

## DRAFT COMPARISON OF HAWTHORNE BRIDGE AND TILIKUM CROSSING FOR DIVISION ROUTE OPTIONS

In order for the transit project to connect to Downtown Portland from Inner Division it must cross the Willamette River. Three route options are currently under consideration using the Hawthorne Bridge or the Tilikum Crossing. The existing 4-Division bus route accessing the Hawthorne Bridge is one route option, while the route options accessing the Tilikum Crossing include crossing the UPRR and MAX Orange Line tracks at-grade via 8<sup>th</sup> Avenue or an over-crossing of the UPRR and MAX Orange Line tracks at 7<sup>th</sup> Avenue.

This document provides a summary of the potential performance of these options by comparing relative travel times, potential bus travel time reliability, land uses directly served, and preliminary capital cost estimates. Key findings include:

- A Hawthorne Bridge route would provide a faster connection to the highest demand destination in the system (central downtown) by minimizing out-of-direction travel.
- Due to disruptions from UPRR freight train crossings, the Tilikum Crossing route would be very unreliable without a new bridge for the buses over the UPRR tracks. However, TriMet is currently working with UPRR on options to help mitigate freight train delays, which if successful would increase the reliability of a Tilikum Crossing route.
- A preliminary cost estimate of a new bridge over the UPRR is approximately \$35 million.
- A Tilikum Crossing route would provide direct access to OHSU, OMSI, and PSU. A Hawthorne Bridge route would require a transfer or walk to reach these destinations.

A summary of the comparison is included in the table and bullets below.

- **Land Use Access:** The Tilikum Crossing routes would provide direct service to OMSI, South Waterfront, Portland State University, and south downtown while the Hawthorne Bridge route would provide direct service to a portion of the Central Eastside and Goodwill. All routes would serve the heart of downtown Portland along the transit mall from Main St/Madison St north to the vicinity of Union Station.
- **Travel times:** Based on existing bus travel times, a Hawthorne Bridge route to Pioneer Courthouse Square would generally be 4-6 minutes faster than a Tilikum Crossing route, without accounting for possible travel time delays from either the bridge lifts with the Hawthorne Bridge route or UPRR/MAX blockages for the Tilikum Crossing route with an at-grade crossing. Bridge lifts and train blockages are discussed below.

- Travel time reliability:** An at-grade Tilikum crossing route would be subject to travel time delays and significant unreliability resulting from train blockages at the UPRR/MAX tracks. A Hawthorne Bridge route would be subjected to less travel time delay and unpredictability than an at-grade Tilikum Crossing route. Hawthorne Bridge lifts are restricted in the peak hours with no lifts typically allowed from 7-9 am or 4-6 pm, while UPRR/MAX blockages have no restrictions and occur at all times including peak traffic hours. Train blockages can also be much longer than bridge lifts due to freight trains moving slowly to and from the nearby Brooklyn Yard, resulting in occasional long delays to service. A Tilikum Crossing route with bridge over the UPRR/MAX tracks would avoid delays from both train blockages and bridge lifts. Additionally, TriMet is currently working with UPRR on options to help mitigate freight train delay, which if successful would increase the reliability of a Tilikum Crossing route.
- Capital Costs:** The least expensive route option would likely be Tilikum Crossing via an at-grade crossing. The most expensive route option would likely be Tilikum Crossing via a new bridge.

**TABLE 1: SUMMARY COMPARISON OF ROUTE OPTIONS**

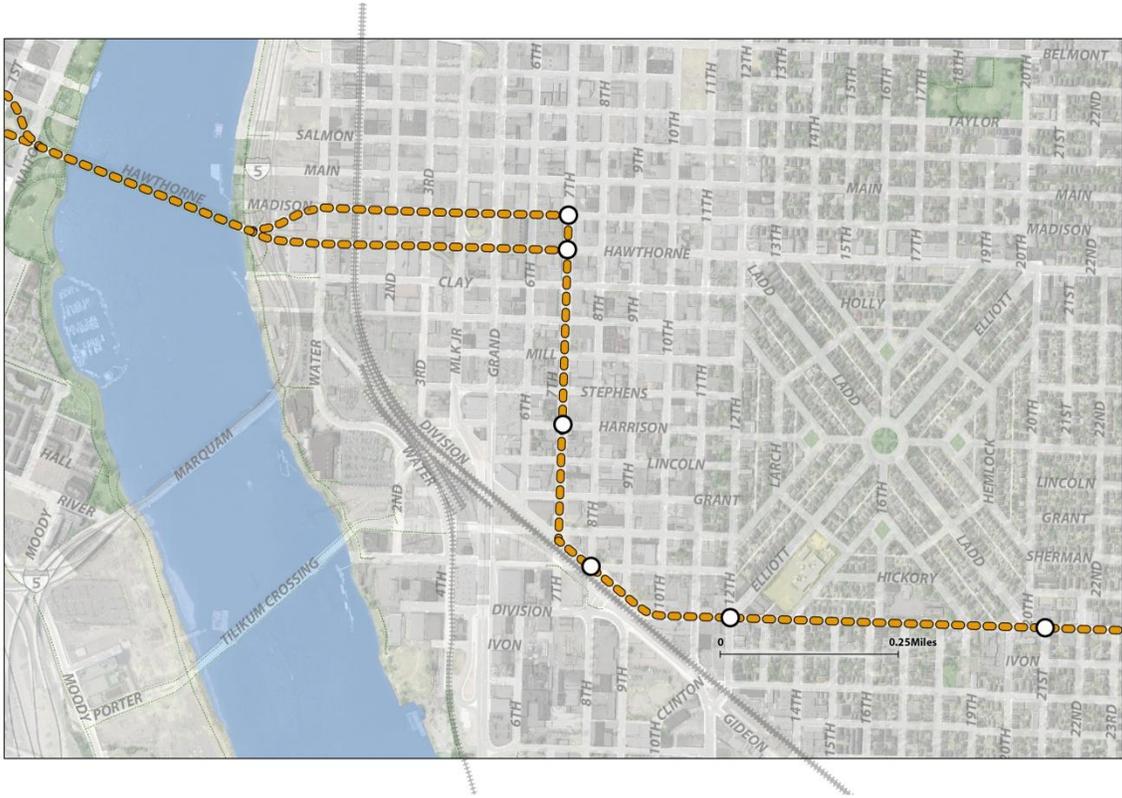
	<b>Hawthorne Bridge</b>	<b>Tilikum Crossing At-Grade crossing of UPRR/MAX</b>	<b>Tilikum Crossing with Bridge over UPRR/MAX</b>
<b>Land Use Access</b>	Directly serves southern portion of Central Eastside, Goodwill, and Downtown Portland. Transfer to access OHSU, OMSI, PSU, and South Waterfront.	Directly Serves OHSU, OMSI, PSU, South Waterfront, and Downtown Portland.	Directly Serves OHSU, OMSI, PSU, South Waterfront, and Downtown Portland.
<b>Reliability related to Bridge Lifts, MAX and RR Delays</b>	<p>No delays during peak hours. Unpredictable delays during off-peak. Bridge lifts average 7-8 minutes, but can be up to 15 minutes.</p> <p>Can be delayed by traffic waiting to cross tracks at 8<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup>, but only during long freight train blockage events.</p>	<p>Unpredictable delays at all times. RR crossing blockages average 2 minutes 47 seconds, but can be up to 45 minutes. May be more reliable if TriMet negotiations with UPRR are successful.</p> <p>Delayed by traffic waiting to cross tracks at 8<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> during all rail crossing events.</p>	<p>No direct delays crossing tracks.</p> <p>Can be delayed by traffic waiting to cross tracks at 8<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup>, but only during long freight train blockage events.</p>

<b>Travel Times (not including bridge lift, MAX or RR delays) to downtown</b>	Generally 4-6 minutes faster to Pioneer Square than Tilikum Crossing routing.	Generally 4-6 minutes slower to Pioneer Square than Hawthorne Bridge routing.	Generally 4-6 minutes slower to Pioneer Square than Hawthorne Bridge routing.
<b>Capital Costs</b>	Likely slightly more than least expensive option.	Likely least expensive.	Substantially more expensive than other options.

**ROUTE OPTION: INNER DIVISION TO/FROM HAWTHORNE BRIDGE**

**ROUTING TO/FROM HAWTHORNE BRIDGE**

The Hawthorne Bridge route option would follow the same route between SE Division St and downtown Portland as the current 4-Division bus route. From SE 12th Ave, the route follows Division St to SE 7th Ave. The route then follows SE 7th Ave, utilizing the couplet streets of Madison St (westbound) and Hawthorne Blvd (eastbound) to access the Hawthorne Bridge. On the west side of the Hawthorne Bridge, this route would use the couplet streets of Main St (westbound) and Madison St (eastbound) to connect to the transit mall. From there, this route would run along the transit mall to the vicinity of Union Station. The map below shows the route between Division and the Hawthorne Bridge.



## HAWTHORNE BRIDGE LIFTS

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Routing on the Hawthorne Bridge would be subject to disruption from bridge lifts both eastbound and westbound during off-peak hours. Multnomah County, which operates the Hawthorne Bridge, keeps records of the time, date, and purpose of bridge lifts. A table summarizing bridge lift data from selected months of 2015 is provided below. Overall, bridge lifts occurred an average 128 times a month from June to October 2015, with the average lift duration being 7-8 minutes. On average, 4.1 lifts per day lasted longer than 5 minutes, and 0.6 lifts per day lasted longer than 10 minutes.

The Hawthorne Bridge lifts most often in the summer months when the water levels are high and many boats are traveling on the Willamette River. July was the busiest month for bridge lifts, with 148 bridge lifts averaging 8 minutes., 143 bridge lifts were for over 5 minutes (4.6 per day) and 37 lifts were for over 10 minutes (1.2 per day). The Hawthorne Bridge has restrictions on lifting during peak commuting hours (7 a.m. – 9 a.m. and 4 p.m. – 6 p.m.). As a result, this route would not incur additional delay during peak hours due to bridge lifts.

**TABLE 2: HAWTHORNE BRIDGE LIFT DATA (JUNE 2015- OCTOBER 2015)**

<b>Hawthorne Bridge - Bridge Lifts June 2015 - Oct 2015</b>	<b>Daily</b>	<b>AM Peak</b>	<b>PM Peak</b>
Average number of lifts	4	0	0
Average duration of lift (minutes:seconds)	7:47	-	-
Average total minutes blocked per day	33	-	-
Average total minutes blocked in peak	0	0	0
Average number of blockages >5 minutes	4	0	0.0
Average number of blockages >10 minutes	0.6	0.0	0.0
Longest blockage (MM:SS)	15:00	0:00	0:00

*Source:* Multnomah County Hawthorne Bridge Daily Record of Draw Openings, acquired March 2016

## TRAVEL TIMES

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Using data from TriMet's Trip Planner tool for current 4-Division buses, westbound travel times between SE 8th/Division and SW 6th/Taylor were 11 minutes in the AM peak and 10 minutes in the PM peak. Eastbound travel times between SW 5th/Salmon and SE 7th/Grant were 8 minutes in the AM peak and 10 minutes in the PM peak. Generally travel times to Pioneer Square for a Hawthorne Bridge routing are 4-6 minutes faster than travel times for a Tilikum Crossing routing. Travel times are subject to delays from bridge lifts (off-peak only) and from spillover traffic onto Division due to long freight train crossings.

## **CAPITAL COSTS**

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A Hawthorne Bridge routing would be less expensive than an over-crossing of the railroad tracks to Tilikum Crossing routing, but likely slightly more expensive than an at-grade crossing via 8<sup>th</sup> Ave to Tilikum Crossing routing. The major capital costs with a Hawthorne Bridge route would be associated with improving the approaches to the Hawthorne Bridge on Madison and Hawthorne to minimize conflicts between the buses and people driving or biking.

## **LAND USE / TRIP ATTRACTION**

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The Hawthorne Bridge route would directly serve the southern portion of the Central Eastside, Goodwill, and Downtown Portland.

According to Metro's 2035 travel demand model, a Hawthorne Bridge route would serve demand for 103,000 total person trips and 18,000 total transit trips between Downtown and SE Division St. Travel demand modeling estimates that this trip demand from Inner Division to Downtown is 2.3 times that between South Waterfront and SE Division St. This indicates that more riders would be better served with a faster trip to downtown, with the option of a transfer to reach the South Waterfront area.

## **HAWTHORNE BRIDGE ROUTE PERFORMANCE SUMMARY**

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Key findings for the Hawthorne Bridge route include:

- Most reliable connection without constructing a new over-crossing of UPRR (especially in peak hours when bridge lifts are prohibited)

- Trip times to downtown Portland 4-6 minutes faster than the Tilikum Crossing
- More direct connection to downtown (highest demand location), Central Eastside, and Goodwill
- Requires transfer to access South Waterfront, OMSI, OHSU, PSU, and south downtown
- Follows current 4-Division routing (a very high ridership route that is over capacity, currently experiencing overcrowding and pass-ups, particularly during peak times and in inner Division).

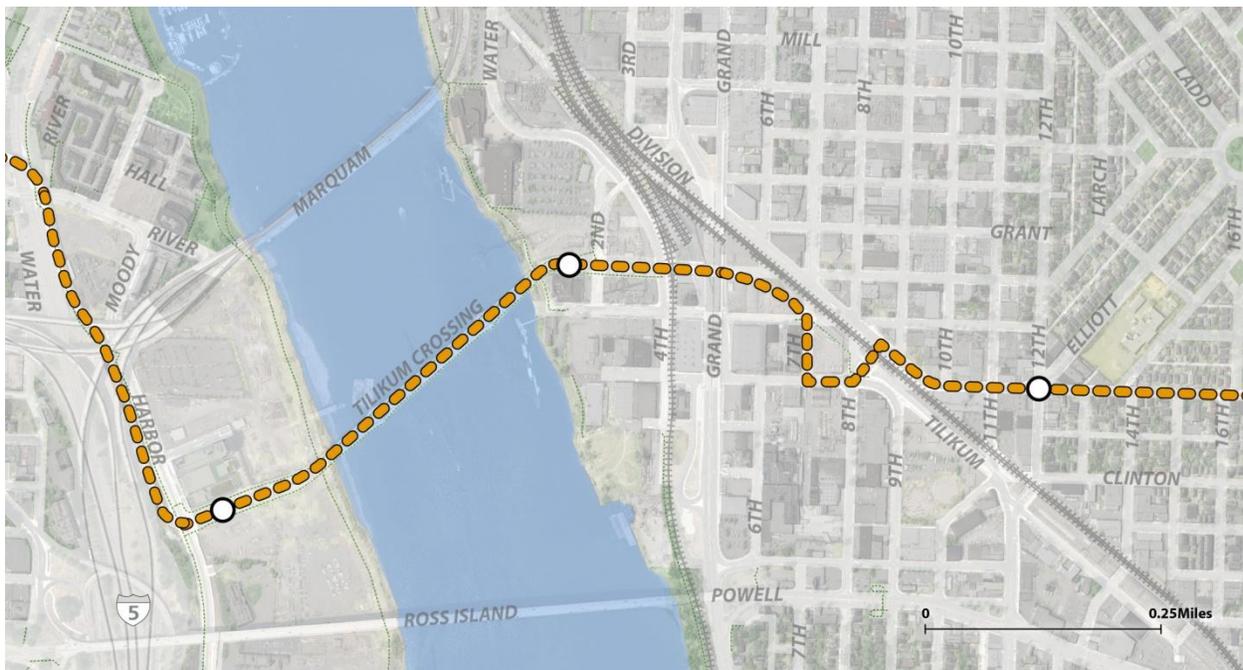
## ROUTE OPTIONS: INNER DIVISION TO/FROM TILIKUM CROSSING

### ROUTING FROM DIVISION TO/FROM TILIKUM CROSSING

There are two route options for connecting the Tilikum Crossing and Inner Division. Both routes would follow Division St between SE 12<sup>th</sup> Ave and SE 8<sup>th</sup> Ave.

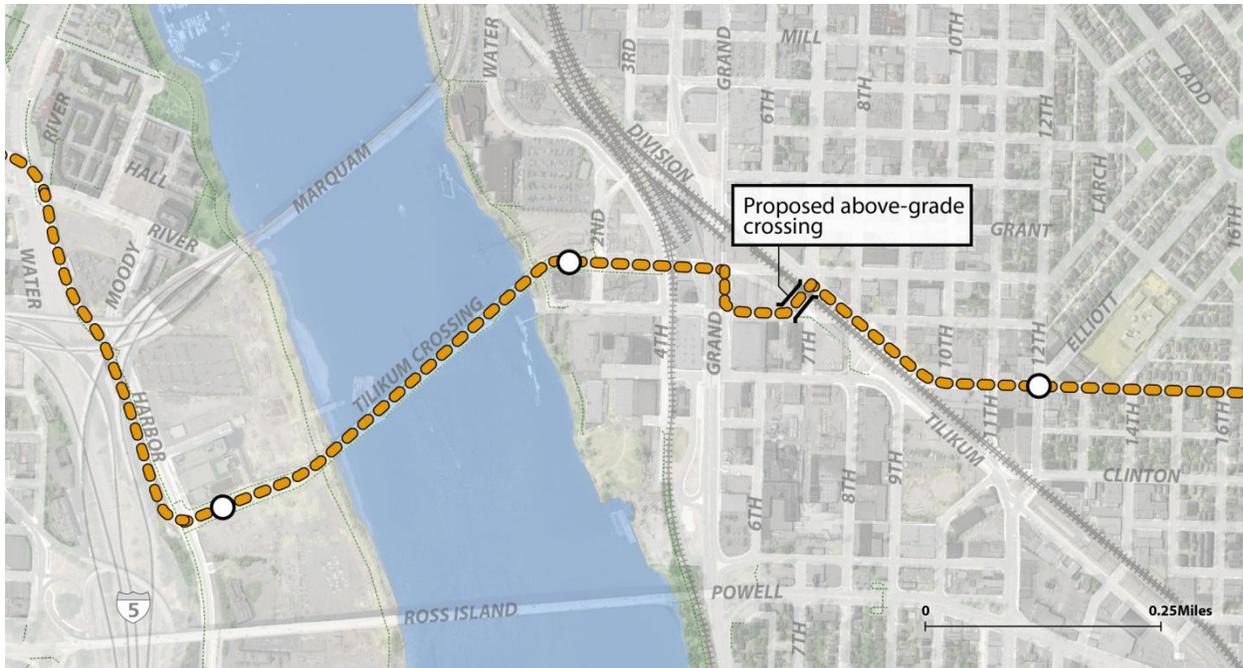
#### AT-GRADE ROUTE

The at-grade option would cross the UPRR and MAX tracks using the existing at-grade crossing at SE 8<sup>th</sup> Ave, then travel west on Division Place, turning north on SE 7<sup>th</sup> Ave to reach the dedicated transitway, as shown on the map below.



#### OVER-CROSSING ROUTE

The over-crossing route option would cross the UPRR and MAX tracks using a new over-crossing that the bus would access from Division Street, in the vicinity of SE 7<sup>th</sup> Ave. The over-crossing would cross both sets of tracks, landing in the vicinity of SE Tilikum Way at Grand Ave. This route would require roadway reconstruction of Division St, SE 7<sup>th</sup> Ave, and Sherman St to raise the height of the intersection and ensure the over-crossing is high enough to meet minimum UPRR clearance requirements. Based on initial design investigation, such an over-crossing appears to be feasible within allowable design parameters. This route is shown on the map below.



On the west side of the Tilikum Crossing, both routes would travel on the Harbor Viaduct to SW Lincoln Street before transitioning to the transit mall at 5<sup>th</sup> and 6<sup>th</sup> avenues. Alternatively, the bus would reach the transit mall using SW 4<sup>th</sup> Ave to College, Hall, or Harrison streets.

**UPRR AND MAX TRAIN CROSSINGS**

UPRR and MAX rail crossing data for SE 8<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> avenues was collected from October 2015 to January 2016 using automatically generated data from the rail grade crossing hardware.

On an average day, there are 21 UPRR blockages and 112 MAX blockages at 8<sup>th</sup> Ave. The UPRR blockages last 2 minutes 47 seconds on average, with a maximum blockage of 45 minutes 40 seconds. An average 3.4 UPRR blockages per day lasted longer than 5 minutes, and an average 0.7 blockages per day lasted longer than 10 minutes. The MAX blockages last 33 seconds on average, with a maximum blockage of 3 minutes 36 seconds. On average, less than one MAX blockage per day lasted more than 5 minutes.

There are no restrictions on UPRR or MAX blockages during peak hours. On average, there are 3 UPRR blockages and 18 MAX blockages at 8<sup>th</sup> Ave during the AM peak each day. The UPRR blockages last 2 minutes 2 seconds on average, with a maximum length of 17 minutes 49 seconds. The MAX blockages last 33 seconds on average, with a maximum length of 36 seconds. On average, less than one blockage lasted more than 5 minutes during the AM peak.

On average, there are 3 UPRR blockages and 19 MAX blockages at 8<sup>th</sup> Ave during the PM peak. The UPRR blockages last 2 minutes 38 seconds on average, with a maximum length of 22 minutes 3 seconds. The MAX blockages last 33 seconds on average, with a maximum length of 1 minute 13 seconds. On average, less than one blockage lasted more than 5 minutes during the PM peak.

**TABLE 3: UPRR TRAIN BLOCKAGE DATA (OCTOBER 2015 – JANUARY 2016)**

<b>UPRR Mainline at SE 8th/Division Train blockages Oct 2015 - Jan 2016</b>	<b>Daily</b>	<b>AM Peak</b>	<b>PM Peak</b>
Average number of UPRR train blockages	21	3	3
Average duration of UPRR train blockages (minutes:seconds)	2:47	2:02	2:38
Average total minutes blocked per day	57	-	-
Average total minutes blocked in peak	12	5	7
Average number of blockages >5 minutes	3.4	0.2	0.4
Average number of blockages >10 minutes	0.7	0.1	0.1
Longest blockage (MM:SS)	45:40	17:49	22:03

*Source:* City of Portland Rail Grade Crossing Summary, acquired March 2016

**TABLE 4: MAX TRAIN BLOCKAGE DATA (OCTOBER 2015 – JANUARY 2016)**

<b>MAX Orange Line at SE 8th/Division Train blockages Oct 2015 - Jan 2016</b>	<b>Daily</b>	<b>AM Peak</b>	<b>PM Peak</b>
Average number of MAX train blockages	112	18	19
Average duration of MAX train blockages (minutes:seconds)	0:33	0:33	0:33
Average total minutes blocked per day	61	-	-
Average total minutes blocked in peak	20	10	10
Average number of blockages >5 minutes	0.0	0.0	0.0
Average number of blockages >10 minutes	0.0	0.0	0.0
Longest blockage (MM:SS)	03:36	00:36	01:13

*Source:* City of Portland Rail Grade Crossing Summary, acquired March 2016

## **TRAVEL TIMES**

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Using data from TriMet's Trip Planner tool for current 9-Powell buses, westbound travel times between SE 7<sup>th</sup>/Tilikum Way and SW 6<sup>th</sup>/Alder were 15 minutes in the AM peak and 15 minutes in the PM peak. Eastbound travel times between SW 5<sup>th</sup>/Taylor and SE 8<sup>th</sup>/Division Place were 12 minutes in the AM peak and 13 minutes in the PM peak.

Generally travel times for a Tilikum Crossing routing are 4-6 minutes slower than travel times for a Hawthorne Bridge routing. Travel times are also subject to additional delays from railroad crossing events. These delays would be more impactful to an at-grade crossing but less impactful to a grade-separated crossing.

## **CAPITAL COSTS**

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An at-grade crossing of the UPRR and MAX tracks would likely be the least expensive route option. The most significant expenses associated with this route would be addressing the bottleneck on Division St between SE 12<sup>th</sup> and 7<sup>th</sup> Avenues, which can be accomplished using low-cost measures such as re-striping.

A grade-separated crossing of the UPRR and MAX tracks would be the most expensive route option. In addition to a new over-crossing of the UPRR and MAX tracks at SE 7<sup>th</sup> Ave, this route would require reconstructing the roadways approaching the intersection of SE 7<sup>th</sup> Ave and Division St to the required elevation. Preliminary engineering indicates such an over-crossing could be constructed within allowable design parameters, with a preliminary cost estimate in the range of \$35 million.

## **LAND USE / TRIP ATTRACTION**

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The Tilikum Crossing route option would directly serve OMSI, South Waterfront, PSU, and Downtown Portland. According to Metro's 2035 travel demand model, a Tilikum Crossing route would serve demand for about 45,000 total person trips and 4,000 total transit trips between South Waterfront/Marquam Hill/PSU and SE Division St. Trip demand between Downtown and SE Division St is about 2.3 times that between South Waterfront and SE Division St. As mentioned previously, this indicates that more riders would be better served with a faster trip to downtown, and the option of a transfer to reach the South Waterfront area.

## **TILIKUM CROSSING ROUTE PERFORMANCE SUMMARY**

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Key findings for the Tilikum Crossing route include:

- Least reliable connection without constructing a new over-crossing of UPRR (especially in peak hours when Hawthorne Bridge lifts are prohibited)
- A new over-crossing of UPRR could improve reliability, but would require significant capital investment (approx. \$35 million) to build. Also, TriMet is currently working with UPRR on options to help mitigate freight train delay, which if successful would increase the reliability of a Tilikum Crossing route.
- Trip times to downtown Portland 4-6 minutes slower than the Hawthorne Bridge route
- Less direct connection to central downtown (highest demand location), Central Eastside, and Goodwill
- Direct access to access South Waterfront, OMSI, OHSU, PSU, and south downtown