	113,048	592,072	592,072	111,480	111,480	0.2634
134,001	8	23,881	23,881	115,817	115,817	16,624	16,624	0.2008
134,001	9	6,491	6,491	30,239	30,239	3,285	3,285	0.1520
136,001	5	0	0	0	0	0	0	
136,001	6	0	0	1	0	0	0	
136,001	7	50,137	50,137	268,158	268,158	54,455	54,455	0.2841
136,001	8	27,062	27,062	130,393	130,393	19,921	19,921	0.2138
136,001	9	6,195	6,195	25,152	25,152	3,260	3,260	0.1813

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
138,001	5	0	0	0	0	0	0	
138,001	6	203	203	1,669	1,669	444	444	0.3725
138,001	7	102,081	102,081	557,627	557,627	115,977	115,977	0.2910
138,001	8	46,926	46,926	234,533	234,533	36,420	36,420	0.2173
138,001	9	7,179	7,179	34,035	34,035	3,920	3,920	0.1612
140,001	5	0	0	0	0	0	0	
140,001	6	0	0	0	0	0	0	
140,001	7	30,864	30,864	175,569	175,569	37,226	37,226	0.2967
140,001	8	29,690	29,690	148,485	148,485	25,122	25,122	0.2367
140,001	9	2,437	2,437	12,183	12,183	1,379	1,379	0.1584
142,001	5	0	0	0	0	0	0	
142,001	6	0	0	0	0	0	0	
142,001	7	27,989	27,989	202,361	202,361	36,558	36,558	0.2528
142,001	8	48,787	48,787	245,071	245,071	44,207	44,207	0.2524
142,001	9	5,792	5,792	24,123	24,123	3,569	3,569	0.2070
144,001	5	0	0	0	0	0	0	
144,001	6	0	0	0	0	0	0	
144,001	7	54,204	54,204	335,874	335,874	74,050	74,050	0.3085
144,001	8	52,122	52,122	270,906	270,906	49,314	49,314	0.2547
144,001	9	7,260	7,260	36,804	36,804	4,618	4,618	0.1756
146,001	5	0	0	0	0	0	0	
146,001	6	0	0	0	0	0	0	
146,001	7	106,176	106,176	740,887	740,887	157,791	157,791	0.2980
146,001	8	49,027	49,027	264,721	264,721	47,366	47,366	0.2503
146,001	9	5,107	5,107	25,022	25,022	3,351	3,351	0.1874
148,001	5	0	0	0	0	0	0	
148,001	6	0	0	0	0	0	0	
148,001	7	21,585	21,585	146,494	146,494	33,588	33,588	0.3208
148,001	8	66,106	66,106	367,072	367,072	70,477	70,477	0.2686
148,001	9	16,693	16,693	77,938	77,938	11,286	11,286	0.2026

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
150,001	5	0	0	0	0	0	0	
150,001	6	0	0	0	0	0	0	
150,001	7	12,091	12,091	83,673	83,673	19,783	19,783	0.3308
150,001	8	21,192	21,192	120,855	120,855	23,229	23,229	0.2689
150,001	9	11,009	11,009	48,645	48,645	7,884	7,884	0.2268
152,001	5	0	0	0	0	0	0	
152,001	6	0	0	0	0	0	0	
152,001	7	74	74	603	603	128	128	0.2974
152,001	8	43,531	43,531	254,065	254,065	50,328	50,328	0.2772
152,001	9	6,455	6,455	30,075	30,075	4,752	4,752	0.2211
154,001	5	0	0	0	0	0	0	
154,001	6	0	0	0	0	0	0	
154,001	7	335	335	2,829	2,829	605	605	0.2990
154,001	8	37,977	37,977	230,737	230,737	45,046	45,046	0.2732
154,001	9	13,095	13,095	73,834	73,834	10,163	10,163	0.1926
156,001	5	0	0	0	0	0	0	
156,001	6	0	0	0	0	0	0	
156,001	7	0	0	87	0	0	0	
156,001	8	34,803	34,803	221,815	221,815	44,761	44,761	0.2823
156,001	9	7,667	7,667	37,678	37,678	6,717	6,717	0.2494
158,001	5	0	0	0	0	0	0	
158,001	6	0	0	0	0	0	0	
158,001	7	0	0	87	0	0	0	
158,001	8	61,501	61,501	400,104	400,104	81,558	81,558	0.2852
158,001	9	32,101	32,101	161,144	161,144	29,088	29,088	0.2526
160,001	5	0	0	0	0	0	0	
160,001	6	0	0	0	0	0	0	
160,001	7	0	0	12	0	0	0	
160,001	8	11,790	11,790	85,023	85,023	16,224	16,224	0.2670
160,001	9	5,888	5,888	31,322	31,322	5,571	5,571	0.2488

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
162,001	5	0	0	0	0	0	0	
162,001	6	0	0	0	0	0	0	
162,001	7	0	0	0	0	0	0	
162,001	8	4,992	4,992	40,952	40,952	7,469	7,469	0.2552
162,001	9	10,520	10,520	53,058	53,058	10,374	10,374	0.2736
164,001	5	0	0	0	0	0	0	
164,001	6	0	0	0	0	0	0	
164,001	7	0	0	204	0	0	0	
164,001	8	11,778	11,778	88,498	88,498	18,328	18,328	0.2898
164,001	9	35,639	35,639	180,739	180,739	37,995	37,995	0.2941
166,001	5	0	0	0	0	0	0	
166,001	6	0	0	0	0	0	0	
166,001	7	0	0	0	0	0	0	
166,001	8	11,982	11,982	90,020	90,020	19,364	19,364	0.3010
166,001	9	14,469	14,469	73,745	73,745	16,149	16,149	0.3064
168,001	5	0	0	0	0	0	0	
168,001	6	0	0	0	0	0	0	
168,001	7	301	301	3,389	3,389	749	749	0.3093
168,001	8	12,023	12,023	96,456	96,456	20,514	20,514	0.2976
168,001	9	40,615	40,615	209,699	209,699	47,768	47,768	0.3187
170,001	5	0	0	0	0	0	0	
170,001	6	0	0	0	0	0	0	
170,001	7	0	0	0	0	0	0	
170,001	8	3,690	3,690	29,728	29,728	6,517	6,517	0.3067
170,001	9	20,530	20,530	103,025	103,025	24,762	24,762	0.3363
172,001	5	0	0	0	0	0	0	
172,001	6	0	0	0	0	0	0	
172,001	7	62	62	808	808	171	171	0.2959
172,001	8	1	1	142	142	1	1	0.0130
172,001	9	17,371	17,371	97,928	97,928	22,688	22,688	0.3242

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
174,001	5	0	0	0	0	0	0	
174,001	6	0	0	0	0	0	0	
174,001	7	0	0	0	0	0	0	
174,001	8	0	0	60	0	0	0	
174,001	9	69,271	69,271	355,298	355,298	93,248	93,248	0.3672
176,001	5	0	0	0	0	0	0	
176,001	6	0	0	0	0	0	0	
176,001	7	0	0	1	0	0	0	
176,001	8	0	0	11	0	0	0	
176,001	9	11,789	11,789	67,995	67,995	16,459	16,459	0.3387
178,001	5	0	0	0	0	0	0	
178,001	6	0	0	0	0	0	0	
178,001	7	0	0	0	0	0	0	
178,001	8	318	318	2,945	2,945	677	677	0.3215
178,001	9	56,907	56,907	318,753	318,753	85,140	85,140	0.3737
180,001	5	0	0	0	0	0	0	
180,001	6	0	0	0	0	0	0	
180,001	7	0	0	0	0	0	0	
180,001	8	0	0	0	0	0	0	
180,001	9	22,286	22,286	115,449	115,449	34,680	34,680	0.4203
182,001	5	0	0	0	0	0	0	
182,001	6	0	0	0	0	0	0	
182,001	7	0	0	0	0	0	0	
182,001	8	0	0	0	0	0	0	
182,001	9	16,041	16,041	99,225	99,225	25,925	25,925	0.3656
184,001	5	0	0	0	0	0	0	
184,001	6	0	0	0	0	0	0	
184,001	7	0	0	0	0	0	0	
184,001	8	268	268	2,877	2,877	652	652	0.3169
184,001	9	49,069	49,069	296,006	296,006	83,718	83,718	0.3957

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
186,001	5	0	0	0	0	0	0	
186,001	6	0	0	0	0	0	0	
186,001	7	0	0	0	0	0	0	
186,001	8	0	0	0	0	0	0	
186,001	9	25,187	25,187	143,336	143,336	43,980	43,980	0.4293
188,001	5	0	0	0	0	0	0	
188,001	6	0	0	0	0	0	0	
188,001	7	0	0	0	0	0	0	
188,001	8	31	31	80	80	84	84	1.4568
188,001	9	45,452	45,452	279,675	279,675	83,002	83,002	0.4152
190,001	5	0	0	0	0	0	0	
190,001	6	0	0	0	0	0	0	
190,001	7	0	0	0	0	0	0	
190,001	8	0	0	0	0	0	0	
190,001	9	35,366	35,366	203,651	203,651	67,766	67,766	0.4656
192,001	5	0	0	0	0	0	0	
192,001	6	0	0	0	0	0	0	
192,001	7	0	0	0	0	0	0	
192,001	8	0	0	0	0	0	0	
192,001	9	17,420	17,420	112,802	112,802	34,773	34,773	0.4313
194,001	5	0	0	0	0	0	0	
194,001	6	0	0	0	0	0	0	
194,001	7	0	0	0	0	0	0	
194,001	8	0	0	6	0	0	0	
194,001	9	52,146	52,146	315,410	315,410	107,219	107,219	0.4756
196,001	5	0	0	0	0	0	0	
196,001	6	0	0	0	0	0	0	
196,001	7	0	0	0	0	0	0	
196,001	8	0	0	0	0	0	0	
196,001	9	27,245	27,245	168,376	168,376	58,743	58,743	0.4881

EXHIBIT 6-3 (CONTINUED): DETAILED COMPARISON OF AVERAGE ANNUAL COST RESPONSIBILITY AND USER FEES PAID BY FULL-FEE-PAYING VEHICLES BY DECLARED WEIGHT CLASS

Weight Class	Axles	Annual VMT		Annual Cost Responsibility		Annual User Fees		Full-Fee Scaled Equity Ratio
		All	Full-Fee	All	Full-Fee	All	Full-Fee	
198,001	5	0	0	0	0	0	0	
198,001	6	0	0	0	0	0	0	
198,001	7	0	0	0	0	0	0	
198,001	8	0	0	0	0	0	0	
198,001	9	106,620	106,620	671,428	671,428	235,218	235,218	0.4902
200,001	5	0	0	0	0	0	0	
200,001	6	0	0	0	0	0	0	
200,001	7	0	0	0	0	0	0	
200,001	8	0	0	0	0	0	0	
200,001	9	348,997	348,997	2,208,685	2,208,685	794,362	794,362	0.5032

As stated in the introduction to this report, the purpose of this 2025 Oregon Highway Cost Allocation Study (HCAS) is to:

1. determine the share that each class of road users should pay based on the respective share of costs for maintenance, operation, and improvement of Oregon's highways, roads, and streets attributable to their use; and
2. if necessary, recommend adjustments to existing tax rates and fees to bring about a closer match between payments and responsibilities for each vehicle class.

A principal finding of this study is that equity ratios for full-fee-paying vehicles, the ratio of projected payments to responsibilities for vehicles in each class, are **0.8935** for light vehicles and **1.2595** for heavy vehicles. Under existing tax rates and fees, light vehicles are projected to underpay their responsibility by 10.7 percent whereas heavy vehicles are projected to overpay by 26.0 percent during the next biennium.

This finding is a continuation of recent trends that depart from a historical pattern of equity. An examination of equity ratios from previous HCAS reports over the last decade, as seen in Exhibit 7-1 below, demonstrates that equity between light-duty and heavy vehicles has been relatively stable until 2021.

EXHIBIT 7-1: EQUITY RATIOS FROM PREVIOUS HCAS REPORTS

	Equity Ratio, Full-Fee	
	Basic	Heavy
2011	1.00	1.01
2013	0.99	1.01
2015	1.00	1.00
2017	1.01	0.99
2019	0.99	1.02
2021	0.94	1.14
2023	0.88	1.32
2025	0.89	1.26

This substantial shift in equity beginning in the 2021 study and continuing through the 2025 study necessitates some additional exploration of factors contributing to this change. As is always the case, the current HCAS relies upon new forecasts of both vehicle miles traveled and transportation revenues for the upcoming biennium. The revenue forecasts serve to provide control totals for the revenue that is attributed to each vehicle class, and the vehicle-miles-traveled forecasts are used in the apportionment of costs to classes of vehicles. Miles driven, in combination with weigh-in-motion data, contributes to a process for deriving pavement damage costs. And each new HCAS study involves a projection of transportation-related expenditures at the programmatic level and on individual transportation projects. Finally, any changes in tax rates are also incorporated into the revenue apportionment process. Any and all of these factors can play a role in changing the equity ratios that are produced by the HCAS modeling.

CHANGES IN EXPENDITURES OVER TIME

The principal factor contributing to the changes in equity ratios is the mix of project and non-project expenditures associated with each biennium. An examination of expenditure patterns going back to the 2017-2019 biennium reveals some expenditure trends that have shifted cost responsibility toward basic vehicles and away from heavy vehicles. Expenditures in the following categories (as shares of total expenditures during the biennium) are notable:

- Administration has decreased from 24 percent in 2017, to 19 percent in 2025
- Pavement-specific maintenance (not part of general maintenance and operations) has decreased from 13 percent in 2017, to 8 percent in 2025
- Preservation has decreased from 5 percent in 2017, to 1 percent in 2025
- Bike and Pedestrian has increased: from 3 percent in 2017, to 10 percent in 2025
- Bridge and Interchange has increased from 2 percent in 2017, to 8 percent in 2025
- Preliminary Engineering has increased from 3 percent in 2017, to 7 percent in 2025

The net result is the share of total costs that are attributable to light-duty vehicles has increased starting in 2019, with the only year-over-year decrease recorded during this period being from 2023 to 2025, as seen in Exhibit 7-2 below.

EXHIBIT 7-2: SHARE OF COST RESPONSABILITY 2017-2025

Share of Cost Responsibility					
Declared Weight	**2017**	**2019**	**2021**	**2023**	**2025**
1 to 10,000	66.4%	66.9%	68.9%	72.5%	70.9%
10,001 to 26,000	4.0%	3.9%	3.6%	3.5%	2.6%
26,001 and up	29.6%	29.2%	27.5%	24.0%	26.5%
Total	100%	100%	100%	100%	100%

OTHER CHANGES

The share of total user fees attributable to light-duty vehicles has declined during this same time, but in a less dramatic fashion. The share of total user fees that are attributable to basic and heavy vehicles since 2017 is shown in Exhibit 7-3 below.

EXHIBIT 7-3: SHARE OF USER FEES 2017-2025

Share of User Fees					
Declared Weight	**2017**	**2019**	**2021**	**2023**	**2025**
1 to 10,000	64.8%	66.1%	64.5%	63.6%	63.4%
10,001 to 26,000	4.4%	4.2%	3.8%	3.7%	3.0%
26,001 and up	30.8%	29.7%	31.7%	32.7%	33.7%
Total	100%	100%	100%	100%	100%

And finally, the allocation of pavement costs is an important step in determining equity ratios since heavy vehicles are responsible for a significant portion of pavement damages. Beginning in 2023 the HCAS study has made use of a new source of information (new state data vendor) for weigh-in-motion records. The share of light-duty vehicles on some functional classes has increased in the new data set which has resulted in a slight shift in the allocation of pavement costs to light-duty vehicles. This finding is likely an improvement in data rather than a change in the actual share of vehicles on various parts of the state road network.

HIGHWAY COST ALLOCATION LOOKBACK STUDY

In September 2024, the Oregon State University conducted a *Highway Cost Allocation Study Review: A Three Biennia Lookback Study*. The study replicated HCAS results from the three biennia and then substituted actual expenditure and revenue data for the projected data to determine differences between actual and projected equity ratios. The study recommendations were as follows:

After completing the evaluation of the HCAS models for the 2017-2019, 2019-2021, and 2021-2023 biennia, the OSU research team recommends the following to OEA:

1. *perform further research on the limitations of the HCAS model,*
2. *streamline the coding of project WorkTypes, and*
3. *improve the documentation on project WorkType and Bridge Type Coding process.*

During the preparation of the 2025-2027 HCAS these recommendations have been implemented. The coding and documentation of WorkTypes has been a specific focus of the Study Review Team and has involved ODOT project delivery and engineering staff expertise. The limitations of the HCAS model, as encountered by the OSU staff have also been evaluated. The specific problems encountered by the OSU team appear to be related to the use of unanticipated input data, including the presence of negative values for project costs. In addition, while actual data was made available for project expenditures and user fee revenue, no updates to the forecast for vehicle miles traveled were used in the Lookback Study which introduces some inconsistency in the core data elements in the modeling. These limitations can all be easily addressed in future Lookback analysis with some additional data preparation guidance.

In spite of these limitations there are other important findings from the Lookback Study. Specifically, the Lookback Study:

- Replicated previous HCAS results and findings.
- Highlighted areas for additional documentation regarding project expenditure classification.
- Resulted in an improved process for classifying projects by type of work performed.

- Documented differences in actual expenditure and revenue compared with projections.
- Found that changes in equity ratios for actual as compared with projections are largely explained by differences in expenditures, and to a lesser degree by differences in revenues.
- Verified the challenges presented by the pandemic with respect to forecasting vehicle usage, expenditures, and revenues.

An important question is what happened "on the ground" to explain the differences in actual as compared with projected equity ratios. The notable factors explaining those differences for the most recent biennium, the period during which the actual data inputs are most comprehensive and consistent, appear to be as follows:

- Actual revenues in 2021-23 were 0.5 percent lower than projected.
- Actual expenditures in 2021-23 were 15.3 percent lower than projected.
- Equity ratio for basic vehicles: actual = 0.91, projected = 0.93.
- Equity ratio for heavy vehicles: actual = 1.22, projected = 1.16.
- Actual expenditure types substantially lower than projected included:
    - Modernization (37 percent decrease)
    - Preservation (85 percent decrease)
    - Pavement and Shoulder Rehabilitation (55 percent decrease)
    - Bike and Pedestrian (57 percent decrease)
- Actual expedinture types substantially higher than projected included:
    - Preliminary Engineering (29 percent increase)

Future applications of the Lookback methodology can be streamlined and made more consistent with the underlying HCAS modeling. Lookback findings from the most recent biennium where actual data is available can be incorporated into the general HCAS reporting. Over time, it is possible that trends in actual versus projected expenditures, revenues, and highway system utilization may emerge. Those trends may suggest specific improvements to forecasting methods, project delivery and HCAS modeling. And those trends may also suggest further action for the Legislature to consider with regard to tax rate setting.

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CHAPTER 8: RECOMMENDATIONS FOR CHANGES IN TAX RATES

GENERAL RECOMMENDATIONS

Based on findings from the HCAS analysis the Study Review Team has developed the following general recommendations for legislative consideration and for guidance in conducting future HCAS studies:

- Tax rates should be adjusted such that basic and heavy vehicles have equity ratios that fall within an acceptable range.
- Acceptable equity ratios can be achieved through an increase in the taxes on light-duty vehicles (motor fuels and registration fees) and a decrease in taxes on heavy vehicles (weight mile tax and other heavy vehicles fees).
- Absent the development of a new funding package, tax rate adjustments should result in no net gain or loss of user fee revenues.
- Any new funding package should include new revenue that is cost responsible.
- Future HCAS studies should incorporate results from evaluating actual versus projected revenues and costs for the most recent biennium for which comprehensive data is available.
- Forthcoming HCAS white papers relating to Section 75 analysis and medium heavy vehicle data may result in changes to HCAS methods and may suggest other legislative actions.

BALANCING LIGHT AND HEAVY VEHICLE TAX RATES

The findings of the 2025 HCAS study indicate that during the upcoming biennium heavy vehicles will pay a higher share of user fees than the share of costs that are allocated to those heavy vehicles. There is expected to be a corresponding underpaying of user fees for basic, or light-duty, vehicles. The HCAS model permits the testing of alternative tax rates that can bring equity ratios closer to balance.

To address the inequity between basic and heavy vehicles while keeping total user fee revenues approximately constant (i.e. revenue neutral), the tax rate on motor fuels would need to be increased as would the light-duty registration fees. The medium duty registration fees would need to be reduced and the rates for the weight mile tax would need to be decreased.

For light-duty vehicles the tax on motor fuels would need to be increased from $0.40 per gallon to $0.46 per gallon and the registration fees would need to increase by 7 percent.

Within the various classes of heavy vehicles, there are inequities that the legislature could choose to address through changes to the rate structure. In this chapter, we offer alternative rate schedules that, if implemented, would bring about greater equity within heavy vehicle classes without materially changing the total amount of revenue collected from heavy vehicles.

The inequities within heavy vehicle classes may be generalized (for details see Exhibit 6-3) as follows:

- Vehicles between 10,001 and 26,000 pounds are paying more than their fair share.
- Vehicles weighing between 26,001 and 78,000 pounds are paying less than their fair share.
- Vehicles with a declared weight of 78,001 to 80,000 pounds (which account for 59.0 percent of vehicle miles by full-fee-paying vehicles over 26,000 pounds) are paying more than their fair share.
- Vehicles weighing more than 80,000 pounds are paying more than their fair share.

To achieve equity for the medium duty vehicles (10,001 and 26,000 pounds) registration rates for these vehicles would need to be reduced to 85 percent of their current rates.

To achieve equity within heavy vehicle classes, several rate schedules would need to be changed. These include the Table A and Table B weight-mile tax rates; the optional flat fee rates for haulers of logs, sand and gravel, and wood chips; and the road use assessment fee applicable to vehicles operated under single-trip, non-divisible load permits at gross weights over 98,000 pounds.

WEIGHT MILE TAX RATE TABLE A AND TABLE B RATES

Commercial vehicles operated at declared weights of 26,001 to 105,500 pounds are subject to the weight-mile tax for their Oregon miles of travel. Operators of vehicles with declared weights of 26,001-80,000 pounds pay the statutory Table A rates. Vehicles operated under special annual permits at declared weights of 80,001-105,500 pounds are subject to the statutory Table B rates. The rates for 2024 range from 7.64 cents per mile for vehicles declared at 26,001-28,000 pounds to 25.12 cents per mile for vehicles declared at 78,001-80,000 pounds.

EXHIBIT 8-1: WEIGHT-MILE TAX TABLE A

Declared Weight	Current WMT Rate	Alternative Rate	Difference	Percent Difference
26001 to 28000	0.0764	0.0990	0.0226	29.58%
28001 to 30000	0.0809	0.1009	0.0200	24.68%
30001 to 32000	0.0846	0.1029	0.0183	21.57%
32001 to 34000	0.0884	0.1048	0.0164	18.59%
34001 to 36000	0.0918	0.1068	0.0150	16.35%
36001 to 38000	0.0966	0.1089	0.0123	12.73%
38001 to 40000	0.1002	0.1110	0.0108	10.77%
40001 to 42000	0.1038	0.1131	0.0093	8.94%
42001 to 44000	0.1077	0.1153	0.0076	7.04%
44001 to 46000	0.1113	0.1175	0.0062	5.55%
46001 to 48000	0.1149	0.1197	0.0048	4.16%
48001 to 50000	0.1187	0.1220	0.0033	2.77%
50001 to 52000	0.1231	0.1243	0.0012	0.97%
52001 to 54000	0.1277	0.1267	-0.0010	-0.77%
54001 to 56000	0.1325	0.1291	-0.0034	-2.54%
56001 to 58000	0.1380	0.1317	-0.0063	-4.59%
58001 to 60000	0.1443	0.1342	-0.0101	-7.00%
60001 to 62000	0.1517	0.1367	-0.0150	-9.87%
62001 to 64000	0.1601	0.1394	-0.0207	-12.95%
64001 to 66000	0.1693	0.1420	-0.0273	-16.12%
66001 to 68000	0.1813	0.1448	-0.0365	-20.15%
68001 to 70000	0.1941	0.1475	-0.0466	-24.00%
70001 to 72000	0.2069	0.1504	-0.0565	-27.32%
72001 to 74000	0.2187	0.1532	-0.0655	-29.94%
74001 to 76000	0.2300	0.1562	-0.0738	-32.09%
76001 to 78000	0.2411	0.1592	-0.0819	-33.98%
78001 to 80000	0.2512	0.1623	-0.0890	-35.41%

To achieve better equity within heavy vehicle classes, Table A rates could be changed to range from 9.00 cents per mile to 14.75 cents per mile, as shown in Exhibit 8-1. These modified rates would result in a 26-percent reduction in revenue collected from vehicles paying Table A rates. If Table A rates are to be adjusted as recommended here, Table B rates must also be adjusted as described below.

Table B rates are specified for combinations of 2,000-pound increment and number of axles. The rates are structured so that, at any given declared weight, carriers can qualify for a lower rate by utilizing additional axles. At a declared weight of 96,000 pounds, for example, the per-mile rate for a five-axle vehicle is 35.33 cents and the rate for a six-axle vehicle is 29.17 cents. Thus, by adding an axle, a carrier can reduce tax liability by more than five cents per mile. Current Table B rates range from 19.87 cents per mile for a nine-axle vehicle declared at 82,000 pounds to 35.33 cents per mile for a five-axle vehicle declared at 96,000 pounds. Vehicles declared at over 98,000 pounds must have six or more axles, and vehicles declared at over 100,000 pounds must have seven or more axles.

To achieve better equity within the heavy vehicle classes, Table B rates could be adjusted as shown in Exhibit 8-2.

EXHIBIT 8-2: WEIGHT-MILE TAX TABLE B

Weight Class	Axles	Current Rate	Alternative	Difference	Percent Difference
80001 to 82000	5	0.2594	0.2519	-0.0075	-2.90%
80001 to 82001	6	0.2373	0.2304	-0.0069	-2.90%
80001 to 82002	7	0.2218	0.2154	-0.0064	-2.90%
80001 to 82003	8	0.2107	0.2046	-0.0061	-2.90%
80001 to 82004	9	0.1987	0.1929	-0.0058	-2.90%
82001 to 84000	5	0.2678	0.2542	-0.0136	-5.08%
82001 to 84000	6	0.2411	0.2336	-0.0075	-3.11%
82001 to 84000	7	0.2254	0.2185	-0.0069	-3.06%
82001 to 84000	8	0.2134	0.2069	-0.0065	-3.05%
82001 to 84000	9	0.2014	0.1950	-0.0064	-3.18%
84001 to 86000	5	0.2758	0.2565	-0.0193	-7.00%
84001 to 86000	6	0.2466	0.2368	-0.0098	-3.97%
84001 to 86000	7	0.2291	0.2216	-0.0075	-3.27%
84001 to 86000	8	0.2161	0.2092	-0.0069	-3.19%
84001 to 86000	9	0.2042	0.1970	-0.0072	-3.53%
86001 to 88000	5	0.2852	0.2588	-0.0264	-9.26%
86001 to 88000	6	0.2520	0.2401	-0.0119	-4.72%
86001 to 88000	7	0.2327	0.2248	-0.0079	-3.39%
86001 to 88000	8	0.2199	0.2115	-0.0084	-3.82%
86001 to 88000	9	0.2069	0.1991	-0.0078	-3.77%
88001 to 90000	5	0.2962	0.2611	-0.0351	-11.85%
88001 to 90000	6	0.2584	0.2434	-0.0150	-5.80%
88001 to 90000	7	0.2365	0.2280	-0.0085	-3.59%
88001 to 90000	8	0.2235	0.2139	-0.0096	-4.30%
88001 to 90000	9	0.2107	0.2012	-0.0095	-4.51%
90001 to 92000	5	0.3090	0.2635	-0.0455	-14.72%
90001 to 92000	6	0.2659	0.2467	-0.0192	-7.22%
90001 to 92000	7	0.2399	0.2313	-0.0086	-3.58%
90001 to 92000	8	0.2271	0.2163	-0.0108	-4.76%
90001 to 92000	9	0.2144	0.2033	-0.0111	-5.18%

FIGURE 8-2 (CONTINUED): WEIGHT-MILE TAX TABLE B

Weight Class	Axles	Current Rate	Alternative	Difference	Percent Difference
92,001 to 94,000	5	0.3230	0.2659	-0.0571	-17.68%
92,001 to 94,000	6	0.2731	0.2501	-0.0230	-8.42%
92,001 to 94,000	7	0.2438	0.2346	-0.0092	-3.77%
92,001 to 94,000	8	0.2308	0.2187	-0.0121	-5.24%
92,001 to 94,000	9	0.2172	0.2054	-0.0118	-5.43%
94,001 to 96,000	5	0.3377	0.2683	-0.0694	-20.55%
94,001 to 96,000	6	0.2815	0.2535	-0.0280	-9.95%
94,001 to 96,000	7	0.2483	0.2380	-0.0103	-4.15%
94,001 to 96,000	8	0.2346	0.2211	-0.0135	-5.75%
94,001 to 96,000	9	0.2207	0.2075	-0.0132	-5.98%
96,001 to 98,000	5	0.3533	0.2707	-0.0826	-23.38%
96,001 to 98,000	6	0.2917	0.2570	-0.0347	-11.91%
96,001 to 98,000	7	0.2539	0.2414	-0.0125	-4.92%
96,001 to 98,000	8	0.2384	0.2236	-0.0148	-6.21%
96,001 to 98,000	9	0.2207	0.2097	-0.0109	-4.93%
98,001 to 100,000	5	0.3205	0.2469	-0.0736	-22.98%
98,001 to 100,000	6	0.2594	0.2449	-0.0145	-5.58%
98,001 to 100,000	7	0.2428	0.2261	-0.0167	-6.89%
98,001 to 100,000	8	0.2281	0.2119	-0.0162	-7.10%
98,001 to 100,000	9	0.2221	0.2111	-0.0110	-4.96%
100,001 to 102,000	7	0.2649	0.2484	-0.0165	-6.23%
100,001 to 102,000	8	0.2483	0.2326	-0.0157	-6.34%
100,001 to 102,000	9	0.2319	0.2141	-0.0178	-7.64%
102,001 to 104,000	7	0.2705	0.2520	-0.0185	-6.84%
102,001 to 104,000	8	0.2539	0.2312	-0.0227	-8.94%
102,001 to 104,000	9	0.2365	0.2163	-0.0202	-8.54%
104,001 to 106,000	7	0.2777	0.2555	-0.0222	-7.98%
104,001 to 106,000	8	0.2594	0.2338	-0.0256	-9.88%
104,001 to 106,000	9	0.2411	0.2185	-0.0226	-9.37%

OPTIONAL FLAT FEE RATES

Under existing law, carriers hauling qualifying commodities logs, sand and gravel, and wood chips—have the option of paying monthly flat fees in lieu of the weight-mile tax. There are separate flat fee rates applicable to each of the three different commodity groups. Each rate is set so that carriers paying it should, on average, pay the same amount as they would on a mileage basis. For this reason, flat fee vehicles are treated as full fee vehicles in this study. Before the 2015 study, flat fee vehicles were classified as alternative fee vehicles.

When paying the weight-mile tax, log haulers can use a lower declared weight when their trailer is empty and stowed above the tractor unit. It was assumed that 55 percent of log-truck miles are with an empty, decked trailer. Weight-mile taxes apply only to miles on public roads in Oregon, but log trucks may incur some of their miles on private logging roads.

The existing statutory flat fee rate for carriers transporting logs is $11.60 per 100 pounds of declared combined weight. These fees typically paid in monthly installments. The monthly flat fee applicable to a log truck declared at 80,000 pounds, for example, is $773.34 ($11.60 x 800 = $7,280/12 months = $773.34). This amount must be paid each month the vehicle remains on a flat fee basis, regardless of the number of miles traveled during the month. The flat fee rates are required to be reviewed biennially and appropriate adjustments presented to each regular legislative session. This review is accomplished through the biennial flat fee studies, the latest of which was completed in August 2024 and entitled "Testing for Revenue Neutrality of Flat Fee Firms in Oregon (2023)."

That study compared flat fee revenues in 2023 to what those vehicles would have paid in weight-mile tax in 2023. The 2023 flat fee study found that flat fee log haulers overpaid by 11.13 percent, while sand and gravel haulers underpaid by 33.44 percent compared with what they would have paid on a mileage basis.

ROAD USE ASSESSMENT FEE RATES

Since 1990, carriers operating vehicles under single-trip, non-divisible load permits at gross weights above 98,000 pounds pay the road use assessment fee. The road use assessment fee takes the place of the weight-mile tax for the loaded portion of non-divisible load hauls. With rare exceptions, the empty backhaul portion of these trips is subject to the weight-mile tax and taxed at the vehicle's regular declared weight. The fees carriers pay are contained in a table of per-mile rates expressed in terms of permit gross weight and number of axles. Because of its size, that table is not reproduced in this report. Per-mile rates for loads over 200,000 pounds are calculated from the actual weight on each axle. As with the Table B rates, carriers are charged a lower per-mile fee for the use of additional axles at any given gross weight. This reflects the fact that spreading any given total load over additional axles reduces the amount of pavement damage imposed by that load.

For the 2025 HCAS, the equity ratios presented in Chapter 6 suggest that vehicles in weight classes above 105,500 significantly underpaid relative to their cost responsibility.

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APPENDIX

Highway Cost Allocation Study

2025-2027 Biennium

PREPARED BY

ECOnorthwest

PREPARED FOR

STATE OF OREGON 1859

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APPENDIX: TABLE OF CONTENTS

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LIST OF ACRONYMS

AAA	American Automobile Association
AMT	Axle Miles of Travel
ATR	Automatic Traffic Recorder
DAS	Department of Administrative Services
DL	Dead Load
DMV	Division of Motor Vehicles
ESAL	Equivalent Single Axle Load
FHWA	Federal Highway Administration
HCAS	Highway Cost Allocation Study
HPMS	Highway Performance Monitoring System
LL	Live Load
MCTD	Motor Carrier Transporation Division
NAPCOM	National Pavement Cost Model
NAPHCAS	National Pavement Model for Highway Cost Allocation
ODOT	Oregon Department of Transportation
OHCAS	Oregon Highway Cost Allocation Study
OTIA	Oregon Transportation Investment Act
PCE	Passenger Car Equivalent
SRT	Study Review Team
VMT	Vehicle Miles of Travel
WIM	Weigh-In-Motion

DEFINITIONS

Alternative Fee: A fee charged to some vehicles in place of the usual fee (e.g., a lower registration fee for publicly owned vehicles).

AMT: See Axle Miles of Travel

Arterial: A road or highway used primarily for through traffic.

ATR: See Automatic Traffic Recorder

Automatic Traffic Recorder: A device that records the number of vehicles passing a point on a road. May be permanent or temporary, may record individual lanes separately, may identify vehicle configurations, and may also record vehicle speeds.

Attributable Costs: Costs that are a function of vehicle size, weight, or other operating characteristics and can therefore be attributed to vehicle classes based on those characteristics.

Axle Miles of Travel (AMT): Vehicle miles of travel multiplied by number of axles. Because trucks, on average, have roughly twice as many axles as cars (i.e., four versus two), their share of the total axle miles of travel on any given highway system will be about double their share of the vehicle miles of travel on that system.

Axle Weight or Axle Load: The gross load carried by an axle. In Oregon, 20,000 pounds is the legal maximum for a single axle and 34,000 pounds is the legal maximum for a tandem (double) axle.

Benefits: Things that make people better off, or the value of such things.

Collector: A road that connects local roads with arterial roads.

Common Costs: Expenditures that are independent of vehicle size, weight, or other operating characteristics and so cannot be attributed to any specific class of vehicles.

These expenditures must therefore be treated as a common responsibility of all vehicle classes and are most typically assigned to all classes on the basis of a relative measure of use, such as vehicle miles of travel.

Cost Allocation: The analytical process of determining the cost responsibility of highway system users.

Cost-Occasioned Approach: An approach that determines responsibility for highway expenditures/costs based on the costs occasioned or caused by each vehicle class.

Such an approach is not based solely on relative use, nor does it attempt to quantify the benefits received by different classes of road users.

Cost Responsibility: The principle that those who use the public roads should pay for them and, more specifically, that payments from road users should be in proportion to the road costs for which they are responsible. The proportionate share of highway costs legitimately assignable to a given vehicle type user group.

Cost-Based Approach: An approach in which the dollars allocated to the vehicle classes are measures of the costs imposed during the study period, rather than expenditures made during the study period. The difference between the cost-based and expenditure-based approaches is most evident when considering large investments in long-lived structures and when deferred maintenance moves the expend- itures associated with one period's use into another period.

Cross-Subsidization: A condition where some vehicles are overpaying and others are underpaying relative to their respective responsibilities.

Dead Load: The load on a bridge when it is empty.

Debt Financing: Funding current activities by issuing debt to be repaid in the future.

Debt Service: Funds used for the repayment of previously incurred debt (both principaland interest).

Deck: The roadway or surface of a bridge.

Declared Weight: In Oregon, vehicles choose a declared weight and pay the weight-mile tax based on that weight. They may not exceed that weight while operating without obtaining a special trip permit. For tractor-trailer combinations, a single tractor may have multiple declared weights, one for each configuration it expects to be a part of.

Depreciation: The amount of decrease in value of a physical asset due to aging in a time period.

Efficiency: The degree to which potential benefits are realized for a given expenditure.

Efficient Pricing: Setting prices for the use of highway facilities so that each vehicle pays the costs it imposes at the time and place it is traveling. Efficient pricing promotes the most efficient use of existing facilities and generates the right amount of revenue to build the most efficient system and perform the optimal amount of maintenance.

Equity: Generally interpreted as the state of being just, impartial, or fair. Horizontal equity refers to the fair treatment of individuals with similar circumstances. Vertical equity refers to the fair treatment of individuals in different circumstances.

Equity Ratio: The ratio of the share of revenues paid by a highway user group to the share of costs imposed by that group.

Equivalent Single Axle Load (ESAL): The pavement stress imposed by a single axle with an 18,000-pound axle load. ESAL-miles are equivalent single-axle loads times miles traveled. Research has concluded that the relationship between axle weight and ESALs is an approximate third- or fourth-power exponential relationship; ESALs therefore rise rapidly with increases in axle weight.

ESAL: See Equivalent Single Axle Load

Excise Tax: A tax levied on the production or sale of a specific item such as gasoline, diesel fuel, or vehicles.

Expenditure: The amount of money spent in a time period.

External Cost: A cost imposed on individuals who do not use the facility.

Federal Highway Funds: Funds collected from federal highway user fees and distributed to states by the Federal Highway Administration for spending on transportation projects by state and local governments.

FHWA: Federal Highway Administration, an agency within the US Department of Transportation that supports State and local governments in the design, construction, and maintenance of the Nation's highway system.

Functional Classification: The classification of roads according to their general use, character, or relative importance. Definitions are provided by the Federal Highway Administration for Rural Interstate, Rural Other Principal Arterial, Rural Minor Arterial, Rural Major Collector, Rural Minor Collector, Rural Local, Urban Interstate, Urban Other Expressway, Urban Other Principal Arterial, Urban Minor Arterial, Urban Collector, and Urban Local.

Fungibility: The relative ability to use funds from different sources for the same purposes. Funds from some sources carry restrictions on how they may be spent; to the extent that those funds free up unrestricted funds that would otherwise be spent that way, they may be considered fungible with the unrestricted funds.

Gross Vehicle Weight: The maximum loaded weight for a vehicle.

HCAS: See Highway Cost Allocation Study

Heavy Vehicles: All vehicles weighing more than the upper limit in the definition of a light (basic) vehicle (see light vehicle). Includes trucks, buses, and other vehicles weighing 10,001 pounds or more.

Highway Cost Allocation Study (HCAS): A study that estimates and compares the costs imposed and the revenues paid by different classes of vehicles over some time period.

Highway Performance Monitoring System (HPMS): The Federal Highway Administration collects and reports data about a sample of road segments in every state in a common format.

Highway User: A person responsible for the operation of a motor vehicle in use on highways, roads, and streets. In the case of passenger vehicles, the users are the people in the vehicles. In the case of goods-transporting trucks, the user is the entity transporting the goods.

HPMS: See Highway Performance Measurement System

Incremental Cost: The additional costs associated with building a facility to handle an additional, heavier (or larger) class of vehicle.

Incremental Method: A method of assigning responsibility for highway costs by comparing the costs of constructing and maintaining facilities for the lightest class of vehicles only and for each increment of larger and heavier vehicles. Under this method, vehicles share the incremental cost of a facility designed to accommodate that class as well as the cost of each lower increment.

Light (or Basic) Vehicles: The lightest vehicle class, usually including passenger cars. In Oregon, the current definition of Light Vehicles includes vehicles up to 10,000 pounds, which account for more than 90 percent of the total vehicle miles of travel on Oregon roads.

Live Load: The additional load on a structure by traffic (beyond the load imposed by holding itself up).

Load-Related Costs: Costs that vary with the load imposed by traffic on a facility.

Marginal Cost: The increase in total cost that results from producing one additional unit of output. With respect to highway use, the marginal cost is the increase in total highway costs that results from one additional vehicle trip. Economic efficiency is achieved when the price charged to the user is equal to the marginal cost.

MCTD: See Oregon Motor Carrier Transportation Division

NAPCOM: See National Pavement Cost Model

National Highway System (NHS): A set of highways throughout the United States that have been designated as National Highways by the federal government. The Federal Highway Administration sets design and maintenance standards and provides funding for national highways, but the highways are owned by the states.

National Pavement Cost Model (NAPCOM): A model of pavement costs that incorporates the wear-and-tear costs imposed by vehicle traffic of different weights and configurations as well as deterioration from age and environmental factors, taking into account the soil type, road base depth, pavement material, pavement thickness, and climate zone.

Non-Divisible Load: Large pieces of equipment or materials that cannot be feasibly divided into smaller individual shipments. All states issue special permits for non-divisible loads that would otherwise violate state and federal gross vehicle weight, axle weight, and bridge formula limits.

ODOT: Oregon Department of Transportation

Operating Weight: The actual weight of a vehicle at a particular time.

Oregon Motor Carrier Transportation Division: A division within the Oregon Department of Transportation that regulates commercial trucking within the state.

Overhead Costs: Costs that vary in proportion to the overall level of construction and maintenance activities but are not directly associated with specific projects.

Passenger Car Equivalent (PCE): A measure of road space effectively occupied by a vehicle of a given type under given terrain, vehicle mix, road type, and congestion conditions. The reference unit is the standard passenger car operating under the conditions on the road category in question.

PCE: See Passenger Car Equivalent

Registered Weight: The weight that determines the registration fee paid by a single-unit truck or a tractor. For a tractor, it is typically the highest of that vehicle's declared weights.

Revenue Attribution: The process of associating revenue amounts with the classes of vehicles that produce the revenues.

Right of Way: The strip of land, property, or interest therein, over which a highway or roadway is built.

Road Use Assessment Fee: In Oregon, vehicles carrying non-divisible loads over 98,000 pounds on special permit pay a fee based on the number of ESAL-miles for the trip (see Equivalent Single-Axle Load).

Social (or Indirect) Costs: Costs that highway users impose on other users or on non-users. Costs typically included in this category are those associated with noise, air and water pollution, traffic congestion, and injury and property damage due to traffic accidents.

Span: A section of a bridge.

SRT: Study Review Team

State Highway System: Roads under the jurisdiction of the Oregon Department of Transportation.

Studded Tire: A tire with metal studs imbedded in its tread for better traction on icy roads.

Tax Avoidance: The legal avoidance of a tax or fee.

Tax Evasion: The illegal failure to pay a tax or fee.

Truck: A general term denoting a motor vehicle designed for transportation of goods. The term includes single-unit trucks and truck combinations.

User Charge: A fee, tax, or charge that is imposed on facility users as a condition of usage.

User Revenues: Highway revenues raised through the imposition of user charges or fees.

Value Pricing: Prices set in proportion to the benefits received, rather than the cost of production.

Vehicle Class: Any grouping of vehicles having similar characteristics for cost allocation, taxation, or other purposes. The number of vehicle classes used in a cost responsibility (allocation) study will depend on the needs, purpose, and resources of the study. Since the Oregon weight-mile tax rates are graduated in 2,000-pound increments, the Oregon studies have traditionally divided heavy vehicles into 2,000-pound gross weight classes. Light (basic) vehicles are considered as one class in the Oregon studies. Potential distinguishing characteristics include weight, size, number of axles, type of fuel, time of operation, and place of operation.

Vehicle Miles of Travel (VMT): The sum over vehicles of the number of miles each vehicle travels within a time period.

Vehicle Registration Fees: Fees charged for being allowed to operate a vehicle on public roads.

VMT: See Vehicle Miles of Travel

Weigh in Motion: A device embedded in the roadway that captures the weight of each axle passing over it. May also record transponder IDs of transponder-equipped trucks, axle spacing, and speeds.

Weight-Mile Tax: In Oregon, commercial vehicles over 26,000 pounds pay a user fee based on the number of miles traveled on public roads within Oregon. The per-mile rate is based on the declared weight of the vehicle, and for vehicles weighing over 80,000 pounds, the number of axles. Vehicles paying the weight-mile tax are exempt from the use-fuel (diesel) tax.

WIM: See Weigh in Motion

INTRODUCTION

This document summarizes three highway cost allocation studies (HCAS) published during 2009 to 2023: Nevada 2009, Idaho 2010, and Minnesota 2012. This review of recent HCAS is intended to investigate HCAS processes and methods used in other states, with particular attention paid to innovations, issues, or other methodologies or data that might be of use or interest for the Oregon HCAS process. The document also summarizes the findings from recent papers and reports on HCAS methods.

SUMMARY

Overview of HCAS Studies

2009 Nevada Highway Cost Allocation Study

The Nevada HCAS used the FHWA State HCAS software and methodology, conducted the study using ten vehicle classes (based on the HPMS vehicle classes), and presents equity ratios for vehicle weight using 2,000 lb. increments. The study included revenues from the vehicle sales tax and ad valorem tax for passenger vehicles. As a result, total state revenues were roughly 75% higher than total state expenditures in calculating the unadjusted state equity ratios.

Inclusion of revenues that are diverted to non-highway increases the revenue shares for passenger vehicles. Two other unique aspects of the study are the inclusion of deferred maintenance costs for vehicle cost responsibility and the subtraction of federal stimulus funding from deferred maintenance. The study found that heavy vehicle user fees do not increase as fast as heavy vehicle cost responsibility. Light vehicle classes have equity ratios greater than 1.0 and heavy vehicles have equity ratios less than 1.0.

2010 Idaho Highway Cost Allocation Study

The report considers the equity of Idaho's tax structure for highway users and whether different vehicle classes are paying their proportional share of highway costs. The Idaho HCAS used a refined version of the FHWA State HCAS Model. The model was used to consider how adjustments to the current tax and fee structure and the implementation of a vehicle miles travelled (VMT) fee could affect equity ratios.

The study differentiates user classes by vehicle class and weight for a total of 20 user classes. For state and federal programs combined, the study finds that highway user payments fall short of expenditures by 20% ($139.5 million per year). The study also finds that when collections from state and federal programs are combined, payments from combination trucks fall short of cost responsibility by 33%, whereas payments from automobiles exceed cost responsibility by 47%. At a state level, similar results hold, with combination trucks' payments falling 27% short of cost responsibility and automobiles' payments exceeding cost responsibility by 26%.

Minnesota Highway Cost Allocation and Determination of Heavy Freight Truck Permit Fees, 2012

The report examines the pros and cons of different highway cost allocation methods to use in Minnesota and presents a methodology that is most appropriate for the conditions in Minnesota. The report first presents the results of using the State HCAS tool developed by the FHWA. The report then develops and presents the results from a HCAS that was customized for the state, Minnesota Highway Cost Allocation Tool (MHCAT). The report also presents the findings from experiments on auction-based permitting systems.

Oregon's HCAS and Differences with Other States

Cost-Occasioned Approach and Incremental Method

Oregon, in addition to other states, uses the cost-occasioned approach for its HCAS. The basic idea behind this approach is that each class of road user should pay for the road system in proportion to the costs associated with the road use by that class.

Within the cost occasioned approach, Oregon uses the incremental method. This method divides particular aspects of highway costs into increments. It allocates the costs of successive increments to only the vehicles needing the higher cost increment.

A primary example of the incremental method is with bridge allocation costs. The first increment for a new bridge identifies the cost of building the bridge to support its own weight and other non-load related stresses. This is a common cost responsibility, and allocated across vehicle classes on basis of each user class's share of total VMT. The next increments identify the additional cost of building the bridge to accommodate progressively heavier weight classes of vehicle and the costs are allocated on the basis of relative VMT within a truncated range of vehicle weight classes.

Oregon's Weight Mile Tax

A key difference between Oregon and other states is that Oregon implements a weight mile tax in addition to a fuel tax. The Federal FHWA HCAS tool does not support a weight mile tax. Oregon has developed its own HCAS tool that supports a weight mile tax. The weight mile tax is structured in terms of 2,000 pound increments.

Oregon's use of a weight mile tax means that it is able to achieve much better equity ratios. Without a weight mile tax, a state would have to rely on high truck registration fees since the fuel tax alone does not recover the damage to roads imposed by heavy trucks. As vehicle weights increase, the damages imposed to roads increases super-linearly, but fuel consumption increases sub-linearly. This means that as vehicle weights increase, the costs they impose on the road are increasingly higher than the amount of fuel taxes they pay. The inclusion of a weight mile tax allows the State to capture the higher costs from heavier vehicle weights.

It is interesting to note that the 2012 Minnesota report examines the hypothetical effects of including a weight-mileage fee where the user pays a usage fee based on vehicle miles traveled and the tax rate per mile is determined by the registered gross weight of the vehicle. Currently, Minnesota charges only a weight fee that is determined by a commercial vehicle's RGW (e.g., a registration fee). The report finds that adjusted equity ratios under both hypothetical weight-mile fee scenarios are closer to the target ratio (one) than the weight fees for most vehicle classes. Exhibit 2 (p. 105) shows the adjusted ratios at the state level for the weight fees and the weight-mile fees.

Other Differences

- Oregon uses 2,000 pound increments in its HCAS whereas most other states use 5,000 pound increments. This allows Oregon's HCAS to have a finer grain of analysis than other states.
- Oregon, Nevada, and Idaho use the National Pavement Cost Model (NAPCOM) for pavement costs. However, Oregon has modified NAPCOM to use 2,000 pound increments instead of 5,000 pound increments. The 2012 Minnesota report uses regression coefficients from NAPCOM for Minnesota to allocate pavement repair costs.
- Oregon uses different PCE VMT (regular and congested) allocators depending on the type of cost. For example, the common cost portion of projects that add highway capacity are allocated based on congested PCE VMT. Congested PCE VMT uses the shares of PCE-weighted VMT that are present during the most congested hour of the day on that functional class. Using congested PCE VMT in cases where costs are incurred to add capacity means that a portion of those costs is allocated based on the users that are driving the need for additional capacity.
- Unlike Nevada's 2009 HCAS, Oregon's HCAS does not include deferred maintenance. Oregon has looked at deferred maintenance when determining an efficient fee. However, Oregon does not include deferred maintenance in its HCAS because it has very well-defined costs that are within the upcoming biennium.
- Oregon includes a studded tire adjustment that takes into account the additional damage that they cause to the roads.
- Oregon uses truncated VMT allocators for different types of costs to allocate those costs to a subset of all vehicles. For example, the collection costs of the motor carrier Transportation Division are allocated on the basis of VMT for vehicles over 26,000 pounds.
- Oregon's adjusted equity ratios reflect adjustments for subsidized vehicles. In contrast, Nevada's adjusted equity ratios do not consider subsidized vehicles and instead are calculated based on share of revenue and cost responsibility share, rather than gross dollar amounts.
- Exhibit 4 (pp. 17-18) provides a high-level overview of different states' HCASs. The table provides information on the states' HCAS methods, key allocators, types of revenue examined, and cost responsibility for heavy vehicles.

Overview of HCAS Methods

Models for Highway Cost Allocation, 2013

The report reviews the traditional HCAS methods (incremental, proportional, or a combination of the two), and then presents an alternative, non-traditional HCAS method that is based on concepts from the theory of cooperative games.

A Road Pricing Methodology for Infrastructure Cost Recovery, 2010

The broad motivating question for the report is: How can governments equitably recover infrastructure costs from truck users based on real-time operations and individual vehicles? The report presents a framework for charging commercial vehicles using weigh-in-motion (WIM) systems.

Bridge Structure Comparative Analysis, Comprehensive Truck Size and Weight Limits Study, 2013

This study provides a list of agencies that provide technical support through research, ongoing studies, and practice. The study provides a list of documents that the study reviewed with short summaries. A number of the documents address the issue of how to recover costs from heavy vehicles in proportion to the damage they cause on bridges.

State Highway Cost Allocation Studies: A Synthesis of Highway Practice

This report is intended to help states with HCAS methods by laying the foundation on current HCAS methods and areas of improvement for HCAS methods. The report reviews the HCAS methods used by different states, the conceptual foundation of HCAS methods, methods for revenue attribution, and arising issues with HCAS methods.

HCAS BY OTHER STATES

2009 Nevada Highway Cost Allocation Study

The 2009 Nevada HCAS used a refined version of the 1997 FHWA State HCAS program (HCASP). The study covers the eight-year time horizon between 2009 and 2016. Ten vehicle classes (auto, bus, and eight single unit or tractor trailer truck classes) are used, based on the twelve HPMS vehicle classes. Equity ratios are tabulated by vehicle class and also by registered vehicle weight (using 2,000 lb. increments).

The 1999 Nevada HCAS adopted many of the recommendations from the 1994 audit of the Nevada HCAS process. Two additional recommendations were adopted in the

2009 HCAS:

- The use of more vehicle classes. Previously only basic and heavy vehicle classes were differentiated for reporting purposes.
- Inclusion of highway user fees that are diverted to non-highway uses (e.g., inclusion of federal highway funds diverted to mass transit and inclusion of state vehicle sales tax and ad-valorem tax revenues which are diverted to general fund).

Nevada calculates unadjusted and adjusted equity ratios. Unlike Oregon, Nevada's adjusted equity ratios do not reflect subsidized vehicles. Rather, Nevada's adjusted equity ratios are calculated based on share of revenue and cost responsibility share, rather than gross dollar amounts.

The primary difference between the equity ratios in the 1999 Nevada HCAS and 2009 Nevada study is the inclusion of revenues from the vehicle sales tax and the ad valorem (government service) tax. Another difference in the 2009 study from previous Nevada DOT studies is the use of the improved NAPCOM model and more accurate weigh-in-motion (WIM) data for operating weights of heavy vehicles.

Nevada DOT data sources were used when available for calculating revenue, determining future VMT, and determining expenditure classifications. The VMT forecast is based on the Nevada DOT VMT forecast and is validated by applying an assumed per-person annual mileage to Nevada's forecasted population growth rate. There is no mention of differentiating VMT growth rates by vehicle class, although there is some discussion of per person mileage in rural versus urban areas of the state.

Revenue Attribution

The Nevada HCAS includes both federal and state revenues, and also includes all revenue sources regardless of their use (e.g., includes highway revenues diverted to non-highway purposes). As a consequence of including the vehicle sales tax and ad valorem tax, state revenues are forecast to exceed state highway expenditures by 75%. The study notes that this difference is "counterbalanced" by local expenditures, which exceed local user payments (since the state and local governments direct a portion of general funds to local roadways).

Cost Responsibility

Assignment of expenditures to work categories is based on previous expenditures, funded projects data (e.g., STIP, etc.), and trends in project expenditures. In addition to funded future expenditures, the Nevada HCAS also includes estimates of deferred pavement and bridge preservation for allocation of system preservation costs. Nine project work types, covering the typical project categories for pavement, bridges, maintenance, preservation, etc., were used to classify highway expenditures.

Nevada received $201 million in federal stimulus funding, of which $130 million is deducted from the backlog of preservation and the remaining ($71 million) is applied to projects along the National Highway System and urban projects in the STIP. The forecast of future expenditures was developed using recent trends in expenditures and anticipated revenues and consultation with NDOT. Projects were assigned work types based on recent year expenditures and programmed expenditures in the STIP. The FHWA State HCAS Model was used to estimate cost responsibility by vehicle class using the categorized expenditures and allocators for each type of expenditure. Cost allocation by work type is summarized based on the information in the HCAS report:

Pavement cost responsibility is determined using NAPCOM and vehicle class weight distributions developed from weigh-in-motion data. New bridge construction costs were allocated based on an incremental method, as applied in the FHWA HCASP model.

- Bridge replacement costs were allocated based on the replacement attributed to deficient load-bearing capacities relative to total degradation using the FHWA Bridge Sufficiency Rating formula.
- Bridge rehabilitation costs were apportioned based on determining the share of load-related costs relative to all costs based on a sample of bridge repair projects and default values from the FHWA's Bridge Needs and Investment Process.
- DMV expenditures related to the Motor Carrier Program were allocated to heavy vehicles, based on heavy vehicle VMT. The remaining DMV expenditures are allocated across all vehicle classes, based on shares of travel.
- Department of Public Safety expenditures include the State Emergency Response Commission (SERC), which responds to highway incidents. Heavy vehicles are allocated half of the SERC costs, based on the rationale that heavy vehicle crashes are more severe and require more time and expense to clear. The remaining DPS expenditures are allocated based on shares of travel.
- Administrative and overhead costs are allocated to vehicle classes in the same proportion as the sum of the capital and maintenance programs.
- Bond expenditures, both capital expenditures and debt service, are allocated in the same proportion as capital expenditures on urban interstate systems where the bond-financed projects are located.

Equity Ratios and Findings

The study results are presented as unadjusted and adjusted equity ratios for each vehicle class and by registered gross vehicle weight. Unadjusted equity ratios are constructed as the ratio of gross (dollar amounts) revenues to expenditures from each vehicle class. Adjusted equity ratios are constructed as the ratio of the vehicle class share of revenues to share of expenditures.

As a result of the inclusion of the state vehicle sales tax and ad valorem taxes, state revenues exceed state expenditures. This results in an "overpayment" of highway revenues compared to expenditures and produces a total unadjusted equity ratio for state-only revenues and expenditures of 1.75, reflecting that state revenues exceed state expenditures by 75%.

The effect of including revenues used for non-highway purposes is partially obscured by the inclusion of deferred maintenance and the subtraction of federal stimulus dollars from those deferred preservation expenditures. Excluding vehicle sales tax and ad valorem tax revenues from the total state revenues increases the adjusted heavy vehicle class share of state revenues to 31.1% from 18.9%. The heavy vehicle adjusted equity ratio goes from 0.42 up to 0.74 (state revenues and expenditures only) when these non-highway revenues are excluded.

The findings from the study suggest that Nevada's heavy vehicle fee structure does not increase proportionally with registered weight; hence heavy vehicles tend to underpay. Only vehicles less than 8,000 lbs. have an adjusted equity ratio of 1.50. This is consistent with the findings from other states' HCAS.

2010 IDAHO HIGHWAY COST ALLOCATION STUDY

The report considers the equity of Idaho's tax structure for highway users and whether different vehicle classes are paying their proportional share of highway costs. The 2010 Idaho HCAS used a refined version of the FHWA State Highway Cost Allocation Tool (HCAT). The HCAT was used to consider how adjustments to the current tax and fee structure and the implementation of a vehicle miles travelled (VMT) fee could affect equity ratios.

Two factors affecting the 2010 Idaho HCAS include the repeal of the weight-distance tax in favor of a mileage-based registration fee system and the types of projects that are funded by the Grant Anticipation Revenue Vehicle (GARVEE) bonds influence the equity ratios in the report. Idaho issued GARVEE bonds that are backed by federal aid to advance its construction program. The GARVEE bond program affects the cost allocation, as a higher portion of expenditures are pavement-related, which in turn affects the cost responsibility for heavy trucks. Under the reduced GARVEE scenario, expenditures are equal to the annual debt service payments during the six-year time period.

The study uses 20 vehicle classes. Vehicle classes are differentiated by vehicle type and weight. The study has a six-year time period from 2007 to 2012. The study considers three levels of government: state, federal, and local expenditures and revenues. Travel and expenditure data are broken down by rural and urban highway functional classes. Rural includes interstate, principal arterials, minor arterials, major collectors, minor collectors and local. Urban includes interstate, principal arterials, minor arterials, collectors and local. Travel data includes total vehicle miles traveled by the 20 vehicle classes and 11 functional road classifications.

Key findings from the Idaho HCAS include:

- Highway user payments fall short of expenditures by 20% ($139.5 million per year) for state and federal programs combined.
- With state and federal programs combined, combination trucks' payments fall 33% short of cost responsibility (28% under reduced GARVEE scenario), whereas automobiles' payments exceed cost responsibility by 47% (38% under reduced GARVEE scenario).
- Considering state programs alone, combination trucks' payments fall 27% short of cost responsibility (14% under reduced GARVEE scenario), whereas automobiles' payments exceed cost responsibility by 26% (8% under reduced GARVEE scenario).

Revenue Attribution

Revenue data include state and federal historical data from 2007 to 2009 and revenue forecasts based on Idaho Transportation Department (ITD) forecasts from 2010 to 2012. Revenue data include receipts from highway users from the tax and fee structure (e.g., registration fees, motor fuel taxes, driver's license fees, permit fees, and title fees).

The study obtained federal revenues that are attributable to highway users in Idaho for 2008 and 2009 from FHWA 2009 Highway Statistics. The FHWA estimates were forecast forward until 2012 using the revenue forecasts prepared by ITD. The federal tax revenue estimates reflect what Idahoans pay into the Federal Highway Trust Fund.

The study attributed revenue to the 20 vehicle classes and to registered gross weight classes in 2,000 lb. increments above 8,000 lbs. Some of the default data estimates in the FHWA HCAT were replaced with Idaho-specific inputs. The study worked with the ITD and other data sources to estimate the following characteristics for each vehicle class: VMT, percentage of VMT outside of Idaho, MPG, and number of registered vehicles. This allowed tax revenue to be attributed to each vehicle class. Fuel tax revenues were attributed by vehicle class based on the VMT estimates and the vehicle class's MPG. Revenues from registration fees were attributed based on the breakdown of fees by vehicle class (passenger vehicles, trucks, and buses). The study also estimated the number of full fee equivalent vehicles by registered weight class based on total VMT and the average VMT per vehicle estimates.

Cost Responsibility

The study uses expenditure data for nine categories: new pavements, rehabilitated pavements, new bridge, replacement bridge, repair bridge, grading, other construction, maintenance, and administration and other expenditures. Expenditure data were obtained for capital expenditures from ITD for the 2007-2012 time period.

The study estimated cost responsibility for each vehicle class using the FHWA HCAT. Idaho updated the FHWA HCAT to reflect Idaho's highway system and vehicle use. The study used weigh-in-motion (WIM) data to refine weight-related HCAT model inputs. The study used a recent FHWA run of the National Pavement Cost Model (NAPCOM) with 2007 highway section data from ITD. The study uses bridge cost allocation procedures developed by the FHWA in the Federal HCASs in 1982 and 1997.

Travel Data

The study derived VMT data by functional road class and by vehicle class using vehicle classification data from 2004-2008, breakdowns of VMT by functional class from 2008 and 2009, and weigh-in-motion (WIM) data from 2008 and 2009 from ITD. The Idaho Highway Performance Monitoring System (HPMS) has 12 vehicle classes but the FHWA HCAT uses 20 vehicle classes. Idaho used the two years of WIM data to map the 12 HPMS vehicles classes estimated from the classification count data into the 20 vehicle classes. WIM data were only provided for three functional classes: rural interstate, rural principal arterial, and rural minor arterial. The study had to make further assumptions on how to apply the vehicle splits to other roads.

Equity Ratios and Findings

The Idaho HCAS reports the unadjusted and adjusted equity ratios for the state level as well as the state and federal levels combined. Similar to HCAS in other states, as registered gross weights increase, equity ratios decrease.

One particularity of the Idaho HCAS is the GARVEE bond program. The GARVEE bond program affects the cost allocation, in that a much higher proportion of highway funds are directed toward pavement expenditures. Since most pavement costs are a result of the impact of heavy trucks, the bond program significantly increases the cost responsibility to heavy trucks (in particular, trucks with 12,000-18,000 lbs. per axle or 28,000-34,000 lbs. per pair of axles).

The researchers performed a sensitivity analysis to explore the effects of the GARVEE program on the HCAS findings. The researchers considered the scenario where expenditures are equal to the annual debt service payments during the 2007-2012 time period. The annual debt service payments over the six years are approximately equal to 26% of the GARVEE bond expenditures over the same time period. In the reduced GARVEE bond scenario, construction expenditures decrease by $96.9 million. Under this scenario, adjusted equity ratios increase for combination trucks and decrease for automobiles. On the state level, there is a greater difference in results between the two scenarios than on the level where state and federal are combined. On the state level, the adjusted equity ratio for automobiles drops from 1.26 to 1.08 under the reduced GARVEE scenario and increases for combination trucks from 0.73 to 0.86.

The other notable change for Idaho was the repeal of the weight-distance tax on trucks in favor of a mileage-based registration fee system in 2001. According to the study, if the weight-distance tax had remained in place, revenues were forecast to increase to $60.4 million in 2008 (based on analysis of historical trends).

Instead, under the mileage-based registration fee system, revenues were $48.8 million in 2008 ($11.6 million lower than the forecasts under the weight-distance tax).

Policy Analysis

The Gubernatorial Task Force on Modernizing Transportation Funding evaluated 19 possible sources of revenue. They considered eight criteria in their evaluation: fairness, public acceptance, revenue predictability, trend (up or down), cost-effectiveness of implementation, readiness, competitiveness, and out-of-state equity. The top ten revenue sources are (from highest to lowest): fuel tax of 5 cents per gallon, fuel sales tax, index fuel tax, state truck registration fee, index passenger vehicle registration fee, county vehicle registration fee, sales tax on auto sales, parts, tires and accessories, weight distance tax, electric vehicles, and alternative fuels tax.

The study examines the equity impacts from seven different policy options. The seven policy options are listed below along with their outcomes on equity (equity ratios are for the state and federal levels combined):

1. **Gasoline and special fuel tax rates increase by 5 cents per gallon.** Revenues forecast to increase by $46.2 million annually. Tax falls on passenger vehicles and trucks equally, and there is little change in adjusted equity ratios.

2. **Gasoline tax rate increases by 5 cents per gallon.** Adjust the special fuel tax rate such that the equity ratio for vehicles with RGWs of over 26,000 lbs. is equal to one. Revenues forecast to increase by $307.6 million annually. Equity ratios improve across vehicle classes (move closer to one). Adjusted equity ratios for automobiles and DS8+ change from 1.47 to 1.06 and 0.49 to 0.67, respectively.

3. **Special fuel tax rate increases by 5 cents per gallon, and gasoline tax rate adjusts to the level needed to achieve equity.** Revenues forecast to decrease by $147.0 million annually. Equity is almost realized between broad vehicle classes (between vehicles above and below 26,000 lbs.).
4. **All vehicle registration fees increase by 10%.** Revenues forecast to increase by $11.6 million annually. Fees are applied to all vehicle classes, and have almost no effect on equity.
5. **Passenger car vehicle registration fees increase by 10% and heavy truck registration fees increase by level needed to achieve equity.** Revenues forecast to increase by $165.8 million annually. Heavy truck registration fees would need to increase by a factor of 4.07 to achieve equity. Equity would be achieved between light and heavy vehicle classes. However, payments from heaviest vehicle classes would still fall short of cost responsibility by up to 45%.
6. **Heavy truck registration fees increase by 10% and passenger car vehicle registration fees increase by level needed to achieve equity.** Revenues forecast to decrease by $47.7 million annually. Passenger car (light vehicle) registration fees would be eliminated. Equity would improve with the automobiles adjusted equity ratios decreasing from 1.47 to 1.38.
7. **Vehicles over 26,000 lbs. RGW pay a VMT tax.** Revenues forecast to increase by $81.9 million annually. VMT fees are around 5.3 cents per mile for vehicles with RGW of 80,000 lbs. and 11.1 cents per mile for RGW of 105,500 lbs. Equity ratios for heavy vehicles improve significantly. The adjusted equity ratio for the DS8+ vehicle class would increase from 0.49 to 0.85. For the LT4 vehicle class, the adjusted equity ratio would decrease from 1.18 to 1.03.

2012 Minnesota Highway Cost Allocation and Determination of Heavy Freight Truck Permit Fees

Minnesota conducted an HCAS in 2009 that used the FHWA's State Highway Cost Allocation Tool (HCAT), relying on some national default data and state specific data when it was available. In 2012, the Minnesota Department of Transportation (MnDOT) and the University of Minnesota developed a customized highway cost allocation tool for Minnesota based on the FHWA's tool, and compared the results of the customized tool to the results from the general tool. The report also presents the findings from the HCAS using the FHWA HCAT that are using the same methods as the 2009 HCAS (see 2009 Minnesota HCAS summary at the end of the paper after References).

In the 2012 HCAS, Minnesota compares the results from the FHWA HCAT and a customized tool for MnDOT, Minnesota Highway Cost Allocation Tool (MHCAT). MHCAT fixes known bugs in the FHWA HCAT and is intended to work with Minnesota-specific data. The FHWA HCAT does not allow certain tax revenues (e.g., registration and weight fees) to be attributed to a specific subset of vehicle classes. Additionally, the FHWA HCAT does not correctly allocate administrative costs associated with the collection of registration and weight fees.

Another issue the study found was that the registered gross weight breakdowns or the vehicle configurations are based on representative data from 2001. Furthermore, the mapping of the 12-vehicle configurations to the 20-vehicle configurations is based on national VMT data from 1997.

MHCAT classifies vehicles according to Highway Performance Monitoring System, (HPMS) 12-class whereas FHWA HCAT classifies them according to HCA 20-class. Without a customized tool, use of the FHWA HCAT requires mapping the HPMS classification onto the HCA classification (as in the case of the 2010 Idaho HCAS and the previous 2009 Minnesota HCAS). The customized tool removes unnecessary data manipulation and increases accuracy. MHCAT also allows the user to enter up to eight customized vehicle classes. This is a useful tool for research purposes, such as considering specific changes to tax rules and cost allocation for specific vehicle classes.

The FHWA HCAT cannot allocate external costs such as environmental impacts, congestion, and accident costs. External costs are a result of highway use, and can be significant. However, they are difficult to include into the HCAT since they are dependent on the time of travel and route selected, and they do not depend solely on the type of vehicle and VMT. This is not an issue that is resolved in the MHCAT.

The report also evaluates the HCAS methods, with particular emphasis on tax equity (vertical and horizontal) and efficiency. In particular, the report compares a fuel versus a weight-distance tax using a stylized mathematical model.

The results support that a weight-distance tax or other mileage-based tax that can be differentiated by truck class can help achieve a more equitable tax policy than a universal fuel tax. However, the examples presented also indicate that equity can be improved if the universal tax encourages the truck industry to use trucks that cause less damage. The alternative is to achieve equity through a tax policy that differentiates by truck class and truck usage.

The report lists two categories with two options in each category as directions for future research that are associated with the equity and efficiency of the road-use tax structure.

- Mileage-Based Taxation: This can be implemented using a comprehensive *Electronic Road Pricing System (ERPS)* or a *weight-distance tax system*.
  - With an *ERPS*, tax rates can be set based on vehicle type, vehicle weights, number of axles, congestion levels, and the road conditions for the individual trip.
  - *Weight-distance taxes* are charged based on the vehicle's registration weight, distance travelled, and axle configuration.
- Special Permits and Willingness-to-Pay: The state currently issues special permits to oversized or overloaded trucks, but there is a need for a better pricing mechanism. Options to improve the pricing mechanism include:
  - Estimating *Willingness-to-Pay (WTP)* using contingent valuation.
  - Implementing an *auction-based permitting system (ABPS)*.

Minnesota Department of Transportation (MnDOT) provided revenue and expenditure data and traffic data for the 2003-2007 time period. MHCAT, like HCAT, requires pavement parameters, bridge parameters, and vehicles' features and travel-related data. The inputs are in nine different Excel tabs in the MHCAT workbook. Default bridge parameters are imported from HCAT but can be modified to reflect the state's conditions through assistance from the state engineer. The report uses VMT numbers from MnDOT that represent an average from 2004 to 2007.

The workbook requires registered gross weight distributions by vehicle class by 2,000 lb. increments from 8,000 lbs. to 152,000 lbs These data were obtained from the Vehicle Inventory and Use Survey from 2002 (VIUS 2002) collected by the U.S. Census Bureau. The default data for MPG by vehicle class and RGW, the average annual distance travelled by vehicle class, and the distribution of vehicles by fuel type are all from VIUS 2002. Axle weight distribution data are from WIM systems from 2006.

Revenue

The MHCAT includes both federal and state revenues. At the federal level, inputs include fuel taxes, heavy vehicle use tax, vehicle sales taxes, and tire taxes. At the state level, inputs include fuel taxes, weight fees (only applicable to trucks), registration fees (passenger vehicles and light trucks), vehicle sales taxes, and permit fees.

Expenditures

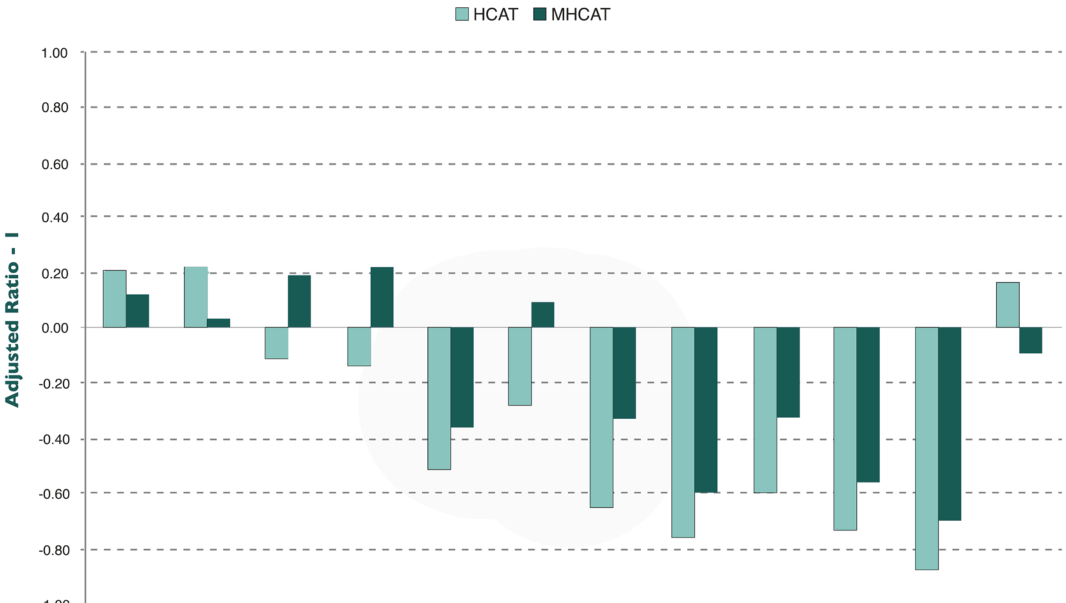
MHCAT inputs related to expenditures are categorized into six parts: state level construction and maintenance, state level administration, state-aid administration, state aid construction and maintenance, federal-aid administration, and federal-aid construction and maintenance. Each part requires expenditures disaggregated by highway functional class for 25 categories. The categories include typical highway project categories such as pavement (new, repair, etc.), bridge (new, replacement, rehabilitation), and maintenance and administrative categories. MHCAT includes the costs of collecting user fees on fuel, which are assumed to be zero by many states.

The default inputs on how non-load-related expenditures are allocated are based on FHWA HCAT. These include grading, residual allocators, other costs, and systemwide and DMV costs. The user can specify the percentage of grading costs by vehicle weight. For residual allocators, other costs that are distributed by highway functional class, and systemwide costs and DMV administration costs, the user can specify VMT or PCE-VMT, or a fraction between 0 and 1 (e.g., 0.3 means that 30% is allocated based on VMT and 70% is allocated based on PCE-VMT).

Equity Ratios and Findings

The report compares the equity ratios obtained from FHWA HCAT and MHCAT. It considers the difference between the adjusted equity ratios from the two tools to the target ratio (one). Like the 2009 Nevada HCAS, unadjusted equity ratios are constructed as the ratio of gross (dollar amounts) revenues to expenditures from each vehicle class. Adjusted equity ratios are constructed as the ratio of the vehicle class share of revenues to share of expenditures.

EXHIBIT 1.
HCAT (FHWA) AND MHCAT: ADJUSTED RATIOS MINUS TARGET RATIO (ONE), STATE REVENUE AND EXPENDITURES ONLY



	AUTO	LT4	SU2	SU3	SU4+	CB34	CB5	CB6	DS5	DS6	DS7+	BUS
HCAT	0.21	0.22	-0.11	-0.14	-0.50	-0.28	-0.65	-0.76	-0.59	-0.73	-0.87	0.16
MHCAT	0.12	0.03	0.19	0.22	-0.36	0.09	-0.32	-0.58	-0.32	-0.55	-0.70	-0.09

Vehicle Class

In general, the equity ratios from MHCAT are less extreme than those from FHWA HCAT. Exhibit 1 shows the differences between the ratios for FHWA HCAT and MHCAT by vehicle class. The report attributes some of the differences to the fact that RGW, OGW, and axle distributions are based on Minnesota specific data in MHCAT, as opposed to national averages in the FHWA HCAT.

The report finds that automobiles, light trucks, and single-unit trucks (three axles or less) have equity ratios greater than one. The report also finds that all combination trucks (except for single trailer with four or fewer axles) have adjusted equity ratios less than one. As is the case in other states' HCASs, the study indicates that heavy trucks are not paying taxes in proportion to the damage they cause to road infrastructure.

Effects of a Weight-Mileage Fee

Currently, Minnesota charges a weight fee that is determined based on a commercial vehicle's RGW (e.g., a registration fee). The report examines the effects of including a weight-mileage fee where the user pays a usage fee based on vehicle miles traveled and the tax rate per mile is determined by the registered gross weight of the vehicle. The report considers two scenarios. The first scenario assumes that total revenues from trucks are not changed (Minnesota collects $98 million from the weight-mileage fee). The second scenario assumes that the state collects $160 million from the weight-mileage fee (the amount of load-related expenditures (pavement and bridge) allocated to trucks). The study estimates the cost per mile for each vehicle-RGW class and then sets the tax rate to be proportional to the estimated cost.

EXHIBIT 2.
ADJUSTED EQUITY RATIOS FOR WEIGHT FEES (RGW REGISTRATION FEE) AND WEIGHT-MILE FEES, STATE

VC	Weight Fees	W-M Fees (Scenario 1)	W-M Fees (Scenario 2)
AUTO	1.12	1.12	1.08
LT4	1.03	1.03	1.00
SU2	1.19	0.89	0.86
SU3	1.22	0.89	1.00
SU4+	0.64	0.67	0.80
CB34	1.09	0.95	1.07
CB5	0.68	0.75	0.88
CB6+	0.42	0.57	0.71
DS5	0.68	0.81	0.93
DS6	0.45	0.63	0.77
DS7	0.30	0.52	0.67
BUS	0.91	0.91	0.88

Source: Minnesota HCAS 2012, Table 4.15, p. 56.

Exhibit 2 shows the adjusted ratios at the state level for the weight fees and the weight-mile fees under both scenarios. As the table illustrates, adjusted equity ratios under both weight-mile fee scenarios are closer to the target ratio (one) than the weight fees for most vehicle classes.

Auction-Based Permit System (ABPS)

This section discusses the development and testing of an ABPS that a state transportation agency could implement to learn the demand for permits and freight companies' willingness-to-pay for the permits. The researchers considered multi-item auctions and picked three mechanisms: Vickrey auction with reserve price, Ascending clock auction, and Clinched ascending clock auction. These three mechanisms were picked because they satisfied the following criteria:

- The price paid by a winning bid depends only on the opposing participants' bids.
- Bidders do not gain from over-bidding or under-bidding their true demand.
- The objective of the auction mechanism is to maximize revenue per permit sold.

The report explores the three auction mechanisms and how utility maximizing freight companies would bid under a competitive Nash equilibrium for each mechanism. The researchers then designed an experiment to test the different mechanisms using University of Minnesota graduate students and MnDOT staff members. The results of the experiment indicate that the ascending clock mechanism provided the maximum revenue per permit sold. Issues of auction fairness were not discussed in the report. The report considers the outcome of an auction as efficient when the individual item is sold to the bidder with the highest valuation for the item.

HCAS METHODS

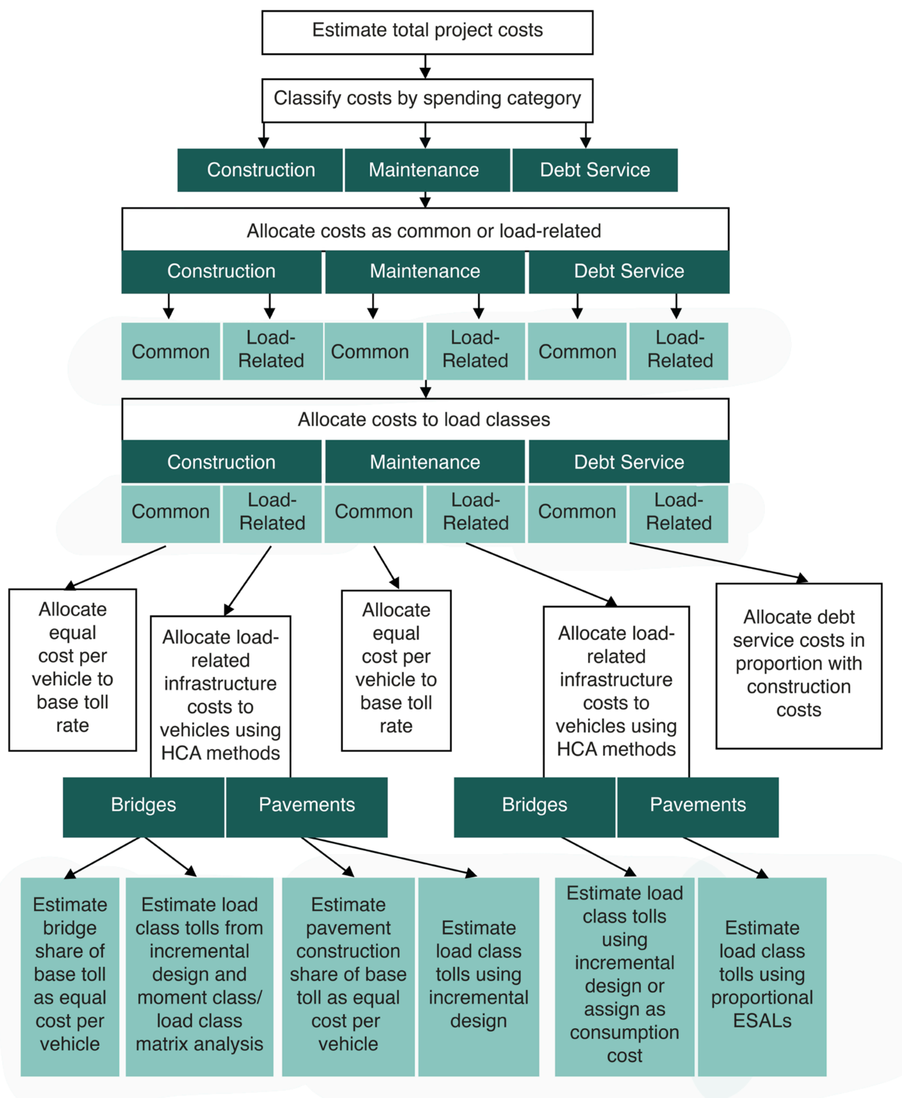
A Road Pricing Methodology For Infrastructure Cost Recovery, 2010 (By Conway & Walton)

The broad motivating question for the report is, "What future method of truck user charging can be employed to equitably recover infrastructure costs from individual vehicles based on real-time operations?" (Conway & Walton, 2010, p. 3). The report presents a framework for charging commercial vehicles using weigh-in-motion (WIM) systems. The WIM systems collect real-time vehicle weight and configuration information that can be used to charge vehicles on a toll structure. The report proposes using highway cost allocation methods to estimate a more equitable toll structure based on the individual axle weights that can be measured real-time using the WIM systems. The report presents a hypothetical case study using information from Texas State Highway 130 to consider the improvements in equity that could be realized using the proposed methodology. The study proposes a two-part toll. The first part is a base toll that is charged to all commercial and passenger vehicles that is calculated such that all common costs and basic infrastructure costs are recovered. The second part is an additional toll for heavy vehicles that is estimated using the "axle-load" estimation (preferred) or the "number-of-axle" estimation. Exhibit 3 (on the following page) illustrates the process.

Under an axle-load toll structure, heavy vehicles pay an additional cost per axle-load to recover infrastructure costs (pavement and bridge costs) that are required in order to support their weight. Pavement impacts are estimated as a function of individual axle loads, so initial load classes must be developed using the relative impacts on pavement by loads from individual classes. The particular characteristics of the facility with respect to traffic volumes, truck profiles, and axle load distribution need to be identified to determine the relative impacts of each class. Traffic analysis provides vehicle volumes, and WIM data can provide axle load distributions and truck profile information. This information can be used to calculate the probability that a load belongs to a given class and estimate the toll rates for each individual load class.

The case study considers State Highway 130 in Texas. The results indicate that the "axle-load" tolling structure recovers costs more equitable for heavy vehicle consumption than a "number-of-axle (n-1)" structure. The addition of an axle can lessen the load at a given point, reducing the pavement and bridge impacts. The pavement impact is lower from a 20,000 lb. load split across two axles than the same load on one axle. The "axle-load" structure is more effective at mirroring the estimated cost responsibility of different vehicle classes.

EXHIBIT 3.
CENTER FOR TRANSPORTATION RESEARCH/SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER - COST ALLOCATION METHOD FOR TOLL RATE DETERMINATION



Models For Highway Cost Allocation, 2013 (By Garcia-Diaz & Lee)

The report reviews the traditional HCAS methods, incremental or proportional (or a combination of the two) and then presents an alternative, non-traditional HCAS method that is based on concepts from the theory of cooperative games. The study considers how well different HCAS methods fulfill three fundamental properties: completeness, rationality, and marginality. Completeness means that highway costs are fully recovered by all participating vehicle classes. Rationality means that each vehicle class will have a lower cost by participating in the large group of all vehicle classes. Marginality means that each vehicle class pays the incremental cost that is incurred by including it in the grand coalition. Traditional HCAS methods, incremental and proportional, satisfy completeness. The incremental method sometimes satisfies marginality.

The non-traditional method presented in the paper, the Generalized Method (known as the Nucleolus Method in game theory) is based on concepts from the theory of cooperative games. Villarreal and Garcia-Diaz (1985) first proposed the use of this method in HCAS.[1] With this method, all three properties are forcibly satisfied as a result of constraints in the method's mathematical formulation. The generalized method guarantees "that every vehicle class will be allocated a lower cost in the grand coalition (all vehicle classes), as compared to any other smaller coalition (one with fewer vehicle classes than the grand coalition)" (Garcia-Diaz & Lee, 2013, p.137).

The average marginal cost for a vehicle class, considering all the permutations of vehicles in the grand coalition, is the Shapley Value. The Shapley Value represents the average marginal cost contribution that each vehicle class would make to the grand coalition if it were forming one vehicle class at a time (Garcia-Diaz & Lee, 2013, p.138). The Aumann-Shapley Value considers two types of costs, the sum of which is the total cost allocated to a vehicle class. The first cost is for ESALs (pavement thickness) and the second is for highway lanes (traffic capacity). The method calculates a cost per ESAL and a cost per lane. This procedure has a number of advantages and tackles some obstacles often found in traditional HCAS. It "allows the consideration of the number of lanes as being a variable and depending on the composition of the traffic using a

[1] A Development and Application of New Highway Cost Allocation Procedures. Villarreal-Cavazos A, Garcia-Diaz Transportation Research Record 1009: 34-41. 1985.

highway (Garcia-Diaz & Lee, 2013, p.138). This "addresses how seemingly conflicting objectives: lighter vehicles require less pavement thickness and more lanes while heavy vehicles require fewer lanes but thicker pavements" (Garcia-Diaz & Lee, 2013, p. 138). After calculating a cost per ESAL and a cost per lane, the method uses the Shapley Value to allocate the number of available lanes between vehicle classes. The paper provides examples using three vehicle classes.

The paper states that the Generalized Method distributes traffic-related costs more equitably than any other HCAS method, as it considers traffic loads and traffic capacity. The combination of the Aumann-Shapley Value (average cost per ESAL and average cost per lane) and the Shapley Value (used to allocate the total number of lanes among vehicle classes), allows for the possibility to calculate the cost per mile for each vehicle class. The paper also proposes a method for separating bridge construction and traffic capacity costs that is similar to the method for separating pavement thickness and traffic capacity costs. There is the additional step that allocates the traffic-load cost to each weight group in a vehicle class using the incremental method. The paper provides examples using three vehicle classes and four weight intervals.

Bridge Structure Comparative Analysis, Comprehensive Truck Size and Weight Limits Study, 2013

This study provides a list of agencies that provide technical support through research, ongoing studies, and practice. This list includes national programs such as the Transportation Research Board (TRB), National Cooperative Highway Research Program (NCHRP) and Strategic Highway Research Program, (SHRP 2). It also includes federal and state transportation agencies and universities.

The second section of the study provides a list of documents that the study reviewed with a link to the document, a summary of the findings, and a discussion of the document's relevance to one of the Comprehensive Truck Size and Weight (CTSW) Study topics. A key discussion area is how to recover the relatively high structural and infrastructure costs on bridges from heavy trucks. The study examines resources in the literature from 1997 to 2013 that may inform approaches that may help recover these costs more equitably.

State Highway Cost Allocation Studies: A Synthesis Of Highway Practice, 2008 (By Balducci & Stowers)

This report is intended to help states with HCAS methods by laying the foundation on current HCAS methods and areas of improvement for HCAS methods. The report reviews the HCAS methods used by different states, the conceptual foundation of HCAS methods, methods for revenue attribution, and arising issues with HCAS methods.

Since the 1997 Federal HCAS, there have not been many major changes in HCAS practice. A significant development in the past few years was FHWA's completion of the development and refinement of the National Pavement Cost Model (NAPCOM) and its development of NAPCOM into a model that can be used in state level HCAS. The FHWA also developed generalized state level HCAS software and documentation for the software.

Exhibit 4 summarizes recent state HCASs. Much of the data in the table is from a previous study by ECOnorthwest in 2005, but has been updated through 2023 by the research team. The results in the method column indicate that the Incremental and Federal Methods are most commonly used for state HCASs. These fall under the cost-occasioned approach that determines cost responsibility using the costs imposed on the highway by the highway-user class and not just by relative use. A key issue in HCAS is the cost responsibility of heavy-truck vehicle classes. Studies consistently find that heavy trucks payments do not fully cover their cost responsibility.

EXHIBIT 4. STATE HIGHWAY COST ALLOCATION STUDIES

State	HCAS Years Completed	Method	% Heavy Vehicle Cost Responsibility	Key Allocators	Types of Revenues Examined
Arizona	1993, 1999, 2000, 2001, 2002, 2005	Federal	31.4% (1999)	VMT, Axle-Load, Gross Weight	State, Federal, and Local Funds Combined
Arkansas	1978	Incremental/Cost Function			
California	1987, 1997	Federal and Incremental	18.90%	ESALs	State, Federal, and Local Funds Analyzed Separately
Colorado	1981, 1988	Federal	37%	VMT, Truck-VMT, ESALs, Ton-Miles	
Delaware	1992, 1993	Federal and Incremental	20.33%	VMT, ESALs, PCE, Axle-Miles, Registrations	State and Federal Funds Combined Only
Florida	1979	Incremental	64.50%	VMT, ESALs, Axle-Miles, Registrations	State and Federal
Georgia	1979, 1982	Incremental	51.2% (1979)	VMT, ESALs, GVW, AMT	State and Federal
Idaho	1987, 1994, 2002, 2010	Prospective Cost- Occasioned, Modified Federal, NAPCOM	Federal & State: 43.5% or 40.9%* State: 40.6% or 34.1%*	VMT, ESALs, ADT	State, Federal, and Local Funds Combined
Indiana	1984, 1988, 1989,2000	Incremental/Consumption	53.20%	ESALs	State, Federal, and Local
Iowa	1983, 1984	Federal	48.94%	VMT, ESALs, Ton-Miles, AMT, PCE	
Kansas	1978, 1985	Hybrid	41.85%	VMT, ESALs, PCE, AMT, Ton-Miles, Number of Vehicles	State Funds
Kentucky	1992, 1994, 1996,1998, 2000	Federal	54.92%	VMT, ESAL-VMT, PCE, Axle-Miles	State and Federal Funds Combined
Maine	1956, 1961, 1982,1989	Hybrid/Expenditure Allocation	35.60%	VMT, ESALs, PCE, Delphi, TMT,Standard Vehicle Equivalent	State and Federal funds
Maryland	1989, 2009	Federal	33.30%		State and Local Funds
Minnesota	1990 2009, 2012	Federal and Incremental, Modified Federal	Federal & State: 29.47%	VMT, ESALs, ADT	State and Federal Funds Combined and State
Mississippi	1980	Incremental	36%	VMT, Truck-VMT	

EXHIBIT 4 (CONTINUED). STATE HIGHWAY COST ALLOCATION STUDIES

State	HCAS Years Completed	Method	% Heavy Vehicle Cost Responsibility	Key Allocators	Types of Revenues Examined
Missouri	1984, 1987, 1990, 2018	Federal, Incremental		VMT, Vehicle Size, Vehicle Weight	
Montana	1992, 1999	Federal	33%	VMT, ESALs, AMT	
Nevada	1984, 1985, 1988, 1990, 1992, 1994, 1999, 2009	Modified Incremental, Modified Federal with NAPCOM (2009)	All Levels: 34.66% State: 38.26%	VMT, ESALs, Axle-Miles, Ton- Miles	State, Federal, and Local Separately and Combined
New Mexico	1972				
North Carolina	1983	Federal		VMT, ESALs, PCE, Weight Axle- Miles	State and Federal Funds
Oregon	1937, 1947, 1963, 1974, 1980, 1984, 1986, 1990, 1992, 1994, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017, 2019, 2021, 2023	Cost-Occasioned with NAPCOM for Pavement Costs (Since 1999)	31.20%	VMT, Congested PCE, Uphill PCE, Truck-VMT, Basic Vehicle VMT	State, Federal, and Local Combined for Cost Allocation Purposes but State Only for Revenue Attribution Purposes
Pennsylvania	1989, 1990	Federal/Cost-Occasioned			
Texas	1984, 1985, 1994, 2002				
Vermont	1990, 1993, 2006	Federal	25.70%	VMT, ESALs, ADT	State and Federal Funds
Virginia	1991, 1992	Federal	21.70%	VMT, ESALs, ADT	State and Federal Funds Combined
Washington	1977	Incremental			
Wisconsin	1982, 1992	Federal (1982)	31.70%	VMT, ESALs, PCE, Ton-Miles	State and Federal Funds Combined
Wyoming	1981, 1999	FHWA State HCAS Model	55.80%	VMT, Vehicle Size, Horsepower, Weight	

Source: Balducci and Stowers 2008. Adapted from ECOnorthwest et al. (2005). Updated by ECOnorthwest through 2023.

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ADDITIONAL HCAS STUDIES

Highway Cost Allocation and Determination of Heavy Freight Truck Permit Fees (MN/DOT): Task 1 Report – 2009 Minnesota Highway Cost Allocation Study.

Prior to the 2009 HCAS, Minnesota had conducted only one HCAS, roughly twenty years ago (published in 1989). Minnesota's 2009 HCAS was conducted by a faculty member and research assistant in the Engineering Department at the University of Minnesota. The study was conducted using FHWA's State HCAS program (HCASP), relying on some national default data and state-specific data when available. MNDOT provided financial (revenue and expenditure) and traffic data for the four-year period of July 2003 to 2007. Thus, the study is retrospective, in that it uses prior year expenditures and VMT; the study does not forecast future year spending, future expenditure work types, or VMT.

Following the Federal HCASP methodology, the study relied on the mapping of twelve HPMS vehicle classes into the 20 HCASP vehicle classes. The study used data from eleven weigh stations to develop distributions of registered Gross Weight for the vehicle classes. Default weight distributions from HCASP were used for those vehicle classes where the raw weigh station data could not be mapped into the HCASP vehicle classes.

The study found that the share of revenues from heavy vehicles is less than their share of costs.

Three "what-if" scenarios were analyzed to determine equity ratios under three different tax policies:

1. Increase in fees paid by vehicles greater than 16,000 lbs. by 26%.
2. Increase in the diesel tax by 25%.
3. Introduction of a weight-distance tax for vehicles more than 57,000 lbs.

Revenue Attribution

All federal, state, and local highway user revenues were included in the Minnesota HCAS. Federal revenues are based on those reported in the FHWA's Highway Statistics. The Federal HCASP contains default federal tax rates and attributes federal revenues to vehicle classes based on those rates and the VMT inputs. State highway user fees include motor fuel taxes, registration and license fees, vehicle sales tax, and an ad valorem tax. Similar to Nevada, Minnesota seems to include revenues that are diverted to non-highway uses. In the Minnesota HCAS, attributed state revenues exceed allocated state expenditures by 27%.

Cost Responsibility

Following the Federal State HCAS Program, the Minnesota HCAS categorized highway- related expenditures into 18 work categories. The work categories are typical highway project categories such as pavement (new, repair, etc.), bridge (new, replacement, rehabilitation), maintenance and administrative categories. Expenditures are also categorized by functional class, though administrative expenditures, rest area maintenance, state police and fuel/ registration collection costs are not assigned a road functional class.

Equity Ratios and Findings

Like the Nevada HCAS, the Minnesota HCAS reports unadjusted and adjusted equity ratios. The unadjusted equity ratio is computed as gross revenues divided by expenditures for each vehicle class and the adjusted equity ratios are the ratio of a vehicle class' revenue share to their share of expenditures. Revenue per mile and cost per mile for each vehicle class is reported along with equity ratios, with equity ratios for state and federal reported separately.

The study finds that vehicle classes with weights greater than 16,000 lbs. have adjusted ratios less than 1.0 for state ratio and vehicles under 26,000 lbs. have federal plus state adjusted equity ratios greater than 1.0.

The scenario analysis demonstrates that a 25% increase in the diesel fuel tax is more effective at bringing the heavy vehicle equity ratios closer to 1.0 than a 25% increase in heavy vehicle fees. Both of these two policy scenarios are more effective at bring equity ratios closer to 1.0 for vehicles between 16,000 and 50,000 lbs., but adjusted equity ratios remain rather low for vehicles weighing more than 50,000 lbs.

The third "what-if" scenario examined equity ratios using weight-mile tax applied to vehicles weighing 57,000 lbs. and greater. The weight-mile tax rates were estimated by fitting a segmented regression model to the difference between the allocated cost per mile and current revenue per mile using registered gross vehicle weight categories. Equity ratios for heavy vehicle classes are closer to 1.0–in particular the equity ratio for five-axle tractor trailers is 1.03 under the weight-mile tax. However many vehicle classes still have equity ratios under 1.0.

APPENDIX C: 2025–2027 SRT MEETINGS

For meeting recordings, please reference the Office of Economic Analysis Department of Administrative Services website on HCAS available here:
https://www.oregon.gov/das/oea/pages/hcas.aspx

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TABLE OF CONTENTS

MODEL OVERVIEW

The full source code for the 2025 Oregon Highway Cost Allocation Model is included with the model distribution. The model is written in Python and is implemented by running HCASModule.py. The process for running the model is described in depth in the Model User Guide.

The HCAS Python code is centered on a class, HCASModule, that calls a series of methods when the Python file is executed.

This appendix provides a detailed description of each of the class methods that are called in the HCAS Python model, explaining the calculations and describing the internal data structures they use. Figure 1 shows a graphical representation of the overall model process, including the Excel workbooks, the HCAS model, and the external data files. Figure 1 shows the required inputs, templates and outputs of the model. Each box shows the general filepath from the base folder where the file(s) is located. The Model User Guide provides a detailed overview of how these files are setup and where they are located in the HCAS model folder.

Table 1 describes the input ranges in various tabs of the "HCAS Inputs.xlsx" workbook, listing the input range name, the tab it is located in, the data it contains, the units those data are in, the class method that loads the data into the HCAS model code, and the name of the data structure in the HCAS model code that accepts the data.

Table 2 describes the tab-delimited text files that contain input data for the HCAS model, listing the file name, what data it contains, the units those data are in, and the data structure in the HCAS model that accepts the data.

Table 3 describes the outputs from the model code that populate the tabs in the "HCAS Outputs 2025.xlsx" workbook, listing the data structure in the HCAS model from which the data are extracted, the method called to calculate and retrieve the data, the tab into which the data are written, and the contents of the data.

Table 4 describes the tab-delimited text files that are written when the HCAS model runs, listing the data structure in the HCAS model from which the data are extracted, the method called to calculate and write the data, the file names, and the contents of the data.

FIGURE 1. OREGON HIGHWAY COST ALLOCATION MODEL

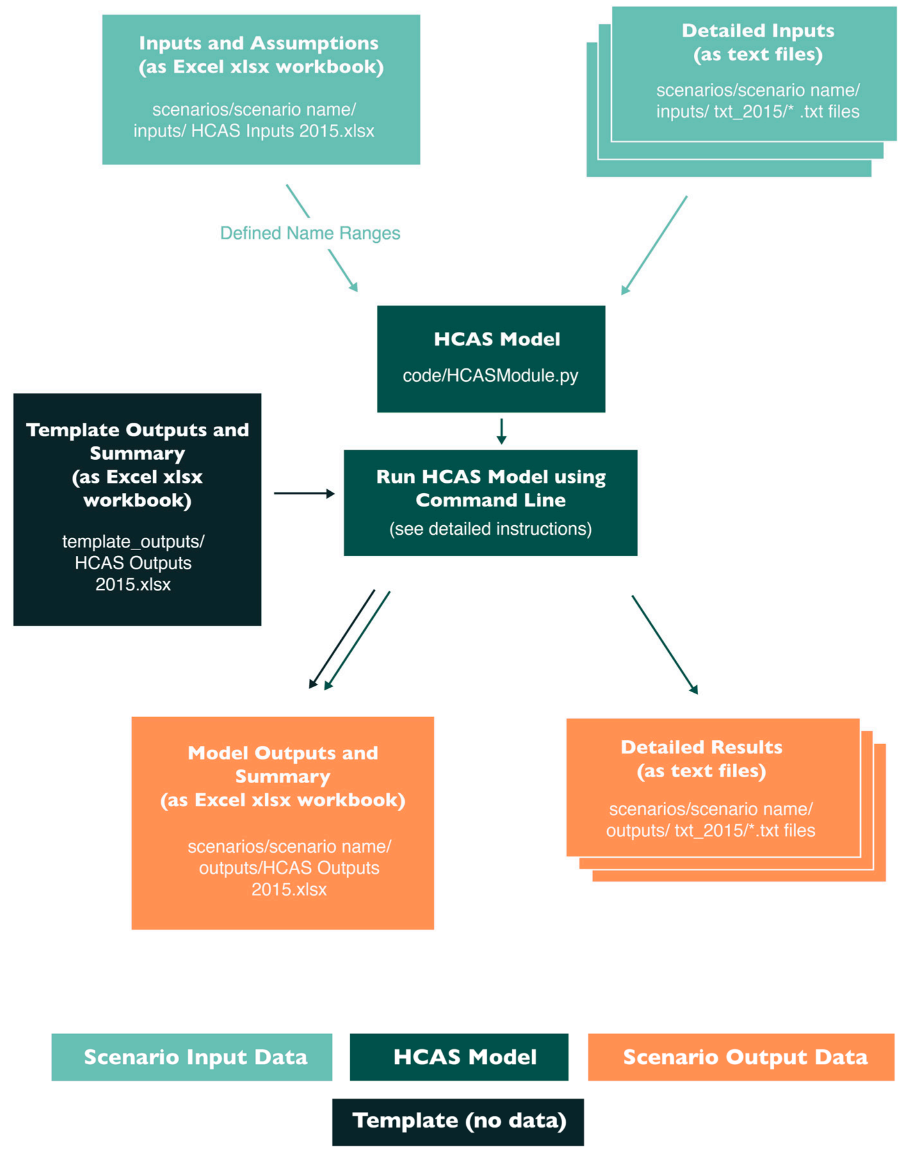

TABLE 1. INPUT RANGES

Range	Tab	Model Function	Model Variable Name	Units	Contains
GrowthRates	VMT Growth	simpleSetup(xls_ inputs['GrowthRates'])	self.growthRates	Annual growth rate (e.g., 0.05 means 5% per year)	VMT growth rates
VMTByFC	VMT by FC	simpleSetup(xls_ inputs['VMTByFC'])	self.VMTbyFC	Base-year vehicle- miles traveled	VMT by functional class and ownership
BaseVMT	Base VMT	setBaseVMT(xls_ inputs['BaseVMT'])	self.baseVMT	Base-year vehicle- miles traveled	Base-year VMT by weight class and tax class
Evasion	General	setEvasion(xls_inputs['Evasion'])	self.gasEvasion, self. dieselEvasion, self. wmtEvasion, self. basicDiesel, self. ruafRegRate, self. ruafReg78, self.ruafReg96, self.ruafReg104, self. emptyLogPercent, self. emptyLogWeight	All are shares (e.g., 0.05 means 5%) except RUAF Registration Rate is in dollars per mile traveled and Empty Log Weight is in pounds	Assumptions for gas-tax avoidance, use-fuel tax evasion & avoidance, weight-mile tax evasion, share of basic VMT that burn diesel, registration rate per mile for RUAF vehicles, share of RUAF vehicles registered at 78,001- 80,000 lbs, share of RUAF vehicles registered at 96,001- 98,000 lbs,share of RUAF vehicles registered at 104,001-105,500 lbs, percent of flat-fee log truck miles that are empty, declared weight for empty log trucks
Path	Policy	setPath(xls_inputs['Path'])	self.path	Names of allocators and shares	Allocator(s) to use for each work type
ProjectCosts	Project Costs	setProjectOrLocalCosts(xls_ inputs['ProjectCosts'])	self.projectCosts	Biennial dollars	Costs to allocate for construction projects
NonProjectCosts	Non-Project Costs	setNonProjectOrStuddedTire (xls_inputs['NonProjectCosts'])	self.nonProjectCosts	Biennial dollars	Other costs to allocate
LocalCosts	Local Costs	setProjectOrLocalCosts(xls_ inputs['LocalCosts'])	self.localCosts	Biennial dollars	Local-government costs to allocate
StuddedTire	General	setNonProjectOrStuddedTire (xls_inputs['StuddedTire'])	self.studdedTire	Biennial dollars	Studded-tire adjustments
BridgeFactors	General	setBridgeFactors(xls_ inputs['BridgeFactors'])	self.bridgeFactors	Shares	Incremental factors for bridge work types
BondFactor	General	float(xls_inputs['BondFactor'][0] [0])	self.bondFactor	Share	Proportion of bonded expenditures to allocate in a biennium
Biennium	General	int(xls_inputs['Biennium'][0][0])	self.biennium	Four-digit year	First year of model biennium
SWT	Codes	setSummaryTypesClasses(xls_ inputs['SWT'])	self.summaryWorkTypes	Work type codes	Definitions of summary work types
SWC	Codes	setSummaryTypesClasses(xls_ inputs['SWC'])	self. summaryWeightClasses	Pounds	Definitions of summary weight classes

TABLE 1 (CONTINUED). INPUT RANGES

Range	Tab	Model Function	Model Variable Name	Units	Contains
RevenueTotals	Revenue Forecast	setRevenueTotals(xls_ inputs['RevenueTotals'])	self.revenueTotals	Biennial dollars	Control totals for revenues by instrument
Rates	Rates	setRates(xls_inputs['Rates'])	self.rates	Dollars per whatever	Current-law rates except RUAF and flat fee
RUAFRates	Rates	setRUAFRates(xls_ inputs['RUAFRates'])	self.RUAFRates	Dollars per mile	Current-law RUAF rates
FFRates	Rates	setFFRates(xls_inputs['FFRates'])	self.flatfee	Dollars per month, miles per month, and shares	Current-law flat fee rates
MPG	MPG		self.MPG	Miles per gallon	Assumed miles per gallon
AltRates	Alt Rates	setRates(xls_inputs['AltRates'])	self.altRates	Dollars per whatever	Alternative rates except RUAF and flat fee
AltRUAFRates	Alt Rates	setRUAFRates(xls_ inputs['AltRUAFRates'])	self.altRUAFRates	Dollars per mile	Alternative RUAF rates
AltFFRates	Alt Rates	setFFRates(xls_ inputs['AltFFRates'])	self.altFlatfee	Dollars per month, miles per month, and shares	Alternative flat fee rates

See: HCAS Inputs 2023.xlsx

TABLE 2. INPUT TEXT FILES

File Name	Model Data Structure	Units	Contains
SeedData.txt	self.seedData	Unitless numbers	Used to populate a preliminary VMT Master table (VMTdata) for iterative proportional fitting (see below). Any seed values (except zeros) could be used to generate fitted results, but this particular set already contains data that reflect the relative proportions of different vehicle types on different functional classes, and so will produce a distribution that not only adds up to the correct totals for each weight class and each combination of functional class and ownership, but also reflects the fact that some functional classes carry higher proportions of heavy vehicles than others. There are five columns: facility class (combines functional class and ownership), functional class, ownership, weight class, axles, and VMT. The first four are keys.
AxleShares.txt	self.shares	Shares (e.g. 0.5 means 50%)	Contains the shares of vehicles weighing more than 105,500 pounds with each number of axles (5 to 9+) by weight class. These data are developed from Special Weighings data. There are three columns: weight class, axles, and share. The first two are keys
SimpleFactors.txt	self.simpleFactors	Shares	Contains vectors of factors to be multiplied by VMT for simple allocators (different weight groupings of VMT). These factors are mostly zeros and ones, reflecting the definition of the allocator. For example, the Under26 factor is one for all weight classes up to 26,000 pounds and zero for all weight classes over 26,000 pounds. There are ten columns: weight class, axles, AllVMT, BasicVMT, Over10VMT, Over26VMT, Over50VMT, Under26VMT, Over80VMT, Over106VMT, Snow, and AllAMT. The first two are keys; the rest are allocators.
PaveFactors.txt	self.paveFactors	Shares	Contains cost responsibility factors (by weight class, functional class, and number of axles) for wear and tear of flexible and rigid pavement projects. These factors are produced by the NAPHCAS-OR model (the Oregon version of the National Pavement Cost Model for Highway Cost Allocation developed by Roger Mingo). There are five columns: facility class (combines functional class and ownership), weight class, axles, flexible, and rigid. The first three are keys.
PCEFactors.txt	self.pceFactors	Shares	Contains passenger car equivalents (PCEs) by weight class, functional class, and number of axles for vehicles on regular, uphill, and congested roadways. These factors represent the amount of roadway capacity a single vehicle of a particular weight class takes up as a proportion of the capacity consumed by a basic vehicle. These factors were developed from a study conducted as a part of the 1997 federal highway cost allocation study. There are six columns: facility class (combines functional class and ownership), weight class, axles, regularPCE, UphillPCE, and congestedPCE. The first three are keys.
DeclaredRegistered.txt	self.declaredRegistered	Shares	Contains shares of vehicles in each declared weight class that are registered in each registered weight class. These data were developed from Motor Carrier registration data. There are three columns: declaredWeight, registeredWeight, and share. The first two are keys.
DeclaredOperating.txt	self.declaredOperating	Shares	Contains shares of vehicles in each declared weight class operating at each operating weight class. These data were developed from the Special Weighings data. There are five columns: declared, declaredAxles, operating, operatingAxles, and Share. The first four are keys.
BasicSharePeak.txt	self.peakShares	Shares	Contains the basic-vehicle share of peak-hour VMT for each functional class. These data were developed from automatic traffic recorder data. There are two columns: functionalClass and share. The first is the key.
BondsYYYY-YYYY.txt	self.priorBondAmount	Biennial dollars	Contains allocated bonded expenditures from prior studies. Uses such files, if they exist, from the nine most recent prior biennia. Columns are declared weight class, declared number of axles, and dollars. The first two are keys. Actual files will have biennium beginning and ending years in place of "YYYY".

TABLE 3. OUTPUTS

Tab	Model Data Structure	Method to Create	Units	Contains
Model VMT	self.vmtByVehicles	makeVMTByVehicles()	Annual vehicle-miles traveled	Model year VMT by weight class and tax class
Allocated Costs	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Allocated costs by declared weight class, declared number of axles, and funding source
Allocated Costs by SWT	self.fullAllocatedCosts	getAllocatedCosts ByWorkType()	Biennial dollars	Allocated costs by funding source, summary work type, and summary weight class
Allocated Costs by WT	self.allocatedByRegularWT	allocateCosts()	Biennial dollars	Allocated Costs by funding source, work type, symmary weight class, and declared number of axles
Costs to Allocate by SWT	self.projectCosts, self. nonProjectCosts, self.bondCosts, self. priorBondAmount	getCoststoAllocate()	Biennial dollars	Costs to allocate by funding source and summary work type
Attributed Revenues	attributedRevenues	attributeRevenues()	Biennial dollars	Attributed revenues by declared weight class, declared number of axles, and revenue instrument
Alt. Attributed Revenues	attributedRevenues	attributeAltRevenues()	Biennial dollars	Attributed alternative revenues by declared weight class, declared number of axles, and revenue instrument
MPG	self.adjustedMPG	getAdjustedMPG()	Miles per gallon	Calibrated estimates of miles per gallon by weight class

See: HCAS Inputs 2023.xlsx

TABLE 4. OUTPUT TEXT FILES

Tab	Model Data Structure	Method to Create	Units	Contains
AllocatedCosts_bond.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Contains allocated costs from current and prior bonded expenditures. Columns are funding source, work type, declared weight class, declared number of axles, and dollars. The first four are keys.
AllocatedCosts_federal.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Contains allocated costs from the expenditure of federal funds by state government. Columns are funding source, work type, declared weight class, declared number of axles, and dollars. The first four are keys.
AllocatedCosts_local-federal.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Contains allocated costs from the expenditure of federal funds by local government. Columns are funding source, work type, declared weight class, declared number of axles, and dollars. The first four are keys.
AllocatedCosts_local-other.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Contains allocated costs from the expenditure of local funds by local government. Columns are funding source, work type, declared weight class, declared number of axles, and dollars. The first four are keys.

TABLE 4 (CONTINUED). OUTPUT TEXT FILES

Tab	Model Data Structure	Method to Create	Units	Contains
AllocatedCosts_local-state.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Contains allocated costs from the expenditure of state funds by local government. Columns are funding source, work type, declared weight class, declared number of axles, and dollars. The first four are keys.
AllocatedCosts_other.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Not used. This may be ignored.
AllocatedCosts_state.txt	self.fullAllocatedCosts	allocateCosts()	Biennial dollars	Contains allocated costs from the expenditure of state funds by state government. Columns are funding source, work type, declared weight class, declared number of axles, and dollars. The first four are keys.
BondsYYYY-YYYY.txt	allocatedBonds	allocateCosts()	Biennial dollars	Contains allocated bonded expenditures from this study. Will be used for the next nine biennia as an input file. Columns are declared weight class, declared number of axles, and dollars. The first two are keys. Actual file name will have beginning and ending years of the model biennium in place of “YYYY”.
DeclaredPaveFactors.txt	self.pavement	makeVMTMaster()	Unitless factors	Contains pavement factors by facility class, declared weight class, and declared number of axles that are constructed from the raw pavement factors, which are by functional class, operating weight class, and actual number of axles. Columns are facility class, functional class, ownership, declared weight class, declared number of axles, flexible factor, and rigid factor. The first five are keys.
FlatFeeReport.txt	ffRevenue, asifWMTRevenue	allocateCosts()	Biennial dollars	Reports fees paid by flat-fee vehicles and the fees they would pay if they paid weight-mile tax. The ‘as-if‘ revenue is to determine the flat fee difference. As of the 2011 study, flat-fee vehicles are not considered alternative fee-paying vehicles. Columns are declared weight class, declared number of axles, log revenue, as-if log revenue, dump revenue, as-if dump revenue, chip revenue, and as- if chip revenue. The first two are keys.
MissingPavementFactors.log	N/A	makeVMTMaster()	N/A	Lists any errors encountered while attempting to make pavement factors by facility class, declared weight class, and declared number of axles from raw pavement factors, which are by functional class, operating weight class, and actual number of axles.
VMTMaster.txt	self.VMTMaster	makeVMTMaster()	Annual vehicle-	Costs to allocate by funding source and summary work type
miles traveled	Contains annual VMT. Columns are functional class, ownership, declared weight class, declared number of axles, and vehicle-miles traveled. The first four are keys.	attributeRevenues()	Biennial dollars	Attributed revenues by declared weight class, declared number of axles, and revenue instrument
SubsidiesbyVehClass.txt	ffRevenue, regRevenue, ruafRevenue, wmtRevenue, gasTaxRevenue, dieselTaxRevenue, asifWMTRevenue	allocateCosts()	Biennial dollars	Contains calculated subsidies by subsidy type for WMT, Farm Registration, Tow Registration, Charitable Non-Profit Registration and E-Plate Registration for each weight class, and actual number of axles.

DESCRIPTION OF MODEL CALCULATION OPERATIONS

The following describes what happens when the Python HCAS model, HCASModule.py, is run. Figure 1 on page 24 illustrates the overarching process of the model. The model loads text files and tabs from the HCAS Inputs Excel workbook, performs calculations in Python, and then populates tabs with the results into the HCAS Outputs Excel workbook and saves output text files with detailed results.

Send Base-Year VMT Data & Retrieve Model-Year VMT Data

Growth rates, from the *VMT Growth* tab, tell the model how fast VMT in each weight class is expected to grow between the base year (the most recent calendar year for which data are available) and the model year (the calendar year in the middle of the fiscal biennium being modeled).

VMT by functional class, from the *VMT by FC* tab, provides control totals for base-year VMT in each functional class. Base VMT, from the *Base VMT* tab, provides base-year VMT by weight class and tax class.

Evasion rates, from the *General* tab, tell the model what evasion and avoidance rates to assume. Evasion and avoidance are combined.

The call to makeVMTMaster() tells the model to do its VMT calculations. The call to makeVMTByVehicles() tells the model to calculate model- year VMT by weight and tax class and populate the *Model VMT* tab in the outputs workbook.

Send Costs to Allocate & Retrieve Allocated Costs

The path, defined in the *Policy* tab, defines the set of allocators to be applied to each work type. Each work type may have up to two allocators. If there are two, the proportion of costs in that work type to which each will be applied is also defined in the path. The proportions must add up to one.

The model obtains costs to allocate from the *Project Costs, Non-Project Costs*, and *Local Costs* tabs. Items (rows) in the lists of costs to allocate include information about the funding source, work type, functional class, and dollar amount. Project costs also include the bridge type, which is zero if the project is not a bridge project.

The model obtains studded-tire adjustments from the Studded Tires table in the *General* tab. These move costs from their original combination of funding source and work type into the studded tire work type with the same funding source.

The model obtains bridge factors from the Bridge Splits table in the *General* tab. These factors are used to reassign bridge costs from their original work types to incremental cost work types so that incremental allocators may be applied. There will be a set of factors for each bridge type.

The model obtains the information necessary for the proper treatment of the expenditure of bond revenues from the *General* tab.

The *Codes* tab allows the model to tabulate allocated costs by summary work type and summary weight class for the report tables. These tabulations are done in the model, rather than in workbook, since it is faster, more reliable, and keeps the workbook size reasonable.

The allocateCosts() method allocates costs and returns the allocated costs by weight class and funding source, which then populate the *Allocated Costs* and *Allocated Costs by WT* tabs in the outputs workbook.

Send Revenues & Rates & Retrieve Attributed Revenues

The model obtains revenue totals that are the control totals by instrument from the budget. Revenues are located in the *Revenue Forecast* tab in the inputs workbook. Rates are located in the *Rates* tab in the inputs workbook. Rates are for instruments that vary by weight class (e.g., weight-mile tax rates) or not at all (e.g., fuel taxes). The two other types of rates have different dimensions, so are sent separately. RUAF rates extend to a much longer list of weight classes. Flat-fee rates are by commodity and include information about the average miles per month for each weight class and the distribution of VMT in each weight class to numbers of axles for weights over 80,000 pounds. The model obtains estimated miles per gallon by operating weight class from the *MPG* tab in the inputs workbook.

The attributeRevenues() method attributes revenues and returns the attributed revenues by weight class and revenue instrument, which then populate the *Attributed Revenues* tab in the outputs workbook.

The call to getAdjustedMPG() tells the model to return the adjusted miles per gallon (already calculated as part of the revenue attribution calculations), which then populate the *MPG* tab of the outputs workbook to the right of the initial MPG estimates. The initial estimates are adjusted to allow fuel tax revenues to add up the revenue control totals for fuel taxes.

Retrieve Summary Tabulations for Report Tables

The getAllocatedCostsByWorkType() method gets allocated costs by summary work type, funding source, and summary weight class, which then populate *Allocated Costs by SWT* tab in the outputs workbook.

The getCostsToAllocate() method returns costs to allocate by summary work type and funding source, which then populate the *Costs to Allocate by SWT* tab in the outputs workbook.

Send Alternative Rates & Retrieve Attributed Alternative Revenues

The model obtains alternative rates from the *Alt Rates* tab. These alternative rates are used for policy analysis to test the effect on equity of proposed changes to revenue instruments. They do not require changes to revenue control totals, because they use the calibrated miles per gallon and miles per registration from the original revenue attribution calculations, which were calculated from the control totals and rates provided there.

The attributeAltRevenues() method attributes revenues using alternative rate schedules and returns results by weight class and revenue instrument, which populate the *Alt. Attributed Revenues* tab in the outputs workbook.

DESCRIPTION OF MODEL CLASS METHODS

The following sections of the documentation serve two purposes: they describe in detail how the model does what it does and they provide a guide for following the source code. The class methods are described in the order they appear in the source code, which is the order in which they are called in running the model. The first section describes the class methods that load the input data into the model. The subsequent sections describe the way the model analyzes VMT, allocates costs, and attributes revenues.

METHODS TO LOAD DATA

The class methods described in this section serve to get data into the HCAS model. Data that are not expected to be changed by the user are read in from tab-delimited text files. Data and assumptions that an analyst is more likely to want to change between model runs are loaded from the HCAS Inputs Excel workbook. Other class methods, described in later sections, make use of the data and return results to the HCAS Outputs Excel workbook and additional, more-detailed data to tab-delimited text files.

Note that variables beginning with "self." belong to the class object and are available to any class method to which the self reference has been passed. Other variables are available only within the method that creates them.

Load Text Input Data

The readData() method imports the following data sets from tab-delimited text files, which are expected to be in the inputs text folder:

- AxleShares.txt is read into self.shares and contains the shares of vehicles weighing more than 105,500 pounds by number of axles (5 to 9+) by weight class. These data are developed from Special Weighings data to describe the share of each weight class with each possible number of axles (nine or more axles are coded as nine-plus). There are three columns: weight class, axles, and share. The first two are keys.
- BasicSharePeak.txt is read into self.peakShares and contains the basic-vehicle share of peak-hour VMT for each functional class. These data were developed from automatic traffic recorder data. There are two columns: functionalClass and share. The first is the key.
- DeclaredOperating.txt is read into self.declaredOperating and contains shares of vehicles in each declared weight class operating at each operating weight class. These data were developed from the Weigh-in-Motion data. There are five columns: declared, declaredAxles, operating, operatingAxles, and share. The first four are keys.
- DeclaredRegistered.txt is read into self.declaredRegistered and contains shares of vehicles in each declared weight class that are registered in each registered weight class. These data were developed from Motor Carrier and DMV registration data. There are three columns: declaredWeight, registeredWeight, and share. The first two are keys.

- PaveFactors.txt is read into self.paveFactors and contains cost responsibility factors (by weight class, functional class, and number of axles) for wear and tear of flexible and rigid pavement projects. These factors are produced by the NAPHCAS-OR model (the Oregon version of the National Pavement Cost Model for Highway Cost Allocation developed by Roger Mingo). There are five columns: facility class (combines functional class and ownership), weight class, axles, flexible, and rigid. The first three are keys.
- PCEFactors.txt is read into self.pceFactors and contains passenger car equivalents (PCEs) by weight class, functional class, and number of axles for vehicles on regular, uphill, and congested roadways. These factors represent the amount of roadway capacity a single vehicle of a particular weight class takes up as a proportion of the capacity consumed by a basic vehicle. These factors were developed from a study conducted as a part of the 1997 Federal Highway Cost Allocation Study. There are six columns: facility class (combines functional class and ownership), weight class, axles, regularPCE, uphillPCE, and congestedPCE. The first three are keys.
- SeedData.txt is read into self.seedData and used to populate a preliminary VMT Master table (VMTdata) for iterative proportional fitting (see below). Any seed values (except zeros) could be used to generate fitted results, but this particular set already contains data that reflect the relative proportions of different vehicle types on different functional classes, and so will produce a distribution that not only adds up to the correct totals for each weight class and each combination of functional class and ownership, but also reflects the fact that some functional classes carry higher proportions of heavy vehicles than others.There are five columns: facility class (combines functional class and ownership), functional class, ownership, weight class, axles, and VMT. The first four are keys.
- SimpleFactors.txt is read into self.simpleFactors and contains vectors of factors to be multiplied by VMT for simple allocators (different weight groupings of VMT). These factors are mostly zeros and ones, reflecting the definition of the allocator. For example, the Under26 factor is one for all weight classes up to 26,000 pounds and zero for all weight classes over 26,000 pounds. There are twelve columns: weight class, axles, AllVMT, BasicVMT, Over10VMT, Over26VMT, Over50VMT, Under26VMT, Over80VMT, Over106VMT, Snow, and AllAMT. The first two are keys; the rest are allocators.

Load Excel Input Data

Input data from the HCAS Inputs Excel workbook are loaded from the workbook using loadExcelInputData() method. This function takes the filename of the input workbook as an argument. In the 2025 HCAS, the model expects the HCAS Inputs Excel workbook to be in the inputs folder and have the filename 'HCAS Inputs 2025.xslx'. A more detailed explanation of the inputs workbook setup is provided in the Model User Guide.

Load Data for VMT Analysis

The following class methods process the loaded data for the VMT calculations. The HCAS model calls these methods to process data for the model before it calls the makeVMTMaster() method.

- simpleSetup sets up data (in this case, Growth Rates and VMTbyFC) that has a shared format.

  Captures VMT growth rates by weight class and puts them into self.growthRates. The key is weight class and values are annual growth rates for VMT.

  Captures base-year VMT by functional class and ownership and puts them into self.VMTbyFC. The key is facility class (combination of functional class and ownership) and the values are base-year VMT. These data are developed from the state's HPMS submission and FHWA Highway Statistics reports.
- setBaseVMT() captures base-year VMT by weight class and tax class and puts them into self.baseVMT. self.baseVMT is a nested dictionary. The outer keys are weight classes (from the first column of the second and greater rows of the input data). The inner keys are vehicle tax classes from the contents of the second and greater columns of the first row. Values are base-year VMT in that combination of weight class and tax class. These data are typically developed from a variety of sources, including the ODOT Revenue Forecast, DMV registrations data, Motor Carrier registrations data, weight-mile tax reports, flat-fee reports, and road-use assessment fee reports.

- setEvasion() captures evasion and avoidance rates, along with some other assumptions used in revenue attribution. These assumptions are specified by the analyst. The function puts the assumptions into:
  - self.emptyLogWeight (the assumed declared weight of an empty log truck with its trailer decked).
  - self.emptyLogPercent (the assumed share of log-truck VMT that are driven while empty and with the trailer decked).
  - self.ruafReg104 (the assumed share of RUAF VMT by trucks with a registered weight of 104,001 to 105,500 pounds).
  - self.ruafReg96 (the assumed share of RUAF VMT by trucks with a registered weight of 96,001 to 98,000 pounds).
  - self.ruafReg78 (the assumed share of RUAF VMT by trucks with a registered weight of 78,001 to 80,000 pounds).
  - self.ruafRegRate (the assumed per-mile registration fee paid by trucks that pay the RUAF).
  - self.basicDiesel (the assumed proportion of basic VMT by diesel-powered cars and light trucks).
  - self.wmtEvasion (the assumed percent of total miles traveled by WMT vehicles upon which taxes are not paid).
  - self.dieselEvasion (the assumed percent of VMT by use-fuel-tax-paying vehicles for which the use-fuel tax was not paid; includes evasion and avoidance).
  - self.gasEvasion (the assumed percent of VMT by gas-tax-paying vehicles for which the gas tax was not paid; probably is entirely avoidance).

Load Data for Cost Allocation

The following class methods capture data from the inputs workbook for the cost allocation calculations and are called before the model calls the allocateCosts() method.

- setPath() captures allocation rules to be applied to each expenditure category (work type) and puts them into self.path. self.path is a nested dictionary. Outer keys are work-type codes and inner keys are allocator names. Values are shares of costs in that work type to which that allocator should be applied. These assumptions are specified by the analyst in conformance with the approach agreed upon by the Study Review Team.
- setProjectOrLocalCosts() sets up data (e.g., self.projectCosts and self. localCosts) that has a shared format.

  Captures project costs to be allocated and puts them into self. projectCosts. The key is a tuple consisting of funding source, work type, facility class (combination of functional class and ownership), and bridge type. The values are biennial dollars of costs to allocate. These are typically derived from the ODOT Cash Flow Model and Project Control System.

  Captures local government costs to be allocated and puts them into self. localCosts. The key is a tuple consisting of funding source, work type, facility class (combination of functional class and ownership), and bridge type. The values are biennial dollars of costs to allocate. These are typically derived primarily from Local Roads and Streets Survey reports.
- setNonProjectOrStuddedTire() sets up data (e.g., self. nonProjectCosts and self.studdedTire) that has a shared format.

  Captures non-project costs to be allocated and puts them into self. nonProjectCosts. The key is a tuple consisting of funding source, work type, facility class (combination of functional class and ownership), and bridge type (always zero). The values are biennial dollars of costs to allocate. These are typically derived from the Agency Request Budget.

  Captures studded tire costs to be allocated and puts them into self. studdedTire. The key is a tuple consisting of funding source, work type, facility class (combination of functional class and ownership), and bridge type (always zero). The values are biennial dollars of costs to allocate, which will later be moved from the work types specified here into the work type for studded tire damage. These assumptions are supplied by the analyst.
- setBridgeFactors() captures cost shares used to distribute bridge expenditures for incremental cost allocation and puts them into self. bridgeFactors, a nested dictionary. The outer key is the bridge type and the inner key is a bridge-reclassification work type. Values are shares of costs for that bridge type to be allocated according to that work type. Shares for each bridge type must add up to one. The default values for these assumptions were developed from the 2002 OBEC Bridge Cost Allocation Study.

- self.bondFactor is defined as the proportion of bond-funded expenditures that will be repaid in a single biennium. This assumption is specified by the analyst. It represents the biennial repayment amount as a proportion of the principal amount.
- self.biennium is defined as the starting year of the model biennium. Specified by the analyst.

Load Data for Revenue Attribution

The following class methods capture data from the inputs workbook for the revenue attribution calculations. The HCASModule calls these methods to give data to the model before calling the standard implementation attributeRevenues() method or the alternative implementation attributeAltRevenues() method. The alternative rates are specified by the analyst to test changes in policy.

- setRevenueTotals() captures revenue control totals and puts them into self.revenueTotals. The key is the name of the revenue instrument and the value is biennial dollars of revenue to attribute. These are typically derived from the Agency Request Budget and must be consistent with current-law rates and the VMT data and assumptions specified elsewhere.
- simpleSetup sets up data (in this case, MPG) that has a shared format. Captures initial MPG assumptions by weight class and puts them into self.MPG. The key is operating weight class and values are miles per gallon. The default values for these assumptions were derived from a regression analysis of Vehicle Inventory and Use Statistics (VIUS) data.
- setRates() captures current-law (or alternative) rates for each of gas tax, use-fuel tax, VMT tax, weight mile tax, normal registration, farm registration, tow registration, charitable/nonprofit registration, e-plate registration, light-trailer registration, heavy-trailer registration, and title fees and puts them into self.rates (or self.altRates). self.rates (or self.altRates) is a nested dictionary. The outer keys are revenue instruments and the inner keys are tuples of weight class and number of axles. Values are rates in dollars per VMT, gallon, or year, as appropriate. For the standard implementation, these are specified by the analyst based on current law and must match the assumptions used to develop the revenue control totals. For the alternative implementation, these are specified by the analyst to test proposed changes to rates.
- setRUAFRates() captures current-law (or alternative) road-use assessment fee rates and puts them into self.RUAFRates (or self.altRUAFRates). The key is a tuple consisting of weight class and number of axles and values are dollars per mile. For the standard implementation, these are specified by the analyst based on current law. For the alternative implementation, these are specified by the analyst to test proposed changes to rates.
- setFFRates() captures current-law (or alternative) monthly flat-fee rates, average monthly miles, and axle distribution and puts them into self.flatfee (or altFlatfee). The key is one of 'Log Rate', 'Dump Rate', 'Chip Rate', 'Log VMT', 'Dump VMT', 'Chip VMT', 'Log Axles', 'Dump Axles', or 'Chip Axles' and the values are rates in dollars per month, average miles per month, or shares of VMT in that weight class accounted for by trucks with that number of axles, as appropriate. For the standard implementation, rates are specified by the analyst based on current law and the assumptions about average miles per month and distribution of miles among numbers of axles are derived from flat- fee reports from MCTD. For the alternative implementation, rates are specified by the analyst to test proposed changes to rates.

Load Data for Summary Tables

The following class methods capture data from the inputs workbook and use it to tabulate summary tables of allocated costs and costs to allocate. The HCASModule calls these methods to give data to the model before calling the getAllocatedCostsByWorkType() and getCostsToAllocate() methods.

- setSummaryTypesClasses()

  Captures definitions of summary work types and puts them into self.summaryWorkTypes. The key is the work type and the value is the summary work type.

  Captures definitions of summary weight classes and puts them into self.summaryWeightClasses. The key is the weight class and the value is the summary weight class.

VMT ANALYSIS METHODS

The makeVMTMaster() method returns VMT by functional class, ownership, weight class, and number of axles for the model year. It uses VMT by weight class and number of axles (VCTotals, obtained from self. baseVMT), VMT by functional class and ownership (FCTotals, obtained from self.VMTbyFC), and the seed data from self.seedData to create a VMT Master table.

Using iterative proportional fitting, the program repeatedly scales the seed data until each row sums to its corresponding VC total and each column sums to its corresponding FC total. The program stops fitting data once the sum of squared errors for the fitted values falls below a specified threshold.

Methods within makeVMTMaster()

The following methods are defined and used within the makeVMTMaster() class method:

- findFCSums() sums VMTData by functional class and ownership across weight classes and numbers of axles.
- findVCSums() sums VMTData by weight class and number of axles across functional class and ownership.
- scaleToFC() multiplies each value in VMTData by the ratio of its FCTotal control total to its current FCSum.
- scaleToVC() multiplies each value in the VMTData by the ratio of its VCTotal control total to its current VCSum.
- findSSE() calculates the sum of squared errors for the FCSums. (The SSE for VCSums will equal zero because the scaling process for VCSums runs after scaling for FCSums.) The "errors" are differences between the sums of VMT by individual facility class and the control total for that facility class. They are squared (multiplied by themselves) before adding up over facility classes for two reasons: positive and negative differences can't cancel each other out and a large difference in an individual facility class will be given greater weight than several small differences that add up to the large difference. It is important that none be off by a lot, but it is acceptable for many to be off by a tiny amount each.

How makeVMTMaster() Works

VMTMaster is a matrix of vehicle-miles traveled (VMT) by vehicle classes and by road classes. Vehicle classes are combinations of 2,000-pound weight increments and numbers of axles. Road classes are combinations of functional classes (defined by the Federal Highway Administration) and ownership.

We start with base-year VMT by declared weight class by tax class to develop the row totals. Vehicles weighing 80,000 pounds and under are not classified by axles (axles=0). Base-year VMT by weight-mile-tax vehicles between 80,000 and 105,500 pounds are available by numbers of axles because the tax rate varies with the number of axles. Other vehicles in this range (e.g., farm, publicly-owned, or road-use assessment fee) are assumed to have the same distribution of miles by number of axles within each weight class as weight-mile tax vehicles.

Base-year VMT by road-use-assessment-fee vehicles weighing more than 105,500 pounds are distributed among numbers of axles according to the proportions specified in self.axleShares. A dictionary named VCTotals, keyed by weight class and number of axles, is built to contain the row totals for the VMT Master matrix.

The column totals are copied from self.VMTbyFC and scaled to add up to exactly the same total as the row totals. The individual cells of the VMT Master matrix are initialized with the proportions from self.seedData. The columns initially sum to one.

The iterative proportional fitting follows the following steps:

1. Scale each column so that it adds up to its column control total (scaleToFC())
2. Sum each row (findVCSums())
3. Scale each row so that it adds up to its row control total (scaleToVC())
4. Sum each column (findFCSums())
5. Find the sum of squared differences between column totals and column control totals and compare to the threshold value (findSSE()). The threshold value is arbitrarily set to 48, meaning that if each of the 48 facility classes was off by less than one vehicle mile traveled (out of a total of more than 30 billion), it would be satisfied.
6. If the sum of squared errors is less than the threshold, stop. Otherwise, return to Step 1.

Once iterative proportional fitting is complete, the growth rates for each weight class from self.growthRates are applied to the fitted base-year VMT data to bring it to the model year (the middle 12 months of the study biennium).

Three additional, summary facility classes are then added to the matrix. FC 0 is all state-owned roads, FC -1 is all roads, and FC -2 is all locally owned roads.

VMTMaster is copied to self.VMTMaster for use by other methods, is written to disk, and selected portions (FC -2 to FC 0, and all combinations of state ownership and functional class) are returned to the Model VMT tab in the outputs workbook.

The key in self.VMTMaster is a tuple consisting of facility class, declared weight class, and declared number of axles. Values are model-year VMT.

Once VMTMaster is built, it is used to convert self.paveFactors, which are by operating weight, actual number of axles, and functional class, into factors by declared weight class, declared number of axles (zero if declared weight under 80,000 pounds and nine if nine or more), and facility class (combinations of functional class and ownership, including the aggregate facility classes for all roads, all state-owned roads, and all locally owned roads), which are stored in self.pavement and used in allocateCosts() to allocate pavement costs to declared weight classes. The factors in self. pavement are VMT-weighted averages of the factors in self. paveFactors. Factors are constructed for both flexible and rigid pavements.

The structure of self.pavement is a nested dictionary. The outer key is the pavement type (Flex or Rigid) and the inner key is a tuple consisting of facility class, declared weight class, and declared number of axles. The code for preparing the pavement factors is intermingled with the code for building VMTMaster to save repeated looping over the same data structures.

The makeVMTByVehicles() method multiplies VMT values in self. baseVMT by the appropriate compounded growth rates to produce self. vmtByVehicles, which contains model-year VMT by weight class and tax class. These are returned to the HCAS Outputs workbook. self. vmtByVehicles is a nested dictionary. The outer key is the tax class and the inner key is the weight class.

COST ALLOCATION METHODS

The **allocateCosts()** method performs the following processes:

- Combine local costs data from self.localCosts with project costs data from self.projectCosts into self.projectCosts.
- Do bridge splits on project costs. For projects in work types 13, 14, 15, 19, 67, 68, 113, 114, 115, 119, 167, and 168 (bridge and interchange projects), the bridge type for each project is identified and the project's cost is split into multiple work types (60-65) using the bridge factors appropriate to the bridge type. Costs in the original work types are removed from self.projectCosts and the aggregated, split costs in work types 60-65 are inserted into self.projectCosts. Bridge projects that add capacity (work types 67, 68, 167, and 168) get their base increment allocated according to the allocator(s) specified in work type 65, so the portion of their costs that would go to work type 60 according to the bridge factors defined in the Bridge Splits tab of the workbook is instead assigned to work type 65.
- Separate bond projects and apply the bond factor. Projects where the funding source is "bond" are identified, their costs are multiplied by the bond factor, and they are removed from self.projectCosts and inserted into bondsToAllocate.
- Do studded tire adjustment. For each work type and corresponding dollar amount in self.studdedTire, the dollar amount is divided proportionally among all projects in that work type in self.projectCosts and moved out of those projects and into work type 39 or 139 (if the original work type was over 100, indicating work on locally owned roads).
- Set up allocation vector data structure (allocators) and build allocation vectors. There are allocation vectors for each combination of allocator, functional class, and ownership. Within each allocation vector, there is an element for each combination of weight class and number of axles.
- Build allocation vectors with the vector of allocation factors appropriate to the allocator. The allocation factors are proportional to costs imposed per VMT and come from self.simpleFactors, self.pavement, and self. pceFactors. Each allocation factor is then multiplied by the VMT in thatcombination of weight class and number of axles for the combination

of functional class and ownership for which the allocation vector is being prepared, which come from self.VMTMaster. The VMT multiplied by the allocation factors for Congested PCE are adjusted using the shares from self.peakShares so that they represent VMT during the peak hour for that functional class.

- Scale allocation vectors so that the elements of each vector sum to one. The resulting allocation vectors may then be multiplied by a project cost and the result will be a vector of allocated costs with each element containing the dollar amount for that combination of weight class and number of axles. All the elements in the allocated costs vector sum to the original amount to be allocated. For this to work, it is necessary that there be non-zero VMT in the combination of functional class and ownership associated with the project. Incorrectly recorded functional classes (e.g., locally owned interstates) can cause costs to disappear during allocation.
- Apply allocation vectors to project costs to allocate (except for “other construction” and “other bridge” costs) as described above to generate allocated project costs.
- Make Other Bridge and Other Construction allocators. Once bridge project costs other than “other bridge” have been allocated, a special allocation vector is built to allocate these costs in proportion to all previously allocated bridge project costs. The same is done to create a special allocation vector to allocate “other construction” costs in proportion to all previously allocated construction project costs.
- Apply Other Bridge and Other Construction allocators to “other bridge” and “other construction” costs.
- Apply allocators to non-project costs. Any bond-funded projects found in self.nonProjectCosts are removed, multiplied by self.bondFactor, and added to bondsToAllocate. Remaining non-project costs have the appropriate allocation factors applied to them and are added to allocatedCosts.
- Apply allocation vectors to bonded costs to allocate. Applies the allocators to bondstoAllocate and stores the result in allocatedBonds.
- Store allocated bonded costs. Creates a text file of allocated bond costs (allocatedBonds) for use in future studies. (Future model runs will use this file to obtain prior allocated bond costs.)
- Get prior allocated bonds from files. Captures allocated, current payments due on bonds issued for projects in previous biennia (priorBonds).
- Add current and prior allocated bonded costs to allocatedCosts.
- Write out detailed allocation results to tab-delimited text files, one for each funding source. These are named AllocatedCosts_federal.txt, AllocatedCosts_state.txt, etc.
- Copy allocators to self.allocators and allocatedCosts to self. fullAllocatedCosts.
- Prepare a summary table of allocated costs and that is returned to the HCAS Outputs workbook. Columns are funding sources and rows are combinations of declared weight class and declared number of axles. Cells contain allocated biennial dollars.

The getAllocationVectors() method gets the allocation vectors from self. allocators. Columns are allocators and rows are combinations of facility class, declared weight class, and declared number of axles.

The getAllocatedCostsByWorkType() method gets allocated costs from self.fullAllocatedCosts and aggregates them by summary work type from self.summaryWorkTypes and by summary weight class from self. summaryWeightClasses and returns the aggregated allocated costs to the Allocated Costs by SWT tab in the outputs workbook. Columns are summary weight classes and rows are combinations of funding source and summary work type. Cells contain allocated biennial dollars.

The getCostsToAllocate() method gets costs to allocate from self. projectCosts (which now includes local costs and excludes bonded costs), self.nonProjectCosts (which now excludes bonded costs), self.bondCosts, and self.priorBondAmount and aggregates them by summary work type from self.summaryWorkTypes. It returns the aggregated costs to allocate to Costs to Allocate tab in the outputs workbook. Note that prior bond amounts do not contain information about their original work type and are put into their own summary work type (21). Columns are funding sources and rows are summary work types. Cells contain biennial dollars.

REVENUE ATTRIBUTION METHODS

The attributeRevenue() method performs the following processes:

- Attribute road-use assessment fee (RUAF) revenue. RUAF revenues are attributed to weight classes by multiplying their model-year VMT in each combination of weight class and number of axles by the appropriate RUAF rate from self.RUAFRates. RUAF VMT are the total
- VMT in that combination of weight class and number of axles from self. VMTMaster times the ratio of RUAF VMT in that weight class to all VMT in that weight class from self.vmtByVehicles. This assumes that axle shares for RUAF vehicles under 105,500 pounds will be the same as for weight-mile tax vehicles in the same weight class, which has been determined to be a reasonable assumption. The resulting revenues are doubled to make them biennial. It is assumed that there is no evasion of road-use assessment fees. Attributed RUAF revenues are put into ruafRevenue, where the key is a tuple consisting of weight class and number of axles and the value is biennial dollars.
- Attribute weight-mile tax (WMT) revenue and as-if WMT revenue. WMT revenues are attributed to weight classes by multiplying their model-year VMT in each combination of weight class and number of axles form self.vmtByVehicles by the appropriate WMT rate from self.rates. The base-year VMT from which the model-year VMT were derived were adjusted upward from base-year WMT reports to account for assumed evasion, so the reverse adjustment must be applied to estimate WMT revenue. This is accomplished by multiplying revenues by (1.0 - self. wmtEvasion). The resulting revenues are doubled to make them biennial and stored in wmtRevenue. For all VMT by vehicles in weight classes to which WMT rates apply, but do not pay the WMT, flat fee, or RUAF, the weight-mile taxes they would pay if they did pay the WMT are calculated and stored in asifWmtRevenue. As-if WMT revenues for those paying flat fees are calculated later, along with flat-fee revenues. The key in both wmtRevenue and asifWmtRevenue is a tuple consisting of declared weight class and declared axles.
- Attribute flat-fee revenue. For each flat-fee commodity (log, dump, and chip), for each combination of weight class and number of axles, divide the model-year VMT by the average VMT per month for that commodity and weight, and multiply the resulting number of vehicle-months by the appropriate monthly flat-fee rate. As-if weight-mile taxes for flat-fee-paying vehicles are calculated at the same time. For flat- fee log trucks, the model VMT must be adjusted prior to estimating as-if WMT revenues. When paying the WMT, log trucks can declare a lower weight when empty and traveling with their trailer decked. When estimating as-if WMT revenues for flat-fee log trucks, VMT in each weight class are multiplied by (1.0 - self.emptyLogPercent) and then by the WMT rate appropriate to that weight class. The VMT then are multiplied by self.emptyLogPercent and the WMT rate appropriate to self.emptyLogWeight. The flat-fee and as-if WMT revenues are doubled to make them biennial and stored in ffRevenue and asifWmtRevenue, respectively. A tab-delimited text file, FlatFeeReport.txt, containing flat-fee VMT, revenues, and as-if WMT revenues by commodity and weight class is written out to disk as a text file.
- Attribute registration and title revenues. Budgeted total DMV registration, Motor Carrier Apportioned, Motor Carrier Non-Apportioned, and title fee revenues are attributed to vehicle classes using fee-weighted VMT. VMT for vehicles over 26,000 pounds are adjusted using the declared-to-registered factors. VMT by tax class and weight class are multiplied by the registration fee that applies to that combination and the resulting amounts are scaled so that they add up to the total expected registration fee revenue. For vehicles over 26,000 pounds, registration fee revenues by registered weight are converted back to revenues by declared weight class using the same declared-to-registered factors. A further adjustment is made to give RUAF vehicles credit for the registration fees they pay.
- This method eliminates the need for forecasting vehicle counts and automatically accounts for the substantial registration revenues that are produced by fees other than the regular registration fee (e.g., temporary registrations, duplicates, etc.). It also eliminates the need for directly forecasting the number of titles that will be issued. There is an implicit assumption that vehicles in the different weight classes of heavy vehicles all travel the same number of miles per title issuance. “As-if” registration fees are estimated for alternative-fee-paying vehicles. As of the 2011 Study, Flat Fee vehicles are no longer treated as alternative fee-paying vehicles.

- The method loops over the rows (combinations of declared weight class and declared number of axles) in self.rates, which are the current-law rates entered in the General tab of the HCAS Inputs workbook. It multiplies the fee per year by the VMT per year by the vehicles subject to that fee (as if the rate were per VMT). It then adds up those (large) numbers for each instrument and divides the biennial revenue control total for that instrument by the sum of annual miles times annual fee for that instrument. It applies that ratio to the annual miles times annual fee for each combination of declared weight class and declared number of axles to get biennial revenues for that combination and instrument.
- For vehicles over 26,000 pounds, an individual vehicle will have one registered weight, but may have multiple declared weights, depending on configuration. When getting the annual VMT to multiply by each rate, self.declaredRegistered, which contains the proportion of VMT for each declared weight class that is in each registered weight class, is used.
- For vehicles over 80,000 pounds, the revenues are attributed to vehicles classes defined by both declared weight and number of axles, so axle shares for each weight class are calculated and used to spread the registration revenues (which vary only with weight) among the numbers of axles for each weight class.
- At the same time that registration revenues are attributed for “alternative” registration fees (e.g., farm, charitable/non-profit, publicly owned, etc.), “as-if” registration fees are calculated as if they paid the “normal” registration rate for their weight. Those are used later to calculate the “subsidy” amount.
- Make an adjustment to registration revenues to give RUAF vehicles some credit. When a vehicle pays the road-use assessment fee, it is often operating at a weight above the maximum allowed declared or registered weight of 105,500 pounds. These vehicles do pay registration fees, but at a weight that does not correspond to the weight recorded in the RUAF data. Assumptions are specified in the Revenues tab of the workbook that allow RUAF vehicles to be credited with registration fees by transferring attributed fees from lower weight classes.
- Attribute fuel tax and VMT tax revenues. Gasoline and diesel fuel tax revenues are attributed separately because the model allows for different tax rates and different evasion/avoidance assumptions. VMT by fuel type and weight class for fuel-tax paying vehicles are assembled and adjusted for evasion/avoidance. A preliminary attribution is made by dividing the adjusted VMT in each combination of weight class and fuel type by the assumed miles per gallon for that weight class from the MPG data set and multiplying the resulting number of gallons by the per-gallon rate for that fuel type. The attribution to vehicles between 10,001 and 26,000 pounds is then adjusted to bring those weight classes, as a group, to equity (before considering subsidies). The attribution to basic vehicles (those 10,000 pounds and under) is adjusted to make the total revenues attributed add up to the forecast revenues from the budget. The implied miles per gallon after adjustment for each weight class is calculated and returned to the MPG tab in the outputs workbook where it may be examined for reasonableness. The reasons for using this approach are detailed in Issue Paper 6 from the 2005 study.
- The first step in attributing fuel tax revenues is finding the taxed VMT by weight class for the gas tax and for the use-fuel (diesel, etc.) tax, taking into account avoidance, evasion, the portion of basic vehicles that do not burn gasoline, and the fact that publicly owned vehicles such as transit and school buses do not have to pay the use-fuel tax.
- The taxed VMT for each weight class is divided by the assumed miles per gallon from self.MPG and multiplied by the tax rate per gallon to get revenues by weight class. The assumed miles per gallon for vehicles between 10,001 and 26,000 pounds are then adjusted to force those weight classes into perfect equity (before the subsidy adjustment) and their attributed fuel-tax revenues are recalculated. The sum of attributed non-basic (over 10,001 pounds) fuel taxes are subtracted from their revenue control totals, leaving the amount from basic vehicles. The assumed average basic-vehicle is then recalculated so that basic vehicles will produce this amount of revenue and that amount is attributed to basic vehicles. The calibrated miles-per-gallon assumptions are stored in self.adjustedMPG.
- Attribute other motor carrier revenue. Budgeted other motor carrier revenue is attributed to heavy vehicle weight classes on the basis of all RUAF and WMT VMT.

- Determine subsidy amount for each weight class. These are calculated for each tax class by subtracting what they do pay in each revenue category from what they would pay if they paid the “regular” tax or fee. Subsidy amounts may be negative.
- Prepare a table of attributed revenues and subsidy amounts to save to a tab in the outputs workbook.

Attributed revenues are saved in the Attributed Revenues tab of the outputs workbook. getAdjustedMPG() returns the calibrated miles-per-gallon assumptions from self.adjustedMPG to the MPG tab in the outputs workbook.

ALTERNATIVE REVENUE ATTRIBUTION METHODS

The attributeAltRevenues() method repeats the revenue attribution process using alternative rates specified by the analyst in the *Alt. Rates* tab of the inputs workbook.

The process for alternative revenue attribution is essentially the same as for the primary revenue attribution, but there are important differences:

- When attributing registration and title fee revenues, assume that the revenues per VMT for each combination of instrument and weight class will change by the ratio of alternative rate to original rate. This allows estimating revenues from alternative registration and title fees without specifying the total revenue they will produce in advance.
- When attributing fuel-tax revenues, use the calibrated miles per gallon from the original revenue attribution. This allows estimating revenues from alternative fuel-tax rates without specifying the total revenue they will produce in advance.

Alternate attributed revenues are saved in the *Alt. Attributed Revenues* tab of the outputs workbook.

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MODEL ASSUMPTIONS AND DATA SOURCES

This appendix documents the assumptions and data used in the final run of the HCAS model for the 2025 Highway Cost Allocation Study. Data used in the final model run were collected between roughly September 2024 and December 2024. The final model run was completed and verified in January 2025.

Table 1 through Table 6 list assumptions in the HCAS Inputs Excel workbook that are used in the final run of the model. Table 1 and Table 2 have the HCAS Inputs workbook tab listed in the first column followed by the assumption name or brief description.

Like prior HCAS inputs workbooks, this workbook includes a Base VMT tab. Table 1 lists the assumptions used to develop the Base VMT tab in the inputs workbook. These assumptions are yellow-shaded cells in their respective workbook tabs. The key tabs that are linked to and build up the Base VMT tab are the VMT Growth, DMV VMT, MCTD VMT, Federal VMT, and Bus VMT tabs.

Table 2 lists the assumptions in the HCAS inputs workbook. Most of the assumptions listed in Table 2 correspond to yellow-shaded cells in their respective workbook tab.

Table 3 through Table 5 display the assumptions for studded tires, motor home weight classes, bridge splits, and initial mpg because these assumptions are tables or ranges, not single values.

Table 3 displays expenditures related to studded tires. It shows biennium expenditures by funding source, work type and facility class.

Table 4 displays the assumed bridge splits used to split bridge project expenditures among the bridge reclassification work types. These assumed values are from the 2002 OBEC Bridge Allocation Report.

Table 5 contains the assumed initial MPG, created from an ECO Analysis of 2019-2023 IFTA data, as well as projections of basic vehicle MPG received from ODOT.

Table 6 lists the files and sources of the data used in the 2025 Final HCAS model run.

TABLE 1. BASE VMT WORKSHEET ASSUMPTIONS

Tab	Assumption	Value
DMV VMT	Commercial Trucks & Buses Annual VMT per vehicle (10,001 to 26,000 weight class)	12,873
DMV VMT	Tow Truck Annual VMT per vehicle	22,527
DMV VMT	Farm Vehicle Annual VMT per vehicle	12,282
DMV VMT	Permanent Registration Annual VMT per vehicle	5,549
DMV VM	Charitable & Non-Profit Annual VMT per vehicle	7,556
DMV VMT	Motorhome Annual VMT per vehicle	3,798

See: HCAS Inputs 2023.xlsx

TABLE 2. HCAS MODEL USER-SPECIFIED ASSUMPTIONS

Tab	Assumption	Value	Justification/Source
General	Split of bridge expenditures across bridge reclassification work types	See Table 4	2002 OBEC Bridge Allocation Study
General	Base Year	2025	Ch. 2, pg. 15
General	Biennium	2027	Ch. 2, pg. 15
General	BondFactor	0.1472	Ch. 3, pgs. 21-22
General	Forecast Year (also, Model Year)	2026	Ch. 2, pg. 15
General	Percent of basic gallons that are diesel	5.0%	NA
General	Percent of RV gallons that are diesel	50%	NA
General	Percent of taxed gallons that are basic	91.57%	NA
MPG	MPG (initial) by weight class	See Table 5	Estimated from ECONW Analysis of 2019-2023 IFTA data and ODOT projections for basic vehicle MPG
Policy	Preliminary and Construction Engineering (and etc.) Share 1	55.95%	Ch. 3, pg. 17
Policy	Right of Way (and Utilities) Share 1	73.75%	Ch. 3, pg. 17
Policy	New Pavements-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 17
Policy	New Pavements-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 17
Policy	Pavement and Shoulder Reconstruction-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 17
Policy	Pavement and Shoulder Reconstruction-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 17
Policy	Pavement and Shoulder Rehab-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 17
Policy	Pavement and Shoulder Rehab-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 17
Policy	Surface and Shoulder Maintenance-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 17
Policy	Surface and Shoulder Maintenance-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 17
Policy	Local Gov: Preliminary and Construction Engineering (and etc.) Share 1	55.92%	Ch. 3, pg. 19
Policy	Local Gov: Right of Way (and Utilities) Share 1	55.92%	Ch. 3, pg. 19
Policy	Local Gov: New Pavements-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 19
Policy	Local Gov: New Pavements-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 19
Policy	Local Gov: Pavement and Shoulder Reconstruction-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 19
Policy	Local Gov: Pavement and Shoulder Reconstruction-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 19
Policy	Local Gov: Pavement and Shoulder Rehab-Flexible Allocator/Share 1	3.99%	Ch. 3, pg. 19
Policy	Local Gov: Pavement and Shoulder Rehab-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 19
Policy	Local Gov: Surface and Shoulder-Rigid Allocator/Share 1	3.99%	Ch. 3, pg. 19
Policy	Local Gov: Surface and Shoulder-Flexible Allocator/Share 1	5.43%	Ch. 3, pg. 19

TABLE 2 (CONTINUED). HCAS MODEL USER-SPECIFIED ASSUMPTIONS

Tab	Assumption	Value	Justification/Source
Policy	All other Allocators Shares for work types not Prelim. Engineering, ROW, or Pavement	100%	Ch. 3, pgs. 17-20
General	Gas Tax Avoidance Rate	3.53%	Ch. 3, pg. 26
General	Diesel Tax Evasion & Avoidance Rate	4.53%	Ch. 3, pg. 26
General	WMT Evasion Rate	9.4%	Ch. 3, pg. 26
General	Basic Diesel (Percent of basic VMT by diesel vehicles)	5%	
General	Taxed Diesel (percent of taxed gallons that are diesel)	10.5%	
General	RUAF Registration Adjustment	4.5%	NA
General	RUAF Reg. from 78001	14%	NA
General	RUAF Reg. from 96001	15%	NA
General	RUAF Reg. from 104001	71%	NA
General	Log truck miles empty	55%	Ch. 8, pg. 64
General	Split of studded tire expenditures across funding sources and work types	See Table 3	NA

See: HCAS Report; General, Policy and MPG tabs, HCAS Inputs.xlsx

TABLE 3. STUDDED TIRE ASSUMPTIONS

Funding	Work Type	Facility Class	Biennium Expenditures ($)	Distribution by Work Type
state	-	0	4,188,4481[1]	100%
state	1	0	199,118	5%
state	11	0	3,318,633	79%
state	26	0	670,697	16%
local-state	-	-2	460,7292[2]	100%
local-state	101	-2	21,903	5%
local-state	111	-2	365,050	79%
local-state	126	-2	73,777	16 %

See: General tab, HCAS Inputs.xlsx

[1] Figure 5.5, Review of Studded Tires in Oregon, Final Report, SPR 304-671, December 20, 2014, ODOT Research Section

[2] Equal to 11% of state expenditures (using state / local-state split, speed adjustment factor).

TABLE 4. BRIDGE SPLIT ASSUMPTIONS

Bridge Type	Work Type	Share
0	60	0.6849
0	61	0.2520
0	62	0.0000
0	63	0.0000
0	64	0.0631
1	60	0.6666
1	61	0.2999
1	62	0.0000
1	63	0.0000
1	64	0.0335
2	60	0.6849
2	61	0.2520
2	62	0.0000
2	63	0.0000
2	64	0.0631
3	60	0.7221
3	61	0.1697
3	62	0.0000
3	63	0.0514
3	64	0.0568
4	60	0.8713
4	61	0.1029
4	62	0.0000
4	63	0.0000
4	64	0.0258

See:General tab (Bridge Splits Table), HCAS Inputs.xlsx

TABLE 5. MPG ASSUMPTIONS (INITIAL MPG)

Declared	MPG	Declared (cont.)	MPG (cont.)
1	26.45	66001	6.51
10001	10.85	68001	5.39
12001	10.27	70001	5.52
14001	9.77	72001	4.75
16001	9.33	74001	5.07
18001	8.94	76001	4.19
20001	8.59	78001	6.35
22001	8.27	80001	5.77
24001	7.98	82001	5.77
26001	8.93	84001	5.87
28001	7.01	86001	6.02
30001	7.64	88001	5.39
32001	6.57	90001	5.89
34001	8.11	92001	5.56
36001	8.17	94001	5.81
38001	8.37	96001	5.10
40001	8.39	98001	5.36
42001	6.89	100001	5.07
44001	6.98	102001	4.78
46001	7.70	104001	4.92
48001	7.30	110001	5.07
50001	7.07	112001	5.04
52001	6.39	114001	5.01
54001	6.25	116001	4.99
56001	6.23	118001	4.96
58001	7.07	120001	4.93
60001	5.43	122001	4.91
62001	5.25	124001	4.88
64001	5.65	126001	4.86

Declared	MPG	Declared (cont.)	MPG (cont.)
128001	4.83	164001	4.42
130001	4.81	166001	4.40
132001	4.79	168001	4.38
134001	4.76	170001	4.36
106001	4.74	172001	4.34
108001	4.72	174001	4.33
136001	4.70	176001	4.31
138001	4.67	178001	4.29
140001	4.65	180001	4.28
142001	4.63	182001	4.26
144001	4.61	184001	4.24
146001	4.59	186001	4.23
148001	4.57	188001	4.21
150001	4.55	190001	4.19
152001	4.53	192001	4.18
154001	4.51	194001	4.16
156001	4.49	196001	4.15
158001	4.47	198001	4.13
160001	4.45	200001	4.12
162001	4.43		

See: MPG tab, HCAS Inputs.xlsx

PROCESSING OF ORIGINAL DATA

The following section discusses data sets that require pre-processing outside of the HCAS model.

Project Costs

The project costs table from the input data was reshaped into a table which recorded expenditure amounts by each unique combination of project, funding source, and work type. The resulting table was sent to ODOT so that their engineers could identify the appropriate work and bridge types for projects whose classifications could not be determined based on the data that was received.

The information from ODOT was then added to the Inputs Workbook.

Flat Fee Collections

The flat fee data was summarized into a series of tables that were each used as inputs into the model.

The first table summarizes VMT for flat fee vehicles by summary weight and type of permit. The second table summarizes monthly VMT by summary weight, number of axles, and type of permit. The third table summarizes the share of VMT within each weight class that is attributed to vehicles of each axle count.

HPMS

The entire HPMS data set is an input file for the NAPCAS model. The HPMS data are also used in the process of estimating distributions of VMT by functional class and ownership in the VMT by FC tab in the inputs workbook. To perform the data tabulation of the HPMS data for the VMT by FC tab, the HPMS section average annual daily traffic (AADT) was divided by the section length in miles and multiplied by 365 days to calculate the section VMT. Since HPMS is a sample, each sample section VMT was expanded by multiplying it by its section weight. A summary table of VMT by functional system and ownership was tabulated and pasted into the inputs workbook such that the rows are the functional system, the column headings are ownership, and the cell entries are the sum of VMT.

Road Use Assessment Fee

The RUAF data was used to calculate VMT by RUAF permit type, weight, and axle class. This data was then added to the Inputs Workbook for use in the model.

Weigh-in-Motion

The WIM data were used to calculate distributions of operating weight classes and numbers of axles for each declared weight (and number of axles for declared weights over 80,000 pounds). For each declared weight and axle category, analysts calculated the VMT among vehicle operating weight classes and number of axles (coding 9 or more axles as 9), and the distribution of these values expressed in percentages. These tables are both used as inputs in the model.

DMV Vehicle Registrations

The DMV registrations data were used to create a summary table of vehicle registrations by fuel type and weight class for the following vehicle tax classes: Commercial Trucks (10,001 to 26,000 pounds), Tow Trucks, Farm Vehicles, Charitable Non-profit, and E-Plate (exempt). This table is then added to the inputs workbook.

WMT Colletions Reports

The records in the WMT Collections Report data were each assigned to a weight class and axle class using the HCAS weight class and axle class categories. Then, a summary table giving the sum of the miles traveled by weight and axle class categories was created. This table was added to the inputs workbook.

Motor Carrier Registrations

The Motor Carrier Registrations data was used to determine the share of vehicle registrations for the distribution of registered weights for each declared weight. A final processed table was created which contained the declared weight, the registered weight, and the share of registrations at that declared weight. This table is used as an input into the model.

TABLE 6. 2025 HCAS DATA FILES AND SOURCES

Data	Source	File Name
Bridge Project Information	ODOT	Costs to Allocate and Projects Expenditures 2025-27_final.xlsx
DMV Registration Data	ODOT	CurReg_122023_with_DataOne.dta
Federal Fleet Report	https://www.gsa.gov/policy-regulations/policy/vehicle-management-policy/ffr-open-data-set-library	2023 Federal Fleet Report. US General Services Administration (GSA).
FHWA Highway Statistics-Table MV7	https://www.fhwa.dot.gov/policyinformation/statistics.cfm	FHWA Highway Statistics-Table MV7 (2022): mv7.xls
FHWA Highway Statistics-Table VM2	https://www.fhwa.dot.gov/policyinformation/statistics.cfm	FHWA Highway Statistics-Table VM2 (2022): vm2.xls
Flat Fee Collections Reports	ODOT	OR_LOGS_Combined_2023.xlsx, AppendixD_OtherStates_2023.xlsx, OR_S&G_100%_97%_95%_2023.xlsx
OR HPMS Submittal Data	ODOT	OR2023.gdb.zip
Local Costs: Local Roads and Streets Survey	ODOT	2023 LRSS Master Combined City County 11-28.xlsm
Motor Carrier Registrations	ODOT	CurReg_122023_with_DataOne.csv
Non-Project Costs	ODOT	Costs to Allocate and Projects Expenditures 2025-27_final.xlsx
Pavement Factors	Roger Mingo, Mingo and Assoc.	Pave Results 2025 WIM v3 VMT v4.xlsx
Project Costs	ODOT	Costs to Allocate and Projects Expenditures 2025-27_final.xlsx
VMT Forecast	ODOT	VMT forecast for HCAS_2025 summary.xlsx
Revenue Forecast	ODOT	Transactions Revenues 2025-27_April 2024 Forecast.xlsx
RUAF Collection reports	ODOT	RUAF_2023.csv
Transit VMT: Tri-Met	ODOT	2023_HCAS_Bus_VMT.xlsx
Weigh-In-Motion Data	ODOT	RFW 43808 - HCAS WIM Data 2023.xlsx
WMT Collection Reports	ODOT	CPTUHUS8.THUSMSTR.TXT

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