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**THE PROPOSED LIGHT RAIL EXTENSION  
TO VANCOUVER, WASHINGTON – COMPARISON  
OF LIGHT RAIL AND BUS TRAVEL TIMES**

**October 11, 2011**

**INTRODUCTION**

I have been asked to review the travel times for transit passenger service (a) On the proposed extension of Tri-County Metropolitan Transportation District of Oregon (Tri-Met) light rail Yellow Line to Vancouver, Washington, with (b) The comparable bus service over the same general transportation system alignment.

As presented in detail following, the travel times from Washington Street and West 15<sup>th</sup> in the Vancouver central business district (CBD) to Pioneer Square in the Portland CBD are:

Existing C-Tran Route 105 (scheduled):	16 minutes
Locally Preferred Option (light rail, projected):	36 minutes
Bus Rapid Transit (BRT) (projected):	14 minutes

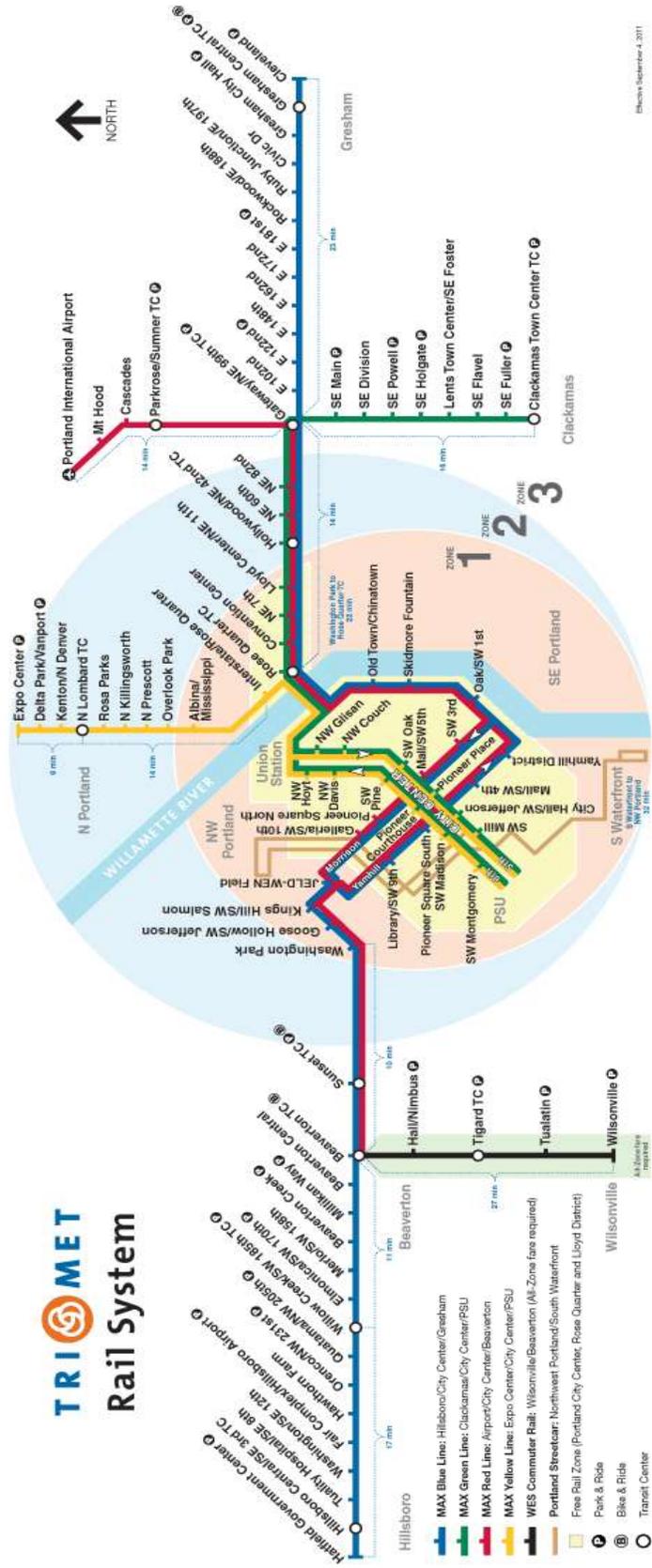
The projected capital cost for the Locally Preferred Option of light rail is \$865 million and, for the BRT alternative, \$746 million.

**SCOPE OF PROJECT AND THIS ANALYSIS**

Tri-Met currently operates four light rail lines, including the Yellow Line, which operates from the Southeastern end of the Portland Transit Mall generally North to the Expo Center Station, relatively close to the Columbia River, which is the state line between Oregon and Washington (see Tri-Met light rail system map following<sup>1</sup>).

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<sup>1</sup> Tri-Met, accessed October 11, 2011: <http://trimet.org/maps/railsystem.htm>



As part of a proposed new bridge project between Portland and Vancouver, carrying I-5 over the Columbia River, an extension of the Yellow Line North into Vancouver has been proposed<sup>2</sup>.

As part of the FEIS process, various alternatives were prepared and studied, including Alternative 2, the Replacement River Crossing with BRT, and Alternative 3, the Replacement River Crossing with Light Rail. The Locally Preferred Alternative (LPA) is a modified version of Alternative 3, as shown in the maps below<sup>3</sup>.

Beginning on the Oregon side, the proposed LPA extension would run North from the existing Expo Center Yellow Line Station, crossing the Columbia into Washington State on a lower level of the replacement bridge of the Southbound lanes of the Western replacement bridge, and then to the Vancouver central business district, west of the I-5 alignment, and then crossing under I-5 to terminate at Clark College just East of I-5 on McLoughlin Blvd<sup>4</sup>. See map for details.

The sole comparison of operating times for light rail and bus in the FEIS is:

" Transit travel time from Mill Plain Station to Expo Center via transit

Alternative 2 (BRT): eight minutes  
Alternative 3 (Light Rail): six minutes<sup>5</sup>"

There is no Mill Plain Station in the LPA; the term appears to be a remnant of an early phase of the project planning, perhaps the "Mill Plain MOS" as shown in the Alternative 2 and 3 map in FEIS Exhibit 10 below. Given that the direction of travel for the above would be Southbound, it can be safely assumed that the station would be located on the Washington Street Southbound portion of the Washington/Broadway loop, and the closest station to Mill Plain Blvd. would be at West 15<sup>th</sup> and Washington (referred as "Washington Street" Station in the FEIS<sup>6</sup>). We will use this station as the start point for our travel time analyses.

It appears to be reasonable to conclude that travel from the Vancouver CBD to Expo Center Station is *not* the primary purpose of the proposed light rail extension. In order to provide a

<sup>2</sup> Clark County Public Transportation Benefit Area Authority (C-Tran); Metro (the elected regional government and metropolitan planning organization for Clackamas, Multnomah, and Washington Counties, Oregon within the greater Portland urbanized area [UZA], and their 25 included cities, including Portland); Oregon Department of Transportation (ODOT); Southwest Washington Regional Transportation Council (RTC, the metropolitan planning organization for the Clark County Washington portion of the greater Portland UZA, including the City of Vancouver and the regional transportation planning agency for Clark, Klickitat, and Skamania, Counties, Washington and their included cities); Tri-Met; U.S. Department of Transportation (U.S. DOT) (Federal Highway Administration [FHWA] and Federal Transit Administration (FTA)); and Washington State Department of Transportation (WSDOT); *Columbia River Crossing – Interstate 5 Columbia River Crossing (CRC) Project*, Final Environmental Impact Statement and Final Section 4(f) Evaluation, September 2011 (FEIS).

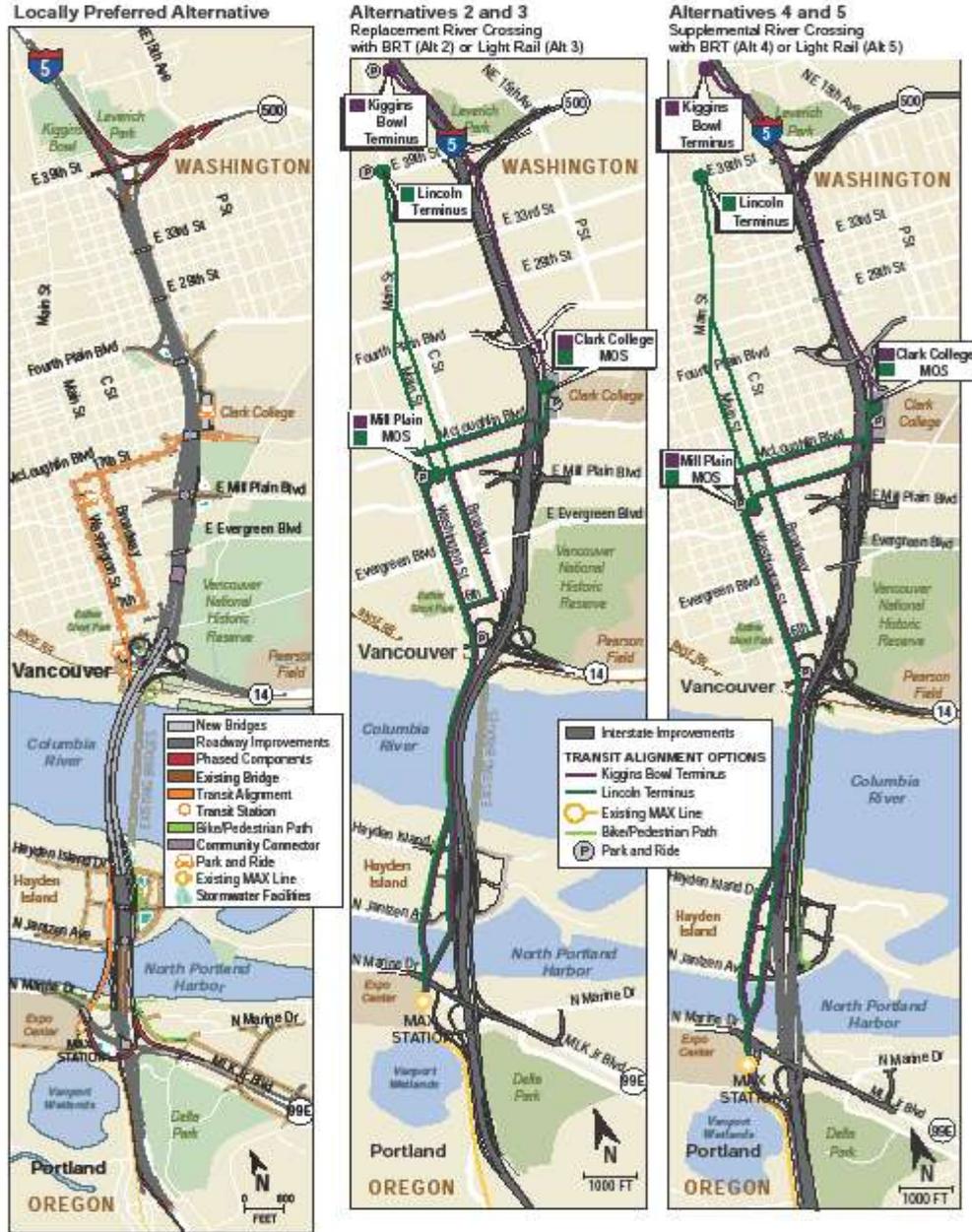
<sup>3</sup> FEIS.

<sup>4</sup> FEIS, pp. S-21 and S-24.

<sup>5</sup> FEIS, Exhibit 18, "Summary of Transportation Effects and Cost for Each Alternative," page S-31. (See appendix for commentary on bus trip time.)

<sup>6</sup> FEIS, Exhibit 13, Transit Alignments and Street Cross-Sections, page S-23.

Exhibit 10  
 LPA and Alternatives Evaluated in DEIS



travel time comparison that is likely more representative, I will compare the travel times from the proposed Yellow Line Washington Street Station in Vancouver to Pioneer Square in the Portland CBD, more specifically the Pioneer Place/Southwest 5th Avenue MAX Station (Stop ID 7646).

The light rail Yellow Line travel time is as follows:

Washington Station-Expo Center:	6 minutes (from FEIS; see above)
Expo Center-Pioneer Place	<u>30</u> minutes <sup>7</sup>
Total	<u>36</u> minutes

For the comparable bus service, I will use C-Tran line 105, the I-5 Express, which has a travel time, Washington & Evergreen in the Vancouver CBD to 5th Avenue & Alder in the Portland CBD, of fifteen minutes<sup>8</sup>.

The beginning and end points for these two trips are very close, but not identical. In Vancouver, the bus stop on Washington at Evergreen is five blocks, approximately one-quarter mile, South of the Washington Street Yellow Line Station at West 15<sup>th</sup> Street, and closer to Portland<sup>9</sup>.

In Portland, the light rail station is at SW Fifth Avenue and SW Yamhill Street, while the bus stop is at SW Fifth Avenue and SW Alder Street, a distance of two blocks, or approximately one-tenth of a mile<sup>10</sup>. Again, the light rail route is longer than the bus route as measured "as the crow flies."

To make up for the shorter travel distance for the bus route, approximately one-third mile in total, I will add one minute to its travel time.

Therefore, we have, at the present time, scheduled bus service between the Vancouver and Portland CBD's with an (adjusted) 16 minutes end-to-end travel time, which is being proposed for replacement by a light rail line extentson with a travel time of 36 minutes, twenty minutes, or a total travel time of 225% of the scheduled travel time of the existing bus service on C-Tran Route 105.

We are not quite done with the bus travel time; there is also the matter of the Alternative 2 BRT improvements. There is no discussion of what the travel time savings for bus travel from this would be to downtown Portland. However, if we go back to the above discussion, and compare the projected eight minute BRT travel from Washington Street/West 15<sup>th</sup> Street to Expo Park Station to the ten minute Route 44 travel time from Broadway/Evergreen to Delta Park/Vanport, we can attempt an approximation.

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<sup>7</sup> Tri-Met, Yellow Line Schedule, [http://trimet.org/schedules/w/t1190\\_1.htm](http://trimet.org/schedules/w/t1190_1.htm)

<sup>8</sup> C-Tran, Route #105 Schedule, [http://www.c-tran.com/routes/105route/weekday\\_south%E2%80%93morning.html](http://www.c-tran.com/routes/105route/weekday_south%E2%80%93morning.html)

<sup>9</sup> Author's measurement.

<sup>10</sup> *Ibid.*



Street Transit Center, want to get off of the bus, walk some distance in mid-trip, and transfer to the Yellow Line in downtown Vancouver?

Part of the answer can be found in the FEIS, Exhibit 15, "Proposed C-Tran Bus Routes Comparison," page S-25, which states:

"#105 I-5 Express – Route truncated in downtown Vancouver."

The good news is that C-Tran routes 134-Salmon Creek Express, and 199-99th Street Express, are *not* on the FEIS list of routes to be truncated in downtown Vancouver, so those that have been boarding further North will be able to continue their travel as they have been experiencing; that is, assuming that these lines are not changed at some later date.

It should also be realized that the 105 is a well-conceived way of adding extra trips from the Northern boarding stops to downtown Portland. The 105 trips to Portland are not arriving empty in Vancouver now; they are carrying riders that found the timing of the 105 departures to be convenient, more convenient than arriving earlier, or waiting at the bus stop longer, for a non-stop ride. C-Tran needs to carefully evaluate the usage of all three lines prior to any service changes. It is not at all unlikely that it will be necessary to add trips on the 134 or 199 to carry directly to the Portland CBD those travelers who are now using the 105 for such trips – and have no interest in transferring to the Yellow Line in the Vancouver CBD to do so.

However, for those who had boarded the 105 in downtown Vancouver to travel to downtown Portland – which appears to include many passengers who take other C-Tran bus routes to downtown Vancouver to transfer to the 105 to continue to downtown Portland – there will no real transit option other than light rail to make their trips.

From my past experience with such situations, I believe that, if the travel times referenced above prove realistic after the start-up of light rail service, the C-Tran Board of Directors is likely to face a very determined effort to retain the 105 in service from the Vancouver CBD to the Portland CBD, or some reasonable replacement thereof; in fact, a save-the-105 movement is likely to begin long before its termination date approaches. If the 105, or some similar service, were to be kept in place, and/or if additional trips on the 134 and/or 199 were found to be required to replace the trips from the Northern park-and-ride lots taken on the 105, this would have an impact on the system-wide operating costs and subsidies because the financial calculations in the FEIS are based on the assumption that the operation of the 105 will cease at approximately the time that light rail service commences. (There is no discussion of any changes to the 134 or 199, they are *not* in the Route Comparison Table above, and therefore I assume this means that no changes are contemplated.)

While the cost of the BRT option is not specifically spelled out in the FEIS, either a separate Columbia River crossing, or separate deck for buses on one of the two primary bridges (as is proposed for light rail in the LPA and is therefore the more likely alternative for a BRT lane),<sup>12</sup>

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<sup>12</sup> FEIS, Exhibit 2.5-1, "Alternative 2: Replacement Crossing with Bus Rapid Transit," page 2-56.

appears to be in excess of three-quarters of a billion dollars<sup>13</sup>. This, of course, leads to the question, is it worth it to pay more than \$500 million to save two minutes of travel time?

I, as an accountant and transportation specialist, can frame this question, but it is not for me to answer it.

I will, however, add some context with the following question: Is it worth it to pay that, and about \$110 million more, to *increase* the travel time by 20 minutes by building the light rail alternative?

This issue also gives me pause when I consider Exhibit 18, Summary of Transportation Effects and Cost for Each Alternative, on page S-31. There is only one measure of before-and-after travel time in the FEIS, that mentioned above, between Mill Plan Station in the Vancouver CBD and Expo Center Station. This appears instead of a more generalized reporting of total, or average, transit travel times, which is particularly disturbing because this sole reported trip pair travel time appears to be extremely non-representative to be used as the sole metric for this extremely important criterion. In fact, as I have discussed above, it is even possible to argue that this may be one of only a small number of trips where light rail may have a travel time advantage – and I am far from convinced if light rail even does have an advantage here.

This, in turn, leads me to question what is reported for another important metric, transit trips over the I-5 crossing during the PM peak, 6,350 for light rail vs. 5,350 for BRT<sup>14</sup>. How can a significantly slower option for trips to the Portland CBD, one that appears to offer little, if any time advantage over trips connecting to the Yellow Line South of the river and other non-Portland CBD destinations, attract *more* riders than the current, faster service to downtown Portland?

I cannot find an answer to this question in the FEIS, but, based on my past experience in this field, all or part of the answer may be found in the details of the transportation modeling process. In it, various assumptions are made to project ridership, one of them being "modal preference" – e.g., more people will ride light rail than bus because people prefer to ride on light rail over bus, or *vice versa*. While there is considerable documentation of this in the professional literature and

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<sup>13</sup> Although the data presented in the Financial Analysis chapter of the FEIS is not ideally structured to calculate the marginal cost added by Alternative 2 BRT over a replacement bridge without light rail or BRT (no such alternative was studied as part of the FEIS, which is another most interesting attribute of this process all by itself), there is data that appears to support a rough estimate of the cost of BRT lanes and associated facilities in the high nine figure range.

FEIS, page 4-4, shows LPA Transit (which means light rail) costs of \$856.3 million, medium estimate. Although it is not specifically stated, the context makes it appear that this is the result of an allocation of the total costs of the combined project between Transit and Highway, as opposed to the additional cost to add light rail transit to a stand-alone highway bridge project. While, in my opinion, the proper method of costing would be marginal cost, this data is not available and, therefore, I will use, without further comment, the costing methodologies of the project sponsors.

On FEIS, page S-32, we have a comparison of the capital costs of the full project with BRT vs. light rail, \$3,427-3,609 million for light rail vs. \$3,318-3,499 million for BRT; indicating that the light rail option cost was \$109-110 million higher than that of light rail. Deducting that difference from the \$856.3 million in the above paragraph would leave a cost allocation to BRT of approximately \$746 million for the Alternative 2 BRT.

<sup>14</sup> FEIS, page S-31.

it has been accepted by the Federal Transit Administration in FEIS work for decades, it should be understood that any proper description of modal preference ends with, "all else equal."

A light rail trip that takes 257% of the travel time of a bus trips is quite far from, "all else equal."

In this context, what "all else equal" means is, for example, modal preference analysis must segregate other causation factors. For example, if one was doing a stated preference survey (what people say they do, or will do) of potential riders, and asked how many would take light rail for a fifteen-mile trip at a speed of 25 mph, and how many would take bus for the same trip at a speed of 12 mph, it would be expected that the light rail option would have more positive responses. However, what is really going on is that responders are expressing a preference for a trip that takes 36 minutes over one that takes 75 minutes.

There may be some modal preference for light rail – that is, even if all attributes of the trip are identical or comparable, there are some people who would utilize light rail, but not bus, for that trip, or *vice versa* – at work as well, but it cannot be determined from this type of flawed survey design.

Simplifying somewhat, if the questions were, what is the likelihood that you would take light rail for a 15-mile trip at 25 mph and what is the likelihood that you would take bus for an identical 15-mile trip at 25 mph (which would approximate the travel times for light rail and bus rapid transit built on comparable dedicated/semi-dedicated transit guideways between the terminus points), and light rail scored higher, those results would have significantly validity in quantifying modal preference.

Such concerns of comparing the attributes of specific modal transportation lines, attributes that are specific to the particular lines, rather than the characteristics of the mode itself also impact revealed preference (what people actually do, not what they say they do) techniques.

It would take significant effort to review the modeling process and model runs to draw any conclusion of anything improper, and the modeling process that was utilized for the FEIS was carefully reviewed and approved by specialists in this field for the FTA – but the data presented, on their face, are currently difficult for me to reconcile.

## **CONCLUSION**

The Locally Preferred Alternative in the FEIS, light rail, appears to be spending a minimum of ~\$850 million to implement a transit option that will increase the current downtown Vancouver to downtown Portland travel time from 16 to 36 minutes. While there may be some trips that may produce slightly shorter travel times via light rail than via bus, such as to Expo Park from the Vancouver CBD, and some other trips, such as those ending further down the Yellow Line, that are likely to not be significantly negatively impacted, it is difficult to draw any conclusion other than the implementation of this proposal would produce an increase in total transit travel time and could also reduce transit usage – at very significant cost to the taxpayers.

**APPENDIX – BUS TRAVEL TIME BETWEEN DOWNTOWN PORTLAND AND YELLOW LINE EXPO CENTER STATION**

At the present time, there is no direct C-Tran bus service between the Vancouver CBD and the Yellow Line Expo Center Station, primarily because the Expo Center Station is so close to the shore of the North Portland Harbor that the off-ramps and surface street connections from I-5 are circuitous. In fact, using the C-Tran Trip Planner to find a transit connection between Washington Street/West 15<sup>th</sup> Street and Expo Center produced a trip consisting of a .4 mile walk to Evergreen Boulevard/Broadway, taking the Route 44 Fourth Plain Limited to the Yellow Line Delta Park/Vanport Station – the first station down from Expo Park, about .7 miles South – and then taking the Yellow Line *North* to Expo Center. The Route 44 bus trip, by itself, is scheduled for ten minutes.

The eight minutes shown between Mill Plain Station and Expo Center for bus in the FEIS appears higher than I would have expected, particularly in comparison to the six minutes for light rail for the exact trip on the same alignment (from the FEIS Alternative 2 and 3 map above, the BRT and light rail trips would be over the identical path of travel to be constructed as part of the CRC project. The full new extension, Expo Park to the Clark College terminus, is 2.9 miles<sup>15</sup>. From the terminus back to the Washington Street Station is .7 miles<sup>16</sup>, so the light rail trains will be covering 2.2 miles in six minutes, or at an operating speed of ~22 mph.

It is difficult for me to see how a bus, over the same route – only ~.7 mile of which is on city streets in Vancouver<sup>17</sup> – would take two minutes more – indeed, the eight minutes is only two minutes less than the scheduled travel time for the existing Route 44 trip to Delta Park station, .7 miles<sup>18</sup> further South, without any of the proposed advantages of the busway. If the intention is for the bus riders to transfer to the Yellow Line, then the walk distance – and where the bus stop is placed at the Expo Center Station – could be the critical factor in the difference in the travel times presented.

However, since this issue does not have any real impact on anything else in this paper, it will not be pursued further.

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<sup>15</sup> FEIS, page 2-22.  
<sup>16</sup> Author's measurement.  
<sup>17</sup> *Ibid.*  
<sup>18</sup> *Ibid.*