

APPENDIX

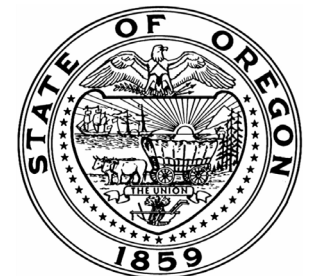
Highway Cost Allocation Study 2023-2025 Biennium

PREPARED BY

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EVALUATING THE I-205 TOLL PROJECT

This issue paper, however, is focused on evaluating the potential cost-allocation implications of tolling in the I-205 corridor at and approaching the Abernethy Bridge. That toll program is designed to finance corridor improvement while also retaining some variable toll rates in hopes of alleviating congestion and providing a lower toll cost option for corridor users during off-peak travel periods. In this paper, our concern is narrowly defined as the question of whether the shares of incremental costs allocated to different classes of highway users (light-duty versus heavy-duty vehicles) are similar to the shares of toll revenues that are paid.

Our approach to evaluating this question necessarily relies upon a current implementation of the HCAS model and reporting framework. However, tolls in the I-205 corridor will not be levied during the upcoming biennium. So, the first step in the evaluation is determining the methods for incorporating information about future tolling within the existing HCAS model. The steps are as follows:

1. Establish a baseline set of equity ratios from the current HCAS model for the 2023-25 biennium.
2. Identify an estimate of toll revenues appropriate for inclusion in the HCAS model.
3. Include in the HCAS model a list of projects and project costs associated with the I-205 toll program.
4. Assign work types to the I-205 toll program projects.
5. Calculate a new set of equity ratios that reflect both toll revenue and toll-program projects and costs.

The source of information about toll-revenue estimates is the I-205 Toll Project Level 2 Toll Traffic and Revenue Study Report released in October of 2022. Information about the I-205 projects and project costs, and their work types, was provided by the Oregon Department of Transportation.

I-205 TOLL PROJECT

ODOT is proposing to implement tolls on the Abernethy Bridge and Tualatin River Bridges of I-205 to generate funding for the I-205 Improvements and to manage congestion on I-205 between Stafford Road and Oregon Route 213. The I-205 Toll Project is located on I-205 approximately five miles south of Portland and crosses through the jurisdictions of Oregon City, West Linn, and Clackamas County. Exhibit 1 illustrates the I-205 Toll Project and the locations for placement of toll gantries near the Abernethy Bridge and the Tualatin River Bridges.

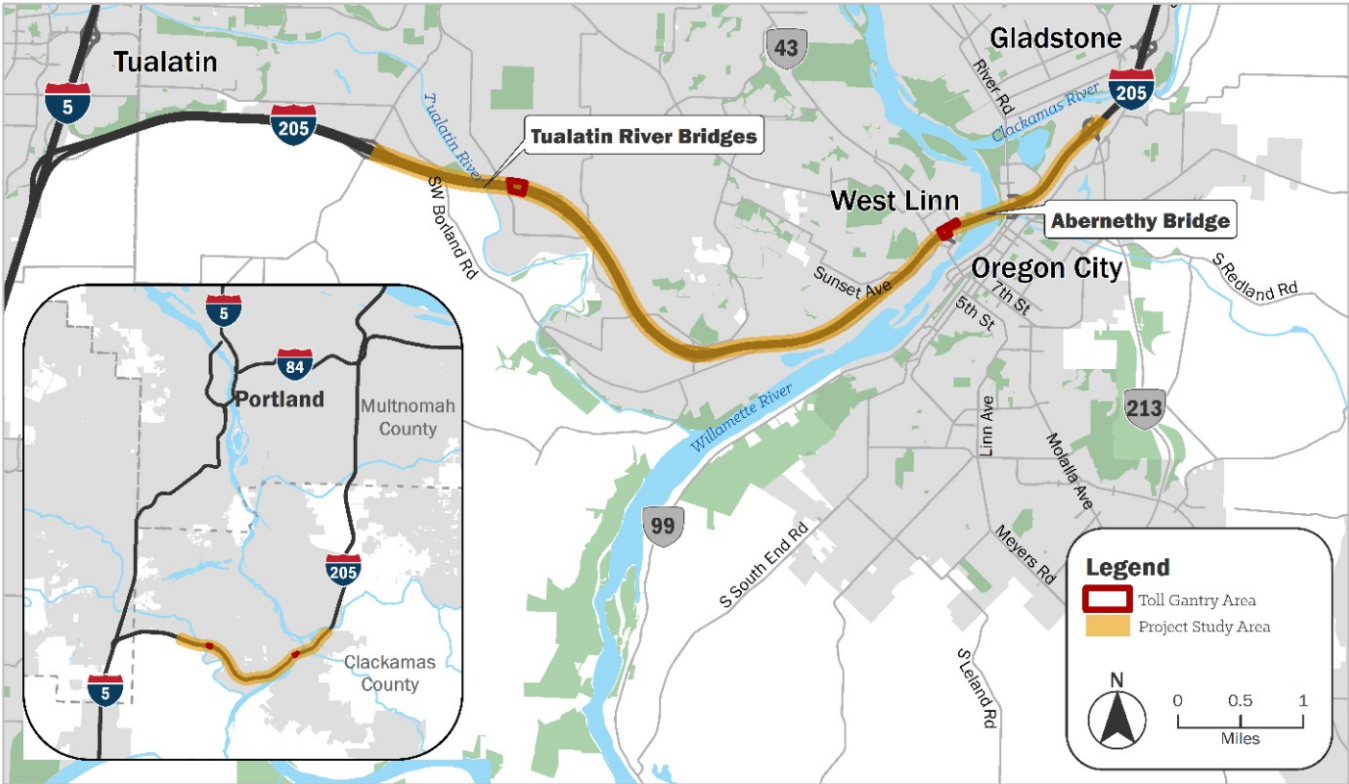
The I-205 Improvements Project includes the following project elements:

- Constructing seismic upgrades to eight bridges along I-205
- Constructing a third lane in each direction of I-205 between Stafford Road and OR 99E and constructing a northbound auxiliary lane from OR 99E to OR 213
- Constructing interchange improvements.

The I-205 Improvements Project would be constructed in two phases (Exhibit 2). Phase 1 would involve multiple contracts and subphases (A – D). In 2021, HB 3055 provided state financing tools that allow construction of Phase 1A to begin in 2022, prior to toll implementation. Phase 1A includes reconstructing the Abernethy Bridge and adjacent interchanges at OR 43 and OR 99. Funding through toll revenues is necessary to complete the remaining phases of the I-205 Improvements Project:

- Phase 1B (OR 99E to OR 213)
- Phase 1C (Sunset Bridge to OR 43)
- Phase 1D (10th Street to Sunset Bridge)
- Phase 2 (Stafford Road to 10th Street, and reconstruction of the Tualatin River Bridges)

EXHIBIT 1: I-205 TOLL PROJECT LOCATION



Source: I-205 Toll Project Level 2 Toll Traffic and Revenue Study Report, October 2022

EXHIBIT 2: I-205 TOLL PROJECT PHASES



Source: I-205 Toll Project Level 2 Toll Traffic and Revenue Study Report, October 2022

TRAFFIC AND REVENUE STUDY

The I-205 Toll Project Level 2 Traffic and Revenue (T&R) Study is the basis for estimates of toll revenues that are used in this issue paper. The Traffic and Revenue Study begins with the representation of the toll project within the Portland Metro regional travel demand model. The study was conducted by a team comprised of staff from Metro, ODOT, and a WSP Consultant Team.

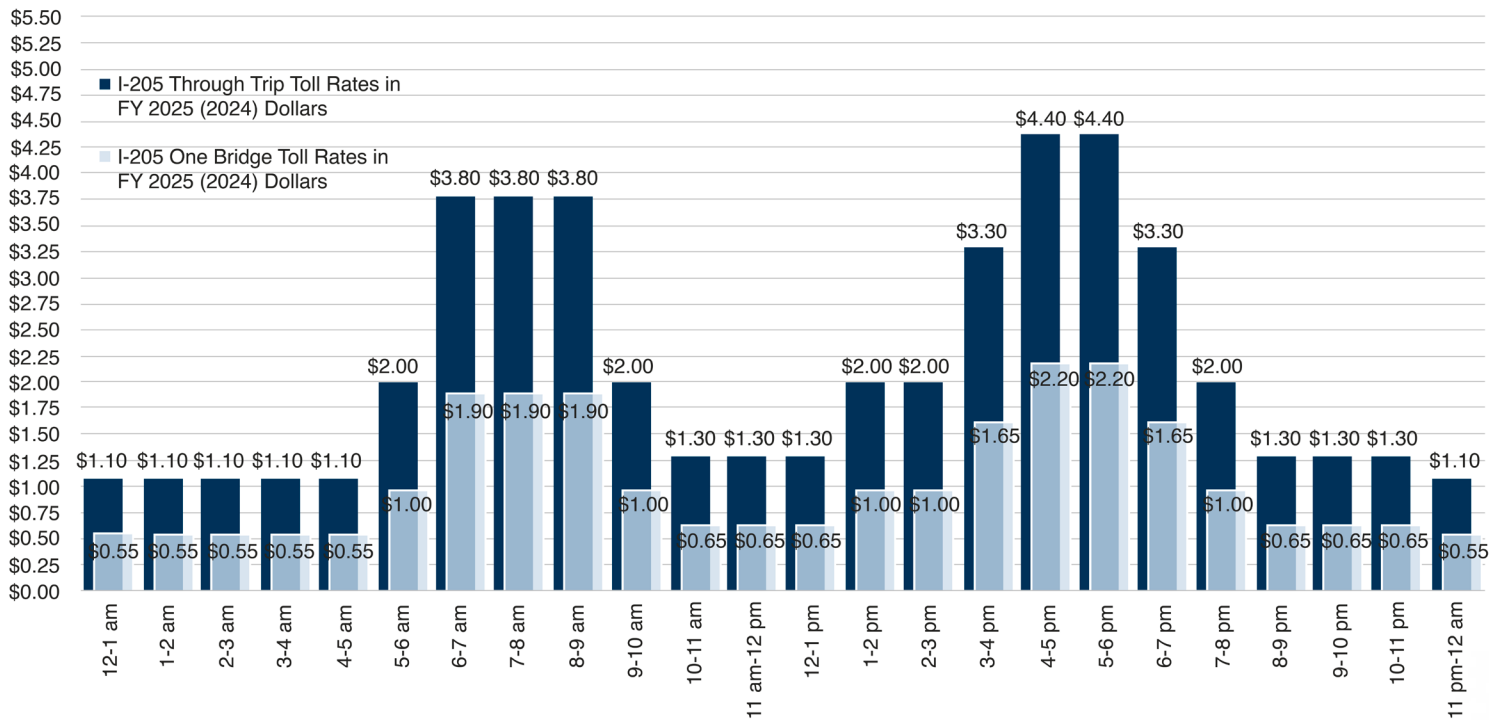
Metro developed and maintains both the regional travel demand model and dynamic traffic assignment models for use on the I-205 Toll Project. These model data include the existing base year (2015) and future years (2027 and 2045) No-Build and Build models. The Consultant Team applied the models to conduct analysis and sensitivity tests, and to derive specific model outputs for analysis purposes. Model volumes from both the demand model and peak-period volumes from the DTA model were post-processed

to obtain the projected 2027 and 2045 weekday traffic volumes used for preparing the annual toll traffic and revenue projections.

The traffic volumes and toll rates (see Exhibit 3 below) that are part of the travel demand forecast were then used in the Traffic and Revenue Study to estimate toll transactions and gross and net toll revenues. The toll rates assumed in the Traffic and Revenue Study varied by time of day but also across light-duty vehicles, medium trucks, and heavy trucks. Medium trucks see a toll that is two times the value of the base toll rate while heavy trucks see a toll that is four times the value of the base toll rate.

The T&R Study estimated toll transactions and gross revenues for each of the above vehicle classes and also estimated the various uncollectable revenue and toll transaction fees that permit the estimation of a net revenue finding.

EXHIBIT 3: I-205 TOLL RATES



Source: I-205 Toll Project Level 2 Toll Traffic and Revenue Study Report, October 2022

TOLL REVENUE ATTRIBUTION

For this issue paper, the I-205 Toll Project toll transactions, gross revenues, and net revenues for each vehicle class are used as a basis for the toll revenue attribution to the various HCAS vehicle categories. Toll revenue attribution is handled as a post-processing step once the HCAS model has been implemented.

Within the I-205 Toll Project Level 2 Traffic and Revenue Study, the gross revenue is first adjusted for uncollectable revenues. This adjusted toll revenue is the starting point for this issue paper’s revenue attribution. Next, a set of toll system-related fees is removed from the adjusted revenue estimates to arrive at net revenues. The fees estimated in the T&R Study are apportioned according to the share of toll transactions that are associated with each vehicle class for the purposes of this issue paper.

The T&R Study projects toll revenue estimates through the year 2060. But for our purposes, we require early-year revenue estimates that coincide as closely as possible with the current HCAS model implementation timeline (2023-25). Since early-year estimates include a tolling ramp-up period (a period where toll system users adjust to the new system) we have chosen revenue estimates that occur just after the ramp-up has concluded. This set of assumptions is a reasonable basis for a preliminary examination of tolling within HCAS that preserve the basic logic of the toll program while conforming to HCAS modeling requirements that otherwise reflect the most recent other HCAS cost and revenue inputs and assumptions.

EXHIBIT 4: TRAFFIC AND REVENUE STUDY INPUTS TO HCAS

Annual Average Adjusted Gross and Net Toll Revenue (millions)			
	Basic Vehicles	Medium Truck	Heavy Truck
Adjusted Revenue	\$71.86	\$ 9.51	\$22.83
Toll System Costs	-40.73	-2.69	-3.24
Net Revenues	31.13	6.81	19.60

Source: I-205 Toll Project Level 2 Toll Traffic and Revenue Study Report, October 2022

As a sensitivity test, we examined the average gross toll and net toll revenues over the full T&R forecast and determined that the share of revenues by vehicle class does not change substantially.

TOLL PROJECT COST ALLOCATION

The I-205 Corridor investments are to be financed, in part, with toll revenue. The initial phase of investment is the replacement of the Abernathy Bridge. As described above, subsequent phases of investment include constructing a third lane in each direction of I-205 between Stafford Road and OR 99E and constructing a northbound auxiliary lane from OR 99E to OR 213, improving interchanges, and reconstructing the Tualatin River Bridges.

Total additional investment beyond the current Phase 1A will total \$697 million. ODOT has indicated that the expenditures can be allocated to various types of work activities in the following manner:

- Engineering, 20% (this includes construction engineering)
- ROW/utilities, 5%
- New structures (retaining walls), 2%
- Replacement structures, 7%
- Roadside improvements, 30%
- Safety improvements, 5%
- Bike/ped improvements, 1%
- Bridge replacement with capacity (Tualatin River Bridges). 20%
- Structures rehabilitation: 10%

In addition, there are toll system deployment costs of \$84 million that are not otherwise accounted for in the T&R study gross to net revenue data that is part of our revenue analysis.

Much in the same way that toll revenues will not be collected during the 2023-25 biennium,

these project costs will likewise be incurred in the future. Similarly, in order to preserve the basic logic of the toll program while conforming to HCAS modeling requirements that otherwise reflect the most recent other HCAS cost and revenue inputs and assumptions, we include these project costs in the current HCAS model. However, since the project costs are large and will be supported through bond sales, we include the costs as bonded projects so that only annual bond payments are included in the comparison with toll revenues.

FINDINGS

The test of the I-205 Toll Project within the HCAS model is necessarily an incremental analysis that builds upon the base 2023 HCAS model and results. In order to make this analysis feasible, the actual details of the investment—including when projects are built (or costs are incurred) and when tolls are paid and revenues are collected—have been modified. In short, the analysis is equivalent to imagining that the toll project has already been built and toll operations have begun at the beginning of the 2023-25 biennium. This assumption is a necessary abstraction in order to make the HCAS analysis feasible but it does not fundamentally alter the equity implications and findings.

This paper examines how toll operations might be expected to affect the equity of highway finance by examining cost responsibility and revenue attribution across three toll-paying vehicle classes (light-duty, medium trucks, and heavy trucks). Within the HCAS model, these vehicle classes are based on vehicle weight (under 10,000 lbs., 10,000 to 26,000 lbs., and above 26,000 lbs.). The toll system is expected

to classify vehicles by shape rather than weight, but nonetheless, the two classification systems are similar.

The base 2023 HCAS results are included in Exhibit 5 below. The exhibit displays cost shares, revenue shares, and equity ratios for the three vehicle classes. Exhibit 6 includes the same metrics for the 2023 HCAS model with the inclusion of the I-205 toll program.

EXHIBIT 5: BASE 2023 HCAS: COST SHARES, REVENUE SHARES, AND EQUITY RATIOS

BASE 2023 HCAS			
	Basic/ Light	Medium Truck	Heavy Truck
Cost Share	72.7%	3.3%	24.0%
Revenue Share	63.9%	3.5%	32.6%
Equity Ratio	0.878	1.076	1.358

Source: ECONorthwest, 2023 HCAS Model

The comparison of Exhibits 5 and 6 demonstrates the equity implications for the entire system of highway finance. With the inclusion of the I-205 toll program medium and heavy trucks pay a higher share of user fees than in the Base case. The share of costs allocated to medium and heavy vehicles, with

EXHIBIT 6: 2023 HCAS WITH I-205 TOLL PROGRAM: COST SHARES, REVENUE SHARES, AND EQUITY RATIOS

2023 HCAS with I-205 Toll Program			
	Basic/ Light	Medium Truck	Heavy Truck
Cost Share	73.3%	3.2%	23.5%
Revenue Share	63.5%	4.0%	32.5%
Equity Ratio	0.866	1.225	1.386

Source: ECONorthwest, 2023 HCAS Model

the inclusion of the I-205 toll program, decline slightly as compared with the Base case. As a result, the equity ratio for basic vehicles with the inclusion of the I-205 toll program declines and the equity ratios for medium and heavy vehicles increase.

And finally, Exhibit 7 includes results from examining just incremental costs and revenues from the I-205 toll program. These findings demonstrate whether the toll program, on its own, results in tolls being paid in proportion to the costs assigned to each class of vehicles. Based on the current analysis assumptions, basic or light-duty vehicles are responsible for 93 percent of the toll program costs while paying 58 percent of the net toll revenues, resulting in

an equity ratio of 0.627. The equity ratios for medium trucks and heavy trucks are 8.577 and 5.230 respectively.

EXHIBIT 7: INCREMENTAL I-205 TOLL PROGRAM: COST SHARES, REVENUE SHARES, AND EQUITY RATIOS

Incremental Results for the I-205 Toll Program			
	Basic/Light	Medium Truck	Heavy Truck
Cost Share	92.8%	1.2%	6.0%
Revenue Share	58.2%	10.3%	31.5%
Equity Ratio	0.627	8.577	5.230

Source: ECONorthwest, 2023 HCAS Model

POTENTIAL IMPLICATIONS

An ex-ante evaluation of the I-205 toll program has limitations, especially given the assumptions that need to be made in order to include toll project costs and revenues in the 2023 HCAS model. As such, these findings need to be considered with those limitations in mind. The potential implications for equitable highway finance are a best guess based on existing plans for tolling implementation as included in the I-205 Phase 2 Traffic and Revenue Study.

The expectation is that toll rates established for the Portland metro region will vary according to

a time-of-day schedule based on congestion relief goals, revenue needs, and public input. However, actual toll policy in Oregon is set by the Oregon Transportation Commission and is likely to be set about six months before tolling begins.

This current analysis suggests that basic/light-duty vehicles may not contribute to toll revenues proportionate to their cost responsibility, and that medium and heavy trucks may contribute to toll revenues in excess of their cost responsibility. A reasonable question is what toll policy could yield equity ratios that are closer to 1.0 for each vehicle class?

The assumptions used in the I-205 T&R Study are that medium trucks pay a toll that is twice the base toll rate and that heavy trucks pay a toll that is four times the base toll rate. An alternative approach is to set toll rates that are based on each vehicle’s passenger car equivalency (PCE). PCEs reflect the fact that larger vehicles take up more space on the road and also that heavier vehicles have different performance in terms of acceleration, vehicle spacing, and deceleration. These differences in performance determine how each vehicle contributes to potential traffic congestion. So, tolls that are designed to manage traffic flow might be reasonably based on vehicle PCE. Under typical conditions basic/light-duty vehicles have a PCE of 1.0, medium trucks often have a PCE value of around 1.1, and heavy trucks can have PCE values of approximately 1.5.

Tolls based on base toll rate multipliers that are PCE values would yield lower revenue for medium and heavy trucks than is true in the Base case. A simplistic adjustment of toll

revenues based on this policy yields an equity ratio for basic/light-duty vehicles of around 0.9. A more formal analysis of alternative toll policy requires re-running demand models and further T&R analysis and would also result in higher toll-paying truck volumes in response to lower toll rates. And in turn, a larger portion of toll operating costs and fees would be attributed to truck traffic. In summary, it is reasonable to expect that a toll policy based on PCE would bring the equity ratio for basic/light-duty vehicles closer to 1.0 for the I-205 toll program.