

DRAFT

*I-5 Columbia River Crossing Partnership:
Traffic and Tolling Analysis*

Toll Collection Options

Working Paper 5.2

Prepared by

Vollmer Associates LLP
David Evans and Associates, Inc.

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TABLE OF CONTENTS

PURPOSE	2
TOLL COLLECTION OPTIONS	2
TOLLING BOTH DIRECTIONS	3
TOLLING I-5 BRIDGE ONLY: TWO-WAY TOLLING RECOMMENDED	3
TOLLING I-5 AND I-205 BRIDGES: ONE-WAY TOLLING RECOMMENDED	4
TOLL PLAZA IMPACTS ON TOLL COLLECTION OPTIONS	4
WORKSHOP ASSUMPTIONS AND CONCLUSIONS	5
<i>Assumptions for Siting Toll Plazas</i>	5
<i>Conclusions from the Toll Plaza Workshop</i>	5
RECOMMENDATION.....	6

PURPOSE

Working Paper (WP) 5.2 is the second of three working papers aimed at identifying practical tolling rate options that demonstrate the material differences in tolling policy, revenue generation, and impacts of potentially tolling the I-5 Columbia River crossing or both the I-5 and I-205 river crossings. WP 5.1 identified and evaluated alternative toll rate structures and recommended a set of toll rate structure options to be examined in this study ([what study is “this study” – this phase or the DEIS?](#)). WP 5.2 assesses the operational, revenue, and traffic impacts of collecting tolls for one or both bridges and for northbound, southbound, or both directions. [The third part of this trilogy will tell us...? In general, this paragraph could be clearer about the context and purpose of this memo.](#)

TOLL COLLECTION OPTIONS

There are several ways by which toll collection can be set for the I-5 and I-205 River Crossings:

- 1) The I-5 Bridge could be tolled in both directions.
- 2) Both the I-5 Bridge and the I-205 Bridge could be tolled in both directions.
- 3) Both the I-5 Bridge and the I-205 Bridge could be tolled in one direction, either northbound or southbound.

Regardless of whether to toll one bridge or both, or whether to toll one direction or two, how tolls will be collected, the rate structure, and the size of the resulting toll plaza footprint influences toll collection options. Working Paper 5.3, Technical Memorandum 5.5, and Working Paper 7.1 provide a discussion and recommendation for rate structures and predicted ETC utilization. Working Paper 5.3 provides typical ETC market share distribution for major facilities located in the Northeastern U.S. While there are examples of toll plazas achieving ETC usage as high as 70%, this share of ETC usage is rare ([is this the Canadian highway being retrofitted for tolls and using ETC exclusively? If so, we should distinguish it here rather than leave that 70% figure as an unexplained “rare” occurrence](#)). A more likely target for ETC usage at the end of the start-up period is 35-45% ([why? If this was discussed in more detail in another WP or TM, reference that discussion to support this conclusory statement](#)); with usage as low as 25-30% in the early stages of project start-up. For comparison, the Tacoma Narrows Bridge project in Washington designed their toll collection system for a start-up 40% ETC market share.

Because I-5 and I-205 are large volume interstate highways, even a 40% start-up ETC market share will require a sizeable toll plaza footprint. The remaining 60% of the customers will need to use automated/manual collection facilities, estimated at up to 16 tollbooths depending on rate structure and method of collection adopted. Within the Bridge Influence Area (BIA) on I-5, and similarly on I-205, adjacent land use is urban in nature with commercial and residential land use abutting the existing right-of-way. Because of the potential property impacts, suitable locations for toll plazas are limited.

This WP will focus on a brief discussion of the impacts of these toll collection schemes, and then address the influence toll plazas will have on collection options based on a toll plaza design workshop held for the Columbia River Crossings on August 25, 2004.

Tolling Both Directions

Traditionally, bridges across major river crossings have been tolled in both directions. It became obvious to the operators of such facilities over time that the operating costs to collect tolls became an increasingly larger expense, reducing the net revenues available for maintenance and capital needs. (order of magnitude? Percentage of revenues lost to operating costs?) Most major river crossings have shifted to a directional system to minimize operating costs and driver delays.

Example facilities switching to one-way collection include:

Hudson River Eastbound Tolls	Tappan Zee Bridge (NYSTA) George Washington Bridge (PANYNJ) Lincoln Tunnel (PANYNJ) Holland Tunnel (PANYNJ) Bayonne Bridge (PANYNJ) Outerbridge Crossing (PANYNJ) Bear Mountain Bridge (NYSBA) Newburgh Beacon Bridge (NYSBA) Mid Hudson Bridge (NYSBA) Kingston Rhinecliff Bridge (NYSBA) Rip Van Winkle Bridge
Delaware River Westbound Tolls	Delaware Memorial Bridge (DRBA) Commodore Barry Bridge (DRPA) Walt Whitman Bridge (DRPA) Betsy Ross Bridge (DRPA) Ben Franklin Bridge (DRPA) Tacony Palmyra Bridge (BCBC) Delaware Water Gap Bridge (DRJTBC)

In these cases, all the authorities with bridges crossing the river changed their toll collection at the same time to avoid the diversion of traffic from one bridge to another.

Tolling I-5 Bridge Only: Two-Way Tolling Recommended

Tolling the I-5 Bridge (and not the I-205 Bridge) would change the nature of traffic patterns in both Portland and Vancouver. Traffic, where possible, would attempt to change trip patterns to avoid the tolled crossing, potentially shifting substantial traffic to the I-205 corridor. The amount and time of such shifts will be the subject of future work.

In an interesting parallel case, the Verrazano Narrows Bridge crossing between Staten Island and Brooklyn, New York was changed to a one-way toll, while no other toll collection change was made in the region. This caused measurable traffic dislocations to other crossings and a significant diversion of trucks shifting in one direction to cross Lower Manhattan (trucks changed their travel pattern in order to avoid the toll, crossing lower Manhattan instead? This example could be made more relevant if it was explained how far out of their way truck traffic was going by avoiding the

Verrazano toll, and the time they were giving up crossing lower Manhattan rather than going directly from Staten Island to Brooklyn). This became an issue of interest due to the air quality issues raised by this shift in traffic.

Thus, notwithstanding the increased operating costs associated with two-way tolling, it would likely be necessary to employ two-way tolling if only the I-5 Bridge (and not the I-205 Bridge) were to be tolled.

Tolling I-5 and I-205 Bridges: One-Way Tolling Recommended

In the event the decision is made to toll both the I-5 and I-205 bridges, ~~Considering~~ the above discussion demonstrates that, collecting tolls for both the I-5 and the I-205 crossings in one direction is the approach alternative that would minimize collection costs and ~~minimize~~ regional shifts of traffic, ~~and therefore is the prime alternative for consideration.~~ This option also has the potential to initially reduce traffic at each river crossing as drivers consolidate trips, and/or eliminate trips, that are currently being made in response to the imposition of tolls cross the Columbia River. As noted previously, further traffic analysis will be required to verify traffic impacts.

TOLL PLAZA IMPACTS ON TOLL COLLECTION OPTIONS

Placement of toll collection facilities in both the northbound and southbound directions on I-5 and I-205 may not be possible for all of the build concepts that may be ~~ing~~ studied. Adjacent land use in the areas of the Columbia River crossings are urban in nature, with commercial and residential properties abutting the existing I-5 and I-205 corridors. Toll plazas, of necessity and by design, ~~can~~ cover a large footprint and create environmental impacts. For safety reasons, plazas need to be highly visible and require high levels of light. The large number of vehicles decelerating and accelerating ~~passing~~ through the tollbooths adds ~~to the~~ noise impacts and raises issues associated with air quality and surface water runoff. Therefore, siting northbound and southbound tollbooths in sensitive urban areas may not be possible for all of the concepts that have been ~~were~~ evaluated to date or may be evaluated in the DEIS.

In order to gain a clearer picture of the challenges associated with toll plaza placement, ~~a~~ toll plaza workshop was held on August 25, 2004 for the purpose of identifying ~~evaluating~~ potential toll plaza sites for each of the four concepts that were studied in some detail in the I-5 Transportation and Trade Partnership Strategic Plan process project, The workshop also sought to identify potential toll plaza sites in the ~~and for~~ I-205 bridge corridor. The workshop included toll plaza siting experts from Washington State Department of Transportation (WSDOT) and Vollmer and Associates, as well as interstate highway design experts from the Oregon Department of Transportation (ODOT), WSDOT, and the consulting firms that developed the four river crossing concepts.

Workshop Assumptions and Conclusions

Assumptions for Siting Toll Plazas

- Tolling options should have the potential to provide sufficient revenue to recover capital, maintenance, and operational costs of the new facilities – within the framework of potential state and regional policies.
- Scenarios should include options that allow for existing as well as new river crossings to be tolled (what does this mean?).
- Toll plazas can be located either in Washington or Oregon. Tolls can be collected one direction or two directions. If one direction, they can toll either southbound or northbound.
- Efforts should be made to avoid historic places, mitigation areas, and to minimize the impact on other sensitive areas such as neighborhoods, wetlands, and parks.
- All standard options for collecting tolls should be considered, such as Electronic Toll Collection (ETC), manual, automatic coin machines (ACM), tokens, bar code readers, credit card, and tickets.
- It is premature to assume policies (is policy the issue or is it the practical limitations of technology that make assuming 100% ETC premature? explain) will allow 100% ETC in the near future. For design purposes, an assumption of 40% ETC is satisfactory for testing toll plaza configurations.
- Toll lane capacities (the number of vehicles per hour per lane that can be handled?) should follow averages as outlined in NCHRP Synthesis 240.
- Innovative methods to minimize toll plaza footprints should be considered.

Conclusions from the Toll Plaza Workshop

- Toll collection facilities were not considered when designing the four build concepts for the I-5 Transportation and Trade Partnership project. Providing toll facilities will require modifications to the existing concepts.
- In the initial workshop evaluation, no acceptable sites were found that would allow for efficient collection of two-way tolls. This was under the assumption that toll plazas should be located in close proximity for both NB and SB traffic to allow for a single administration building and common facilities (shouldn't this assumption be delineated above in the assumption category – this is the first mention of the impact of the administrative support infrastructure needed to implement tolls). If two-way tolls are to be collected under a scenario where only I-5 is tolled, additional design work will be required for optimal siting of two-way toll plazas.

- There were no practical northbound toll plaza sites in Washington because the footprint would encroach on the historic properties located between SR 14 and East Mill Plain. Northbound plaza sites in Oregon appear to have had greater property impacts than southbound sites.
- Based on the initial analyses, toll facilities should be considered for one-way southbound traffic if both I-5 and I-205 are tolled. Is what you are saying: Based upon initial analysis of the physical options, it looks like it will be easier to design and locate toll facilities in the southbound direction for both I-5 and I-205? Does this apply to locations in Washington and Oregon?
- For I-5, Concepts 1, 4, and 7 were evaluated in the workshop. Concept 4 (briefly describe) appeared to provide the most flexibility to site toll plazas. Options that used the existing bridges and options that included arterials were more difficult to design for toll collection due to split alignments.
- All of the toll plaza sites will require further design analyses to confirm their footprint and how they can be integrated into each of the design options.
- Although there are no standards for the design of toll plazas (first time you have mentioned this fact – some discussion of this issue, the guidelines and elements thereof would enhance the reader's understanding of this analysis and the conclusions), there are guidelines based on a synthesis of current practices. All of the toll plaza concepts will require innovative siting techniques that rely on approach and departure taper rates that are less than recommended by the guidelines, but within rates that have been used elsewhere.
- Placement of ETC lanes that allow for high speed toll collection in the center lanes will create weave conflicts for vehicles wanting to enter or leave the interstate system in close proximity of the toll plaza (due to the fact that we have entrances and exits on I-5 on both sides fo the bridge that are very close to the bridgehead). Additional traffic analysis will be required to analyze travel demand and assess the impacts of varying toll plaza sites and layouts.
- Based on current technology, relying on 100% ETC that eliminates the need for toll collection plazas is not recommended. For the purposes of the tolling analysis, ETC rates in the 25% to 45% range in the first 3-5 years is a reasonable estimate based upon the experience of other jurisdictions around the country predicted.

RECOMMENDATION

It is recommended that two tolling scenarios be carried forward in the study:

- ~~1. The I-5 and the I-205 bridges would both be tolled in the southbound direction, with toll collection facilities located in either Washington or Oregon.~~
1. The I-5 bridge(s) would be tolled in both directions, with toll collection facilities located in either Washington or Oregon.
2. The I-5 and the I-205 bridges would both be tolled in the southbound direction, with toll collection facilities located in either Washington or Oregon.

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