Economic Impacts Supplemental Memorandum

Multnomah County | Earthquake Ready Burnside Bridge Project

Portland, OR

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Earthquake Ready Burnside Bridge Economic Impacts Supplemental Memorandum

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Acronyms, Initialisms, and Abbreviations

ADA	Americans with Disabilities Act
API	Area of Potential Impact
AASHTO	American Association of State Highway and Transportation Officials
BLTS	bicycle level of traffic stress
EIS	Environmental Impact Statement
EQRB	Earthquake Ready Burnside Bridge
GDP	gross domestic product
HSM	Highway Safety Manual
I-5	Interstate 5
I-84	Interstate 84
LOS	Level of service (for analysis of intersections)
mph	miles per hour
PDO	Property Damage Only (category of vehicle crash)
ROW	right-of-way
SDEIS	Supplemental Draft Environmental Impact Statement
U.S.	United States (no need to define this abbreviation in text or include on acronyms page)
USDOT	United States Department of Transportation

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Executive Summary

The Project proposes to build a seismically resilient Burnside Bridge that would become a lifeline crossing over the Willamette River and remain fully operational and accessible for vehicles and other modes of transportation following a major Cascadia Subduction Zone earthquake. The various aspects of the environmental impacts of this Project were evaluated and reported in Draft EIS technical reports.

This supplemental technical memorandum has been prepared to evaluate the potential economic impacts of potential design refinements to the Draft EIS Preferred Alternative, the Draft Long-span Alternative, intended to reduce the Project costs.

The alternative with design refinements is referred to as the Refined Long-span Alternative, whereas the Draft EIS Preferred Alternative is referred to as the Draft EIS Long-span Alternative.

The key new design feature of the Refined Long-span Alternative is a reduction in the width of the bridge and a reduction in the number of lanes on the roadway compared to the existing bridge and the Draft EIS . Both the existing bridge and the Draft EIS Long-span Alternative have 5 traffic lanes with 4 general purpose lanes and one eastbound bus lane (although they are narrower on the existing bridge than under the Draft EIS Long-span Alternative) whereas the Refined Long-span Alternative has 4 traffic lanes with various lane configurations being evaluated. The Refined Long-span Alternative is narrower than the Draft EIS Long-span Alternative and of about the same width as the existing bridge. In addition, several other design refinements are being evaluated that are intended to mitigate various impacts.

Most of the economic impacts of the Refined Long-span Alternative are similar to the impacts of the Draft EIS Long-span Alternative. Key differences between the two Build alternatives include the following:

- In terms of traffic flow around and through the Burnside Bridge, the Refined Long-span Alternative Lane Options 1, 2, and 3 perform worse (with reduced throughput during peak hours) than the No Build and the Draft EIS Long-span Alternative while Lane Option 4 performs about the same as the No Build and the Draft EIS Long-span Alternative. Worse traffic flow under Lane Options 1, 2, and 2 would increase travel delays and travel costs to Burnside Bridge users.
- All Build alternatives (including Draft EIS Long-span) are estimated to increase the number of crashes on the bridge. The Refined Long-span Alternative in all lane configurations increases the number of crashes on the bridge relative to No Build and relative to the Draft EIS Long-span Alternative. This will increase the social cost of accidents.
- The Refined Long-span Alternative would have two sets of columns in Tom McCall Waterfront Park compared to just one with the Draft EIS Long-span Alternative. This may require more permanent easements, may interfere with sightlines in the park area and may negatively affect visitor perceptions of the park. However, the Refined Long-span Alternative would still represent an

improvement compared to the existing situation which features five sets of columns.

- Certain other design refinements would reduce the impacts on the surrounding properties, or generate other benefits to stakeholders and users, compared to the Draft EIS Long-span Alternative.
    - The Refined Long-span Alternative would provide an enhanced ADA access (elevators and stairs) from the bridge to the Vera Katz Eastbank Esplanade and the Skidmore MAX light rail station instead of a ramp which would benefit persons with mobility impairments.
    - The Refined Long-span Alternative would place the eastern pier of the tied arch span to the west of 2nd Avenue. This approach would leave the Burnside Skatepark relatively unaffected avoiding its possible closure or relocation.
    - The Refined Long-span Alternative would reduce impacts to the Rose City Transportation building and Pacific Coast Fruit Company (PCFC) property in such a way that PCFC's relocation is not anticipated to be necessary.
- The Project would provide an economic boost to the local, regional, and state economies due to the expenditures on goods and services needed to construct the Project. Given that the construction cost of the Refined Long-span Alternative is less than the cost of the Draft EIS Long-span Alternative, the magnitude of the impacts can be expected to be smaller as well.

1 Introduction

In support of the Supplemental Draft Environmental Impact Statement (SDEIS) for the Earthquake Ready Burnside Bridge (EQRB) Project, this supplemental technical memorandum has been prepared to evaluate the impacts of potential design refinements to the Preferred Alternative on the economic resources within the project's Area of Potential Impact (API). The intent of the design modifications is to reduce the overall cost and improve the affordability of the EQRB Project. This technical memorandum is a supplement to the Draft EIS technical reports and as such does not repeat all of the information in those reports, but instead focuses on the impacts of the design modification options, and how they compare to the version of the Preferred Alternative that was evaluated in the *EQRB Draft Environmental Impact Statement* (Multnomah County 2021b).

Much of the information included in the Draft EIS and Draft EIS technical reports, including project purpose, relevant regulations, analysis methodology and affected environment, is incorporated by reference because it has not changed, except where noted in this technical memorandum.

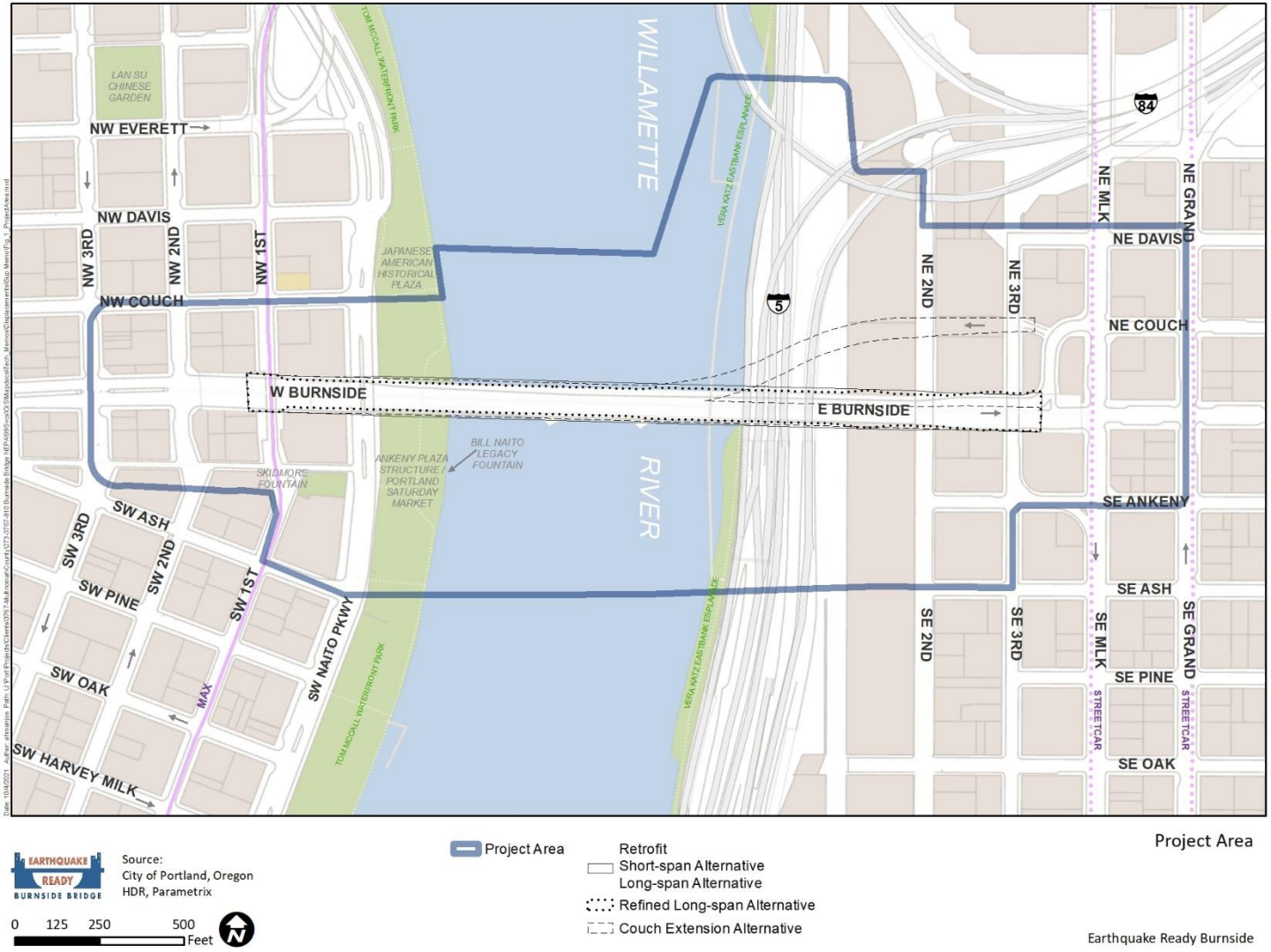
1.1 Project Location

The Project Area is located within the central city of Portland. The Burnside Bridge crosses the Willamette River connecting the west and east sides of the city. The Project Area encompasses a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from NW/SW 3rd Avenue on the west side of the river and NE/SE Grand Avenue on the east side. Several neighborhoods surround the area including Old Town/Chinatown, Downtown, Kerns, and Buckman. Figure 1 shows the Project Area.

1.2 Project Purpose

The primary purpose of the Project is to build a seismically resilient Burnside Street lifeline crossing over the Willamette River that will remain fully operational and accessible for vehicles and other modes of transportation following a major Cascadia Subduction Zone (CSZ) earthquake. The Burnside Bridge will provide a reliable crossing for emergency response, evacuation, and economic recovery after an earthquake. Additionally, the bridge will provide a long-term safe crossing with low-maintenance needs.

Figure 1. Project Area



2 Project Alternatives

This technical memorandum evaluates the impacts of potential design refinements to the Draft EIS Preferred Alternative. All of the Project Alternatives evaluated in the Draft EIS are summarized in Chapter 2 of the Draft EIS and described in detail in the *EQRB Description of Alternatives Report* (Multnomah County 2021a). Briefly, the Draft EIS evaluated a No-Build Alternative and four Build Alternatives. One of the Build Alternatives, the Long-span Alternative, was identified as the Preferred Alternative. The potential refinements evaluated in this technical memorandum are collectively referred to as the "Refined Long-span Alternative (Four-lane Version)" or the "Refined Long-span." The Refined Long-span includes Project elements that were studied in the Draft EIS but have been modified as well as new options that were not studied in the Draft EIS. These refinements and new options are intended to provide lower cost and, in some cases, lower impact designs and ideas that could be adopted to reduce the cost of the Draft EIS Preferred Alternative while still achieving seismic resiliency. The potential design refinements, and how they differ from the Draft EIS Long-span Alternative, are described below.

- Bridge width – The total width of the bridge over the river would be approximately 82 to 93 feet (the range varies depending on the bridge type and segment). For comparison, the Draft EIS Replacement Alternatives were approximately 110 to 120 feet wide over the river. The refined bridge width would accommodate approximately 78 feet for vehicle lanes, bike lanes, and pedestrians, which is comparable to the existing bridge.
    - The refined bridge design would accommodate four vehicle lanes (rather than five as evaluated in the Draft EIS). The following lane configuration options are being evaluated:
        - Lane Option 1 (Balanced) – Two westbound lanes (general-purpose) plus two eastbound lanes (one general-purpose and one bus-only lane)
        - Lane Option 2 (Eastbound Focus) – One westbound lane (general-purpose) plus three eastbound lanes (two general purpose and one bus only)
        - Lane Option 3 (Reversible Lane) – One westbound lane (general-purpose) plus two eastbound lanes (one general-purpose and one bus-only) plus one reversible lane (westbound AM peak and eastbound PM peak)
        - Lane Option 4 (General Purpose with Bus Priority) – Two westbound general-purpose lanes plus two eastbound general-purpose lanes, plus bus priority access (e.g., queue bypass) at each end of the bridge.
    - The width of the vehicle lanes would be, at minimum, 10 feet and could vary depending on how the total bridge width is allocated between the different modes.
    - The total width of the bicycle lanes and pedestrian sidewalks would be approximately 28 to 34 feet. This is wider than the existing bridge but 9 feet narrower than what was proposed in the Draft EIS for the replacement

alternatives. Physical barriers between vehicle lanes and the bicycle lanes are proposed and are in addition to the above dimensions.

  - The refined bridge would allow narrower in-water piers, due to less weight needing to be transferred to the in-water supports.

- Other key design refinements:
  - West approach –A refined girder bridge type for the approach over the west channel of the river, Tom McCall Waterfront Park, and Naito Parkway. Compared to the cable-stayed and tied-arch options evaluated in the Draft EIS, this option would not only reduce costs but also avoid an adverse effect to the Skidmore/Old Town National Historic Landmark District. It would have two sets of columns in Tom McCall Waterfront Park compared to just one with the Draft EIS tied-arch option and five with the existing bridge.

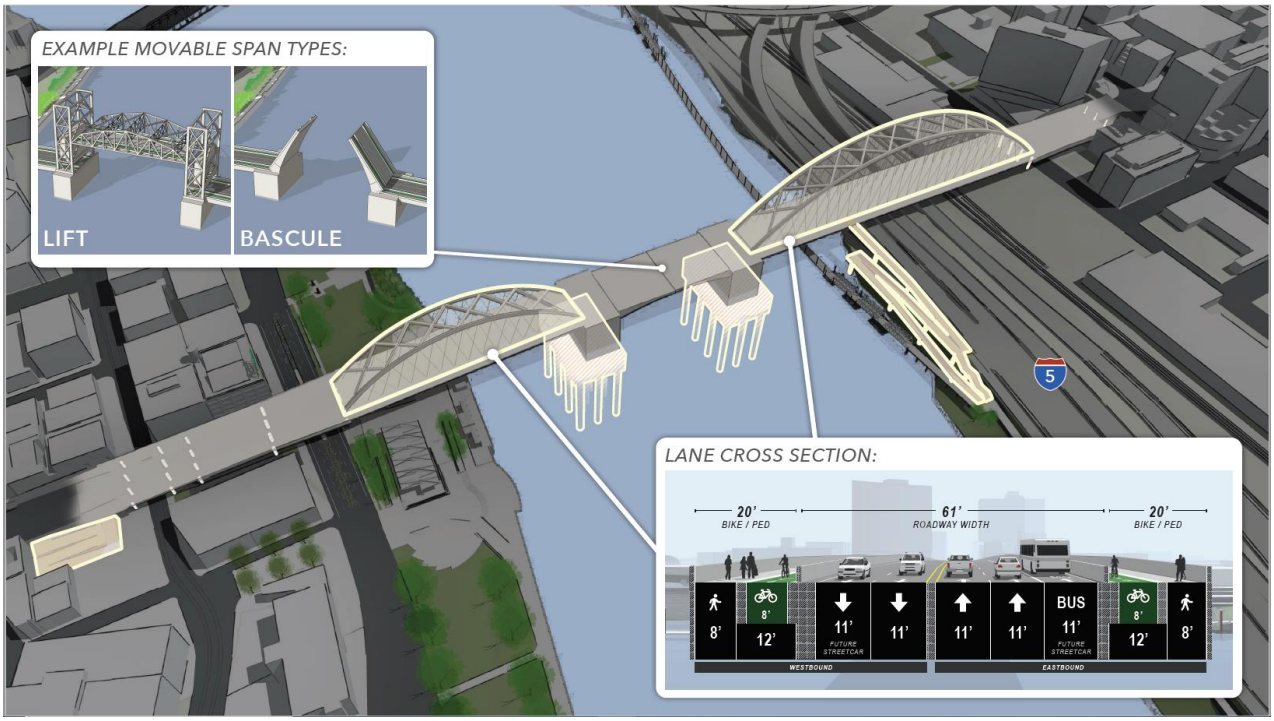
  - East approach –Potential span length change for the east approach tied-arch option that would minimize the risks and reduce costs associated with placing a pier and foundation in the geologic hazard zone that extends from the river to about E 2nd Avenue. The refined tied-arch option would be about 720 to 820 feet long and approximately 150 feet tall (the Draft EIS Long-span Alternative was the same height and 740 feet long). The Refined Long-span Alternative would place the eastern pier of the tied-arch span either on the east side of 2nd Avenue (Option 1) or just west of 2nd Avenue (Option 2). Increasing the length of the tied-arch span would also reduce the length and depth of the subsequent girder span to the east.

  - Americans with Disabilities Act (ADA) access –A refined approach for providing direct ADA access between the bridge and the Vera Katz Eastbank Esplanade, as well as between the bridge and W 1st Avenue and the Skidmore Fountain MAX station. The Draft EIS evaluated multiple ramp, stair, and elevator options for these locations. This SDEIS memorandum evaluates a refined option that would provide enhanced ADA access at both locations using both elevators and stairs. These facilities would also provide pedestrian and potentially bicycle access. For the west end, there is also the potential for replacing the existing stairs with improved sidewalk access from the west end of the bridge to 1st Avenue.

Figure 3 highlights the elements of the Draft EIS Long-span Alternative that have been modified to create the Refined Long-span Alternative, as described above. Figure 2 shows the Draft EIS Long-span Alternative and Figure 3 shows the Refined Long-span Alternative. Both figures include the tied-arch option for the east approach and the bascule option for the center movable span, but the east span could also be a cable-stayed bridge and the movable span could be a vertical lift bridge. For the west approach, the Draft EIS Long-span Alternative shows the tied-arch option while the Refined Long-span Alternative shows the refined girder bridge. The Refined Long-span Alternative image shows just one of the four possible lane configuration options being studied. All four configuration options, as well as many more graphics of the Refined Long-span Alternative, and how it compares to the Draft EIS Long-span Alternative, can be found in Chapter 2 of the *EQRB Supplemental Draft Environmental Impact Statement*

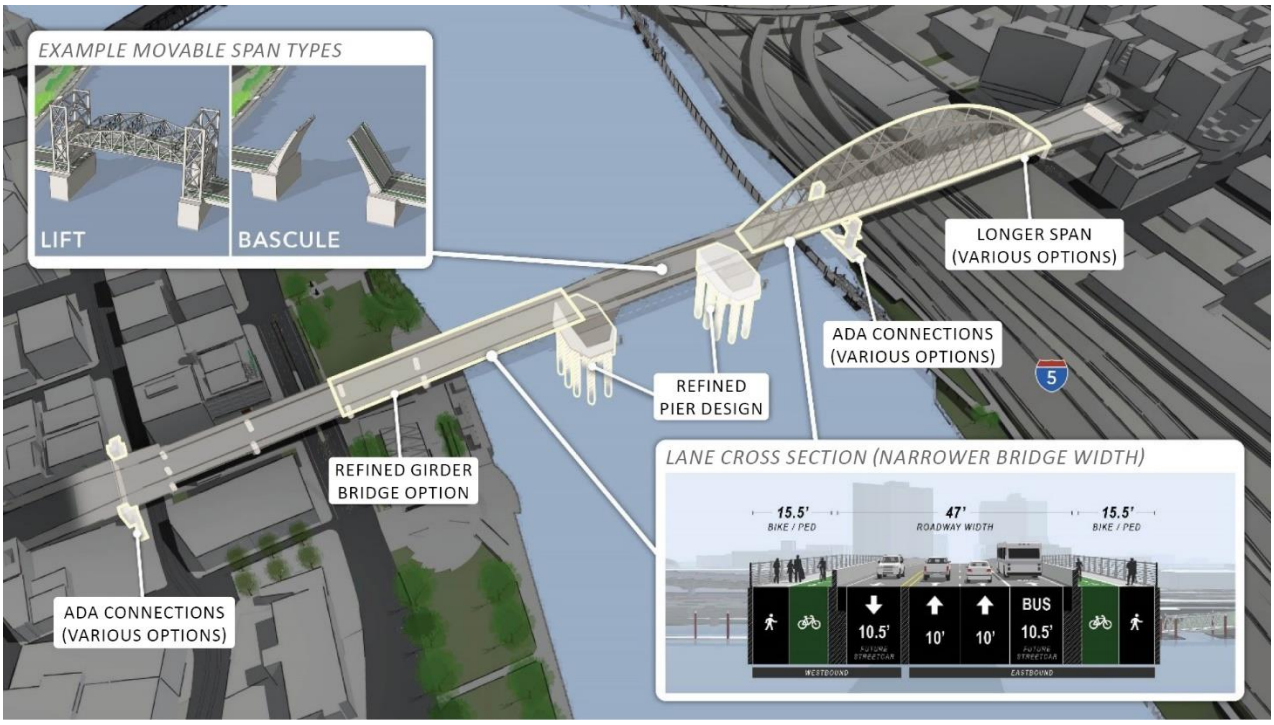
(Multnomah County 2022a). Figure 3 also shows just one of the possible ways to allocate the bridge width between vehicle lanes, bicycle lanes and sidewalks; the total width of the bicycle and pedestrian facilities could range from approximately 28 to 34 feet.

Figure 2. Draft EIS Long-Span Alternative



Note: The Draft EIS Long-span Alternative included multiple bridge types for both the east and west approach. This figure shows only the tied arch option.

Figure 3. Refined Long-Span Alternative



Notes: The Refined Long-span Alternative evaluated in this SDEIS includes both cable-stayed and tied arch options for the east span. This figure shows only the tied arch option. The Draft EIS studied, and SDEIS further studies, a bascule option and vertical lift option for the center movable span. The inset shows both options but the main figure shows the bascule option. This figure also shows just one of the lane configuration options considered in the SDEIS.

- Construction assumptions:
  - Construction duration – The expected duration of project construction is 4.5 to 5.5 years, dependent upon the design option. See Table 1 for more information regarding construction impact extent and closure timeframes.
  - Construction area – Compared to the Draft EIS Long-span Alternative, the main refinement is that the construction area would be smaller for the west approach south of the bridge, including a smaller area within Tom McCall Waterfront Park south of the bridge.
  - Construction access and staging – The construction access and staging is expected to be the same as that described in the Draft EIS.
  - Vegetation – The Refined Long-span Alternative would remove slightly fewer trees and vegetation impacts than the Draft EIS Long-span Alternative, primarily within Tom McCall Waterfront Park south of the bridge.
  - In-water work activity – The in-water work would be similar to that described in the Draft EIS, except that the replacement bridge in-water foundations would consist of a perched footing cap and a group of drilled shafts. Whereas the Draft EIS discussed the use of cofferdams to isolate in-water work, the Refined Long-span Alternative proposes to use a temporary caisson lowered to an elevation about mid-height of the water column to construct footing caps, avoiding additional disturbance of the riverbed that would be needed for a cofferdam.

Additionally, the existing Pier 4 would be fully removed, Pier 1 would be partially removed below the mudline and Piers 2 and 3 would be removed to below the mudline. Existing in-water piles would be removed, subject to the design option advanced.

- Temporary freeway, rail, street, and trail closures – Temporary closures are expected to be the same as those described in the Draft EIS.
- Access for pedestrians and vehicles to businesses, residences, and public services – Access is expected to be the same as that described in the Draft EIS.
- On-street parking impacts – On-street parking impacts are expected to be the same as those described in the Draft EIS.
- Property acquisitions and relocations – Property acquisitions and relocations are similar to those listed in the Draft EIS, except that they have been modified to reflect a narrower set of bridge design options.
- Temporary use of Governor Tom McCall Waterfront Park – The park area that would be temporarily closed for construction has changed since the Draft EIS. On the north side of the bridge, the closure area has been reduced to avoid removing ten cherry trees and a berm that are part of the Japanese American Historical Plaza; this change would apply to all of the build alternatives. On the south side of the bridge, the park closure area has also been reduced to include only the area north of the Tom McCall Waterfront Park trellis; this revision applies only to the Refined Long-span Alternative.

Table 1. Construction Impacts, Closure Extents, and Timeframes by Build Alternative

Facility Impacted	Draft EIS Long-Span Alternative	Refined Long-Span Alternative
Tom McCall Waterfront Park	4.5-year closure within boundary of potential construction impacts	Same; Smaller closure area south of the bridge
Willamette River Greenway Trail	Portion of trail within Tom McCall Waterfront Park closed for same duration as park; detours in place for construction duration	Same
Japanese American Historical Plaza	Southern portion of plaza would be closed for same duration as Tom McCall Waterfront Park	Same
Ankeny Plaza Structure	Closure for duration of construction but no impacts to Ankeny Plaza structure	Plaza Structure would not be closed during construction or impacted
Bill Naito Legacy Fountain	No closure of fountain and associated hardscape	Same
Vera Katz Eastbank Esplanade	18 months (this could extend to 3.5 to 4.5 years if the project builds ramps rather than elevators and stairs for the ADA/bicycle/pedestrian connection); detours in place for construction duration	Same
Burnside Skatepark	4-month full closure	Same
River Crossing on Burnside Street	4- to 5-year closure	Same

Facility Impacted	Draft EIS Long-Span Alternative	Refined Long-Span Alternative
Saturday Market Location	4.5-year closure or use of alternative location	Same
Skidmore Fountain MAX Station	Approximately 5 weeks	Same
Navigation Channel/Willamette River Water Trail	Intermittent closures; 2 to 10 closures; each closure up to 3 weeks	Same
Overall Construction Duration	**4.5 to 5.5 years**	**Same**

3 Definitions

The following terminology is used when discussing geographic areas in the EIS:

- **Project Area** – The area within which improvements associated with the Project Alternatives would occur and the area needed to construct these improvements. The Project Area includes the area needed to construct all permanent infrastructure, including adjacent parcels where modifications are required for associated work such as utility realignments or upgrades. For the EQRB Project, the Project Area includes approximately a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from NW/SW 3rd Avenue on the west side of the river and NE/SE Grand Avenue on the east side.
- **Area of Potential Impact (API)** – This is the geographic boundary within which physical impacts to the environment could occur with the Project Alternatives. The API is resource-specific and differs depending on the environmental topic being addressed. For all topics, the API will encompass the Project Area, and for some topics, the geographic extent of the API will be the same as that for the Project Area; for other topics (such as for transportation effects) the API will be substantially larger to account for impacts that could occur outside of the Project Area.
- **Project vicinity** – The environs surrounding the Project Area. The project vicinity does not have a distinct geographic boundary but is used in general discussion to denote the larger area, inclusive of the Old Town/Chinatown, Downtown, Kerns, and Buckman neighborhoods.

4 Relevant Regulations

Relevant regulations are the same as described in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021c). These included primarily the following:

- U.S. Department of Transportation Federal Highway Administration, Community Impact Assessment. A Quick Reference for Transportation, 2018 Update. – Identification of factors and characteristics to consider, data sources, and type of impacts.

5 Analysis Methodology

Analysis methodology is the same as described in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021c).

The analysis of direct long-term economic impacts considered effects due to the Project compared to the existing conditions that will likely persist for a period of time after Project completion. The following effects were taken into account:

- Impacts on traffic and travel
- Impacts on safety
- Impacts on businesses, community facilities, and community services
- Noise impacts
- Impacts of bridge seismic resiliency in the post-earthquake scenario

The analysis leveraged work conducted for other Draft EIS disciplines and interpreted the impacts reported in economic terms by identifying their various economic costs and benefits which were quantified to the extent possible.

The analysis of direct short-term economic impacts considered Project effects that may affect local communities, local and regional economies but which are temporary, likely to persist only during project construction. The following effects were taken into account:

- Construction-related disruptions in various forms, including
    - Disruptions, detours, and delays to traffic using the Burnside Bridge
    - Disruptions and delays to other transportation in the API
    - ROW, impeded access, and displacement impacts
    - Increased noise
- Business and employment opportunities related to Project construction, supply of input materials and other services (directly and indirectly).
- Impacts of temporary closures of parks and trails on Park department revenue

Business and employment opportunities were quantified in terms of jobs and business activity generation using input-output methodologies and construction cost estimates. Other impacts were assessed by identifying various economic cost consequences of disruptions and displacements, primarily in qualitative terms.

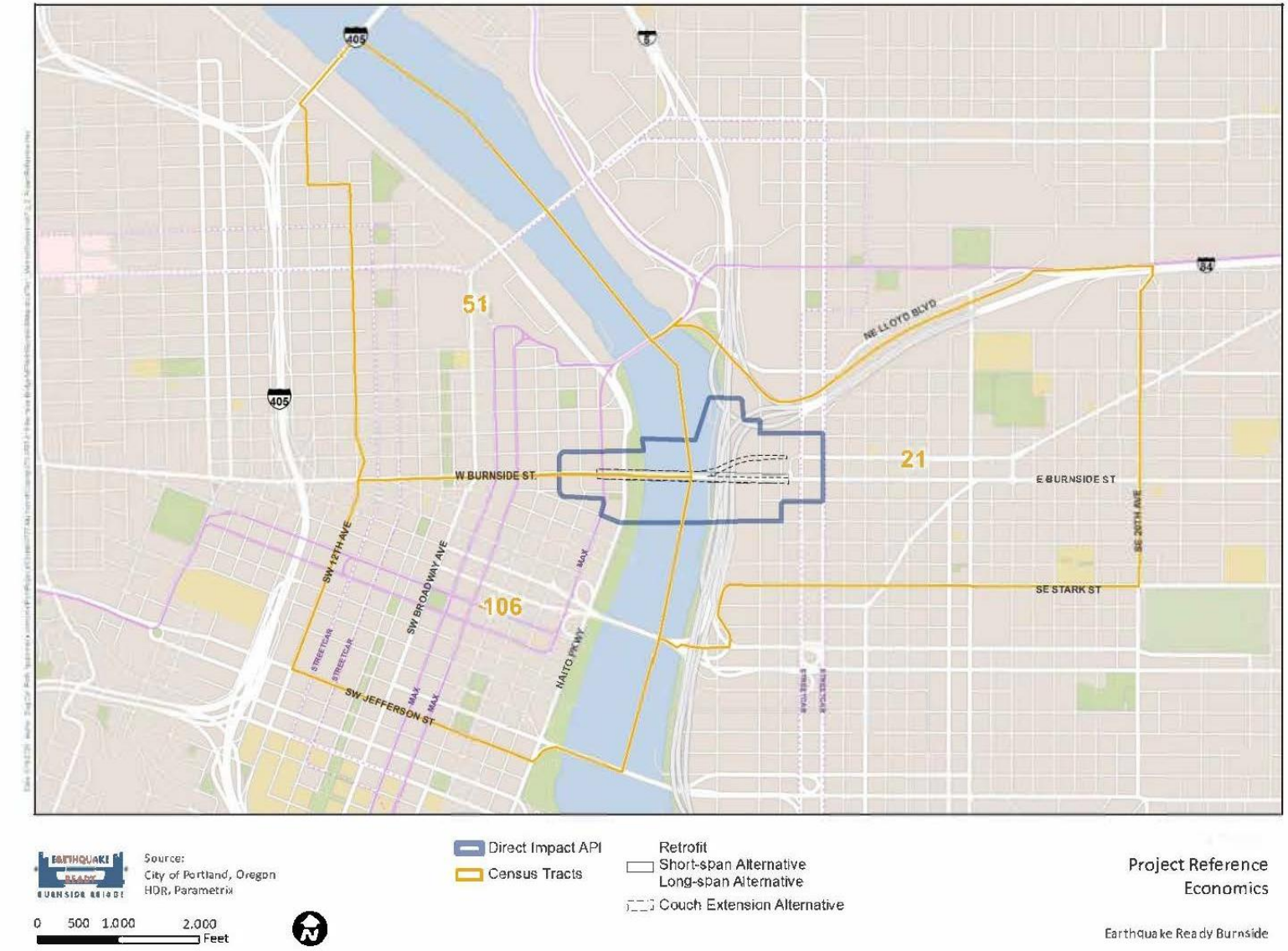
Indirect and cumulative project impacts were assessed considering a broader context of the project taking into account existing and known future plans. This analysis was conducted in qualitative terms.

6 Affected Environment

The affected environment is the same as described in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021c).

The API for socioeconomics is represented by three census tracts intersected by the proposed Project: Census Tract 21, Census Tract 51, and Census Tract 106. The location of these census tracts in relation to the Project Area is shown in Figure 4. Business establishments, services, amenities located there as well as people living in these areas, or coming for work and other purposes represent the affected environment. However, other economic effects of the Project and its construction may extend more broadly across Portland and Multnomah County.

Figure 4. Census Tracts Intersecting API



7 Impacts from the Design Modifications and Comparison to Draft EIS Alternatives

This section evaluates the impacts of the Refined Long-span Alternative (also referred to as the Refined Long-span for short). The Refined Long-span is a modified version of the Draft EIS Long-span which was identified as the Preferred Alternative in the Draft EIS. The Refined Long-span includes modified Project elements as well as new options that were not considered in the Draft EIS and is intended to provide the seismic resiliency and other advantages of the Draft EIS Long-span Alternative at a lower cost.

7.1 Introduction

The description of long-term Impacts of the Refined Long-span Alternative is divided into (a) pre-earthquake impacts, and (b) impacts that would occur after the next CSZ earthquake (emergency response and longer-term recovery). Each of these is then considered within No-Build and Build scenarios. The focus is on impacts that are different than impacts of the Draft EIS Replacement Long-span Alternative. Impacts which are the same are only briefly summarized for reference purpose. Unless noted otherwise, the Build impacts are the same for all roadway lane configurations.

7.2 Pre-Earthquake Impacts

Direct Impacts

Traffic Flow Impacts

The design of the Refined Long-span Alternative reduces the number of lanes on the roadway compared to the existing bridge and the Draft EIS Long-span Alternative. Both the existing bridge and the Draft EIS Long-span Alternative have 5 traffic lanes with 4 general purpose lanes and one eastbound bus lane. In comparison, the Refined Long-span Alternative has a total of 4 lanes. Depending on the specific lane configuration, this may reduce average speeds, increase travel times for trips across the bridge, and increase travel time costs to travelers using the Burnside Bridge.

Traffic flows on the bridge and intersections in the vicinity of the bridge were analyzed for the *EQRB Transportation Supplemental Memorandum* (Multnomah County 2022b) using the VISSIM and SimTraffic traffic simulation software to identify best performing lane configuration during peak hours. The key findings from this analysis are as follows.[1]

[1] The VISSIM and SimTraffic analysis did not include the DEIS Replacement Long-span Alternative. However, given that this alternative has a wider footprint and maintains the same number of lanes and lane configuration as the No Build scenario, its performance can be expected to be no worse (or possibly better) than No Build.

- Lane Option 4 and No Build are estimated to perform at a similar level of efficiency. Traffic throughput[2] on the bridge is equal to demand, and all study intersections perform within City of Portland Level of Service (LOS) standards, except for one intersection on Couch Street.
- Lane Options 1, 2, and 3 perform worse than Lane Option 4 and No Build. Traffic throughput is reduced below demand during PM peak hours (throughput of 71 percent of demand in the eastbound direction under Option 1, and 84 percent of demand in the westbound direction under Option 2 and 3). The intersection performance is forecasted to worsen as well with three intersections being below City LOS standards.

Traffic Safety Impacts

The introduction of shoulders and wider vehicle lanes on the bridge under the Build scenarios compared to the existing conditions can improve safety and reduce the number of crashes on the bridge. However, the impact of the physical barrier separating the roadway and the bike and pedestrian lanes is more complex. This barrier is a fixed object that prevents pedestrian-vehicle and bike-vehicle collisions, but it introduces a risk that some vehicles crash into it.

The safety performance of the roadway was estimated for the *EQRB Transportation Supplemental Memorandum* (Multnomah County 2022b) using the AASHTO Highway Safety Manual (HSM) Predictive Method for urban and suburban arterials combined with crash modification factor adjustments for relevant road treatments. The analysis was conducted for a mid-span location and at the approach intersections of NW 2nd Avenue/ W. Burnside Street, NE MLK Boulevard/E. Burnside Street and NE Couch St/NE MLK Boulevard.

The results are summarized in Table 2 through Table 4. The key observations are as follows:

- Table 2 shows that all Build alternatives (including Draft EIS Long-span) are estimated to increase the number of crashes on the bridge compared to No Build.
  - The Refined Long-span Alternative in all lane configurations increases the number of crashes relative to No Build and relative to the Draft EIS Long-span Alternative.

Lane Options 1, 2, and 3 have impacts of a similar magnitude while Option 4 has a much greater impact in terms of the incremental crashes.

- Table 3 shows that over 20 years, compared to the Draft EIS Long-span Alternative, Lane Options 1, 2, and 3 are estimated to increase the number of fatal and injury crashes by about 2 and the number of Property Damage Only (PDO) crashes by about 6 to 7. Option 4 is estimated to increase these crashes by 9 and 24, respectively.

[2] Traffic performance is often analyzed in terms of volume demand and volume throughput. Volume demand is the amount of traffic that would like to use a certain roadway or intersection during the peak hour. The volume throughput represents the actual amount of the volume that is able to make it through during the peak hour. Throughput less than demand implies traffic delays and queueing that may extend upstream on the roadway.

- The increase in the number of road crashes on the bridge will increase total social costs of accidents. Over 20 years, compared to the Draft EIS Long-span Alternative, Options 1, 2, and 3 are estimated to increase total social accident costs by about $2 million - $2.5 million while Option 4 is estimated to increase them by $10.7 million.

- Table 4 shows that Refined Long-span Option 1, 2, and 3 are estimated to reduce the number of crashes on approach intersections compared to No Build and to the Draft EIS Long-span Alternative. Over 20 years, the impact amounts to a reduction in the number of fatal or injury crashes by 1 to 2, and property damage crashes by 2 to 3. Total accident costs are reduced by about $2 million.
- Table 4 also shows that the Draft EIS Long-span and Refined Long-span Option 4 alternative does not have any significant impact on crashes on approach intersections compared to No Build.

Table 2. Safety Performance of Mid-Span Bridge Section, Incremental Crashes Compared to No-Build Scenario, Total over 2026-2045

Alternative	Total Crashes	Fatal and Serious Injury Crashes	Property Damage Only Crashes	Monetary Cost Impact ($2019, M)
Draft EIS Long-span	7.3	1.5	5.8	$1.7
Lane Option 1 (Balanced): 2 WB (GP) plus 2 EB (1 GP and 1 bus only lane)	14.5	3.1	11.4	$3.6
Lane Option 2 (EB Focus): 1 WB (GP) plus 3 EB (2 GP and 1 bus only)	16.3	3.6	12.7	$4.2
Lane Option 3 (Reversible Lane)	15.9	3.5	12.4	$4.1
Lane Option 4 (GP with Bus Priority): 2 WB GP plus 2 EB GP	40.6	10.7	29.9	$12.4

Source: *EQRB Transportation Supplemental Memorandum* (Multnomah County 2022b). Monetary cost impact calculated assuming social costs of accidents recommended by US Department of Transportation ($1,114,500 for a serious injury[3] and $4,500 per vehicle per PDO crash based on USDOT, Benefit-Cost Analysis Guidance for Discretionary Grant Programs, February 2021).

[3] Specific breakdown for fatal and injury accidents was not available. It is assumed that fatal accidents would be very rare.

Table 3. Safety Performance of Mid-Span Bridge Section, Incremental Crashes Compared to Draft EIS Long-span, Total over 2026-2045

Alternative	Total Crashes	Fatal and Serious Injury Crashes	Property Damage Only Crashes	Monetary Cost Impact ($2019, M)
Lane Option 1 (Balanced): 2 WB (GP) plus 2 EB (1 GP and 1 bus only lane)	7.2	1.6	5.6	$1.90
Lane Option 2 (EB Focus): 1 WB (GP) plus 3 EB (2 GP and 1 bus only)	9	2.1	6.9	$2.50
Lane Option 3 (Reversible Lane)	8.6	2	6.6	$2.40
Lane Option 4 (GP with Bus Priority): 2 WB GP plus 2 EB GP	33.3	9.2	24.1	$10.70

Source: *EQRB Transportation Supplemental Memorandum* (Multnomah County 2022b). Monetary cost impact calculated assuming social costs of accidents recommended by US Department of Transportation ($1,114,500 for a serious injury[4] and $4,500 per vehicle per PDO crash based on USDOT, Benefit-Cost Analysis Guidance for Discretionary Grant Programs, February 2021).

Table 4. Safety Performance of Approach Intersections, Incremental Crashes Compared to No-Build Scenario, Total over 2026-2045

Alternative	Total Crashes	Fatal and Injury Crashes	Property Damage Only Crashes	Monetary Cost Impact ($2019, M)
Draft EIS Long-span	0	0	0	$0.0
Lane Option 1 (Balanced): 2 WB (GP) plus 2 EB (1 GP and 1 bus only lane)	-4	-1.7	-2.3	-$2.0
Lane Option 2 (EB Focus): 1 WB (GP) plus 3 EB (2 GP and 1 bus only)	-4.6	-1.7	-2.9	-$2.0
Lane Option 3 (Reversible Lane)	-3.9	-1.5	-2.4	-$1.7
Lane Option 4 (GP with Bus Priority): 2 WB GP plus 2 EB GP	0	0	0	$0.0

Source: *EQRB Transportation Supplemental Memorandum* (Multnomah County 2022b). Monetary cost impact calculated assuming social costs of accidents recommended by US Department of Transportation ($1,114,500 for a serious injury and $4,500 per vehicle per PDO crash based on USDOT, Benefit-Cost Analysis Guidance for Discretionary Grant Programs, February 2021).

Transit and Active Transportation

There is an existing westbound bus stop on the bridge serving TriMet bus lines 12, 19 and 20. This bus stop will have to be relocated to the west about one block of the current location. This proposed location improves access and shortens distances to downtown, but it is further away from the MAX stop located under the Burnside Bridge. While some users may find the new location more convenient, users making a transfer between MAX and bus on the bridge will have to walk further increasing their total travel time and

[4] Specific breakdown for fatal and injury accidents was not available. It is assumed that fatal accidents would be very rare.

causing inconvenience. The data on the number of users affected by this inconvenience is not available but it is believed to be small.

Regarding active transportation impacts, it is noted that conflicts between bicyclists and pedestrians are more likely in the Revised Long-span Alternative compared to the Draft EIS Long-span Alternative given the narrower bike lanes and removal of the separator stripe between bike lanes and pedestrian sidewalks. However, given that there is a barrier between the bike lanes and the vehicle lanes, crashes between vehicles and bicyclists or pedestrians should be largely avoided.

Right of Way, Easements, and Business Displacement Impacts

Refined Long-span Alternative would have two sets of columns in Tom McCall Waterfront Park compared to just one with the Draft EIS Long-span Alternative. This may require more permanent easements, may interfere with sightlines in the Park area and negatively affect visitor perceptions of the Park. However, the Refined Long-span Alternative would still represent an improvement compared to the existing situation which features five sets of columns.

Other impacts would be similar as for the Draft EIS Long-span Alternative.

In particular, the following businesses may be displaced by both options: Portland Saturday Market, Diamond Parking Services, University of Oregon classroom, Rose City Transportation, American Medical Response, and Pacific Coast Fruit Company (PCFC). However, the Refined Long-span Alternative reduces impacts to the Rose City Transportation building and PCFC's property. The details still require an architectural analysis, but it is anticipated that PCFC's building can be reconfigured in a way to make displacement not necessary.

Other Impacts

Existing access from the bridge to 1st Ave and the Skidmore Fountain MAX station is via stairways on the north and south sides of the bridge. On the east side of the river, there are stairs on the south side of the Burnside Bridge providing pedestrian access to the Vera Katz Eastbank Esplanade. The Draft EIS Long-span evaluated the addition of a ramp with stairs or elevators with stairs to connect to the Vera Katz Eastbank Esplanade.

The Refined Long-span Alternative evaluates providing an enhanced ADA access (elevators and stairs) from the bridge to the Vera Katz Eastbank Esplanade and the Skidmore MAX light rail station instead of a ramp. Elevators are typically easier to use by persons with mobility challenges and in conditions of inclement weather, and thus this design change can be considered beneficial by many users, although elevators also have security and maintenance concerns.

The narrower footprint of the Refined Long span also allows to increase some distances to structures within the bridge approach area, for example to the White Stag building. Increasing these distances may be perceived as beneficial by the tenants and users of those buildings.

Indirect Impacts

All impacts expected to be the same as for the Draft EIS Long-span Alternative.

As discussed in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021c), an earthquake-resilient Burnside Bridge may increase the attractiveness of potential development and redevelopment sites in the API as those locations would suffer relatively small disruptions in transportation connectivity after an earthquake.

7.3 Post-Earthquake Impacts

The Refined Long-span design of the earthquake resilient Burnside Bridge will improve the resiliency of Portland's transportation network by providing a crossing over the Willamette River that is expected to withstand a major earthquake. This will help avoid or reduce bridge damage and restoration costs, avoid or reduce fatalities and injuries to people who were on or around the bridge during the earthquake event, reduce transportation disruptions and their economic costs, and speed up the recovery process for the entire region.

However, during the recovery period the extent of congestion on the bridge and in its vicinity will likely be larger given the reduction in the number of traffic lanes compared to the Draft EIS Long-span Alternative.

7.4 Construction Impacts

7.4.1 Without Temporary Bridge

Traffic Disruptions and Delays to Bridge Traffic and Other Traffic in the API

Construction-related traffic disruptions are expected to be the same as for the Draft EIS Long-span Alternative causing similar travel delays and travel delay costs to travelers and freight.

Impacts on Businesses, Access to Services, Amenities, and Residences

Construction-related disruptions in access will be similar as for the Draft EIS Long-span Alternative causing similar disruptions to activities creating various economic costs or loss of benefits to affected stakeholders, users, businesses, or visitors to the API.

However, regarding temporary closure of Tom McCall Waterfront Park, it is noted that on the south side of the bridge, the impacted space has been reduced to an area north of the Tom McCall Waterfront Park trellis. This change increases the potential of park use during the construction period.

Business and Employment Opportunities

Construction plus engineering costs of the Refined Long-span Alternative is estimated at an average of about $715 million in 2021 dollars and $665.5 million in 2017 dollars.[5] This

[5] The cost estimate used in this analysis represents the midpoint estimate with a range of plus/minus 5 percent, net of ROW costs and escalation. Cost estimate is adjusted, or deflated, from 2021 dollars to 2017 dollars using a deflator of 1.0743 based on White House Office of Budget and Management, historical tables (Table 10.1 Gross Domestic Product and Deflators used in Historical tables). This adjustment is applied in order to align the year of cost estimates with the year of input-output multipliers used to estimate the economic impacts.

implies an expenditure of about $484.2 million in Multnomah County and $599 million across Oregon (including Multnomah County) in 2017 dollars.[6]

Table 5 presents the results for the impacts in Multnomah County while Table 6 presents the results for the impacts across all of Oregon over the construction period of the bridge (estimated at about 4.5 years). Average annual impacts (for total effect) are also provided to help interpret the results.

Table 5. Economic Impact of Construction, Refined Long-span Alternative without Temporary Bridge, Multnomah County, Total Over Construction Period and Average Annual

Type of Effect	Business Revenue ($M)	Employment Income ($M)	Employment (Job-Years)	Value Added ($M)
Direct	$499.2	$54.7	889	$261.3
Indirect	$187.8	$28.2	510	$97.3
Induced	$81.8	$14.9	397	$49.6
Total	**$768.7**	**$97.8**	**1.797**	**$408.2**
Average Annual (Total Effect)	$170.8	$21.7	399	$90.7

Note: Monetary values are in 2017 dollars Source: HDR Analysis

Table 6. Economic Impact of Construction, Refined Long-span Alternative without Temporary Bridge, Multnomah County, Total Over Construction Period and Average Annual

Type of Effect	Business Revenue ($M)	Employment Income ($M)	Employment (Job-Years)	Value Added ($M)
Direct	$599.0	$81.8	1,330	$313.5
Indirect	$296.0	$75.6	1,386	$146.9
Induced	$255.5	$76.3	1,980	$151.7
Total	**$1.150.5**	**$233.7**	**4.696**	**$612.1**
Average Annual (Total Effect)	$255.7	$51.9	1.044	$136.0

Note: Monetary values are in 2017 dollars Source: HDR Analysis

[6] It is unlikely that all construction-related expenditures would take place in Multnomah County or elsewhere in Oregon due to availability of appropriate contractors' skills and experience, or availability of materials. For the purpose of this analysis, it was assumed that 75 percent of Project expenditures would take place in Multnomah County and 90 percent would take place in Oregon (including Multnomah County). Lower expenditures in any of these geographies would result in lower economic impacts.

Table 5 shows that over the construction period the Project is expected to generate in Multnomah County a total of 1,797 job-years, $97.8 million in employment income, $768.7 million in business revenue, and $408.2 million in value added. This translates to an annual average of 399 jobs, $21.7 million in employment income, $170.8 million in business revenue, and $90.7 million in value added.

Economic impacts extend beyond Multnomah County to the entire state as some supplies and services would be produced outside of Multnomah County. As Table 6 shows, the Project is estimated to generate in all of Oregon a total of 4,696 job-years, $233.7 million in employment income, $1,150.5 million in business revenue, and $612.1 million in value added. This translates to an annual average of 1,044 jobs, $51.9 million in employment income, $255.7 million in business revenue, and $136 million in value added.

Because of lower costs, the impacts of the Refined Long-span Alternative shown in the tables above are lower than they would be for the Draft EIS Long-span Alternative.

7.5 Cumulative Effects

As discussed in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021c) to the extent that construction occurs on a concurrent schedule with other projects in the API, traffic disruptions due to detours, street closures, or lane reductions can cascade delays for auto and truck travel across the study area. As a result, the length of time over which disruptions are experienced may increase.

However, under the No Build, the Burnside Bridge may need regular maintenance and repairs which could require lane closures on and around the bridge causing traffic disruptions.

7.6 Compliance with Laws, Regulations, and Standards

No compliance issues were identified for economics.

7.7 Conclusions

The Refined Long-span Options 1, 2, and 3 are estimated to reduce traffic flow through the Burnside Bridge in the PM peak period compared to No Build and the Draft EIS Long-span Alternative. On the other hand, the Refined Long-span Alternative offers certain design improvements such as ADA-compliant elevators for access from the bridge to the Vera Katz Eastbank Esplanade and the Skidmore MAX light rail station.

The Project will provide an economic boost to the local, regional, and state economies. Given that the cost of the Refined Long-span Alternative is less than the cost of the Draft EIS Long-span Alternative, the magnitude of impact can be expected to be smaller as well.

Other conclusions regarding the impacts of the Refined Long-span are similar to those pertaining to the Draft EIS Long-span Alternative. In particular:

- Under No-Build, the Burnside Bridge is not expected to survive a major earthquake, get seriously damaged, or collapse altogether. This would result in

severe disruptions to transportation of people and goods and emergency service across Portland. Under the Build scenarios, the Burnside Bridge would serve as a vital post-earthquake connection, facilitate and speed up the recovery and reconstruction efforts in the entire region.

- The Refined Long-span Alternative is estimated to increase the number of crashes on the Burnside Bridge due to the barriers separating the driving and bicycle lanes. Although these barriers serve to prevent bicycle-vehicle and pedestrian-vehicle collisions they introduce a risk that some vehicles crash into them.
- Other long-term impacts include relocation of five businesses, including the AMR, an ambulance service for the Multnomah, Clackamas, and Clark counties. This can be expected to have moderate business relocation and adjustment costs.
- The short-term negative impacts of the Build Alternatives include various construction-related disruptions. These include detours, impediments in access to certain buildings, businesses, public services, and amenities.

8 Potential Mitigation

Generally, mitigation measures will be the same as for the Draft EIS Long-span Alternative. They include measures that aim to (1) reduce the financial burden of various impacts to the affected parties, (2) increase public awareness about the project, construction schedule, closures, and various other impacts, and (3) provide information about alternate ways to access destinations temporarily affected by construction activities.

9 Agency Coordination

The work for this resource relied extensively on the modeling outputs and analytical results from the transportation analysis, project design, and project cost analysis. No other additional contacts were made.

10 Preparers

Name	Professional Affiliation [firm or organization]	Education [degree or certification]	Years of Experience
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11 References

Multnomah County

2021a EQRB Description of Alternatives Report. https://www.multco.us/earthquake-ready-burnside-bridge/project-library

2021b EQRB Draft Environmental Impact Statement. https://www.multco.us/earthquake-ready-burnside-bridge/project-library.

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