Chapter 3

Affected Environment and Environmental Consequences

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Multnomah County

3 Affected Environment and Environmental Consequences

This chapter summarizes essential information about the resources and environment that would be affected by the project alternatives, the impacts of the alternatives to that environment, and potential mitigation for those impacts. For each resource, the analysis considered the potential for long-term impacts, temporary impacts occurring only during construction, impacts that would occur after the next Cascadia Subduction Zone (CSZ) earthquake, direct impacts, indirect impacts, and cumulative impacts. The information included in this Draft EIS is a summary of the detailed analyses and findings that are documented in the technical reports listed in Attachment D and cited in this chapter. Unless otherwise noted, the mitigation measures are potential at this point in time and would not be finalized until after the Draft EIS comment period and before the Final EIS is published and the Record of Decision is signed.

3.1 Transportation

This section identifies potentially affected transportation facilities and operations within and adjacent to the project area and outlines anticipated impacts, including:

- Traffic and freight operational impacts, including volumes and travel times.
- Transit ridership, travel time, and delay.
- Bicycle and pedestrian impacts, including volumes and travel times.
- Safety impacts, including projected changes in crash factors and rates

More detail can be found in the *EQRB Transportation Technical Report* (Multnomah County 2021z).

3.1.1 Affected Environment

Numerous federal, state, and local transportation plans, policies, and design standards (described in the *EQRB Transportation Technical Report* [Multnomah County 2021z]) informed not only the development of the EQRB alternatives but also the transportation analysis methodology. Multiple data sources were used to identify the affected environment and to analyze impacts (see Table 3.1-1). Data were also collected through field visits and surveys including an inventory of the existing bicycle network and collection of video-based traffic counts for all modes across the Burnside Bridge and at surrounding intersections.

Table 3.1-1. Data Resources

Organization	Data Resources	Sources
City of Portland	Traffic Counts Program	https://www.portlandoregon.gov/transportation/article/180473
City of Portland	Bicycle Counts Program	https://www.portlandoregon.gov/transportation/44671
City of Portland	Pedestrian Counts Program	https://www.portlandoregon.gov/transportation/article/259235
Crash Modification Factors Clearinghouse	Crash Factors	http://www.cmfclearinghouse.org/
Metro	RLIS Live	http://rlisdiscovery.oregonmetro.gov/?resourceID=3
Metro	Trip Based Travel Model	https://www.oregonmetro.gov/modeling-services
Multnomah County	Traffic Counts Program	https://multco.us/roads/master-road-list

Organization	Data Resources	Sources
ODOT	Traffic Counts	https://www.oregon.gov/ODOT/Data/Pages/Traffic-Counting.aspx
ODOT	Traffic Crashes	https://www.oregon.gov/ODOT/Data/Pages/Crash.aspx https://www.oregon.gov/odot/Engineering/Docs_TrafficEng/CRF-Appendix.pdf
TREC	Transportation Data Portal	https://portal.its.pdx.edu/home
TriMet	Transit Ridership	https://trimet.org/about/performance.htm
OpenStreetMap	Map Data	https://www.openstreetmap.org/
Portland Streetcar	Crash and Operations Data	https://portlandstreetcar.org/

Notes: ODOT = Oregon Department of Transportation; RLIS = Regional Land Information System; TREC = Transportation Research and Education Center

Multiple topic-specific API boundaries are used for different aspects of the transportation analyses, as summarized below.

Direct Areas of Potential Impact

The direct areas of potential impact (API) define the boundaries for the evaluation of effects that are caused by a given action or design aspect of the Build or No-Build Alternatives. Figure 3.1-1 depicts the three direct API boundaries used for the report.

Traffic, Transit, and Freight Direct API – This API defines the area of evaluation for direct impacts to the freight rail traffic that is under the bridge on the east bank of the river, truck freight traffic crossing the bridge, TriMet bus Lines 12, 19, and 20 operations, TriMet MAX Blue and Red Lines operations, Portland Streetcar Loops A and B operations, and traffic queuing and turning movement at potentially affected intersections in in the project area.

Bicycle and Pedestrian Direct API – This API defines the area of evaluation for direct impacts to bicycling and walking routes, primarily bicycle and pedestrian access onto and across the Burnside Bridge. The walking environment includes sidewalks, crossings, and ramps on the Burnside Bridge and the streets providing direct connection to the bridge as well as the stairway, ramp, and ADA[1] accesses from the bridge to the street, transit, and trail networks below.

Safety Direct API – This API defines the area of evaluation of intersections directly where alternatives could change safety conditions for auto traffic, pedestrians, and bicycle riders.

Areas of Potential Indirect Impact

Because the Project would have little long-term effect on traffic capacity, travel times, or land use development patterns, long-term indirect effects are unlikely prior to the next CSZ seismic event. However, potential indirect impacts during construction both within the API and farther afield are possible. Construction logistics would potentially change traffic patterns, transit routes, and active transportation access points that could have wider dispersed effects. Figure 3.1-2 depicts the three Indirect API boundaries used for this report. Both the safety API and the bicycle and pedestrian API encompass street and intersection specific analysis.

[1] ADA refers to Americans with Disabilities Act, which is a civil rights law that prohibits discrimination based on disability. In this document, "ADA accessible" refers to sidewalks, ramps, and other facilities that are designed to allow use and access by people with disabilities, such as people in wheelchairs.

Figure 3.1-1. Direct API

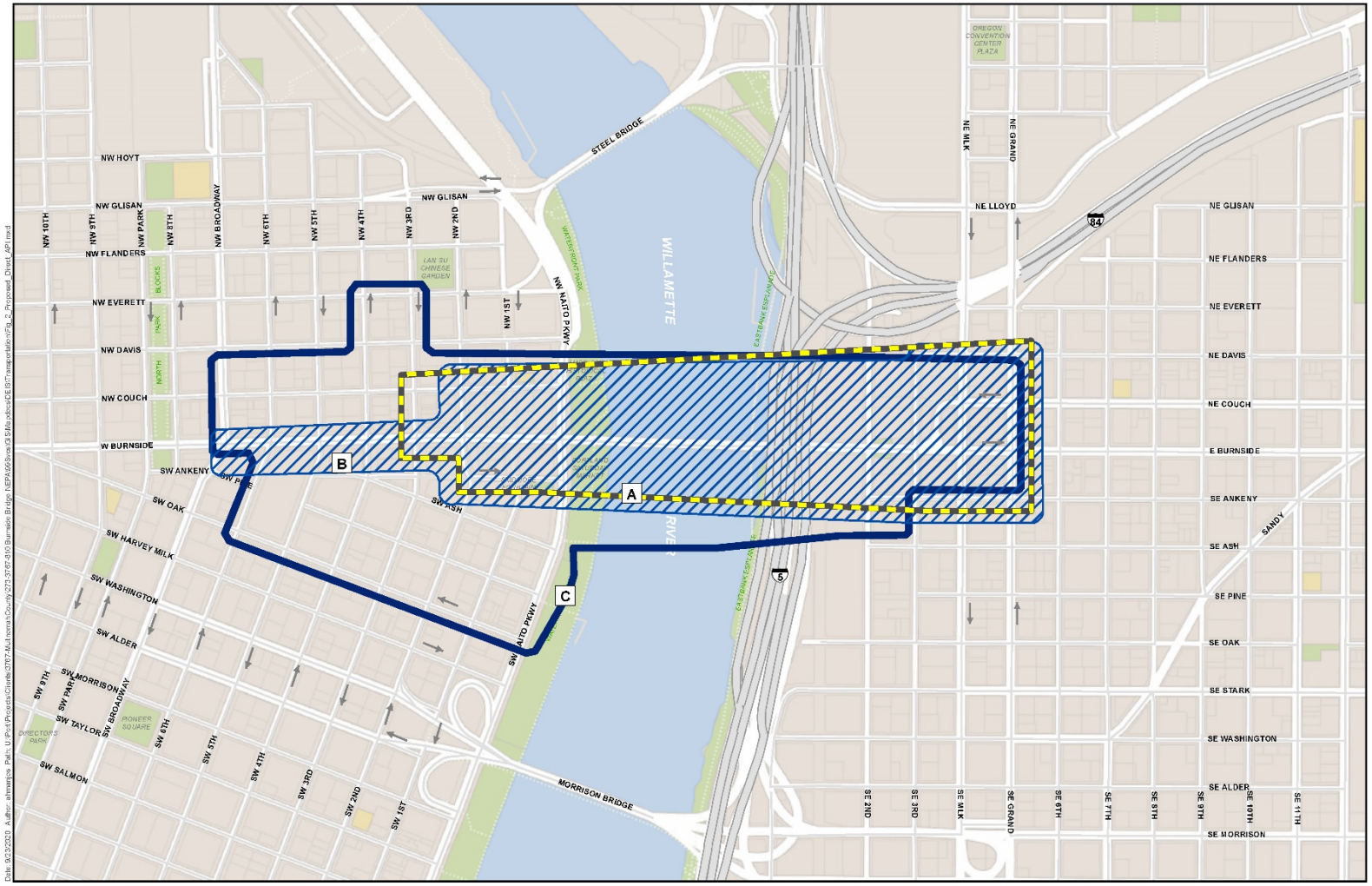


Figure 3.1-2. Indirect API

Traffic, Transit, and Freight Indirect API – This API covers an area broad enough to capture how travel times for these modes could be indirectly affected during project construction. This includes analysis of how construction-related impacts could affect other river crossings.

Bicycle and Pedestrian Indirect API – This API takes into account how bridge, street, bikeway, and multiuse path closures during construction could affect bicycle and pedestrian travel, including the potential for travelers to choose a different mode of travel and for taking alternate routes.

Safety Indirect API – This API defines the area of evaluation for indirect impacts to safety during construction. The safety analysis is focused on specific routes where those impacts are anticipated. Figure 3.1-2 highlights those routes.

Existing Conditions

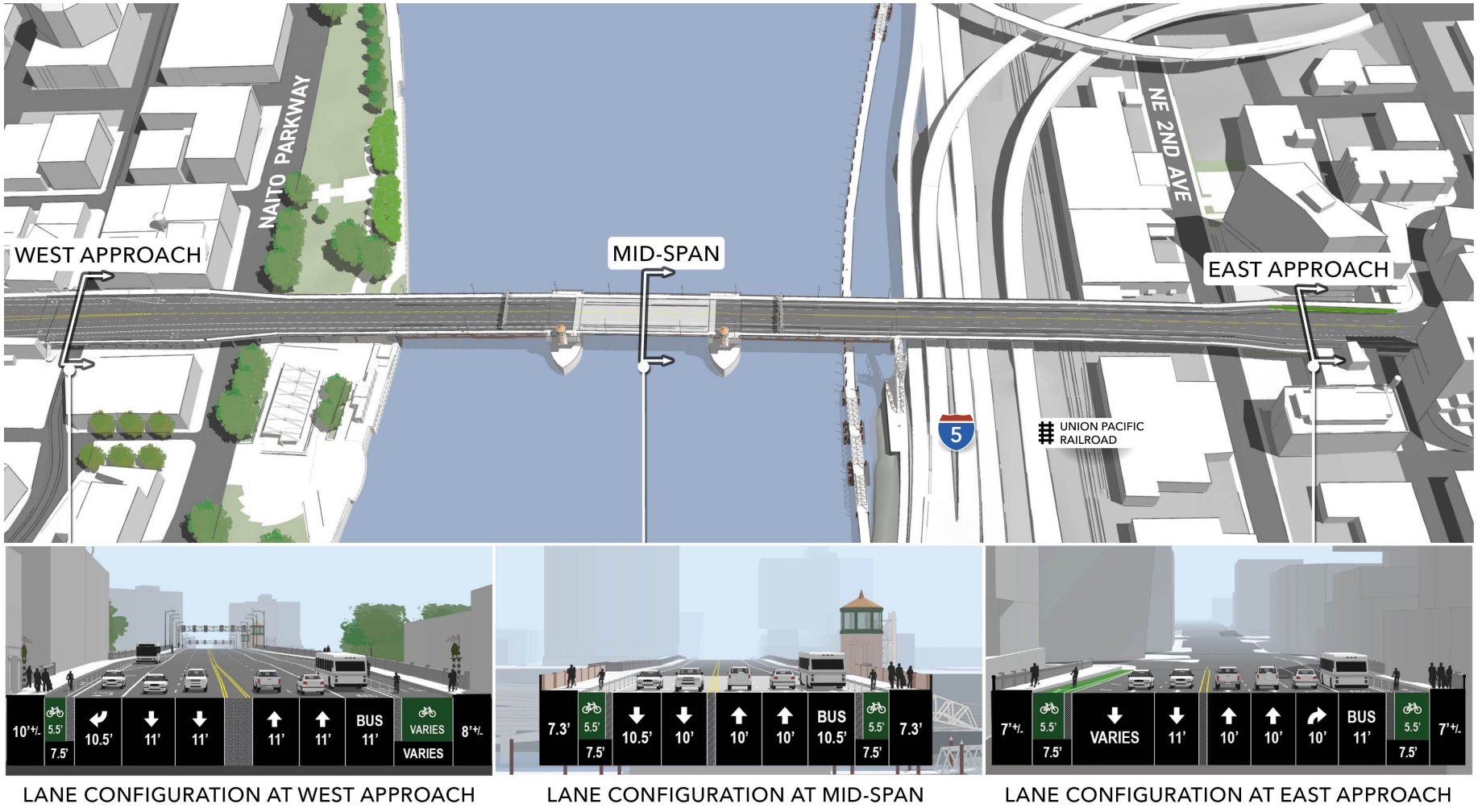
Figure 3.1-3 shows the cross sections of the existing Burnside Bridge at mid-span and near each end. Recent traffic counts indicate that approximately 35,000 vehicle trips cross the Burnside Bridge each day. All study intersections approaching the bridge operate within the City's Level of Service (LOS)[2] standards with LOS ratings of D or above.

The Burnside Bridge functions as an important east/west transit corridor in the Portland region, carrying three TriMet bus Lines (12, 19 and 20), connecting into the streetcar network at the bridge's east approach, and crossing over the MAX light rail network on the bridge's west approach. Transit makes up 25.4 percent of all trips to and from the Portland central business district. For the existing conditions inventory of transit, an analysis of transit service levels, routes, transit stops, rider activity, and major social service and cultural destinations was conducted. Figure 3.1-4 shows the transit network along and adjacent to the project area. At the time of this writing, an eastbound bus-only lane runs across the bridge deck. The bus-only lane allows transit vehicles to bypass queuing vehicles that span the eastbound lanes of the bridge due to congestion at the intersection of E Burnside and Martin Luther King, Jr. Boulevard.

The Burnside Bridge is also a critical connection in the city's pedestrian and bicycle network, identified in the *Portland 2035 Transportation System Plan* (City of Portland 2019) as a Major City Bikeway and a Major City Walkway. See Figure 3.1-5 and Figure 3.1-6 for maps of the existing pedestrian and bicycle networks, respectively. The Metro travel model calculates that bicycle trips make up 7 percent and pedestrians make up 6.3 percent of all trips to and from the Portland central business district. Currently, the cross section of the bridge includes buffered bicycle lanes with flexible delineators to separate bicyclists from adjacent traffic in both directions and sidewalks on both sides of the bridge. Based on adjusted bicycle and e-scooter counts (2019) the Burnside Bridge currently carries approximately 1,750 bicycle and e-scooter trips and approximately 1,400 pedestrian trips on a typical May weekday. Volumes vary by season and weather.

[2] Level of service (LOS) is a quantitative standard for transportation facilities (such as intersections or road segments) describing operational conditions. LOS categorizes traffic flow and assigns different levels of quality (A [best] to F [worst]) based on speed, density, congestion, and other factors.

Figure 3.1-3. Existing Conditions Cross Sections



LANE CONFIGURATION AT WEST APPROACH | LANE CONFIGURATION AT MID-SPAN | LANE CONFIGURATION AT EAST APPROACH

Note: Existing bridge ends include turning lanes, public parking, and bus storage areas (not all conditions shown above).

Figure 3.1-4. Existing Transit Network

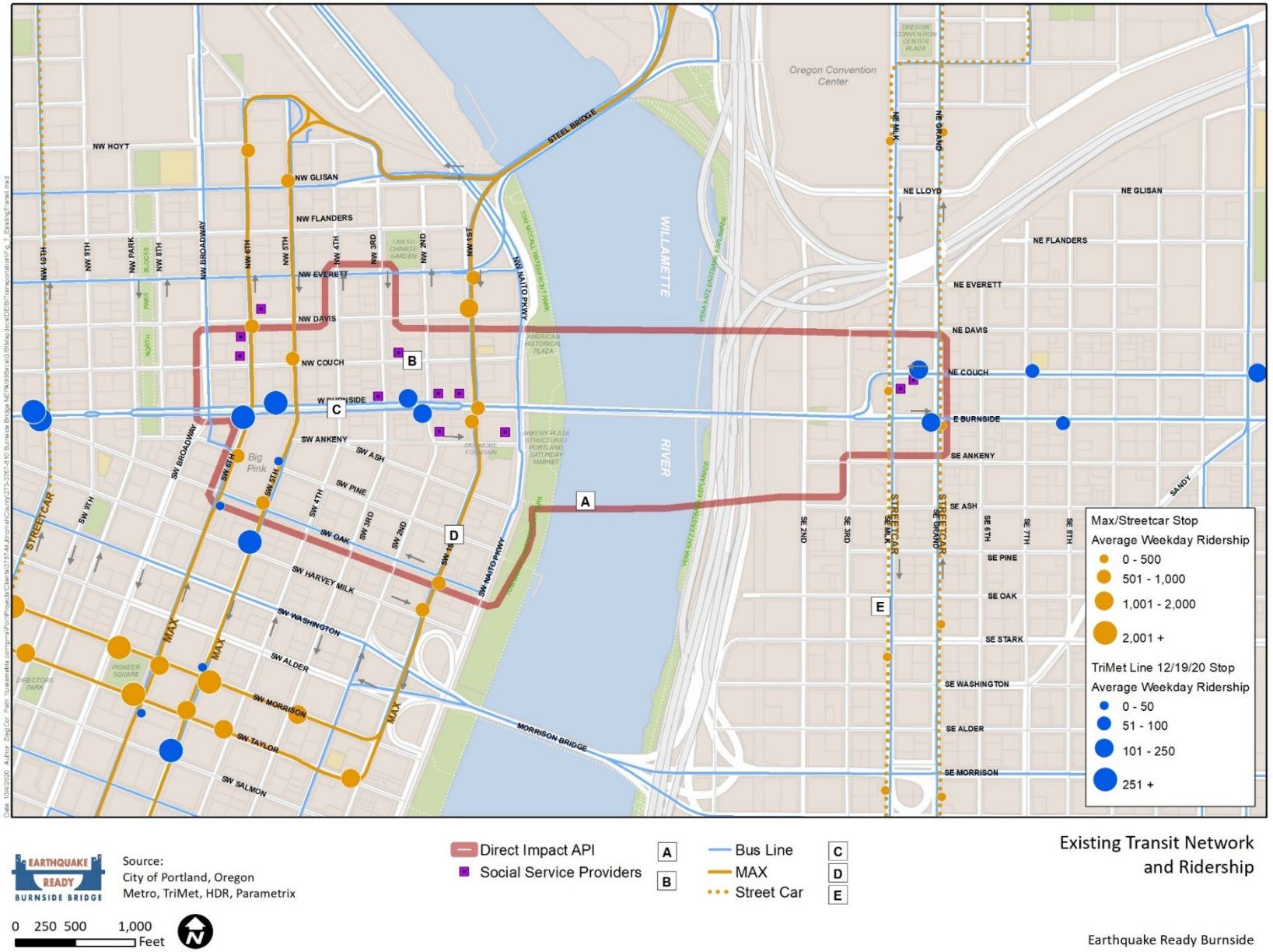


Figure 3.1-5. Pedestrian Existing Conditions

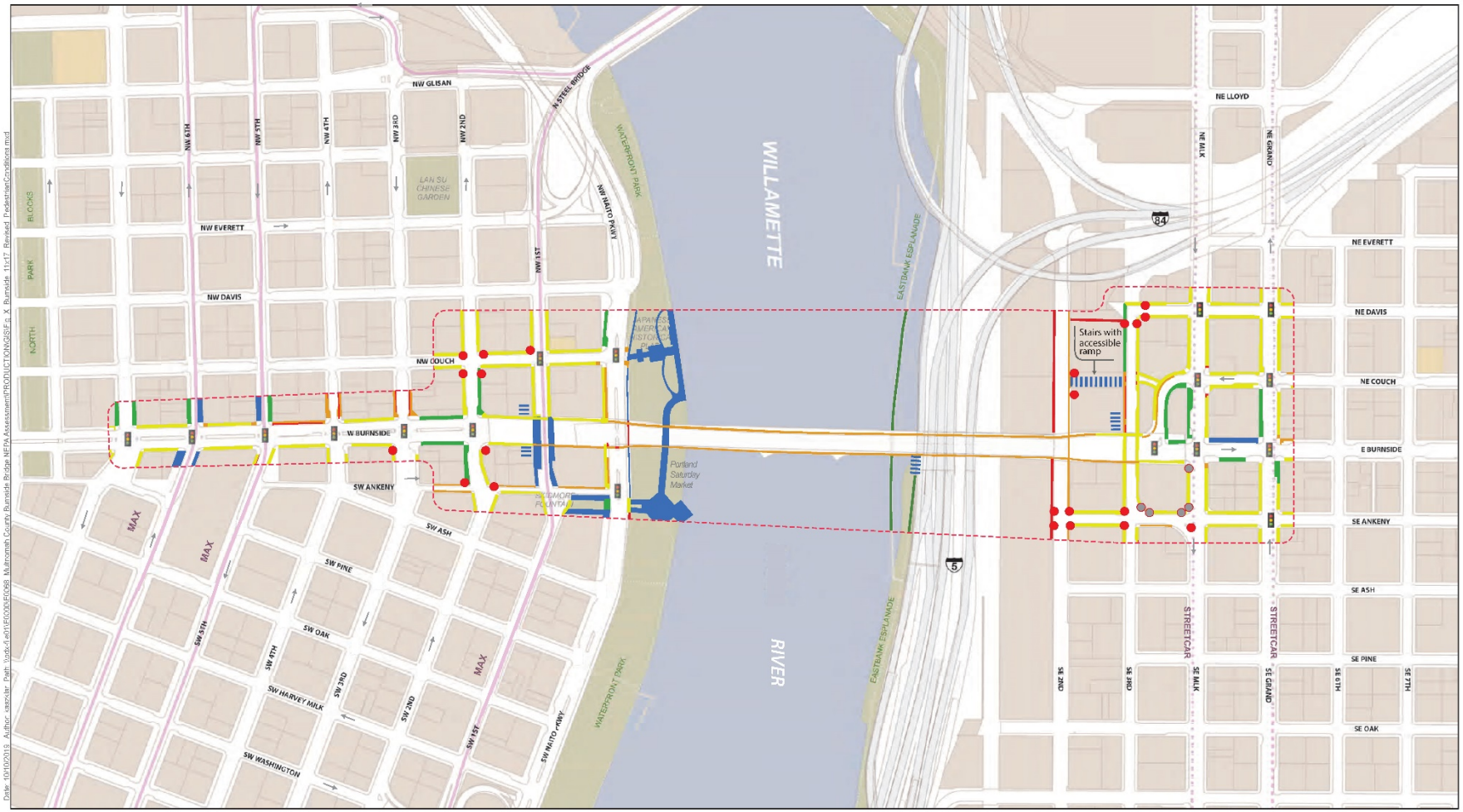
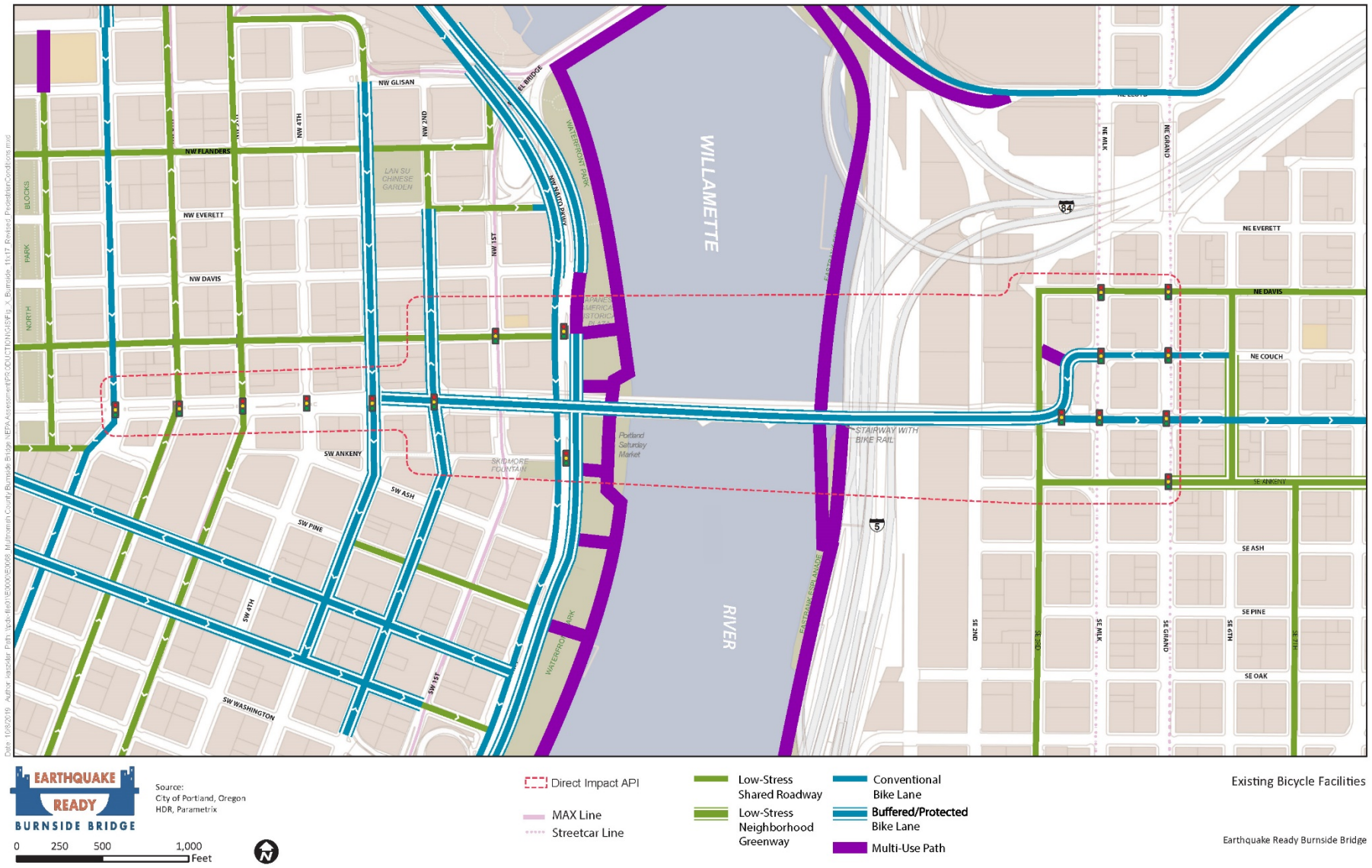


Figure 3.1-6. Existing Bicycle Facilities



Other relevant information on existing conditions is described in conjunction with the impacts in Section 3.1.2 below.

3.1.2 Impacts from Bridge Alternatives

The impacts described below apply to all of the alternatives except where differences are noted. The main long-term differences among alternatives relate to certain walking, bicycling, and safety impacts where design differences provide different levels of opportunity for improvements. Construction-phase impacts would be determined primarily by the construction traffic management options which are discussed in Section 3.1.3.

Traffic Volumes and Intersection Analysis

Traffic modelling of future conditions is based on year 2045 projections of changes in the transportation system, population, employment, and other factors. Year 2045 roadway capacities, traffic volumes, queuing, delay, intersection operations and freight operations are expected to be the same under the build alternatives as they are under the No-Build Alternative due to the functionally equivalent nature of traffic operations on the existing bridge and proposed bridge alternatives (see Table 3.1-2).

Table 3.1-2. No-Build and Build Average Daily Volumes Across the Burnside Bridge – 2045

	ADT Volume	ADT EB	ADT WB	AM Peak Volume	AM Peak EB	AM Peak WB	PM Peak Volume	PM Peak EB	PM Peak WB
Burnside Bridge	34,000	18,500	15,500	2,370	970	1,400	2,605	1,495	1,110
Percentage of Total ADT	Not Applicable	54.3%	45.7%	6.9%	Not Applicable	Not Applicable	7.7%	Not Applicable	Not Applicable

Note: ADT = average daily traffic; EB = eastbound; Ped = pedestrian; Vol = volume; WB = westbound

Key findings include:

- Average daily vehicle volumes in 2045 are projected to decrease by 1,000 vehicles a day as Portland and the Metro region invest in transit and active transportation and as density in the core increases.
- Traffic and freight operations are projected to moderately improve, with the majority of intersections within the project area operating at LOS A and B and all study intersections operating within City LOS standards except for NW Couch and NW 3rd Avenue which is predicted to operate at LOS F.
- The intersection of Burnside Street and Martin Luther King, Jr. Boulevard, previously operating at LOS F in the existing conditions, would improve to LOS C in the future year.
- While the Couch Extension Alternative would change the geometry of where the Couch and Burnside couplet come together on the bridge, that would not impact operations.

Safety

- All the build alternatives would improve motor vehicle, bicycle, and pedestrian safety compared to the existing conditions and No-Build Alternative; improved facilities for bicyclists and pedestrians include better separation from motor vehicles.
- Overall, the Short-span and Long-span Alternatives, because of physical barriers and additional bicyclist and pedestrian capacity, would result in the greatest predicted crash reduction factors of all the

alternatives. Both would reduce all crashes by a predicted 8 percent while reducing bicycle-specific crashes by 63 percent.

Transit

With the build alternatives, TriMet transit service is anticipated to stay the same within the API.[3] Key findings include:

- Transit operations and transit service would be identical between the build and No-Build Alternatives.
- Total ridership for Lines 12, 19, and 20 crossing the Burnside Bridge would double by 2045.
- Travel times for transit vehicles crossing the Burnside Bridge would be anticipated to stay within +/- 6 percent of current travel time.
- All the build alternatives would be designed and built to accommodate the weight and operating envelope of a future Portland Streetcar extension across the bridge. The exact configuration of a future streetcar lane would depend on future decisions. but it is assumed that a future streetcar would share a lane with buses or general traffic.

Active Transportation

A number of separately planned upgrades within the project area would substantially improve the bicycle and pedestrian environments, resulting in an active transportation network leading to the bridge that is more comfortable and better connected. Key findings include:

- The build alternatives would upgrade sidewalks, ramps, stairways, and crossings along the bridge and at its terminal points.
- Planned bicycle and pedestrian improvements on the bridge, for all build alternatives, would provide more separation between modes and would provide a more comfortable and safer experience for bicycle and pedestrian users of the bridge.
- The replacement alternatives would include enhanced bicycle and pedestrian facilities on the Burnside Bridge consisting of an 18-foot section featuring a sidewalk-level bicycle lane with a separate sidewalk on both sides of the bridge. The combined bicycle lane and sidewalk would be separated from motor vehicle traffic by a physical barrier. This would address an existing gap in the City's Pedestrian District standards (City of Portland 1998) that requires sidewalks to be at least 15 feet wide.
- With the No-Build and build alternatives, bicycle and pedestrian daily volumes across the Burnside Bridge are projected to increase by 70 and 95 percent, respectively, due to network-wide projects to improve active transportation access, comfort, and safety.
- The Couch Extension Alternative would require closure of the one-block bicycle/pedestrian plaza connection in the Couch Street alignment between NE 3rd Avenue and NE Couch Street. It would be replaced with a bicycle route along NE 3rd Avenue to NE Davis Street and/or SE Ankeny Street and onto Martin Luther King, Jr. Boulevard to access the Burnside Bridge; this would result in an additional 0.15 miles of out-of-direction travel for pedestrians and bicyclists.
- All the build alternatives would upgrade any noncompliant curb ramps along Burnside Street between W 2nd Avenue and Martin Luther King, Jr. Boulevard. The Couch Extension would also reconstruct curb ramps at the NE 3rd Avenue and NE Davis Street intersection. The City of Portland is inspecting and

[3] Current city plans do not include any signal timing changes or other transit priority upgrades around the Burnside bridgeheads. The Draft EIS analysis is based on these assumptions.

verifying ADA compliance of all existing curb ramps in the city to identify locations requiring upgrade during the design phase.

Table 3.1-3 summarizes the differences in bicycle and pedestrian volumes and the "bicycle level of traffic stress" (BLTS)[4] ratings for key segments of the active transportation network comparing existing (2019) conditions to the 2045 No-Build and build alternatives.

Table 3.1-3. Comparison of Active Transportation Volume and Bicyclist Level of Traffic Stress (BLTS)

Link	2019 Existing BLTS	2019 Existing Bike Vol	2019 Existing Ped Vol	2045 No-Build BLTS	2045 No-Build Bike Vol	2045 No-Build Ped Vol	2045 Build BLTS	2045 Build Bike Vol	2045 Build Ped Vol
Burnside Bridge	1	1,750	1,400	1	2,950	2,750	1	2,950	2,750
W Burnside Street	4	N/A	N/A	3	N/A	N/A	3	N/A	N/A
E Burnside Street	3	N/A	N/A	3	N/A	N/A	3	N/A	N/A
NE Couch Street	2	N/A	N/A	2	N/A	N/A	2	N/A	N/A
Better Naito/ Waterfront Trail	1	3,750	3,800	1	6,450	6,600	1	6,450	6,600
Vera Katz Eastbank Esplanade	1	1,500	1,550	1	2,650	2,700	1	2,650	2,700

Source: Toole Design. Note: BLTS = bicycle level of traffic stress; N/A = not applicable; Vol = volume; Ped = pedestrian

Active Transportation Access Options – The project team is considering multiple options for in-kind as well as improved pedestrian, bicycle, and ADA connections near both the east and west ends of the bridge. These would provide access to the roads, pathways, and other facilities located beneath and near the east and west ends of the bridge. Figures for a range of options are shown in Attachment G of this Draft EIS, and detailed descriptions of the options and impacts are in the *EQRB Active Transportation Access Options Memorandum* (Multnomah County 2021). Impacts are summarized below.

West End Connection – Near the west end of the bridge, there is an existing stairway on both the south and north sides of the bridge providing pedestrian access to SW 1st Avenue and the Skidmore Fountain MAX station. Several options are being considered for either replacing these stairs in-kind or providing improved pedestrian, bicyclist, and ADA access.

Option 1 would provide in-kind replacement stairs on the north and south sides. This option would have the longest routes for bicycle and ADA access, which would continue to be via the west end of the bridge using surface streets and sidewalks that circle the block to connect to 1st Avenue.

Option 2 would provide in-kind stairs on the north side (like Option 1) with a new south-side ramp and stairway at the current site of the Saturday Market Administration building.[5] Several layouts are being considered that have different switchback orientations and stair locations. The ramp would provide more direct access for eastbound bicyclists and pedestrians between the bridge and 1st Avenue.

Option 3 is the same as Option 2 but with the addition of a signalized mid-block crossing on the bridge which would provide a shorter-distance (200 to 300 feet less) ADA route for north-side pedestrians than with Options 1 or 2. This traffic signal is anticipated to have an approximately 90-second cycle length, which would provide sufficient green time between pedestrian phases, incur minimal delay to traffic, and would

[4] Bicycle level of traffic stress (BLTS) rates the traffic stress that a given road segment or crossing imposes on bicyclists. BLTS levels range from 1 (lowest stress) to 4 (highest stress)

[5] This building would be removed by bridge construction regardless of the bicycle, pedestrian and ADA access options selected.

have 95 percent queuing that fits within available space between signals to the west and east. Impacts that cannot be mitigated are that this crossing would have a cross slope of 4.2 percent, which is steeper than the desired 2 percent maximum for ADA circulation routes, and there is limited or no space to widen the bicycle and pedestrian facility on the bridge in this location in order to reduce/avoid conflicts between people waiting to cross north-south and bicyclists travelling east-west.

Option 4 would provide in-kind stairs on the north side with a new south-side ramp and stairs at the current site of the Mercy Corps parking lot. Layout variations include tradeoffs between the ramp grade, the ability to include stairs, and the location of the touchdown which would affect whether or not there would be temporary traffic impacts on Naito Parkway during construction. As with Option 2, this option would improve pedestrian and bicycle access between 1st Avenue and the bridge for eastbound travelers.

Option 5 is the same as Option 4 but adds f a mid-block crossing on the bridge, with the same impacts and benefits as described for the mid-block crossing in Option 3.

Vera Katz Eastbank Esplanade – On the east side of the river, several options are being considered for providing access between the Eastbank Esplanade and the bicycle and pedestrian facilities on both sides of the Burnside Bridge. (See the figures in Attachment G of this Draft EIS and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memo*). Currently, there are stairs only from the Esplanade to the south side of the bridge (eastbound sidewalk and bicycle lane). Options being considered to provide improved bicycle, pedestrian, and ADA access include:

1. Stairs and elevator on the north and south sides of the bridge
2. Stairs and elevator on the south side of the bridge only, with a signalized mid-block crossing connecting the north and south sidewalks and bicycle lanes
3. Ramps on the north and south sides of the bridge and stairs on south side
4. Ramp and stairs on the south side only, with a signalized mid-block crossing connecting the north and south sidewalks and bicycle lanes

Option 1 would enhance the connection by providing the most direct, shortest distance, ADA-accessible route from the Eastbank Esplanade to the Burnside Bridge that bicyclists could also use. There could be peak times in which travel time via elevators could be longer than traversing the ramp options. Furthermore, there could be periods in which elevator servicing and cleaning would require short-term service outages.

Option 2 would also enhance the connection by providing the most direct ADA-accessible route from the Eastbank Esplanade to the Burnside Bridge that bicyclists could also use without crossing under the bridge, although westbound trips would need to use a new traffic signal-protected crossing to access the stairs and elevator on the south side. As with Option 1, there could be peak times in which travel time via elevators could be longer than traversing the ramp options. Furthermore, there could be periods in which elevator servicing and cleaning would require short-term service outages. Additionally, the introduction of mid-block crossings creates conflict zones between bicycle users travelling along the bridge with the mid-block crossing users travelling perpendicular to the bicycle flow. Finally, although there is a signal, some concern has been raised about pedestrian safety within mid-block crossings. In order to minimize delays to westbound traffic, the traffic signal would be coordinated with the signal at E Martin Luther King, Jr. Boulevard. The traffic signal is anticipated to have an approximately 70-second cycle length, which would provide sufficient green time between pedestrian phases, incur minimal delay to traffic, and would have 95 percent queuing that fits within available space between signals to the west and east.

Option 3 would also enhance the connection by providing an ADA-accessible ramp from the Eastbank Esplanade to the Burnside Bridge that bicyclists could also use. Because of the approximately 50-foot change in elevation between the Burnside Bridge deck and the Eastbank Esplanade, a ramp structure would

need to be over 1,000 feet long (assuming a continual 5 percent grade). This extended length could create conflicts between experienced bicyclists, recreational users, and pedestrians.

Option 4 would provide similar connection enhancements by providing an ADA-accessible route from the Eastbank Esplanade to the Burnside Bridge that bicyclists could also use. Because of the approximately 50-foot change in elevation between the Burnside Bridge deck and the Eastbank Esplanade, a ramp structure would need to be over 1,000 feet long (assuming a continual 5 percent grade). This extended length could create conflicts between experienced bicyclists, recreational users, and pedestrians. This option would have a mid-block crossing on the bridge, the same as described for Option 2.

Bicycling Network – The future bicycle network with the Short-span and Long-span Alternatives is shown on Figure 3.1-7. The network would be essentially the same as for the other alternatives with the following exceptions: with the No-Build and the Retrofit Alternatives, bicycles would use a narrower, buffered bicycle lane rather than a sidewalk-level protected bicycle lane on the bridge. With the Couch Extension Alternative, westbound bicycle access from south of the east approach would require first travelling two blocks north of the bridge, as previously described.

Rail Network

As with the existing bridge, all the alternatives would cross over the Union Pacific Railroad (UPRR) heavy rail line on the east bank of the Willamette River. None of the alternatives would have long-term effects on the UPRR operations. All the build alternatives could require temporary, short-term operational restrictions during construction.

Access

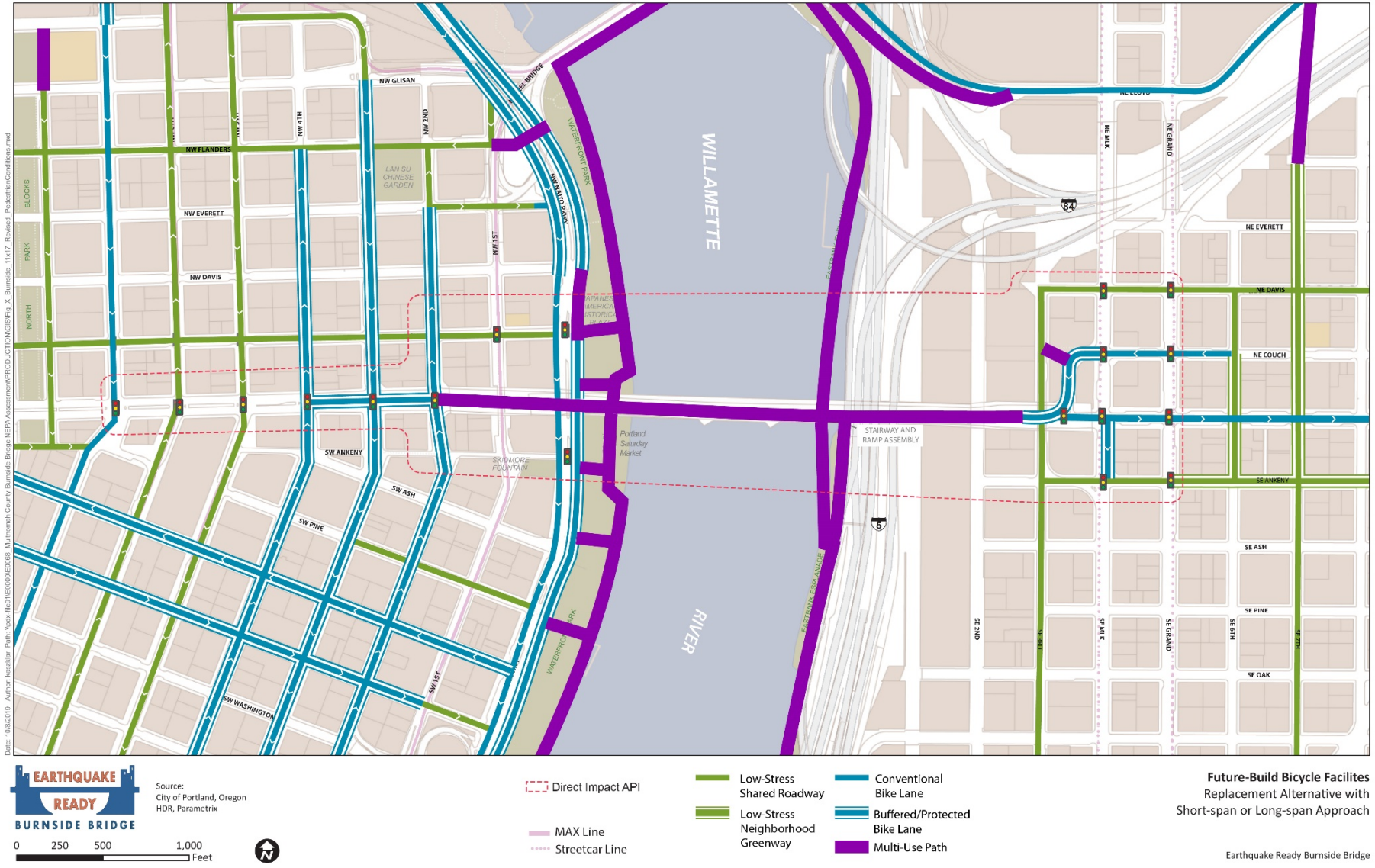
Five building access points and up to two on-street parking locations would be permanently impacted by the build alternatives. Maps and details on temporary and permanent access impacts can be found in Section 3.3, Acquisitions and Displacements.

Under the west approach, all of the build alternatives would permanently impact four pedestrian access points and one parking lot access. On the east bank, the Couch Extension Alternative would cause a number of impacts to pedestrian access, right-of-way, and parking. Pedestrian access to doorways in Block 75 and the Slate apartment building to the north of Couch Street would need to be realigned with the new street elevation of NE 3rd Avenue. The Retrofit, the Short-span, and the Long-span Alternatives would avoid these impacts.

Indirect Impacts

Because the build alternatives would provide the same future traffic and freight capacity as the No-Build Alternative, no substantial, long-term indirect impacts are anticipated prior to the next CSZ earthquake.

Figure 3.1-7. Future Build Bicycle Network – Replacement Alternative with Short-Span and Long-Span



Post Earthquake Impacts

For all of the build alternatives, the bridge would be designed so that it could be used immediately after a CSZ earthquake for emergency response and recovery operations, based on a standard of seismic resiliency for the future Burnside Bridge defined in the *EQRB Seismic Design Criteria Report*. It is also being designed to have limited performance, meaning the ability to have emergency service vehicles use the bridge after some repairs, following a larger 1000-year return period earthquake. These criteria exceed the AASHTO standard "no collapse" criteria for both events.

No-Build Alternative (Post CSZ Earthquake) – Without the proposed project, the Burnside Bridge (No-Build Alternative) is expected to fail and be unusable after a CSZ earthquake. Major portions of the bridge structure and decking would fail, falling as debris and blocking north-south travel along Naito Parkway, SW 1st Avenue, and the TriMet Red and Blue MAX lines under the west approach. On the east bank of the river, the collapsed bridge would sever and block I-5; I-84; 1st, 2nd, and 3rd Avenues; and the UPRR rail line. Debris, abandoned cars, and collapsed or damaged bridges, overpasses, and structures would likely block navigation of streets and major highways for 6 to 12 months, requiring that people turn to walking and bicycling as their main forms of transportation in the immediate and mid-term aftermath of a major CSZ event. With other bridges out of service, Portland would be divided by the Willamette River, leaving tens of thousands stranded. Key impacts would include:

- Emergency responders would be unable to cross the river to aid victims, fight fires, address other emergencies, or facilitate evacuation.
- Businesses that rely on freight would not be able to receive deliveries. There would be delays to freight moving in and out of central Portland geared toward emergency supplies and equipment to aid in the post-earthquake recovery.
- There would be an almost complete shutdown of TriMet transit service within the central city.[6] The structural failure of the Burnside Bridge would result in significant blockage of the Blue and Red MAX lines that are routed under the bridge along NW 1st Avenue.
- The Portland Streetcar would also likely face operational challenges after an earthquake, as the Broadway Bridge would experience severe structural damage that would not allow the streetcar to pass. An earthquake would also likely impact rail tracks for both the MAX and streetcar as ground cracking could lead to misalignment of rail tracks.
- Large amounts of debris from the failed structural integrities of the Burnside Bridge, Steel Bridge, and Hawthorne Bridge would fall onto the UPRR tracks and likely block operations for many months.
- Bridge failures could significantly disrupt bicycle and pedestrian networks and movement on either side of the river. However, these modes could be the quickest to respond through access to temporary bridges or other river crossing services.

The indirect effects of a No-Build Alternative after a major CSZ event would be a slower and less efficient recovery of the Portland region because the lack of a usable river crossing would hamper the movement of emergency supplies and people, the removal of debris, and the transport of construction materials. Ultimately, the region would suffer a slower rebuilding phase while suffering long-term job losses and the possible loss of population.

Build Alternatives (Post CSZ Earthquake) – The transportation conditions after a major CSZ event would be significantly better with the build alternatives compared to the No-Build Alternative. While the build

[6] Description of Alternatives: Earthquake Ready Burnside Bridge Project, 7.

alternatives would be very similar to each other, the Long-span Alternative, with fewer piers in the geologic hazard zones, could have greater resilience as described in the Summary.

Traffic and Freight – Traffic would come to a standstill in much of the Portland region in the immediate aftermath of a CSZ event. Much of the region's major transportation facilities would be severely damaged and unpassable, and streets and highways that experience little physical damage would likely have debris and abandoned cars blocking passage for vehicular traffic. In this scenario, a functional Burnside Bridge would serve an important regional connection, supporting rescue efforts, emergency services, and the movement of people out of downtown in the immediate aftermath.

Priority use of the bridge would be for evacuation and other emergency services and recovery efforts. It is anticipated that the bridge traffic after initial debris clearing would first consist of emergency responders engaging in rescue and debris clearing operations, followed by vehicles hauling emergency supplies such as water, food, fuel, and materials/equipment and personnel needed to make emergency repairs on critical utilities and facilities. Private cars would likely have difficulty reaching the bridge due to ground transportation damage such as fallen debris, damaged utilities, roadway, and bridge/overpass damage.

As the time frame extends out several weeks to a couple of months following a CSZ earthquake, other bridge connections would likely remain closed as inspections and repairs take many months – even years. Having an operational Burnside Bridge would aid in the speed of cleanup and recovery and would address logistical problems in a region divided by a major river. The build alternatives would speed the movement of goods and recovery throughout the wider Portland region.

As the time horizon reaches 6 to 12 months after a CSZ event, debris would be cleaned off of streets and regional connections would be re-opened. Broader movement of freight would again become possible, but much of the freight movement would likely continue to be focused on bringing in rebuilding supplies. As recovery proceeds and other infrastructure is rebuilt, day-to-day life would slowly return to normal. Regional travel needs would return, albeit at lower levels resulting from large portions of the population being displaced and large portions of the region's transportation network continuing to be unusable. The Burnside Bridge would be an important connection allowing for the return of economic activity, speeding recovery, and allowing travel across the region to return more quickly.

Transit – In a CSZ post-earthquake scenario, there would be significant regional impacts to TriMet transit service. Overall, 19 TriMet bus routes, 5 MAX routes, and 2 Portland Streetcar lines cross the Willamette River using one of the six bridges that connect to surface streets. Only 3 of these routes, bus Lines 12, 19, and 20, cross on the Burnside Bridge. In the immediate aftermath of a CSZ earthquake, the majority of regional transit service, including MAX, Portland Streetcar, and bus lines, would likely stop functioning and transit vehicles would likely be used to shuttle survivors away from central Portland and other hazardous areas.

In this scenario, the Burnside Bridge becomes a lifeline, not only for the flow of emergency services and the movement of supplies for recovery efforts, but it would also function for weeks and perhaps months as the only reliable east-west connection in central Portland. In the immediate aftermath, the Burnside Bridge could be a critical link in providing a route for TriMet buses to act as a way to move large numbers of people out of downtown depending on the level of destruction and debris.

As recovery proceeds, the Burnside Bridge would act as the lifeline link that allows TriMet to redeploy and reroute regional service. The Portland Streetcar would also likely face operational challenges after an earthquake, as the Broadway Bridge would experience severe structural damage that would not allow the streetcar to operate. An earthquake would also likely impact rail tracks for both the MAX and streetcar as ground cracking could lead to misalignment of rail tracks. With MAX service down and other bridges not operational, TriMet would likely run temporary bus routes between major MAX stops, to allow MAX service to restart after partial reconstruction.

With the Burnside Bridge likely to be the only functioning bridge downtown, many of the TriMet bus routes would have to be rerouted across the bridge. Portland Streetcar, which crosses the Willamette River over the Broadway and Tilikum Bridges, would also likely not operate in the immediate aftermath and only slowly resume limited operations once the Tilikum Bridge was again accessible and operational. With both the Steel and Tilikum Bridges nonfunctioning, buses would need to cross the Burnside Bridge if TriMet plans to have functioning regional MAX service on either side of the Willamette River.

Freight Rail – A seismically resilient Burnside Bridge would not be expected to block the UPRR mainline located under the east approach. However, rail operations would likely be significantly impacted for months by blockages elsewhere from fallen debris resulting from the failure of buildings and other bridges crossing over UPRR tracks.

Active Transportation – With the build alternatives, the Burnside Bridge would likely be the only usable downtown bridge for bicyclists and pedestrians after a major CSZ event. For those who are able, walking or bicycling could be the most feasible modes for self-evacuation given their flexibility. They may also be important modes for many citizens during the first few weeks after the earthquake before debris is cleared enough to allow motor vehicle travel. Once clear, roads would be prioritized for emergency responders.

Indirect – Post-earthquake recovery efforts throughout the region would be faster and more efficient with the build alternatives compared to the No-Build Alternative. This would help the region reduce the risk of long-term loss of jobs and population that can happen when major, critical transportation infrastructure is destroyed by a natural disaster.

3.1.3 Impacts from Construction Traffic Management Options

The following summarizes impacts associated with four traffic management options: full closure (no temporary bridge); Temporary Bridge All Modes; Temporary Bridge Transit, Bicycles, and Pedestrians Only; and Temporary Bridge Bicycles and Pedestrians.

Full Closure (No Temporary Bridge)

Traffic/Freight

- The approximately 35,000 trips crossing the Willamette River using the Burnside Bridge would need to shift to other routes and potentially other modes. This includes 1,575 westbound vehicles in the AM peak hour (morning rush hour) and 1,700 eastbound vehicles in the PM peak hour (evening rush hour). About two-thirds of the displaced peak-hour traffic are anticipated to shift to the Morrison and Fremont Bridges, with smaller numbers detouring to other nearby Willamette River bridges, as shown in Table 3.1-4 and Table 3.1-5. These tables also show the changes to demand-to-capacity (D/C)[7] ratios across these bridges.

Table 3.1-4. Traffic Volumes and D/C Ratios with Full Closure – Westbound AM Peak Hour

Bridge	Volume Existing	D/C ratio Existing	Volume w/Full Closure	D/C ratio w/ Full Closure	Volume Difference	D/C ratio Difference
Fremont	6,140	0.88	6,520	0.93	+380	+0.05
Broadway	1,925	**1.07** [a]	2,110	**1.17** [a]	+185	+0.10
Steel	990	**1.10** [a]	1,085	**1.21** [a]	+95	+0.11

[7] The demand-to-capacity ratio (D/C) measures the level of congestion on a roadway by dividing the demand volume that is forecast to use the system from the travel demand model by the capacity of the roadway. It is a measure of traffic congestion.

Bridge	Volume Existing	D/C ratio Existing	Volume w/Full Closure	D/C ratio w/ Full Closure	Volume Difference	D/C ratio Difference
Burnside	1,575	0.79	0	Not Applicable	-1,575	Not Applicable
Morrison	3,195	0.89	3,820	**1.06** [a]	+625	+0.17
Hawthorne	1,850	**1.03** [a]	1,955	**1.09** [a]	+105	+0.06
Marquam	5,680	0.81	5,800	0.82	+120	+0.01
Ross Island	3,260	**1.02** [a]	3,325	**1.04** [a]	+65	+0.02

[a] Figures reported in **bold** are D/C ratios above 1.0.

Table 3.1-5. Traffic Volumes and D/C Ratios with Full Closure – Eastbound PM Peak Hour

Bridge	Volume Existing	D/C ratio Existing	Volume w/ Full Closure	D/C ratio w/ Full Closure	Volume Difference	D/C ratio Difference
Fremont	5,760	0.82	6,135	0.88	+375	+0.06
Broadway	1,710	0.95	1,885	**1.05** [a]	+175	+0.10
Steel	970	**1.08** [a]	1,080	**1.20** [a]	+110	+0.12
Burnside	1,700	0.85	0	0.00	-1,700	Not Applicable
Morrison	2,315	0.64	3,115	0.86	+800	+0.22
Hawthorne	2,090	**1.16** [a]	2,155	**1.20** [a]	+65	+0.04
Marquam	6,195	0.88	6,320	0.90	+125	+0.02
Ross Island	3,630	**1.13** [a]	3,680	**1.15** [a]	+50	+0.02

[a] Figures reported in **bold** are D/C ratios above 1.0.

- The largest increases in D/C ratios during peak hours would occur on the Morrison and Steel Bridges.
- Modelling estimates showed that travel time between E 20th Avenue and the intersection of W Burnside and Broadway Avenue would increase about 9 minutes (over existing) for westbound AM peak hour trips using the Morrison Bridge, while westbound routes traveling across the Broadway and Steel Bridges would experience an increase of 3 to 5.5 minutes. During the PM peak hour, between these same two points, eastbound routes using the Morrison Bridge would experience the largest impact to travel times with an increase of 6.5 to 10.5 minutes, while eastbound routes traveling across the Broadway and Steel Bridges would experience an increase of 5.5 to 6 minutes (see Table 3.1-6 and Table 3.1-7).

Table 3.1-6. Travel Times with No Temporary Bridge – Westbound AM Peak Hour

Route	Route Title	Travel Time Existing (minutes)	Travel Time No Temp Bridge (minutes)	Travel Time Difference (minutes)
Multnomah/21st to Burnside/Broadway	Broadway Bridge	11.0	15.5	+4.5
Multnomah/21st to Burnside/Broadway	Steel Bridge	11.0	14.0	+3.0
Multnomah/21st to Burnside/Broadway	Burnside Bridge	9.0	(Burnside Bridge closed)	Not Applicable
Sandy/22nd to Burnside/Broadway	Steel Bridge	12.0	15.0	+3.0

Route	Route Title	Travel Time Existing (minutes)	Travel Time No Temp Bridge (minutes)	Travel Time Difference (minutes)
Sandy/22nd to Burnside/Broadway	Burnside Bridge	8.5	(Burnside Bridge closed)	Not Applicable
Sandy/22nd to Burnside/Broadway	Morrison Bridge	11.5	20.5	+9.0
Burnside/20th to Burnside/Broadway	Broadway Bridge	15.0	20.5	+5.5
Burnside/20th to Burnside/Broadway	Steel Bridge	13.0	16.0	+3.0
Burnside/20th to Burnside/Broadway	Burnside Bridge	9.0	(Burnside Bridge closed)	Not Applicable
Burnside/20th to Burnside/Broadway	Morrison Bridge	13.0	22.0	+9.0
Stark/20th to Burnside/Broadway	Burnside Bridge	10.0	(Burnside Bridge closed)	Not Applicable
Stark/20th to Burnside/Broadway	Morrison Bridge	12.0	21.0	+9.0

Table 3.1-7. Travel Times with No Temporary Bridge – Eastbound PM Peak Hour

Route	Route Title	Travel Time Existing (minutes)	Travel Time No Temp Bridge (minutes)	Travel Time Difference (minutes)
Burnside/Broadway to Multnomah/21st	Broadway Bridge	19.0	25.0	+6.0
Burnside/Broadway to Multnomah/21st	Steel Bridge	16.5	22.0	+5.5
Burnside/Broadway to Multnomah/21st	Burnside Bridge	16.5	(Burnside Bridge closed)	Not Applicable
Burnside/Broadway to Multnomah/21st	Morrison Bridge	21.5	32.0	+10.5
Burnside/Broadway to Sandy/22nd	Steel Bridge	19.0	24.5	+5.5
Burnside/Broadway to Sandy/22nd	Burnside Bridge	16.0	(Burnside Bridge closed)	Not Applicable
Burnside/Broadway to Sandy/22nd	Morrison Bridge	19.0	25.5	+6.5
Burnside/Broadway to Burnside/20th	Steel Bridge	18.0	23.5	+5.5
Burnside/Broadway to Burnside/20th	Burnside Bridge	13.0	(Burnside Bridge closed)	Not Applicable
Burnside/Broadway to Burnside/20th	Morrison Bridge	16.5	23.5	+7.0
Burnside/Broadway to Stark/20th	Burnside Bridge	16.0	(Burnside Bridge closed)	Not Applicable
Burnside/Broadway to Stark/20th	Morrison Bridge	14.0	22.0	+8.0

- Analysis of construction-phase traffic impacts also considers cumulative impacts that could result from the simultaneous construction of the EQRB Project and ODOT's proposed I-5 Rose Quarter project. The potential worst case combination of impacts would be if the I-5 Rose Quarter project construction requires temporary I-5 closures at the same time that the Burnside Street crossing is closed for construction. When the I-5 Rose Quarter construction project implements temporary I-5 closures, all of the nearby bridge crossings would be affected, with the highest travel time impacts on the Morrison and Steel Bridges. Peak hour travel times from around SE 20th Avenue on the east side to the W Burnside/Broadway intersection on the west side would increase by as much as 9.5 minutes if using the Morrison Bridge, as much as 7 minutes if using the Steel Bridge, and as much as 4.5 minutes if using the Broadway Bridge. These are in addition to the travel time impacts that would result from the EQRB No Temporary Bridge Option.

Transit

- Transit riders, especially on bus Lines 12, 19, and 20, would experience substantial out-of-direction travel due to a full closure of the Burnside Bridge. Out-of-direction travel would more than double travel times in the eastbound direction while more than tripling travel times in the westbound direction across the Willamette River between bridge approaches.
- Bus Lines 12, 19, and 20 would be rerouted over the Steel Bridge, and several existing bus stops would be temporarily closed. These lines are predicted to lose 5 percent of their ridership during the construction phase. The majority of these transit riders would likely switch to other transit routes that are more convenient during the construction period. Total transit ridership for MAX lines and other lines passing through the project area would be expected to hold steady.
- The Portland Streetcar would likely face additional delays along Martin Luther King, Jr. Boulevard and Grand Avenue as additional congestion on those streets slows traffic flow by between 10 and 20 percent.
- Portland Streetcar speeds over the Broadway Bridge would slow by 15 percent during the peak period, although in one segment – the AM eastbound segment for the A loop from Lloyd/Martin Luther King, Jr. Boulevard to Burnside – operating speeds would be nearly 40 percent faster.
- The build alternatives would all impact MAX Red and Blue Line operations where they travel under the Burnside Bridge along W 1st Avenue. The Retrofit Alternative would require four separate, 2-week closures for a total of 8 weeks, while the replacement alternatives would require seven separate, 2-week closures for a total of 14 weeks. TriMet would operate a temporary bus route to be able to connect the MAX lines across the Willamette River.
- When combining the impacts of a full Burnside Bridge closure with the temporary I-5 closures associated with the proposed I-5 Rose Quarter construction project, the combined impacts of added congestion would include:
    - A negligible (less than 0.5 percent) difference in ridership for bus Lines 12, 19, and 20 compared to the full closure of the Burnside Bridge alone, and a minor (around 0.4 percent) increase in system-wide ridership.
    - Slower streetcar travel times, especially the A and B loops. As Table 3.1-8 and Table 3.1-9 show, Portland Streetcar speeds over the Broadway Bridge would slow by 25 percent.

Table 3.1-8. Full Closure + I-5 Rose Quarter Closure Portland Streetcar Segment Level Operating Speeds and Travel Times – Eastbound A Loop

Travel Path	Link Length (feet)	AM Peak Speed (mph)	AM Peak Speed Difference[1] (mph)	AM Peak Travel Time (minutes)	AM Peak Travel Time Difference[1] (minutes)	PM Peak Speed (mph)	PM Peak Speed Difference[1] (mph)	PM Peak Travel Time (minutes)	PM Peak Travel Time Difference[1] (minutes)
Broadway Bridge	2,100	7.5	-2.5	3.2	+0.8	4.0	-1.0	6.0	+1.2
Larrabee to Benton	270	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
Benton to Weidler	255	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
Broadway/Weidler to Vancouver	460	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
Vancouver to Williams	260	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
Williams to Victoria	270	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
Victoria to 2nd	515	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
2nd to MLK	515	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
MLK to Grand	260	6.5	-1.5	4.9	+0.9	3.2	-0.8	10.0	+2.0
Length Subtotal	2,805	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Lloyd/MLK to Everett	530	8.5	+2.0	1.8	-0.5	4.5	-2.3	3.3	+1.1
Everett to Davis	270	8.5	+2.0	1.8	-0.5	4.5	-2.3	3.3	+1.1
Davis to Couch	260	8.5	+2.0	1.8	-0.5	4.5	-2.3	3.3	+1.1
Couch to Burnside	260	8.5	+2.0	1.8	-0.5	4.5	-2.3	3.3	+1.1
Length Subtotal	1,320	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

[1] Difference from existing speeds and travel times.

Notes: MLK = Martin Luther King, Jr. Boulevard; mph = miles per hour

Table 3.1-9. Full Closure + I-5 Rose Quarter Closure Portland Streetcar Segment Level Operating Speeds and Travel Times – Westbound B Loop

Travel Path	Link Length (feet)	AM Peak Speed (mph)	AM Peak Speed Difference[1] (mph)	AM Peak Travel Time (minutes)	AM Peak Travel Time Difference[1] (minutes)	PM Peak Speed (mph)	PM Peak Speed Difference[1] (mph)	PM Peak Travel Time (minutes)	PM Peak Travel Time Difference[1] (minutes)
Burnside/Grand to Couch	260	6.0	-12.0	2.5	+1.7	8.0	-2.0	1.9	+0.4
Couch to Everett	530	6.0	-12.0	2.5	+1.7	8.0	-2.0	1.9	+0.4
Everett to Lloyd	530	6.0	-12.0	2.5	+1.7	8.0	-2.0	1.9	+0.4
Length Subtotal	1,320	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Grand to MLK	260	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
MLK to 2nd	515	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
2nd to Victoria	515	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Victoria to Williams	270	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Williams to Vancouver	260	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Vancouver to Flint	230	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Flint to Weidler	190	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Weidler to Benton	260	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Benton to Larrabee	270	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Larrabee to on-ramp	250	3.5	-2.0	9.8	+3.6	4.0	-1.0	8.6	+1.7
Length Subtotal	3,020	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Broadway Bridge	2,100	5.0	-3.0	4.8	+1.8	6.5	-3.5	3.7	+1.3

[1] Difference from existing speeds and travel times.

Notes: MLK = Martin Luther King, Jr. Boulevard; mph = miles per hour

Active Transportation

- Bridge construction-related closures (18 to 30 months, depending on the alternative) of the Vera Katz Eastbank Esplanade would impact bicycle and pedestrian users of that trail throughout the construction period. This would force users to detour around construction, adding out-of-direction travel, or to forgo trips along the Willamette River all together. Figure 3.1-8 shows possible routes that could be used to detour bicyclists around the closure, and Figure 3.1-9 shows two possible pedestrian detour routes considering the shortest paths on the east and west sides of the river.
- For the temporary closure of the Burnside crossing that would last 4 to 5 years, potential detour routes from south of the bridge would likely divert travelers over the Morrison Bridge, adding about 1 mile and 8 minutes travel time for bicyclists and about 18 minutes for pedestrians. A possible alternative would be to route travelers over the Hawthorne Bridge that is located south of the Morrison Bridge.
- Potential detour routes from north of the bridge would likely divert travelers over the Steel Bridge, adding about 0.8 miles and 7 minutes travel time for bicyclists and about 0.6 miles and 14 minutes for pedestrians. Figure 3.1-10 and Figure 3.1-11 show potential routes that could be used to detour bicyclists and pedestrians, respectively, from the approaches to the Steel and Morrison Bridges during periods where the Burnside Bridge would be closed. They also show the associated impacts on travel distance and times.
- Construction would require staging under the west approach, which would temporarily close that section of the waterfront path. The Better Naito Forever project will formalize pedestrian and bicycle facilities along Naito Parkway and provide an alternative route around the closure of the waterfront path. This route is minimally out-of-direction travel and is not expected to have major impacts on usage and volumes.
- The Metro Regional Travel Demand Model estimates that not providing a temporary bridge could result in an approximate 2 percent reduction in bicyclists crossing the Willamette River and 19 percent fewer pedestrians daily compared to providing a temporary bridge.[8]

The I-5 Rose Quarter project construction, which is expected to overlap with the construction of the EQRB Project – could temporarily close lanes on I-5 but would not close any of the active transportation connections to and across the Willamette River. Given that other modes would be more affected by that project's construction, it is likely that some trips would shift to bicycling and walking. There are not expected to be any changes to detour routes, bicycle level of traffic stress, or other metrics as a result of this scenario.

8 The analysis methods for forecasting the effect of a full bridge closure on bicyclists make use of Metro's enhanced bicycle routing tool for measuring route attractiveness in its regional travel demand model. Also note that the Traffic Analysis Zones (TAZs) are relatively small and the forecast impacts generally occur to trips that (a) are less than 5 miles in total length, and (b) have trip ends near to one or both of the Burnside Bridge heads. See the *EQRB Transportation Methodology Memo*, Section 4.4, Future Active Transportation Volumes, for more details on the forecasting method.

Figure 3.1-8. Potential Bicycling Detour Routes during Closure of the Vera Katz Eastbank Esplanade

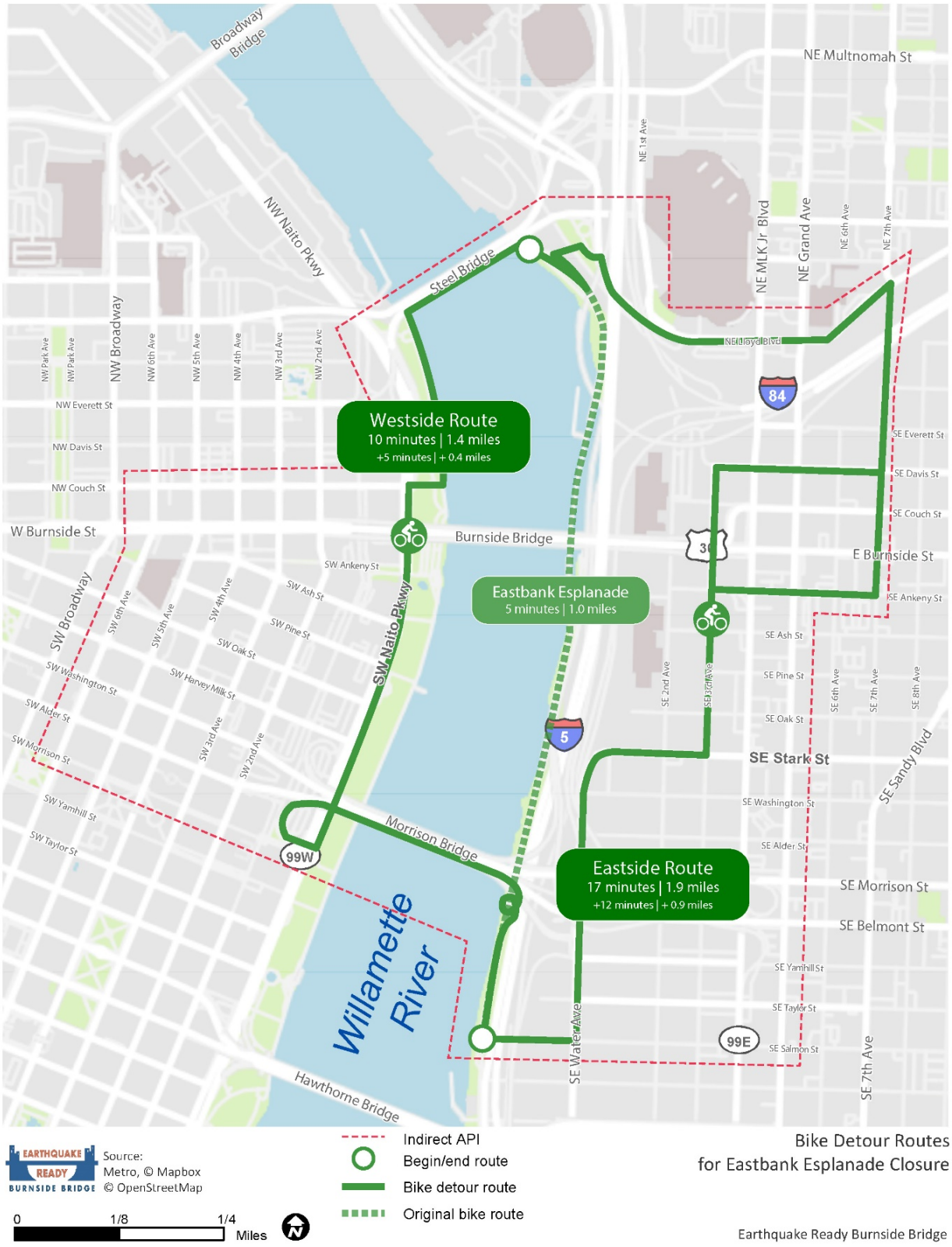


Figure 3.1-9. Potential Pedestrian Detour Routes during Closure of the Vera Katz Eastbank Esplanade

Figure 3.1-10. Potential Bicycling Detour Routes during Closure of the Burnside Bridge

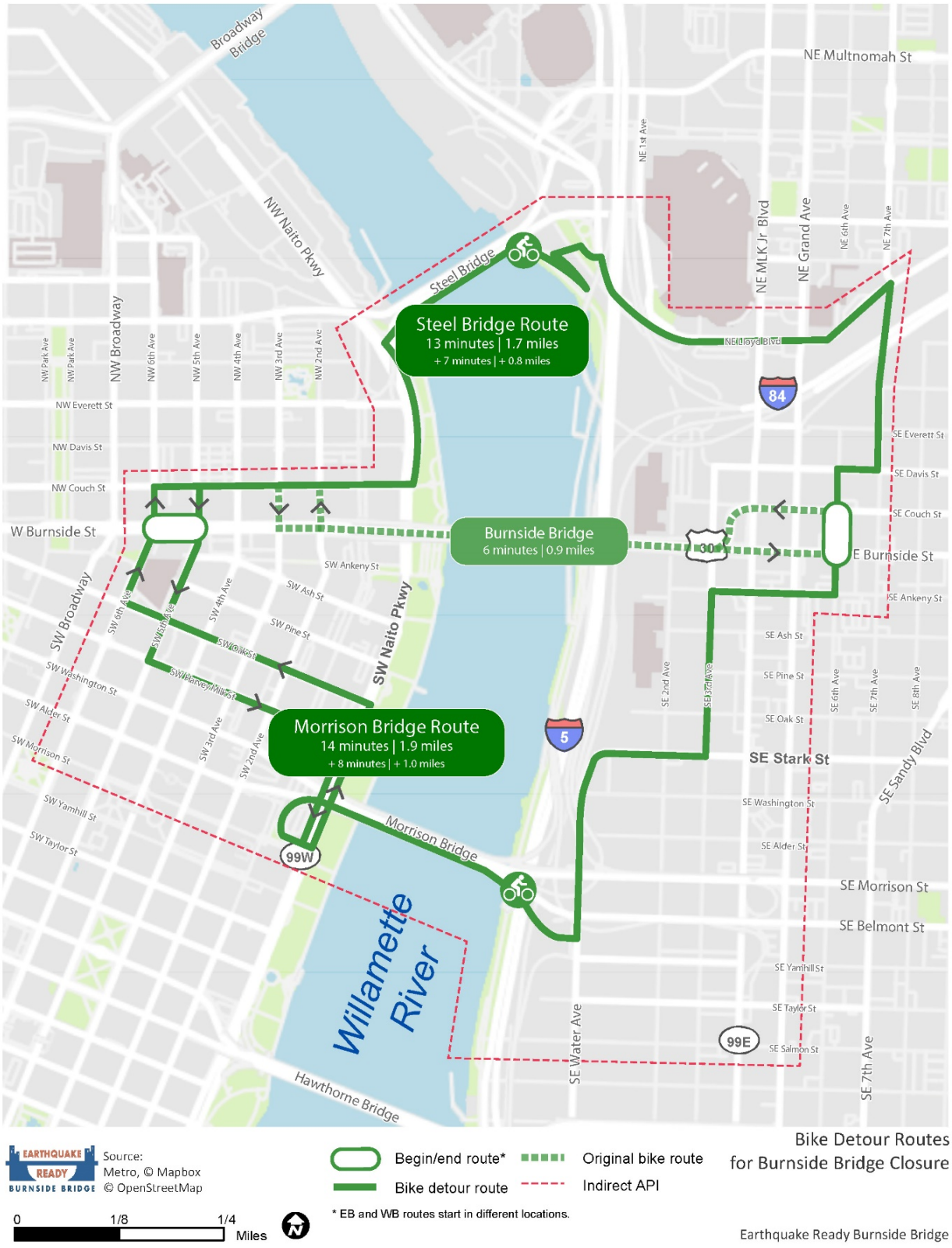
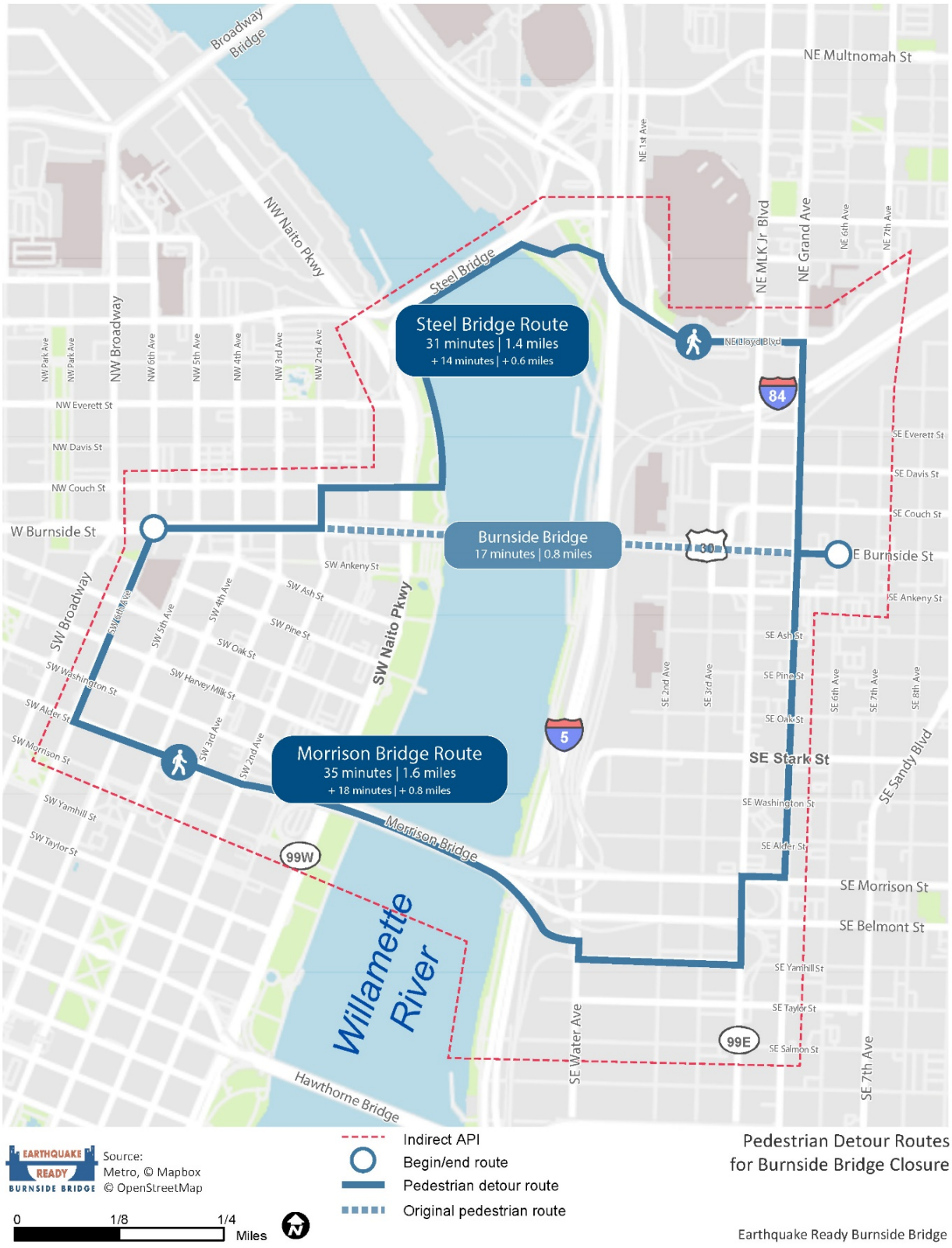


Figure 3.1-11. Potential Pedestrian Detour Routes during Closure of the Burnside Bridge



Rail Network

There would be no impacts to the UPRR mainline rail under the Burnside Bridge with the temporary closure of the Burnside Bridge during construction.

Temporary Access Impacts

Construction activities, such as sidewalk rebuilding and construction staging, would cause temporary closures to adjacent doorways. The Couch Extension would impact the most doors at 38; the Retrofit Alternative would impact the fewest at 11; and the Short-span and Long-span Alternatives would each impact 20. These temporary impacts are further detailed in the *EQRB Transportation Technical Report* (Multnomah County 2021z). The potential for temporary impacts to cause business displacements is discussed in Section 3.3, Acquisitions and Displacements. Temporary parking closures are listed in Table 3.1-10. In total, the Couch Extension would impact the most parking, with temporary impacts to 67 off-street spots on the west side, 25 off-street spots and 73 on-street spots on the east side. Additional permanent on-street parking spot losses would total 35 along NE 3rd Avenue, NE Martin Luther King, Jr. Avenue, and NE Davis Street. Impacts to parking on the west side approach are the same across all design alternatives. On the east side, parking impacts due to the Short-span and Long-span Alternatives would include temporary impacts to 48 on-street and 16 off-street spots with 35 permanent impacts to parking.

Temporary Bridge – All Modes

The Temporary Bridge All Modes alternative would include one general purpose lane in each direction plus bicycle and pedestrian facilities. Below is a summary of the key findings for this option.

Traffic/Freight

- The Temporary Bridge All Modes alternative would be able to accommodate approximately two-thirds of existing vehicle trips that would typically use the Burnside Bridge. The other one-third would primarily detour to other bridges. This option would displace to other bridges, 565 westbound vehicles in the AM peak hour and 710 eastbound vehicles in the PM peak hour.
- Bridges other than the Burnside Bridge would experience congestion increases, but the magnitude would be lower compared to the full closure option. Medium and heavy trucks are 3.4 percent of the existing traffic volume crossing the Burnside Bridge; a portion of that would likely detour onto other bridges. D/C increases would range from 2 to 8 percent, with the greatest increase on the Morrison Bridge.
- Modelling estimates showed that travel time between around E 20th Avenue and the intersection of W Burnside and Broadway Avenue would increase about 5 to 7.5 minutes (over existing) for westbound AM peak hour trips using the temporary Burnside or Morrison Bridges, while westbound trips traveling across the Broadway and Steel Bridges would experience an increase of 1 to 3 minutes.

Table 3.1-10. Anticipated Parking Closures for the Build Alternatives

Parking ID Letter[1]	East or West	Property	Parking Type	Enhanced Retrofit	Short-span and Long-span Alternatives	Couch Extension	Notes
A	West	Mercy Corps, White Stag	Lot	Long-term	Long-term	Long-term	Staging for bridge construction
B	East	Right-of-Way, 2nd Avenue	Street	None	None	Long-term	Staging for bridge construction
C	East	Right-of-Way, 2nd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
D	East	Right-of-Way, 2nd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
E	East	Right-of-Way, 2nd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
F	East	Bridgehead Development LLC	Lot	None	None	Long-term	Staging for bridge construction
G	East	Right-of-Way, 2nd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
H	East	Nemarnik Family Properties, LLC	Lot	Long-term	Long-term	Long-term	Staging for bridge construction
I	East	Right-of-Way, 2nd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
J	East	Right-of-Way, 3rd Avenue	Street	None	None	Long-term	Staging for bridge construction
K	East	Right-of-Way, 3rd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
L	East	Right-of-Way, 3rd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction
N	East	Right-of-Way, 3rd Avenue	Street	Long-term	Long-term	Permanent Closure	For bicycle lane
O	East	Right-of-Way, 3rd Avenue	Street	Long-term	Long-term	Long-term	Staging for bridge construction

[1]See Figures 23 and 24 in Attachment G, Detailed Graphics of Alternatives.

Note: Short-term = a few weeks; long-term = 6 months to a few years

- During the PM peak hour, between these same areas, eastbound routes using the Morrison or temporary Burnside Bridges would experience an increase of 2 to 7.5 minutes, while eastbound routes traveling across the Broadway and Steel Bridges would experience an increase of 2 to 4.5 minutes. Table 3.1-11 and Table 3.1-12 show the impacts to travel times along 12 different routes resulting from this option.

Table 3.1-11. All Modes Temporary Bridge Travel Times – Westbound AM Peak Hour

Route	Route Title	Existing (minutes)	All Modes Temporary Bridge (minutes)	Difference (minutes)
Multnomah/21st to Burnside/Broadway	Broadway Bridge	11.0	13.0	+2.0
Multnomah/21st to Burnside/Broadway	Steel Bridge	11.0	12.0	+1.0
Multnomah/21st to Burnside/Broadway	Burnside Bridge	9.0	14.5	+5.5
Sandy/22nd to Burnside/Broadway	Steel Bridge	12.0	13.0	+1.0
Sandy/22nd to Burnside/Broadway	Burnside Bridge	8.5	15.0	+6.5
Sandy/22nd to Burnside/Broadway	Morrison Bridge	11.5	19.0	+7.5
Burnside/20th to Burnside/Broadway	Broadway Bridge	15.0	18.0	+3.0
Burnside/20th to Burnside/Broadway	Steel Bridge	13.0	14.5	+1.5
Burnside/20th to Burnside/Broadway	Burnside Bridge	9.0	15.0	+6.0
Burnside/20th to Burnside/Broadway	Morrison Bridge	13.0	20.0	+7.0
Stark/20th to Burnside/Broadway	Burnside Bridge	10.0	15.0	+5.0
Stark/20th to Burnside/Broadway	Morrison Bridge	12.0	19.0	+7.0

Note: In this table, all references to the Burnside Bridge are the potential temporary bridge.

Table 3.1-12. All Modes Temporary Bridge Travel Times – Eastbound PM Peak Hour

Route	Route Title	Existing (minutes)	All Modes Temp Bridge (minutes)	Difference (minutes)
Burnside/Broadway to Multnomah/21st	Broadway Bridge	19.0	23.5	+4.5
Burnside/Broadway to Multnomah/21st	Steel Bridge	16.5	18.5	+2.0
Burnside/Broadway to Multnomah/21st	Burnside Bridge	16.5	19.0	+2.5
Burnside/Broadway to Multnomah/21st	Morrison Bridge	21.5	29.0	+7.5
Burnside/Broadway to Sandy/22nd	Steel Bridge	19.0	21.5	+2.5
Burnside/Broadway to Sandy/22nd	Burnside Bridge	16.0	18.0	+2.0
Burnside/Broadway to Sandy/22nd	Morrison Bridge	19.0	23.0	+4.0
Burnside/Broadway to Burnside/20th	Steel Bridge	18.0	21.0	+3.0
Burnside/Broadway to Burnside/20th	Burnside Bridge	13.0	15.5	+2.5
Burnside/Broadway to Burnside/20th	Morrison Bridge	16.5	20.5	+4.0
Burnside/Broadway to Stark/20th	Burnside Bridge	16.0	18.5	+2.5
Burnside/Broadway to Stark/20th	Morrison Bridge	14.0	18.5	+4.5

Note: In this table, all references to the Burnside Bridge are the potential temporary bridge.

- When combined with temporary I-5 closures associated with construction of the I-5 Rose Quarter project, river crossing travel times (between points along 20th Avenue on the east and Burnside/Broadway on the west) would increase even more. The following are increased relative to the No-Build Alternative:
    - AM peak hour – westbound travel times across the Morrison Bridge would increase by 12 minutes; westbound travel times across the Burnside Bridge would increase by 7.5 to 8 minutes, and westbound travel times across the Broadway and Steel Bridges would increase by 4.5 to 6.5 minutes.
    - PM peak hour – eastbound travel times across the Morrison Bridge would increase by 10.5 to 11 minutes, while eastbound travel times across the Burnside, Broadway, and Steel Bridges would increase by 3.5 to 7 minutes.

Transit

- Transit would be able to continue to use the Burnside Bridge, reducing travel time delays compared with the full closure or the Temporary Bridge: Bicycles and Pedestrians Only option. Between E. Grand Avenue/Burnside and W. 5th Avenue/Burnside, travel times for bus Lines 12, 19, and 20 would increase by 32 percent in the eastbound direction and 200 percent in the westbound direction.

- Transit ridership for bus Lines 12, 19, and 20 would decrease by between 1 and 2 percent compared with existing conditions. The Temporary Bridge Option would have a lower impact on TriMet ridership on bus Lines 12, 19, and 20 with a predicted decrease of between 1 and 2 percent vs. 4 to 6 percent for the full closure.
- The Portland Streetcar (Loops A and B) would experience smaller travel time delays (less than 40 seconds) on the east side of the river compared with the full closure. On the west side, streetcar travel times would also be minimally affected.
- When combined with temporary I-5 closures associated with construction of the I-5 Rose Quarter project, changes relative to No-Build, would include:
    - Transit ridership would decrease by not more than 0.5 percent, and transit travel times would increase by 46 and 22 percent (westbound and eastbound, respectively).
    - Streetcar Loops A and B operations and travel times would be affected by temporary changes in traffic volumes. While some segments would have lower traffic volumes, volumes on many segments in the vicinity of the Broadway Bridge and NE Grand Avenue would increase by 7 to 51 percent.

Active Transportation

- A temporary bridge would significantly reduce out-of-direction travel for bicyclists and pedestrians compared with a full closure.
- Pedestrian volumes over the bridge would be steady while bicycle volumes would decrease by about 3 percent compared to existing conditions.
- The Vera Katz Eastbank Esplanade would be closed about 4 months longer with a temporary bridge than without, resulting in longer duration detours, out-of-direction travel, and possible foregone trips.
- The combination of a temporary bridge with temporary I-5 closures associated with construction of the I-5 Rose Quarter project would not be expected to affect pedestrian volumes and would slightly increase bicycle volumes on the Steel Bridge.

Transit, Bicycles, and Pedestrians–Only Temporary Bridge

The Temporary Bridge: Transit, Bicycles and Pedestrians–Only Option would have the same impacts to traffic and freight as with a full closure, while many of the active transportation and safety impacts would be very similar to the Temporary Bridge: All Modes Option. Transit operations would be different than the other options. Below is a summary of the key findings.

Transit

- Transit travel times across the Willamette River would improve for bus Lines 12, 19, and 20 by between 25 and 70 percent compared to the Temporary Bridge: All Modes Option.
- Transit ridership for bus Lines 12, 19, and 20 would decrease by less than 2 percent.
- While the absence of automobile and freight traffic over a temporary bridge would speed up transit vehicles crossing the bridge, out-of-direction vehicle travel and added congestion on roads leading to the temporary bridge would slow transit vehicles getting to the bridge, thus limiting the transit benefits of excluding other vehicle modes.
- The Portland Streetcar Loops A and B would experience similar travel delays as those expected with a full closure.

Active Transportation

- Bicycle and pedestrian impacts would be minimal. A minor portion of bicycle and pedestrian trips are expected to switch to transit trips.
- The impacts to bicyclists and pedestrians using the Vera Katz Eastbank Esplanade would be very similar to the Temporary Bridge: All Modes Option.

3.1.4 Construction Impacts on Safety

The safety-related impacts to vehicles, bicycles, and pedestrians that are anticipated from the temporary construction scenarios are summarized below.

Traffic Safety

Crashes during the construction phase are assumed to be a function of vehicle miles traveled (VMT) within the area studied. The crash frequency is not predicted to substantively change for a full closure or any of the temporary bridge options compared to existing conditions.

The only predicted crash increase, which would still be proportionally small, would be when the I-5 Rose Quarter project temporarily closes I-5; that would transfer vehicles to roads with generally higher crash rates. In this scenario, predicted crash frequencies would increase by 5 to 24 incidents on surface streets within the study area.

Bicyclist and Pedestrian Safety

As traffic volume and/or speed increases on any street, crash risk for pedestrians and cyclists (either frequency or severity) also increases. There would be detour routes signed for pedestrians and bicyclists to get around potential closures of the Burnside Bridge and the Eastbank Esplanade. These routes were evaluated for their comparative safety risk to evaluate the potential impact of the construction scenario without a temporary bridge for pedestrians and bicyclists.

The results of the bicycling safety analysis during construction are shown in Table 3.1-13 along with the change in travel time for bicyclists using various facility types on the designated detour routes around the Burnside Bridge and the Eastbank Esplanade closures. Multiplying the duration and level of traffic stress together and summing the product results is expressed as “BLTS-minutes.” A higher BLTS-minutes score indicates a higher level of bicyclist stress. Without a temporary bridge, bicyclists would use the Steel Bridge (55 percent) or Morrison Bridge (45 percent). Detouring around the Burnside Bridge would increase the stress level for bicyclists (BLTS-minutes score increases from 11.5 to 27), mostly due to an overall increased total travel time (from 7 minutes to 13 to 14 minutes) and additional travel time (2 to 5 minutes) on neighborhood greenways, which are shared with vehicular traffic.

Closing the Eastbank Esplanade would require bicyclists to detour across the Morrison Bridge to the west side of the river (80 percent) or through the Central Eastside Industrial District (20 percent). Detouring around the Eastbank Esplanade increases the BLTS-minutes score from 5 to 17. The detour across the Morrison Bridge to the west side of the river and back via the Steel Bridge can be completed all on BLTS 1 (low stress) facilities; however, the route through the Central Eastside Industrial District is mostly via on-street facilities increasing exposure to traffic.

Table 3.1-13. Bicyclist Level of Traffic Stress due to Construction Impacts by Scenario

Construction Scenario	BLTS-minutes Score	Change in Minutes Traveled on Off-Street Pathway	Change in Minutes Traveled on Bike Lane	Change in Minutes Traveled on Neighborhood Greenway	Change in Minutes Traveled on Shared Street
River Crossing: Temporary bridge with pedestrian and bicyclist facilities	11.5	0 (no change from existing)	0 (no change from existing)	0 (no change from existing)	0 (no change from existing)
River Crossing: No temporary bridge - use alternate bridge	27	Steel: +5, Morrison: +4	Steel: -1, Morrison: -1	Steel: +2, Morrison: +5	Steel: 0, Morrison: -1
Vera Katz Eastbank Esplanade Detour: Esplanade open	5	0 (no change from existing)	0 (no change from existing)	0 (no change from existing)	0 (no change from existing)
Vera Katz Eastbank Esplanade Detour: Esplanade closed	17	Morrison: +5, CEID: -5	Morrison: 0, CEID: +8	Morrison: 0, CEID: +8	Morrison: 0, CEID: +1

Notes: BLTS = bicyclist level of traffic stress; CEID = Central Eastside Industrial District

The results of the pedestrian safety during construction analysis are shown in Table 3.1-14. It shows the pedestrian intersection crossing risk scores and the change in number of required crossings by intersection approach type along the detour routes.

Table 3.1-14. Pedestrian Intersection Crossing Risk Score and Change in Intersection Approach Crossings Due to Construction Impacts by Scenario

Construction Scenario	Pedestrian Intersection Crossing Risk Score	Signalized Minor (weight=1)	Signalized Major (weight=2)	Unsignalized Minor (weight=3)	Unsignalized Major (weight=4)
River Crossing: On Temporary bridge	15	0 (no change from existing)	0 (no change from existing)	0 (no change from existing)	0 (no change from existing)
River Crossing: No temporary bridge – use alternate bridge	40	Steel: 0, Morrison: 0	Steel: +4, Morrison: +3	Steel: +1, Morrison: +11	Steel: 0, Morrison: +1
Vera Katz Eastbank Esplanade Detour: Esplanade open	1	Not Applicable (no change from existing)	Not Applicable (no change from existing)	Not Applicable (no change from existing)	Not Applicable (no change from existing)
Vera Katz Eastbank Esplanade Detour: Esplanade closed	11	Morrison: -1, CEID: +1	Morrison: +1, CEID: +3	Morrison: 0, CEID: +13	Morrison: 0, CEID: 0

Notes: CEID = Central Eastside Industrial District

The crossing risk with a temporary bridge in place is a risk score of 15. Without a temporary bridge, it is assumed that pedestrians would be detoured to the north via the Steel Bridge (55 percent) or to the south via the Morrison Bridge (45 percent). These detours increase the pedestrian crossing risk (score increases from 15 to 40), mostly due to the 11 additional unsignalized minor road approaches that pedestrians are required to cross when using the Morrison Bridge route.

Closing the Vera Katz Eastbank Esplanade would require pedestrians to detour across the Morrison Bridge to the west side of the river (80 percent) or through the Central Eastside Industrial District (20 percent).

These detours increase the pedestrian crossing risk score from 1 to 11, mostly due to the 13 additional unsignalized minor road approaches that pedestrians need to cross using the Central Eastside Industrial District detour route.

3.1.5 Potential Off-Site Staging Areas

The construction contractor could use one or more off-site staging areas outside the bridge study area to store and and/or assemble materials that would then be transported by barge to the construction site. Whether, where, and how to use such sites would be the choice of the contractor; therefore, the actual site or sites cannot be known at this time. To address this uncertainty, the project team has identified four possible sites (see Chapter 2) that represent a broad range of potential sites where off-site staging might occur (see Figure 20 in Attachment G). While the contractor might choose to use one of these or a different site, it is assumed that because of regulatory and time constraints on the contractor, any site they choose would need to be already developed with road and river access. Given the potential sites and likely activities, it is expected that off-site staging of materials would have a limited impact on the overall operation of traffic, transit, and active transportation modes. It is also assumed that the contractor would be responsible for any relevant permitting, environmental clearances and/or mitigation that could be required for the chosen site.

3.1.6 Mitigation

Mitigation for Build Alternatives

Because the impacts analysis identified no permanent adverse impacts relating to traffic, freight, or transit, no additional mitigation for these modes, other than the improvements included in project design, are proposed. Several measures are proposed for improving long-term safety and reducing collision exposure risk for active transportation users.

All of the build alternatives incorporate bicycle and pedestrian improvements into the description of the alternatives including physical barriers between traffic lanes and active users to improve safety and security for pedestrians and bicyclists. In addition, mitigation to improve active transportation safety could include:

- Post a 25-miles-per-hour (mph) speed limit on the Burnside Bridge to be consistent with the proposed 25 mph design speed. Reducing the posted speed limit from 35 to 25 mph could, depending on the road design and degree of driver compliance, result in lower travel speeds. In the event of a crash, lower travel speed at impact would reduce the crash injury severity.
- The intersection of W Burnside and NW 2nd Avenue may warrant changes to signal phasing to better separate bicyclists and pedestrians from right-turning vehicle traffic in the westbound direction. Such mitigation would be further developed in the final design phase.
- As the Project proceeds into final design, consider updating traffic signals within the Safety Direct API to include reflective backplates, protected only left turn phasing where left turn lanes already exist, and right turn and left turn traffic calming to reduce motor vehicle turning speeds and increase driver visibility of pedestrians and bicyclists.

Construction Phase Mitigation

Mitigation measures that would apply to all construction traffic management options are listed in Table 3.1-15

Table 3.1-15. Summary of Proposed Construction-phase Mitigation Measures for All Alternatives and Options

Mode	Proposed Mitigation
All Modes	• The County would avoid capital projects, with the exception of emergency work, that would cause long-term lane closures on other downtown bridges during the Burnside Bridge closure.
Transit	• TriMet could operate buses around closed MAX stations and sections. • The County would support TriMet in outreach and communications regarding service disruptions.
Active Transportation	• Implement temporary traffic calming or diversion measures, where warranted, in either (1) places where bikeways do not have separate facilities within the Bicycle and Pedestrian Direct API, or (2) on select neighborhood greenway streets immediately adjacent to the dedicated bicycle-pedestrian detour routes. Specify and sign/mark detour routes to the Steel Bridge to the north and to either the Morrison or Hawthorne Bridges to the south.
Safety	• Implement temporary low-cost safety countermeasures at intersections within the Direct API or on select neighborhood greenway streets immediately adjacent to the dedicated bicycle-pedestrian detour routes, such as: o Traffic signal reflective backplates o Right-turn or left-turn traffic calming to reduce motor vehicle turning speeds and increase driver visibility of pedestrians and bicyclists o Protected left-turn lane where a left-turn lane already exists • Implement temporary traffic signal phasing to separate pedestrians and bicyclists and turning motor vehicles. • Develop a maintenance of traffic plan to designate and sign a detour route for traffic seeking to cross the Willamette River.

Additional measures for specific temporary bridge options are listed below.

Mitigation for the All Modes and the Transit, Bicycles, and Pedestrians–Only Bridge Options

- Provide bus prioritization at temporary bridgehead at both the east and west banks of the Willamette River, including potential queue jumps and signal timing.
- Coordinate with TriMet to assess the impact to bus routes that cross other bridges. If it is found that diverted traffic has a significant delaying effect on bus operations, routing additional bus lines over the temporary Burnside Bridge would be investigated.

Mitigation for the Bicycles and Pedestrians–Only; Transit, Bicycles, and Pedestrians–Only; and the No Temporary Bridge Options

- Plan specific detour routes that minimize or avoid major transit streets where the additional detoured traffic volumes could significantly delay transit operations, including the Steel Bridge and the Rose Quarter Transit Center.

Mitigation for the No Temporary Bridge and the Bicycles and Pedestrians–Only Bridge Options

- Detour routes for bus Lines 12, 19, and 20 over the Steel Bridge.

- Consider temporary closure of the Steel Bridge to all vehicles except buses and light rail during Burnside Bridge construction. This was suggested by some stakeholders as a potential measure for reducing the impacts of the No Temporary Bridge Option on transit travel times and ridership. This mitigation would need further outreach and analysis as closing the Steel Bridge to non-transit vehicles has the potential to cause significant impacts to vehicular traffic and freight by lengthening their travel times to other bridges and increasing congestion for all on both sides of the river.[9] Travel impacts due to full closure of the Burnside Bridge could be exacerbated by construction of other regional transportation projects such as the I-5 Rose Quarter project which is anticipated to take place in the same timeframe as EQRB construction. Although the potential for cumulative temporary traffic impacts has been analyzed for the Draft EIS, the construction timing and assumptions of these projects are likely to evolve as they advance through project development. It will be important to monitor and evaluate those changes so as to understand and address any changes in the potential for concurrent impacts to all travel modes.
- A transit management plan that considers tools such as transit priority, dedicated travel lanes, or other bus route and streetcar mitigation measures would be developed by the project team in cooperation with TriMet, PBOT, and the other project teams to develop detour routes and inform final mitigation decisions.

Mitigation for the No Temporary Bridge Option (in addition to those listed directly above)

- Provide free or subsidized TriMet passes to social service agency clients (see the discussion in Section 3.9, Environmental Justice).

[9] Discussions with entities receiving frequent and large freight deliveries, such as Broadway Toyota, and/or creating event traffic such as the MODA and Convention Centers would be necessary to pursue this option.

3.2 Navigation

This section summarizes key information from the *EQRB Preliminary Navigation Study* (Multnomah County 2021s) that surveyed river users and solicited input from the US Coast Guard (USCG) on expected navigation clearance requirements. Those requirements were then used to help refine the bridge alternatives as well as eliminate any alternatives that could not meet the minimum clearance requirements. This section summarizes how the Draft EIS alternatives and options would meet and/or require temporary deviations from these clearances.

Prior to the NEPA phase, as part of the EQRB Feasibility Study, an assessment was performed to determine if the build alternatives could comply with the FHWA policy from 23 CFR 650 subpart H § 650.803 Policy, (b): "To provide fixed bridges wherever practicable." This study concluded that the increased height of the bridge deck required to accommodate all vessel types, as illustrated in Figure 3.2-2, had impacts severe enough to deem this approach impractical. See the *EQRB Feasibility Study Report* for more information.

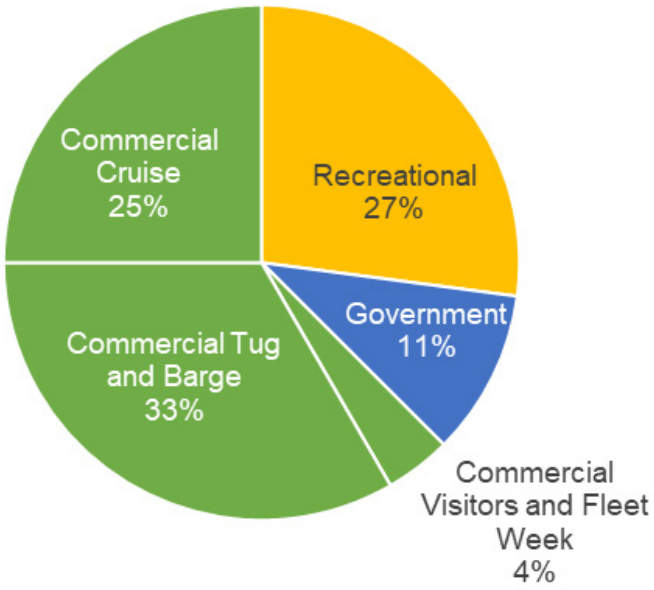
3.2.1 Affected Environment

River Users

A river user is a public or private entity expected to transit under the Burnside Bridge in a vessel during and/or after Burnside Bridge modification. A river user may be an individual (such as a private vessel owner) or a group (such as a company, marina, or organization).

The study contacted 84 river users potentially affected by a change in the clearance of the Burnside Bridge. Elevations and horizontal clearance requirements were ultimately obtained for 47 river users. These 47 users are a representative subset of the thousands of actual river users who may transit under the Burnside Bridge. They fall into three main types – commercial, recreational, or government – as shown in Figure 3.2-1.

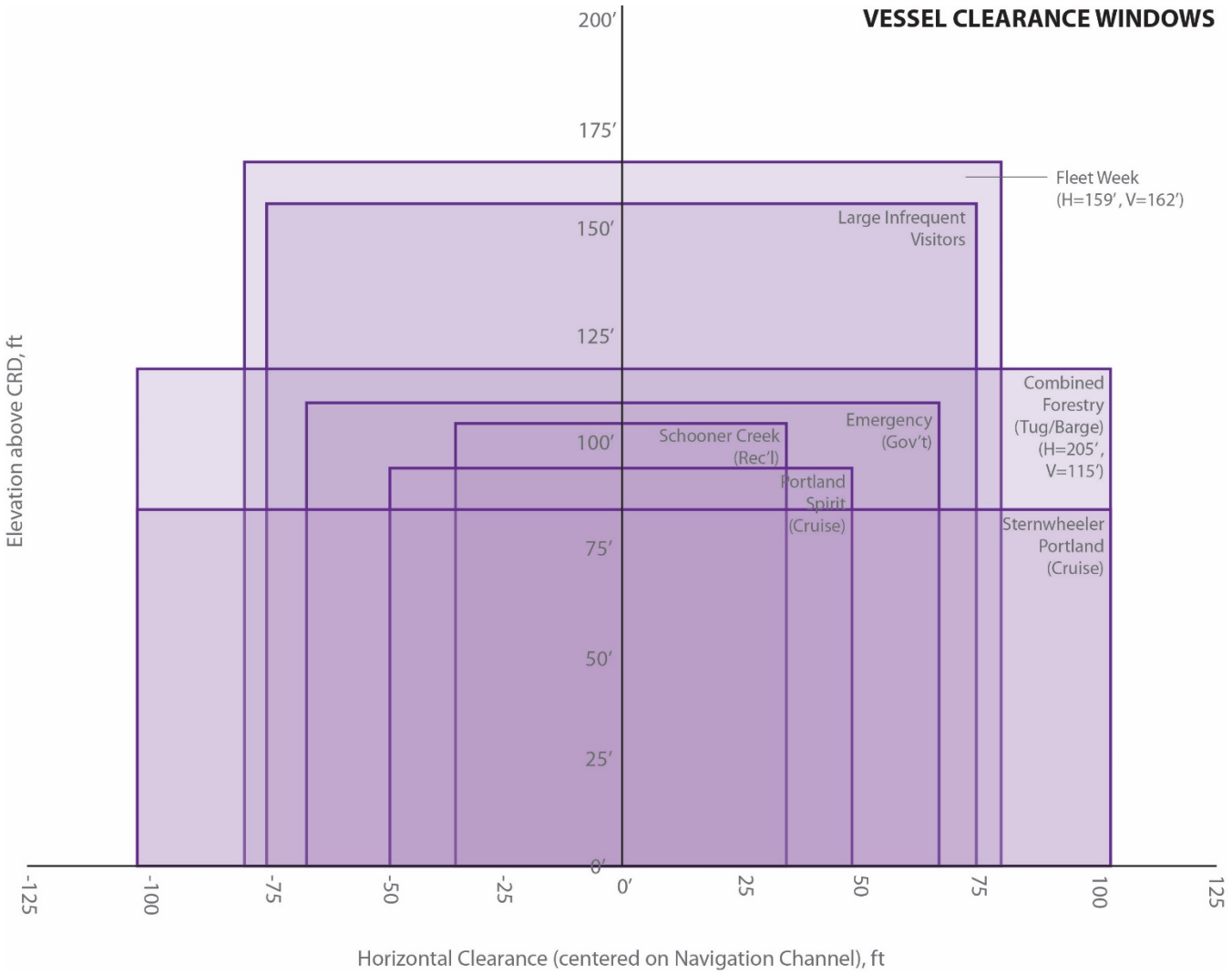
Figure 3.2-1. Distribution of River Users



Elevation and horizontal clearance requirements were provided by the river users themselves. These requirements represent their stated minimum space needed to safely transit under the bridge. The basis for these requirements, such as the season and water surface elevation, varies from river user to river user.

Elevation and horizontal clearance requirements combine to form a clearance window. Figure 3.2-2 displays the clearance windows for the vessels with the largest clearance needs in each user type.

Figure 3.2-2. Elevation and Corresponding Horizontal Clearance for Each River User Type



The height and width of each box in Figure 3.2-2 correspond to the required elevation and horizontal clearance (centered on the navigation channel) for each vessel.

Recommended Clearances

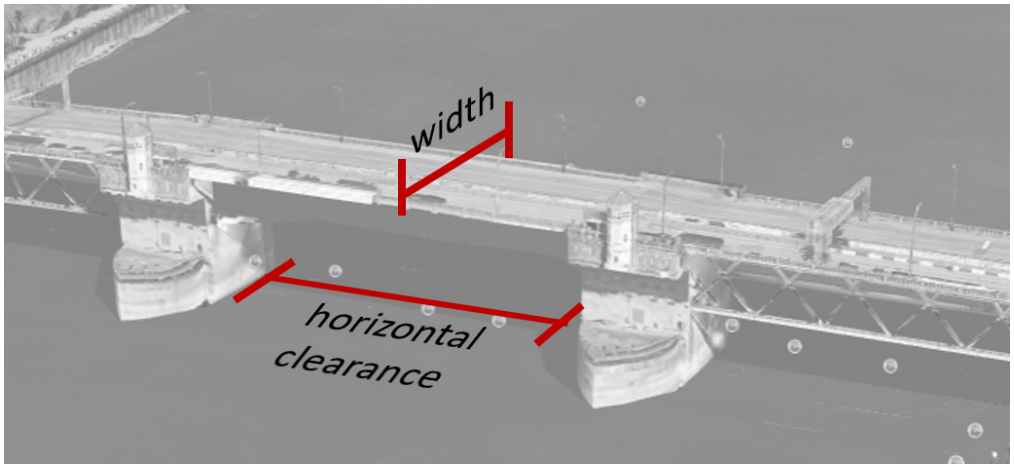
The USCG requirement to enable 100 percent of vessel traffic to safely transit under the bridge drove the clearance recommendations in the *EQRB Preliminary Navigation Study* (Multnomah County 2021s). The recommended minimum clearance elevation for all bridge designs is 147 feet above the ordinary high water mark, which is equivalent to 162 feet above the Columbia River Datum[1] (CRD) (CRD is essentially an

[1] North American Vertical Datum (NAVD) 88 is another elevation baseline that is more commonly used by the US Army Corps of Engineers. At the Burnside Bridge location, 162 feet above CRD is roughly equivalent to 167 feet in NAVD 88.

elevation baseline or standard that allows consistency in expressing elevations). The recommended vertical clearance is based on the maximum air draft of all known river users above the ordinary high water mark, the water level accepted as a design elevation by the USCG and the US Army Corps of Engineers. The recommended horizontal clearance for all bridge alternatives is 205 feet.

Upriver/downriver bridge width (see Figure 3.2-3) can also affect navigation safety. No maximum distance for this parameter is established but the potential increases were evaluated. The effects of bridge widths by alternative are discussed below.

Figure 3.2-3. Horizontal Clearance between Bridge Piers and Upriver/Downriver Bridge Width



Source: Google Earth

3.2.2 Impacts from Bridge Alternatives

Table 3.2-1 presents the existing/No-Build Alternative clearances and the most restrictive clearance for the build alternative permanent conditions, and the temporary bridge option conditions.

Table 3.2-1. Proposed Clearances

Alternative or Option	Vertical Clearance	Horizontal Clearance (feet)	Bridge Width (feet upriver/downriver)
Existing and No-Build Alternative	64 feet above CRD (closed); Infinite (raised)	205	86
Temporary Bridge Options	162 feet above CRD (raised)	165	220–390
Retrofit Alternative (permanent conditions)	64 feet above CRD (closed); Infinite (raised)	205.	86
Replacement Alternatives (permanent conditions)	64 feet above CRD (closed); Infinite (bascule raised); 162 feet above CRD (vertical lift – raised)	205	150–195

Stated elevations are based on the vertical distance above CRD. Horizontal clearance refers to the clear distance between bridge piers. This study assumes the center of the navigation channel would remain the same as with the existing Burnside Bridge.

No-Build Alternative Impacts

The No-Build Alternative would maintain the existing navigational clearances and meet the clearance requirements. Because of the age of the existing bridge, the No-Build Alternative would require more frequent and more intense future maintenance which would lead to the need for more frequent temporary bridge closures and navigation clearance restrictions. After the next major earthquake, the existing bridge would be expected to collapse into the river, creating a navigation barrier and/or hazard, similar to the other aging bridges that cross the river.

Build Alternatives

Direct Permanent – All of the build alternatives satisfy the recommended elevation of 162 feet above CRD and the recommended horizontal clearance of 205 feet.

Bridge upriver/downriver width (Figure 3.2-3) would have navigation effects. The transit width of the replacement alternatives would range from 150 feet to 195 feet, depending on the exact length of the pier fender system. River users do not anticipate requiring regular tug assists to navigate this bridge width. Depending on future project work and river conditions, occasional tug assists could be needed. One river user recommended widening the horizontal clearance to aid navigation through the longer bridge width corridor. Upriver/downriver width will be further considered during the bridge type determination study.

All of the build alternatives would provide pier protection against vessel collisions by either designing the bridge to withstand collision force effects or providing protection against such forces via separated fenders or dolphins. These force effects and systems would be based on AASHTO[2] *LRFD Bridge Design Specifications, 9th Edition* (AASHTO 2020) or provisions developed from AASHTO *Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges, Second Edition* (AASHTO 2009). For all build alternatives, pier locations have been selected to accommodate the potential for pier protection structures (such as fenders or dolphin) while maintaining the recommended 205 feet horizontal clearance identified in the *EQRB Preliminary Navigation Study* (Multnomah County 2021s).

Indirect – None of the alternatives is expected to have indirect impacts to navigation.

Post CSZ Earthquake – All of the build alternatives would create a seismically resilient bridge designed to withstand the next major earthquake. As such, it could be one of the few bridges across the Willamette River that would not create a barrier to river navigation after the earthquake.

Temporary – Short-term reductions to the clearance requirements as well as short-term closures of the navigation channel would be required during construction. It is assumed that there could be between 2 and 10 closures, up to 3 weeks each, over the course of the construction phase. It is reasonable to assume that the USCG would grant temporary deviations to the clearance dimensions, as evidenced by the many recent rehabilitation projects. These temporary deviations, however, are on a case-by-case basis only and should be limited to days and a few weeks rather than months. Temporary deviations could require agreements from affected river users.

3.1.2 Impacts from Potential Off-Site Staging Areas

It is not expected that the use of an off-site staging area would adversely impact navigation for other river users. Barge transit between the staging area and the project site would follow relevant navigation requirements.

[2] American Association of State Highway and Transportation Officials

3.2.3 Impacts from Construction Traffic Management Options

Temporary Bridge Options

In addition to temporary navigation channel closures and clearance deviations needed to construct the main bridge, the temporary bridge options would be expected to add up to two additional closures of 2 weeks each for installation/removal of the temporary movable span.

Once installed, the temporary bridge options would satisfy the recommended elevation of 162 feet above CRD but would not meet the recommended horizontal clearance of 205 feet. The existing Burnside Bridge is the narrowest bridge in the Sellwood Reach (the Willamette River downstream of the Sellwood Bridge). The temporary bridge would become the most restrictive horizontal clearance on the waterway. The 165-foot horizontal clearance of the temporary bridge options would affect the ability of three known river users to transit under the bridge. Any temporary or permanent reduction to its horizontal clearance at either the temporary or permanent phases would require negotiation with three river users listed in Table 3.2-2.

Table 3.2-2. Horizontal Clearance Requirements of Impacted Tug and Barge River Users

User	Horizontal Clearance Requirement (feet)	Temporary Bridge (considering a 165- to 390-foot width range)
Combined Forestry & Marine Services, Inc.	205	**No safe transit**, but tug assist could mitigate the impact
Shaver Transportation	200	Safe transit with one tug assist (on case-by-case basis)
Advanced American Construction	185	Safe transit with one tug assist

In additional to horizontal clearance, bridge upriver/downriver width (Figure 3.2-3) also has navigation effects with a temporary bridge. Transit width could range from 220 feet to 390 feet, subject to how the contractor would construct the bridge. Some river users would require a tug assist due to this extensive bridge width.

3.2.4 Mitigation

Based on feedback from participating river users and vertical and horizontal clearance requirements, several recommendations are presented for the design and construction of the EQRB Project:

- Provide clear navigation signage for both commercial and recreational vessel operators.
- Provide a dedicated transit lane for small recreational craft such as kayaks and stand-up paddleboards to avoid potential conflicts with commercial boat traffic.
- Provide a real-time vertical clearance gauge to inform vessel operators whether they clear the bridge at any given moment or river level.
- Coordinate with river users during construction and provide tug assists as needed (discussed above in Impacts).

3.3 Acquisitions and Relocations

This section describes existing conditions and outlines anticipated project impacts to right-of-way and property. More detail can be found in the *EQRB Right-of-Way Technical Report* and the *EQRB Acquisitions and Displacements Technical Report* (see Attachment D for information about the technical reports).

3.3.1 Affected Environment

Right-of-way impacts are analyzed at the property level for the area directly impacted by the bridge, as well as for properties impacted by off-site construction staging.

The project area (or direct API) extends several blocks east and west of the Willamette River and includes public and private property, as well as existing right-of-way for the I-5 and I-84 freeways, several public roads, and the Union Pacific Railroad (UPRR) tracks. Within this API are two public parks including the Vera Katz Eastbank Esplanade on the east side of the Willamette River and Tom McCall Waterfront Park on the west side of the river. The Burnside Skatepark is located beneath the bridge's east approach. Impacts to these facilities are described in Section 3.9, Parks and Recreation as well as Section 3.11, Historic and Archaeological Resources. Property use within the project area is detailed in Section 3.4, Land Use, and can generally be described as commercial and high-density residential with limited light industrial usage along SE/NE 2nd and 3rd Avenues. Properties and parks adjacent to the project area and their associated impacts can be found in Table 3.3-1 and Figure 3.3-1. A comparative summary of the impacts by alternative is available in Table 3.3-2.

Development of the build alternatives would require acquisition of property and the relocation of businesses. Real property impacts and the relocation of businesses would comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended). Additional federal, state, and local statutes relating to right-of-way acquisition and potential impacts to historic resources are available in the *EQRB Acquisitions and Displacements Technical Report* (see Attachment D).

Table 3.3-1. Impacted Properties

ID	TLID	Property Name	Enhanced Retrofit (bus. displ.)	Short-Span Alternative (bus. displ.)	Long-Span Alternative (bus. displ.)	Couch Extension (bus. displ.)	Temp. Bridge (bus. displ.)
1	1N1E34CA - 09200	Central City Concern (Shoreline Building)	Not Applicable	TCE Access	TCE Access	TCE Access	Not Applicable
2	1N1E34DB - 00900	Portland Rescue Mission	TCE Access (1 [a])	TCE Access	TCE Access	TCE Access	Not Applicable
3	1N1E34DB - 01500	Portland Saturday Market Storage (City of Portland)	Easement	Easement	Easement	Easement	Not Applicable
4	1N1E34DB - 01400	University of Oregon Retail Space[b] (City of Portland)	Full (1)	Full (1)	Full (1)	Full (1)	Not Applicable
5	1N1E34DC - 00800	Portland Saturday Market Administration Offices (Skidmore Fountain Plaza, LLC)	Full [c] (1)	Full [c] (1)	Full [c] (1)	Full [c] (1)	Not Applicable
6	1N1E34CD - 00300	Salvation Army	Not Applicable	TCE Access	TCE Access	TCE Access	Not Applicable

ID	TLID	Property Name	Enhanced Retrofit (bus. displ.)	Short-Span Alternative (bus. displ.)	Long-Span Alternative (bus. displ.)	Couch Extension (bus. displ.)	Temp. Bridge (bus. displ.)
7	1N1E34CD - 00100	Vacant Lot (Skidmore Fountain Plaza, LLC)	Full	Full	Full	Full	Not Applicable
8	1N1E34DC - 00900	Diamond Parking Services (Skidmore Fountain Plaza, LLC)	Full [d] (1)	Full [d] (1)	Full [d] (1)	Full [d] (1)	Not Applicable
9	1N1E34DC - 01000	Diamond Parking Services (Skidmore Fountain Plaza, LLC)	Full	Full	Full	Full	Not Applicable
10	1N1E34DB - 00600	University of Oregon (White Stag Building)	TCE Access	TCE Access	TCE Access	TCE Access	Not Applicable
11	1N1E34DC - 90000	Mercy Corps	TCE	TCE	TCE	TCE	Not Applicable
12	1N1E34DB - 01300	Japanese American Plaza (City of Portland)	Easement & TCE	Easement & TCE	TCE	Easement & TCE	Not Applicable
13	1N1E34DC - 03600	Ankeny Plaza Structure (City of Portland)	Easement & TCE	Easement & TCE	TCE	Easement & TCE	Not Applicable
14	1N1E34DC - 00100	BES Pump Station (City of Portland)	Easement & TCE	Easement & TCE	TCE	Easement & TCE	Not Applicable
15	1N1E34DC - 03700	Bill Naito Legacy Fountain (City of Portland)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	TCE
16	1N1E34DA - 01500	Pacific Coast Fruit Company	TCE [e] (1)	TCE [e] (1)	TCE [e] (1)	Full (1)	Not Applicable
17	1N1E34DA - 01900	Rose City Transportation (David Nemarnik)	Full (1)	Full (1)	Full (1)	Full (1)	Not Applicable
18	1N1E34DD - 01000	AMR (Produce Row LLC)	Partial (1)	Partial (1)	Partial (1)	Partial (1)	Not Applicable
19	1N1E34DA - 02800	Eastside Exchange Building (Bridgehead Development LLC)	Not Applicable	Not Applicable	Not Applicable	Partial & TCE Access	Not Applicable
20	1N1E34DA - 02602	Yard – Pedestrian /Bike Right-of-way (Bridgehead Development LLC)	Not Applicable	Not Applicable	Not Applicable	Full	Not Applicable
21	1N1E34DA - 02001	Yard (Yard Residences LLC)	TCE	TCE	TCE	Partial & TCE	Not Applicable
22	1N1E34DD - 00900	Nemarnik Family Properties Parking Lot	Not Applicable	Not Applicable	Not Applicable	Not Applicable	TCE (1)
23	1N1E34DD - 00700	230 E Burnside Building (Templeton Office Investments LLC)	TCE Access	TCE Access	TCE Access	TCE Access	Not Applicable
24	1N1E34DA - 03100	Union Arms Apartments	Not Applicable	Not Applicable	Not Applicable	TCE Access	Not Applicable
25	1N1E34DA - 02900	Slate (Block 75)	Not Applicable	Not Applicable	Not Applicable	Partial & TCE Access	Not Applicable

ID	TLID	Property Name	Enhanced Retrofit (bus. displ.)	Short-Span Alternative (bus. displ.)	Long-Span Alternative (bus. displ.)	Couch Extension (bus. displ.)	Temp. Bridge (bus. displ.)
26	1N1E34DA - 03300	Block 76	Partial	Partial	Partial	TCE Access	Not Applicable
27	1N1E34DA- 3500	Fair-Haired Dumbbell	Not Applicable	TCE Access	TCE Access	TCE Access	Not Applicable
28	1N1E34DD - 00100	5 MLK (Under Construction)	TCE Access	TCE Access	TCE Access	TCE Access	Not Applicable
A	Not applicable	Willamette River (Dept. of State Lands)	Easement & TCE	Easement & TCE	TCE	Easement & TCE	Not Applicable
B	Not applicable	Eastbank Esplanade (City of Portland)	TCE	TCE	TCE	TCE	Not Applicable
C	Not applicable	I-5 & I-84 (ODOT)	Easement & TCE	Easement & TCE	TCE	Easement & TCE	Not Applicable
D	Not applicable	Union Pacific Railroad	TCE	TCE	TCE	Easement & TCE	Not Applicable

BES = Bureau of Environmental Services | bus. displ. = business displacements | Easement = Permanent Easement | Full = Full Acquisition | Partial = Partial Acquisition | TCE = Temporary Construction Easement | TCE Access = Temporary Construction Easement for accesses only | Temp. = Temporary | TLID = Tax lot ID

Map ID numbers correspond to property numbers shown in Figure 3.3-1.

[a] Under the Retrofit Alternative, the Portland Rescue Mission would require temporary relocation for 2 to 3 months during construction due to its primary access being blocked.

[b] The University of Oregon uses this space and it is identified as a business displacement of personal property.

[c] Portland Saturday Market would be permanently displaced from its administration offices but would only be temporarily displaced from its market location on the waterfront. A single permanent displacement has been tallied for this business.

[d] Diamond Parking Services would be displaced from Map IDs 8 and 9 but is only counted as one business displacement.

[e] The Retrofit and Short-span and Long-span Alternatives could potentially displace the Pacific Coast Fruit Company business due to impacts to the Rose City Transportation building next door which shares a wall. Because of the uncertainty surrounding the building impacts, Pacific Coast Fruit Company is being included as a business displacement.

Figure 3.3-1. Property Reference

Table 3.3-2. Business Displacements and Property Acquisitions by Build Alternative

Alternative	Fee Full Acquisition	Fee Partial Acquisition	Easement [a]	Temporary Construction Easement [b]	Businesses Displaced Permanently	Businesses Displaced Temporarily [c]
Enhanced Retrofit	6	2	6	14	6	1
Short-Span Alternative	6	2	6	17	6	0
Long-Span Alternative	6	2	1	17	6	0
Couch Extension	8	4	7	20	6	0
Temporary Bridge	+0	+0	+0	+2	+0	1

[a] Includes permanent easements for bridge facilities.

[b] Includes temporary construction easements for staging and work as well as building access closures.

[c] Temporary displacements would be limited in duration to the time of construction. It is assumed that after construction is complete, these businesses would reopen in their existing space.

Additional information regarding right-of-way costs and processes can be found in the *EQRB Right-of-Way Technical Report* (see Attachment D).

3.3.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

With the No-Build Alternative, existing property ownership and usage would continue with normal turnover based on market demand. In the event of a major CSZ earthquake, the No-Build Alternative would result in bridge failure leading to building and property damage under and adjacent to the bridge. It is anticipated that 10 properties would be impacted and 7 businesses displaced by collapse of the bridge structure. Bridge sway during a major CSZ event could impact another 6 properties and displace 16 additional businesses along with 284 residences located in the Yard building adjacent to the bridge. For more information on the locations of these impacts, please refer to the *EQRB Acquisitions and Displacements Technical Report* (see Attachment D).

Impacts Common to All Build Alternatives

Direct – All of the build alternatives would require acquisition of property and right-of-way. Of these, eight properties would be impacted by all the build alternatives. Table 3.3-3 below lists these properties along with the proposed relocation considerations.

Table 3.3-3.Common Impacts

ID	Property Name	Use	Businesses	Ownership	Impact	Relocation Notes
3	Portland Saturday Market Storage	Storage	0	Leased from the City of Portland	Permanent easement	See Map ID 5 below.
4	University of Oregon Retail Space [a] (City of Portland)	Retail space and classroom	0	Leased from the City of Portland	Full acquisition	Classroom/retail space would need to be relocated. The university owns the White Stag building (Map ID 10) adjacent to this space which may be an option.

ID	Property Name	Use	Businesses	Ownership	Impact	Relocation Notes
5	Portland Saturday Market Administration Office	Office	1	Leased by tenant	Full acquisition	Portland Saturday Market relies on the proximity of the market space, administration offices, and storage to function. Relocation would need to consider nearby space that meets the administration and storage needs, as the market itself would be able to continue in its current location following completion of the project.
7	Salvation Army Vacant Lot	Vacant	0	Owned by tenant	Full acquisition	Property is vacant so no relocation is necessary.
8	Diamond Parking Services	Surface parking lot	1	Owned by tenant	Full acquisition	Surface parking lots are limited in downtown and the surrounding area. Could require relocating outside the immediate area.
9	Diamond Parking Services	Surface Parking Lot	See above	Owned by tenant	Full acquisition	Surface parking lots are limited in downtown and the surround area. May require relocating outside immediate area.
17	Rose City Transportation	Freight Transportation	1	Owned by tenant	Full acquisition	Site is used as a call center and for administration office with some freight traffic. May require relocating outside the immediate area.
18	American Medical Response	Emergency Medical Response	1	Leased by tenant	Partial	Site is used as a call center as well as for vehicle staging and maintenance. May require relocating outside the immediate area.

[a] The University of Oregon uses this space and it is identified as a business displacement of personal property.

Impacts to these properties would permanently displace six businesses but no residences. Among these businesses are several which would require unique relocation considerations based on their business type and the availability of similar spaces close to the project area.

The following unique personal property relocations would need to be addressed for all the build alternatives:

- All the build alternatives would require the relocation of one outdoor advertising sign located on top of the Portland Saturday Market administration building at the west approach.
- There are 250 to 270 Portland Saturday Market vendors, some of which have inventory (personal property) stored in the market storage space under the west bridge approach (Map ID 3), who may be eligible for personal-property-only move benefits. Some vendors may also have lease agreements with the market for their vendor space. Each of these lease agreements would need to be addressed based on their specific lease terms.
- The Ankeny Market leases the Diamond Parking Lot (Map ID 9) as well as the New Market Theater parking lot across SW Ankeny Street and the SW Ankeny Street right-of-way for vendors in a similar manner to the Portland Saturday Market. Vendors that use the Diamond Parking Lot would need to relocate within the existing market or look for space elsewhere. Lease agreements would need to be addressed based on their specific lease terms.
- The appraisal process would determine whether there are any other personal property items within the acquisition areas that could require relocation benefits. It is standard process to pay for fixtures as part of the acquisition process and pay to move personal property as part of the relocation program.

Indirect – No indirect effects related right-of-way or displacements are anticipated.

Temporary – All of the build alternatives would displace businesses that are relatively unique in the project area; however, all but two of these businesses, the Portland Saturday Market and American Medical Response, have comparable services within the Portland metro region. Other retail markets within the Portland metro region could provide a temporary space for vendors from the Portland Saturday Market during construction. Likewise, displacement of Ankeny Market vendors could limit options for these types of goods and force vendors to look for space in other geographic markets elsewhere in the metro region. Both the Portland Saturday Market and Ankeny Market could lose vendors when they are able to reopen. American Medical Response provides emergency medical response for the city of Portland, and while they have call centers in Vancouver, Washington, there are no other comparable providers within the city of Portland. Diligent relocation efforts would avoid a disruption to emergency services in the city.

All of the build alternatives would cause temporary construction-related impacts including the need for temporary easements and temporary closures to building entrances. Included in these impacts would be temporary construction easements for eight properties, and another four would require temporary access closures due to construction. None of the temporary access closures would require displacing the existing use.

Of the eight properties requiring temporary construction easements, four are public or private right-of-way, three are parcels within Tom McCall Waterfront Park, and one is the under-bridge parking lot owned by Mercy Corps (Map ID 11) as shown on Figure 3.3-1. Affected rights-of-way include the Willamette River (Map ID A), the Vera Katz Eastbank Esplanade (Map ID B), the ODOT right-of-way associated with I-5 and I-84 (Map ID C), and UPRR right-of-way (Map ID D). Impacts to these rights-of-way would be limited to the removal or replacement of bridge structural elements. No changes to the long-term function of these rights-of-way are anticipated from any of the build alternatives. The three affected properties within Tom McCall Waterfront Park include the Japanese American Plaza (Map ID 12) north of the bridge, the Bureau of Environmental Services Pump Station (Map ID 14) directly below the bridge, and the Ankeny Plaza structure (Map ID 13), which would need to be relocated (deconstructed and stored) during bridge construction.

For information on the common impacts to parks, please see Section 3.10, Parks and Recreation.

Post CSZ Earthquake – During and immediately following a major CSZ earthquake, impacts to properties not adjacent to the approaches would be the same for the No-Build Alternative and build alternatives. For all the build alternatives, the properties identified in Table 3.3-1 identified as full acquisitions would already have been displaced and the bridge would remain standing. The result would be less property damage and fewer human casualties and injuries from the earthquake, and no affect from the bridge on adjacent properties and right-of-way would be anticipated.

Enhanced Seismic Retrofit Impacts

In addition to the common impacts described above, the Enhanced Seismic Retrofit Alternative would have the following right-of-way impacts and distinctions:

- Lowest total acquisition and relocation costs.
- Smallest right-of-way footprint.
- Shortest construction period.
- Block client access to the Portland Rescue Mission building and services for 2 to 3 months, requiring a temporary displacement. See Section 3.6, Public Services, for more information. (All the other build alternatives would avoid this impact.)

- Displace the Pacific Coast Fruit Company, which uses a portion of the Rose City Transportation Building for its operation. The Pacific Coast Fruit Company owns this property and leases the Nemarnik Family Properties surface parking lot (Map ID 22) on SE 2nd Avenue. (This impact is shared by all the build alternatives except the Couch Extension Alternative.)
- Require permanent easements for five properties to protect bridge structural elements and allow for maintenance (shared by all the build alternatives except the Long-span Alternative).
- By using the same footprint as the existing bridge, this alternative would result in three fewer properties requiring construction easements as compared to the other build alternatives.
- Permanently remove the Burnside Skatepark. (All other alternatives would avoid this impact.)

Replacement Alternative with Short-Span Approach Impacts

In addition to the impacts common to all the build alternatives, the Short-span Alternative would have the following impacts and distinctions:

- Temporarily close access to three additional properties as compared with the Retrofit Alternative. These closures could occur at the approaches and would not result in additional displacements (shared by all other build alternatives).

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following impacts and distinctions:

- The fewest number of right-of-way acquisitions.
- Fewer bridge footings would result in five fewer properties requiring permanent easements, including the public rights-of-way for the Willamette River (Map ID A) and I-5/I-84 (Map ID C), as well as the three parcels within Tom McCall Waterfront Park (Map ID 12, 13, and 14).

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the other replacement alternatives, with the following impacts and distinctions:

- Highest total acquisition and relocation costs. Approximately 26 percent higher than for the Enhanced Seismic Retrofit Alternative.
- Largest right-of-way footprint.
- Longest construction period.
- The highest number of right-of-way acquisitions with more temporary construction easements, permanent easements, and fee acquisitions than the other build alternatives.
- Full acquisition and demolition of the existing Pacific Coast Fruit Company building (Map ID 16) to build the NE Couch Avenue extension. Upon project completion, the parcel could be resold and redeveloped. See the comment under Enhanced Seismic Retrofit Alternative impacts for relocation considerations. (All the other build alternatives would avoid this impact.)
- Require full acquisition of the courtyard and multiuse path (Map ID 20) located north of the Yard building for the connection to NE Couch Avenue. (All the other build alternatives would avoid this impact.)

- Require partial acquisition of Yard (Map ID 21) and Slate (Map ID 25) properties for the connection to NE Couch Avenue. Neither building would be impacted. (All the other build alternatives would avoid these impacts).
- Permanent right-of-way impacts from the new adjacent elevated bridge, which would be situated within 2 to 5 feet of three existing buildings: Yard, Eastside Exchange, and Slate. (All the other build alternatives would avoid these impacts).
- Require three additional access closures along NE Couch Avenue during construction when compared with other alternatives.

Additional Impacts from Active Transportation Access Options

The project team is considering multiple options for providing improved pedestrian, bicycle, and ADA connections near both the east and west ends of the bridge. Figures for a range of options are shown in Attachment G of this Draft EIS, and detailed descriptions of the options and impacts are in the *EQRB Active Transportation Access Options Memorandum* (Multnomah County 2021a). Two of the options for the west-side access would displace the existing surface parking area owned by Mercy Corps that is located between its building and the south side of the bridge between 1st Avenue and Naito Parkway. This parking could potentially be replaced under the bridge on land that is currently leased by the University of Oregon from the City of Portland.

Impacts from Potential Off-Site Staging Areas

Four representative sites have been identified as possible off-site staging locations. One of these locations would be used for staging construction materials and then returned to the existing condition following completion of the Project. The sites are identified in Figure 20 in Attachment G and the property information is included in Table 3.3-4.

Table 3.3-4.Off-Site Staging Parcels

Map Label and Name	TLID	Property Owner	Current Use	Staging Acres
A - Willamette Staging Option off Front Ave.	1N1W13 -00205	Atofina Chemical Inc.	Industrial	14.89
A - Willamette Staging Option off Front Ave.	1N1W13 -00206	Atofina Chemical Inc.	Vacant	24.18
B - USACE Portland Terminal 2	1N1E28B -00100	Port of Portland	Industrial	11.70
B - USACE Portland Terminal 2	1N1E28B -00400	Port of Portland	Industrial	16.39
C - Willamette Staging Option off Interstate Ave.	1N1E34AD -01300	Union Pacific Railroad	Rail right-of-way	1.32
C - Willamette Staging Option off Interstate Ave.	1N1E34AC -00400	900 Thunderbird LLC	Industrial	3.18
D - Ross Island Sand and Gravel	1N1E27CB -03000	R B Pamplin Corp. & Subs	Industrial	1.59
D - Ross Island Sand and Gravel	1N1E27CB -02900	R B Pamplin Corp. & Subs	Industrial	0.32

3.3.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

The No Temporary Bridge Option would result in no additional right-of-way impacts and would reduce the project construction time by 1.5 to 2 years, thereby reducing the duration of temporary construction easements and access closures described above.

With a Temporary Bridge

The temporary bridge (regardless of the travel mode option selected) would add an additional 1.5 to 2 years of construction closure to the project duration. It would require two additional temporary construction easements including one for the Bill Naito Legacy Fountain (Map ID 15) and one for a commercial parking lot leased to the Pacific Coast Fruit Company (resulting in a business displacement) (Map ID 22). The temporary bridge would require partial demolition and reconstruction of the Burnside Skatepark under any of the replacement alternatives. The Ankeny Plaza structure (in Tom McCall Waterfront Park) would need to be deconstructed and stored during construction. The temporary bridge would add 1 percent to the total acquisition and relocation right-of-way costs and approximately $60 to $90 million to overall project costs.

3.3.4 Mitigation

Build Alternatives

Table 3.3-5. Potential Mitigation for the Build Alternatives

Topic	Description/Impact to Resource	Potential Mitigation Measure
Property	Acquisitions and displacements	• Identify potential relocation sites for displaced businesses • Coordination with Multnomah County and the City of Portland to identify potential relocation sites for businesses • Identify potential opportunities to reduce property impacts during design • Acquisitions and relocations would be conducted in accordance with the Uniform Relocation and Real Property Acquisition Policy Act of 1970
Property	Design and construction impacts to land uses and their functions	• Comply with local and state land use plans and design guidelines • Comply with Greenway Overlay Zone design guidelines for river resource protection • Comply with local land use permitting (Greenway Overlay Zone) to evaluate impacts of the new Eastbank Esplanade connection
Property/ Parking/ Access	Multiple impacts to parking and vehicular ingress and egress including the Portland Saturday Market building, Mercy Corps, etc.	• Identify potential opportunities to reduce property impacts during design • Prepare a schedule and plan to communicate temporary access closures
Property Access	Makes access to social services difficult	• Identify opportunities to avoid or reduce access impacts through design and construction refinements • Conduct ongoing coordination with social service providers throughout project duration • Provide signage and advanced information about access and transit modifications

Construction Traffic Management Options

Table 3.3-6. Potential Mitigation for Construction Traffic Management

Topic	Description/Impact to Resource	Potential Mitigation Measure
Property	Temporarily displaced land uses	• Compensation and relocation assistance for temporarily displaced land uses

3.4 Land Use

This section identifies existing land use and land use plans, and outlines anticipated project impacts to land use. More detail can be found in the *EQRB Land Use Technical Report* (see Attachment D).

3.4.1 Affected Environment

Land use impacts are analyzed at two scales: the immediate project area including the parcels of land around the bridge, and the much larger Portland metropolitan region.

Commercial and industrial uses occupy the majority of the immediate project area (or direct API), with the remainder a mix of multi-family residential, open space and parks, social services, institutional, parking, right-of-way, and vacant land (see Figure 3.4-1). Social services, historic buildings/sites, and institutional uses are prevalent along the west end of the Burnside Bridge. Governor Tom McCall Waterfront Park, which hosts the Portland Saturday Market, dominates the riverfront area on the west side of the Willamette River. Businesses and multi-family residences lie along E Burnside Street on the east end of the Burnside Bridge. Table 3.4-1 lists the existing land uses by acreage and percentages within the API.

Table 3.4-1. Existing Land Uses in the API

Land Use Type	East (acres)	West (acres)	Total API (acres)	East (%)	West (%)	Total API (%)
Commercial: Office	3.1	0.5	3.6	15.8	4.1	11.5
Commercial: Office/Retail	1.5	1.2	2.7	7.5	10.5	8.6
Commercial: Retail	0.8	1.9	2.7	4.0	15.9	8.4
Industrial	6.7	0.0	6.7	33.5	0.0	21.1
Institutional	0.0	1.7	1.7	0.0	14.7	5.5
Mixed Use	1.8	0.2	2.0	9.1	1.6	6.3
Multi-Family	0.3	0.3	0.7	1.6	2.9	2.1
Park/Open Space	1.6	4.4	6.0	8.0	37.2	18.8
Parking	1.7	0.6	2.3	8.7	5.1	7.4
Right-of-way	0.7	0.0	0.7	3.5	0.2	2.3
Social Services	0.2	0.8	1.1	1.1	7.1	3.3
Vacant	1.4	0.1	1.5	7.1	0.7	4.7
Total	**19.9**	**11.7**	**31.6**	**100.0**	**100.0**	**100.0**

Source: Summarized from the *EQRB Acquisitions and Displacements Technical Report* (see Attachment D).

Zoning on the west end of the Burnside Bridge within the API includes Central Commercial with a design overlay zone, the Central City Plan District, and Skidmore/Old Town Historic District (see Figure 3.4-2). Around the east end of the bridge, zoning consists of General Industrial 1 and Central Employment with a design overlay zone, within the Central City Plan District. The center of the Willamette River extending west landward to SW Naito Parkway is zoned Open Space with design, and river recreational overlays. The eastern side of the Willamette River is zoned Open Space with river general overlay and a scenic resource overlay extending from the center of the bridge northeast. Open Space comprises the land directly east of the river to the railroad tracks.

Figure 3.4-1. Existing Land Use

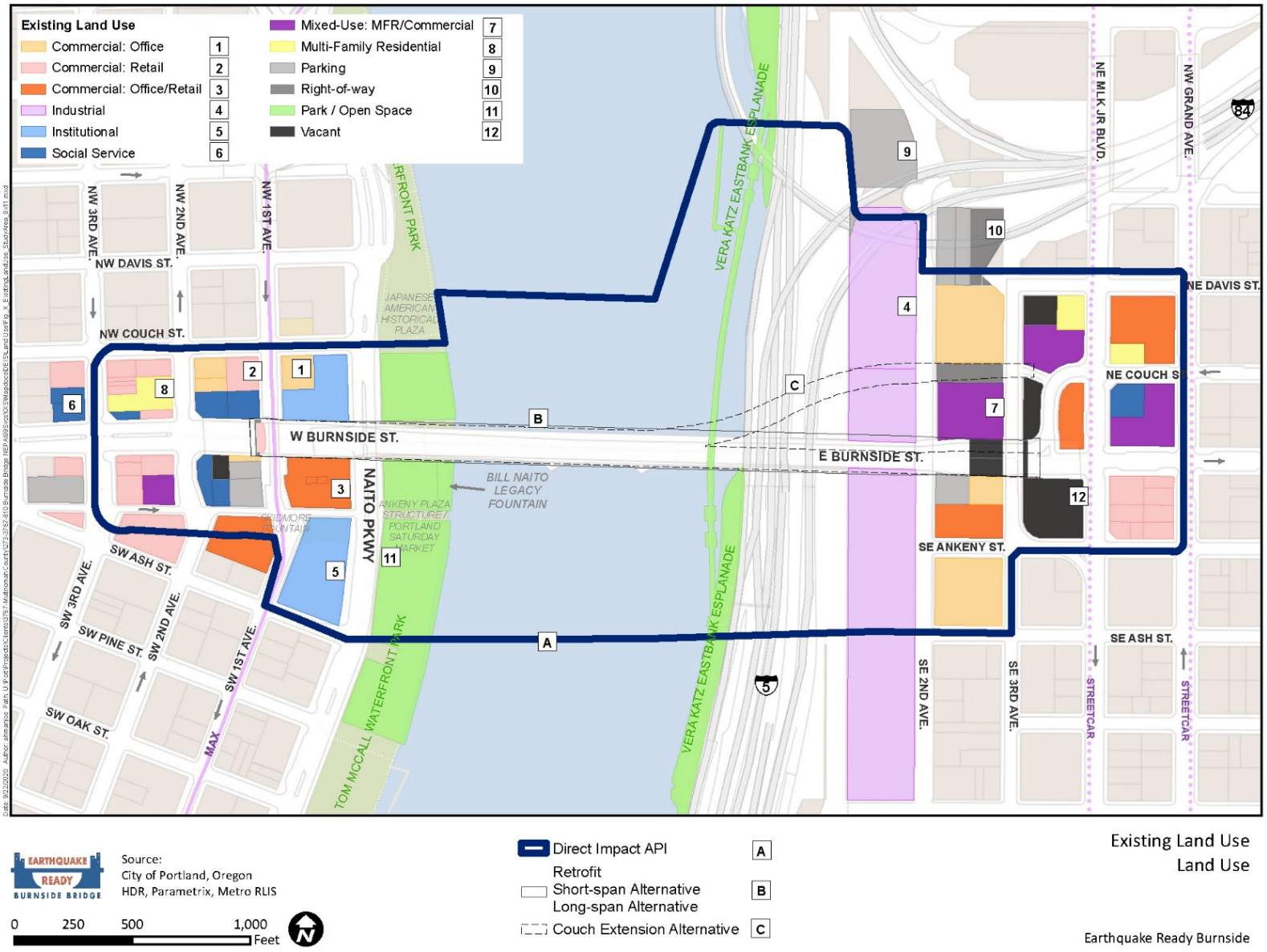
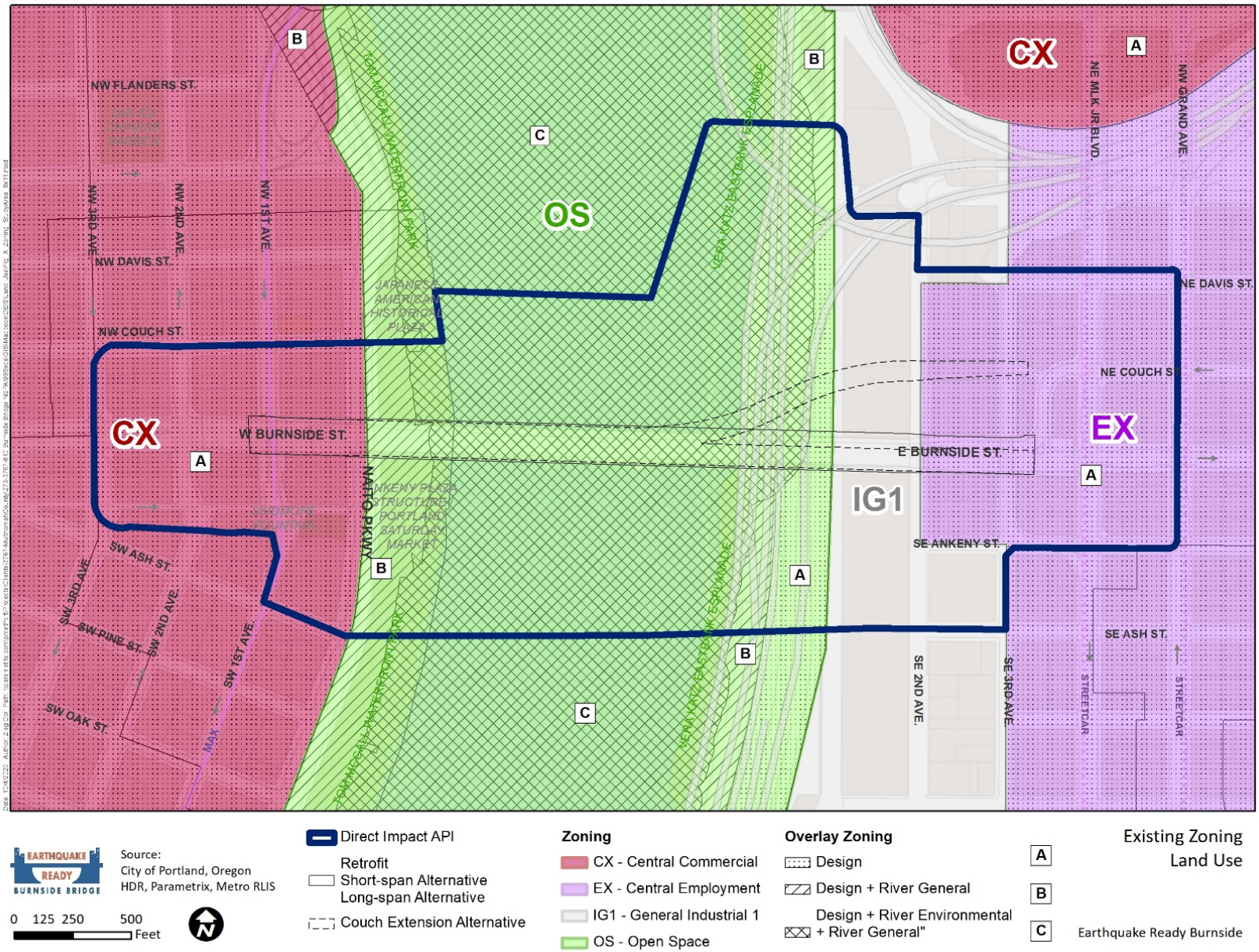


Figure 3.4-2. Existing Zoning



Applicable regional and local land use plans include the City of Portland *2035 Comprehensive Plan*, *Central City 2035 Plan* (when re-adopted), the Metro *2040 Growth Concept*, and Metro *2018 Regional Transportation Plan* and *Regional Framework Plan*. The City of Portland *2035 Comprehensive Plan* provides long-range planning and retains Commercial, Industrial, Central Employment, and Open Space as the primary designations for the area. The *Central City 2035 Plan*[1] addresses planning within the Central City area and recommends classifying the Burnside Bridge as a major emergency response route, major transit priority street, major city bikeway, and city walkway. The Metro *2040 Growth Concept* shows W/E Burnside Street designated as a Main Street and the existing high capacity transit running through the API on the west side of the river. The Metro *2018 Regional Transportation Plan* identifies the importance of the regional transportation system including bridges crossing the Willamette River to support an interconnected system and planned land uses. Metro's *Regional Framework Plan* unites all of Metro's adopted land use planning policies with an objective to focus growth and transportation investment in designated 2040 growth areas, which includes Portland's Central City area.

3.4.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

With the No-Build Alternative, development trends are expected to continue, consistent with relevant local plans. In addition, should a major CSZ earthquake occur, the No-Build Alternative would result in bridge failure limiting access for emergency response and restricting recovery efforts. Access to social services, commercial land uses, and educational institutional use in other parts of the city would be severely affected by a failed bridge, inhibiting the long-term goals of the local comprehensive plans. The No-Build Alternative is inconsistent with the *Central City 2035 Plan* recommendation classifying the Burnside Bridge as a major emergency response route.

Impacts Common to All Build Alternatives

Direct – All of the build alternatives would require property acquisitions/displacements and easements (please refer to Table 3.3-1). No residential displacements would be required. The build alternatives are consistent with the *Central City 2035 Plan* and Metro's *2040 Growth Concept* for the following reasons*:*

- The build alternatives support the goals of designating Burnside as a major emergency response route and supporting bicycle and pedestrian connections.
- The build alternatives would provide redevelopment opportunities on affected lots that would allow for development consistent with existing plans.
- The build alternatives would not change travel patterns or traffic volumes and so would not induce land use changes that might be inconsistent with existing plans.

Additionally, the build alternatives are consistent with Oregon Statewide Goal 5 by maintaining open spaces within Tom McCall Waterfront Park and the Vera Katz Eastbank Esplanade. All build alternatives would need to comply with Title 33 Zoning codes and development standards. A Type II or Type III land use review and a Type IV Demolition Review procedure would be required.

All build alternatives would require either full/partial acquisitions or business displacements for three parcels designated IG1 (General Industrial) zoning in which the primary purpose is to provide land for a variety of industrial purposes. These parcels include, Pacific Coast Fruit Company (1N1E34DA -01500), Rose City

[1] The Oregon Court of Appeals remanded the Central City 2035 Plan on March 16, 2020. The City plans to address the necessary changes related to allowed heights in the New Chinatown/Japantown Historic District and readopt the Central City 2035 Plan.

Transportation (1N1E34DA -01900), and American Medical Response (1N1E34DD -01000). Please refer to Table 3.3-1 for more information.

The IG1 zone restricts other uses to prevent potential conflicts and to preserve land for industry. Nearly all the industrial land the Project would acquire would be available for redevelopment with industrial uses after construction is complete so there would not be an indirect effect.

Vacant tax lot 1N1E34CD-00100 (R180200460) at 118–124 W Burnside Street would not be available for potential new development as it would maintain a permanent right-of-way for a transportation use for light rail pedestrian access.

Indirect – Anticipated acquisitions and displacements associated with the build alternatives could provide limited redevelopment opportunities to support intense high-density development in the area for housing and a mix of employment and commercial opportunities which is consistent with the Metro *2040 Growth Concept* and current zoning regulations. In the entire API, there are 16 lots, identified as potential sites for new development or redevelopment to a more intensive use. These are discussed further in Section 3.4.4, Mitigation.

Temporary – All of the build alternatives would cause temporary construction-related impacts including temporary easements and access impacts, changes to noise levels, dust, visual changes, and traffic detours and congestion. Several staging areas would be used temporarily during construction, disrupting their current land use functions including Tom McCall Waterfront Park north to the Japanese American Historical Plaza, and use of the Mercy Corps parking lot. Indirect impacts are anticipated to be minor with all the build alternatives as there are no long-term travel pattern, bridge capacity, or connection changes.

Post CSZ Earthquake – All the build alternatives would provide a lifeline route across the Willamette River by preventing bridge failure and reducing damage to adjacent buildings, thereby improving survival rates and supporting long-term recovery efforts consistent with the Central City 2035 Plan's recommendation classifying the Burnside Bridge as a major emergency response route. Initial debris clearing could potentially block access to adjacent land uses. After the immediate short-term recovery uses of the bridge following a major CSZ earthquake, non-disrupted access to the Central City could help expedite post-earthquake redevelopment and stimulate growth to the area to meet goals identified in the *2035 Comprehensive Plan*.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would impact 0.04 acres of commercial, 0 acres of institutional, 1.63 acres of industrial, 0.3 acres of parking, and 0.08 acres of vacant land uses by full and partial acquisitions with permanent conversions of land use types to transportation use shown in Table 3.4-2. This alternative would also permanently remove the Burnside Skatepark (all other alternatives avoid this). The land impacts to the Burnside Skatepark are not reflected in Table 3.4-2 as it is not a designated tax lot parcel. The skatepark is a recreational use.

Table 3.4-2. Land Use Types Permanently Converted to Transportation Use by Alternative

Land Use Type	Retrofit Alternative (acres)	Short-Span Alternative (acres)	Long-Span Alternative (acres)	Couch Extension (acres)	Additional with Temporary Bridge (acres)
Commercial	0.04	0.04	0.04	0.07	0
Industrial	1.63	1.63	1.63	3.8	0
Institutional	0	0	0	0	0
Mixed Use	0	0	0	0.11	0
Multi-Family	0	0	0	0	0

Land Use Type	Retrofit Alternative (acres)	Short-Span Alternative (acres)	Long-Span Alternative (acres)	Couch Extension (acres)	Additional with Temporary Bridge (acres)
Park/Open Space	0	0	0	0	0
Parking	0.3	0.3	0.3	0.3	0
Right-of-way	0	0	0	0.27	0
Social Services	0	0	0	0	0
Vacant	0.08	0.08	0.08	0.08	0

Source: Summarized from the *EQRB Acquisitions and Displacements Technical Report* (see Attachment D).

During construction, land use functions for Waterfront Park (and Portland Saturday Market), Japanese American Historical Plaza, and the Mercy Corps parking lot would be disrupted for the shortest amount of time, of 3.5 years, with this alternative (see Table 3.4-3 for construction impact acreage by land use). Extensive use of jet grouting for ground improvements (necessary for all the build alternatives except the Long-span Alternative) could damage or cause settling to the existing surrounding land uses possibly affecting their current land use functions, including the Ankeny Pump Station, Vera Katz Eastbank Esplanade (please refer to the Section 4(f) Evaluation, Attachment M, for more information regarding potential impacts to the Ankeny Pump Station and Esplanade), I-84 ramps, Union Pacific Railroad, and the Rose City Transportation building.

Table 3.4-3. Land Use Types with Temporary Construction Use by Alternative

Land Use Type	Retrofit Alternative (acres)	Short-Span Alternative (acres)	Long-Span Alternative (acres)	Couch Extension (acres)	Additional with Temporary Bridge (acres)
Commercial	0.16	0.18	0.18	0.07	0
Industrial	0.03	0.06	0.06	0.03	0
Institutional	0.01	0.01	0.01	0.01	0
Mixed Use	0.06	0.05	0.06	0.06	0
Multi-Family	0	0	0	0	0
Park/Open Space	1.26	1.24	1.62	1.24	0.68
Parking	0	0	0	0	0.05
Right-of-way	0	0	0	0	0
Social Services	0	0	0	0	0
Vacant	0.28	0.28	0.28	0.28	0

Source: Summarized from the *EQRB Acquisitions and Displacements Technical Report* (see Attachment D).

Replacement Alternative with Short-Span Approach Impacts

In addition to the impacts common to all the build alternatives, the Short-span Alternative would have the same permanent land use impacts as the Retrofit Alternative (see Table 3.4-2)

During construction, this alternative would only require intermittent closures (4 months total) of the Burnside Skatepark and would not permanently displace it. Overall, the Short-span Alternative would have very similar land use construction impacts as the Retrofit Alternative (see Table 3.4-3 for construction impacts by land use designation).

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same acreage of long-term impacts as the Short-span Alternative (Table 3.4-2). However, because it would result in no bridge supports in Waterfront Park it results in an overall increase in area available to the park for recreation or recreation support services use.

During construction, this alternative requires the least amount of groundwork improvements resulting in less ground disturbance and a reduction in possible damage to surrounding land uses. Overall, the Long-span Alternative would have very similar land use construction impacts as the Retrofit Alternative and Short-span Alternative (see Table 3.4-3 for construction impacts by land use designation).

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the Short-span Alternative, with a few differences. This alternative would demolish the existing Pacific Coast Fruit Company building (zoned General Industrial) to build the new bridge. Table 3.4-2 shows that industrial land uses would have 3.8 acres of permanent impact under this alternative compared with 1.63 acres under the other build alternatives. Only a small portion of the parcel would be needed in the long term; upon project completion, the parcel could be resold and redeveloped. The Couch Extension would eliminate a pedestrian and bicycle courtyard and multiuse path located between multi-family residential and office buildings on the east side of the bridge. The multiuse path is within public right-of-way and is not considered a park. The Project would convert the area to a vehicular roadway use, and bicycles and pedestrians would use a new connection. This alternative would require permanent right-of-way impacts to construct the adjacent elevated bridge which would be situated within 2 to 5 feet of three existing buildings: the Yard, Eastside Exchange, and Block 75 (Slate Apartments). The close proximity of the Couch Extension could have a negative effect on residents located in the affected mixed use buildings (see Section 3.18, Noise and Vibration, and 3.12, Visual and Aesthetic Resources, for details). Overall, the Couch Extension Alternative would have very similar land use construction impacts as the other Build Alternatives (see Table 3.4-3 for construction impacts by land use designation).

Impacts from Bicycle/Pedestrian/ADA Access Options

Multiple options are being considered for providing direct bicycle, pedestrian, and ADA access between the west end of the Burnside Bridge and 1st Avenue which crosses under the bridge (see the figures in Attachment G of this Draft EIS and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memorandum* [Multnomah County 2021]). The areas that would be affected under any of the options are all within the Skidmore/Old Town Historic District, the Central City 2035 Plan area, and are designated with the Central Employment base zone, Comprehensive Plan designation, and a Design overlay zone. Impacts generally consider whether the proposed use is consistent with the applicable designations and plans and whether the options are differentiated from the bridge alternatives in the Draft EIS based on these factors.

Option 1 would be very similar to existing conditions, replacing the existing stairs with in-kind stairs on the north and south sides of the bridge. Options 2 and 3, with stairs on the north side and a ramp on the south side, would use the current site of the Portland Saturday Market Administration building. Any of these options would be required to meet standards in the Central City 2035 Plan and Design Standards. This site is also identified as a location with potential for redevelopment by its inclusion in the Buildable Lands Inventory. Use of this location for a ramp structure would eliminate the employment and housing potential of the site.

Options 4 and 5, with in-kind stairs on the north side and a new ramp structure on the south side within the current Mercy Corps parking lot, would require a permanent acquisition of this portion of the Mercy Corps property. Parking could potentially be replaced under the bridge on the parcel currently owned by the City of Portland and leased to the University of Oregon.

Impacts from Potential Off-Site Staging Areas

Based on the four representative sites identified, the types of land use impacts that could occur from off-site staging could be similar to the short-term construction-related impacts discussed above. Short-term impacts to land use could include potential business displacements; increases in noise levels, vibration, or dust levels; and visual changes which could be inconsistent with existing land uses, although the sample sites identified are all in industrial areas. Temporary area access difficulties could also arise from off-site staging activities.

3.4.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

The No Temporary Bridge Option temporary land use impacts are described above for each alternative and summarized in Table 3.4-3. Having no temporary bridge would reduce the amount of land needed for staging within Tom McCall Waterfront Park (preserving four mature trees in the process) and would not require using parking lot space on the east side for bridge construction. The shorter construction duration would allow visitors to use parks and open spaces located in the project area sooner.

Although longer trip times and detours could have adverse impacts on businesses and residents, the project location within central Portland provides a robust transportation network that allows for flexible access routes, minimizing the adverse impacts. Please refer to Section 3.1, Transportation, for additional information.

With a Temporary Bridge

Building a temporary bridge (regardless of the travel mode option selected) would add 1.5 to 2 years of construction closures to the land uses shown in Table 3.4-3. A temporary bridge would result in 0.73 acres of additional land affected in park/open space land and vacant land.

The temporary bridge would impact park and open spaces by requiring partial demolition of the Burnside Skatepark and the Ankeny Plaza structure (in Tom McCall Waterfront Park) would be deconstructed and stored during construction. Reduced travel times from the temporary bridge and a shorter, more direct access route could help maintain visitor traffic and decrease the adverse impacts to commercial and residential uses within the project area.

3.4.4 Mitigation

Build Alternatives

Displaced land uses could be mitigated by using parcels that are either vacant or significantly underutilized. In the entire API, there are 16 lots, identified as potential sites for new development or redevelopment to a more intensive use. Of these lots, 3 are currently used for parking, 2 are vacant, 1 is right-of-way, and 10 are used for office, retail, or combination of the two, as shown in Figure 3.4-3 and Table 3.4-4. Also see mitigation in Section 3.3, Acquisitions and Relocations.

Figure 3.4-3. Potential Redevelopment Lots

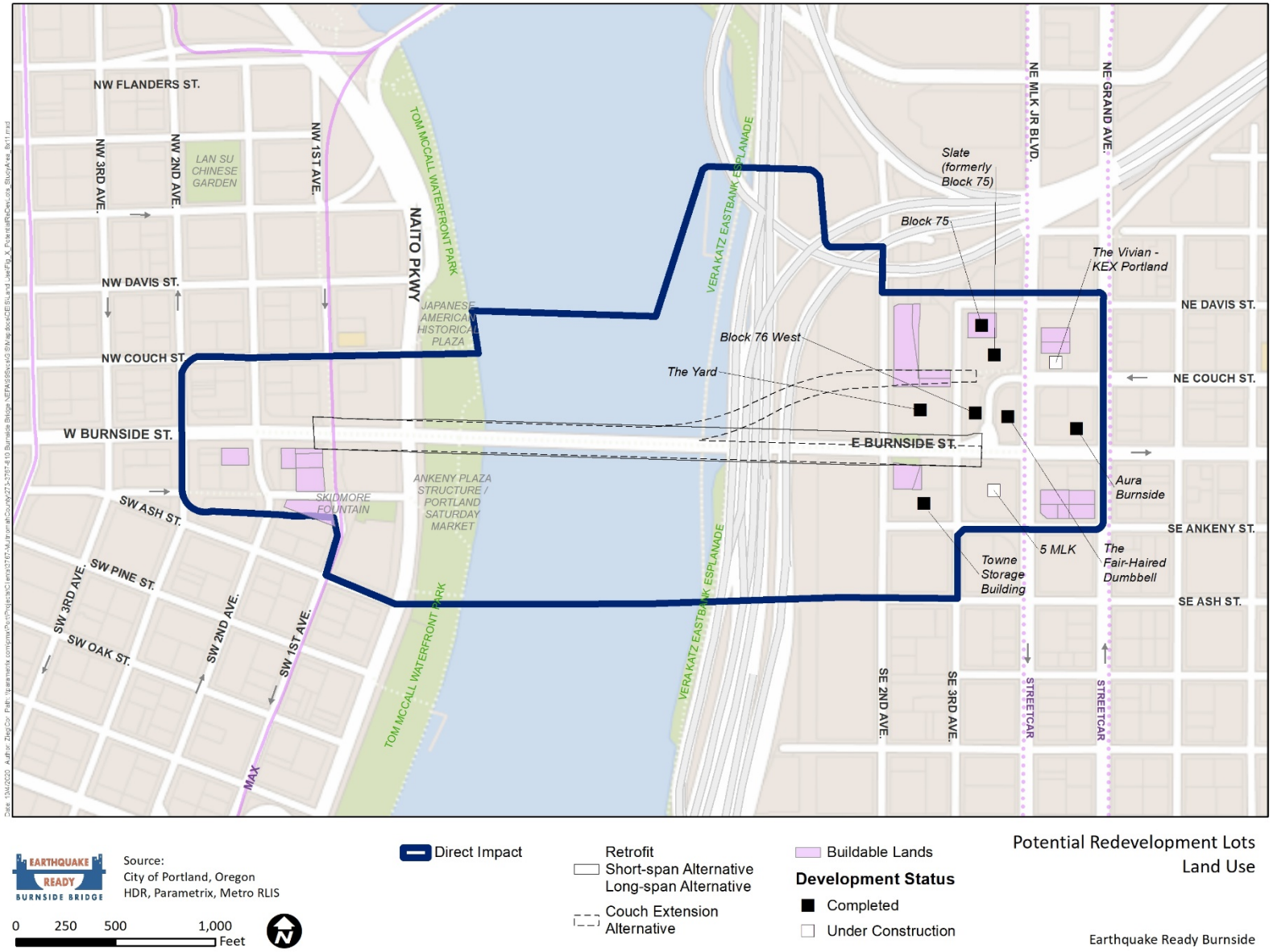


Table 3.4-4. List of Potential Redevelopment Lots

RNO	SITEADDR	SITECITY	SITEZIP	LANDVAL	BLDGVAL	TOTALVAL	YEARBUILT	TAXCODE	SALEDATE	SALEPRICE	X_COORD	Y_COORD	GIS_ACRES	Bridgehead (east / west	Zoning	Business Name	PMX_LandUse	Redevelopable
R180200340	25 SW 1ST AVE	PORTLAND	97204	$1,066,810	$173,580	$1,240,390	1999	708		$0	7645575	684136	0.185916	West	CX - Central Commercial	Parking	Parking	Yes
R180200360	108 WI/ W BURNSIDE ST	PORTLAND	97209	$716,860	$13,610	$730,470	0	708		$0	7645573	684202	0.109046	West	CX - Central Commercial	Parking (Saturday Market Bathrooms)	Parking	Yes
R180200380	108 W BURNSIDE ST	PORTLAND	97209-4008	$241,190	$136,810	$378,000	1890	708		$0	7645571	684236	0.038088	West	CX - Central Commercial	Saturday Market HQ	Commercial: Office	Yes
R180200460	118-124 W BURNSIDE ST	PORTLAND	97209	$555,520	$0	$555,520	0	708		$0	7645501	684213	0.082203	West	CX - Central Commercial	Vacant	Vacant	Yes
R180201400	9-13 SW 2ND AVE	PORTLAND	97204	$906,730	$419,730	$1,326,460	1900	889		$0	7645313	684224	0.129758	West	CX - Central Commercial	Liberation Street Church + X Ultra Lounge	Commercial: Retail	Yes
R226504120	NE 2ND AVE	PORTLAND	97214	$720,660	$33,250	$753,910	0	884	200403	$230,000	7647678	684089	0.200097	East	EX - Central Employment	NA	Parking	Yes
R226504320	102 NE 2ND AVE	PORTLAND	97232-3479	$588,310	$642,530	$1,230,840	0	884	201208	$2,300,000	7647740	684433	0.273192	East	EX - Central Employment	NA	Right-of-way	Yes
R226504340	123 NE 3RD AVE	PORTLAND	97232-2974	$4,058,580	$22,449,230	$26,507,810	1926	884	201208	$2,300,000	7647743	684577	1.047224	East	EX - Central Employment	Exchange Ballroom + Offices	Commercial: Office	Yes
R226504950	111 WI/ NE M L KING BLVD	PORTLAND	97232	$1,951,790	$358,600	$2,310,390	0	884		$0	7647955	684613	0.198964	East	EX - Central Employment	NA	Vacant	Yes
R226507150	400 WI/ E BURNSIDE ST	PORTLAND	97214	$797,050	$0	$797,050	0	884	201808	$9,240,000	7648196	684004	0.114887	East	EX - Central Employment	Subaru of Portland	Commercial: Retail	Yes
R226507160	400 WI/ E BURNSIDE ST	PORTLAND	97214	$446,350	$0	$446,350	0	884	201808	$9,240,000	7648177	683956	0.064358	East	EX - Central Employment	Subaru of Portland	Commercial: Retail	Yes
R226507170	400 WI/ E BURNSIDE ST	PORTLAND	97214	$318,820	$0	$318,820	0	884	201808	$9,240,000	7648225	683953	0.045913	East	EX - Central Employment	Subaru of Portland	Commercial: Retail	Yes
R226507180	400 WI/ E BURNSIDE ST	PORTLAND	97214	$717,350	$0	$717,350	0	884	201808	$9,240,000	7648290	683951	0.103306	East	EX - Central Employment	Subaru of Portland	Commercial: Retail	Yes
R226507190	400 WI/ E BURNSIDE ST	PORTLAND	97214	$717,350	$0	$717,350	0	884	201808	$9,240,000	7648291	684001	0.103308	East	EX - Central Employment	Subaru of Portland	Commercial: Retail	Yes
R226507340	107 NE GRAND AVE	PORTLAND	97232-2936	$4,421,560	$4,425,750	$8,847,310	1927	884		0	7648267	684560	0.734884	East	EX - Central Employment	Shape Hair Design, Starks Vacuum, Cup and Bar	Commercial: Office/Retail	Yes
R667704700	120 SW ANKENY ST	PORTLAND	97204-3564	$5,592,800	$4,525,220	$10,118,020	1872	708	201709	$20,750,000	7645566	683993	0.583427	West	CX - Central Commercial	Mandarin House, Oregon DHS, Pho TNT, others	Commercial: Office/Retail	Yes

3.5 Economics

3.5.1 Affected Environment

The API for socioeconomic data is represented by three census tracts intersected by the proposed Project: Census Tract 21, Census Tract 51, and Census Tract 106 (Figure 3.5-1). However, economic effects of the Project and its construction may extend more broadly across Portland and Multnomah County.

Demographic and Socioeconomic Characteristics

Please see Social and Neighborhood Resources, Section 3.8, for details on demographics and socioeconomic characteristics.

Business Activity

Business activity in the study area was analyzed in terms of the number of establishments, average number of employees, and revenue per establishment by industry. There were 1,340 businesses in the study area that employed a total of over 16,000 people. The largest industry was health care and social assistance with 278 establishments accounting for over 20 percent of total employment. Average revenue across all industries amounted to $2.5 million but varied substantially among industries, from $0.4 million in agricultural-related business, arts, entertainment, and recreation to $13.7 million in manufacturing and $12.6 million in wholesale trade establishments. Business activity was roughly equally distributed across the three census tracts.

3.5.2 Long-Term Impacts from the Bridge Alternatives

No-Build Alternative

The No-Build Alternative would involve primarily maintenance and repairs to ensure that the bridge is fully operational. Minor to moderate economic disruptions, including traffic disruptions with travel-time delays, and impeded access to businesses, social services, and amenities in the local and regional economies could occur during maintenance and repair work.

Under the No-Build Alternative, the existing Burnside Bridge (and all the bridges crossing the Willamette River) is expected to collapse in the next CSZ earthquake. Traffic would not be able to cross the river resulting in economic disruptions in the local and regional economies, including disruptions in the movement of people and goods, disruptions in business operations, as well as disruptions in distributing relief efforts and emergency supplies. Some businesses could be forced to suspend operations resulting in losses in revenue and income. Disruptions could last for weeks, months or longer. See additional discussion in Chapter 1, Purpose and Need.

Figure 3.5-1. Economics Reference Areas and API

All Build Alternatives

Direct – The long-term impacts of the build alternatives are relatively moderate. In particular, no residential displacements or long-term traffic impacts are anticipated. However, for all build alternatives up to six businesses would be displaced: Portland Saturday Market (PSM) Administration and storage space, one classroom at the University of Oregon (area of White Stag), two parking lots operated by Diamond Parking Service, Rose City Transportation parking lot and building, and American Medical Response Ambulance Service. In addition, the build alternatives would also require construction staging on Pacific Coast Fruit Company property, which would displace the current use for more than 12 months, and the Couch Extension Alternative would demolish the building an displace this business. These displacements could be expected to have moderate costs of business relocation and adjustments to new operating conditions. Business revenues could also be affected during the adjustment period.

In addition, all the build alternatives would affect the Burnside Skatepark, as well as require closures of several street-level doors and access points to garages and facilities in the project area. In particular, under the Retrofit Alternative, the Burnside Skatepark would be permanently demolished and relocated. Under other build alternatives, the skatepark would not be demolished but would be unavailable for portions of construction (see Section 3.10, Parks and Recreation). The closure of the skatepark would cause a loss of recreational opportunities and recreational benefits to its users while the closure of street-level access points to garages and facilities would cause inconvenience and possibly some burdens to pedestrians by requiring longer walk times.

The build alternatives are also expected to improve traffic safety in the project area. Specifically, due to changes in the geometry of the bridge roadway, the replacement alternatives would improve safety for automobile, bicycle, and pedestrian traffic on the bridge and bridge approaches. This would lead to a reduction in crashes (including accidents with fatalities and serious injuries), and a reduction in the socioeconomic costs associated with crashes (see Table 3.5-1). The Retrofit Alternative would improve safety only on the west approach.

Table 3.5-1. Comparison of Safety Economic Impacts from Build Alternatives

Alternative	Safety Impacts	Monetary Value (Over 20 Years)
Enhanced Retrofit	Improvements to geometry at west approach and intersections would improve safety for motor vehicles, bicyclists, and pedestrians.	$0.47 million in avoided accidents
Replacement, Short-Span and Long-Span Approach	Greater safety impacts compared to Retrofit. These alternatives would change road geometry of the mid-span and the east approach, improving safety at the locations of past serious accidents.	$61 million in avoided accidents
Replacement with Couch Extension	Somewhat lower reduction in the number of accidents compared to the Short-span and Long-span Alternatives.	$60 million reduction in accident costs

Post CSZ Earthquake – An earthquake resilient Burnside Bridge would improve the resiliency of Portland's transportation network by providing a crossing over the Willamette River that is expected to stand and be usable after a major earthquake. This would help avoid the disruptions resulting under a No-Build Alternative and their associated costs. The overall monetary value of these effects could be substantial. Benefit-cost studies of seismic retrofitting of urban bridges show that these projects can be highly cost-effective with

benefits exceeding costs when both infrastructure restoration costs and socioeconomic disruption costs avoided are taken into account.[1] See additional discussion in Chapter 1, Purpose and Need.

3.5.3 Short-term Impacts from the Build Alternatives

The short-term negative impacts of the build alternatives include various construction-related disruptions, including detours and travel delays to auto, transit, and commercial traffic that use the Burnside Bridge (see Section 3.1, Transportation, for details); impediments in access to certain buildings, businesses, and services in the project vicinity (see Section 3.8, Social and Neighborhood Resources, for impacts); displacements to business operations; temporary closures of parks and amenities in the project vicinity; noise from construction activities; and disruptions to traffic on infrastructure under the bridge (interstate freeways, UPRR rail tracks, TriMet MAX light rail transit, and the Willamette River navigational channel). Construction for the replacement alternatives is anticipated to last 4.5 years, while construction of the Retrofit Alternative would last 3.5 years (without a temporary detour bridge). Thus, economic impacts due to construction would last one year longer under the replacement alternatives than under the Retrofit Alternative. If applicable, different construction periods that would affect specific resources are described below. The key impacts include the following:

- Increase in travel time and travel delay costs for traffic using the Burnside Bridge and other traffic in the vicinity of the Burnside Bridge. The average travel delays to autos are estimated to range between 2.5 to 9.2 minutes per trip depending on the time and direction of travel. Transit trips, bicyclists, and pedestrians crossing the Burnside Bridge are expected to incur average delays of about 3 to 5 minutes, 7.5 minutes, and 16 minutes per trip, respectively.
- Restrictions on TriMet's MAX operations on 1st Avenue around the Skidmore Fountain and closure of the station for a period of up to about 16 weeks requiring provision of shuttle buses. Passengers would likely experience longer travel times, and the transit operator would incur additional operating costs during the closures.
- Closures and restrictions on the navigation channel. The number of closures is estimated at between 2 and 10, each about 3 weeks in duration. During the closures and restrictions, freight shipments using the Willamette River could have to be diverted to trucks thereby increasing transportation costs to shippers.
- Closure of parking lots under the bridge causing inconvenience to motorists as well as a loss of revenue to parking operators and inconvenience to nearby businesses.
- Closure or relocation of PSM from its current location during construction. If PSM cannot be relocated, temporary closure would mean a loss of income for the participating vendors (estimated at over $8 million annually to over 300 members),[2] loss of revenue to Portland Parks and Recreation (PP&R), and temporary loss of a city landmark and tourist attraction.
- Closure of the Vera Katz Eastbank Esplanade for a portion of construction. The shortest possible closure would last for 18 months with the Long-span Alternative, the next shortest would be 26 months with the Retrofit Alternative, and the longest would be 30 months under either the Short-span Alternative or the Couch Extension Alternative. Users of the esplanade would experience longer travel times losing

[1] As an example, see Caltrans, Division of Research and Innovation *Socio-Economic Effect of Seismic Retrofit Implemented on Bridges in the Los Angeles Highway Network*, Report CA06-0145, December 2008. Assuming low to moderate residual link capacity, the benefit-cost ratio was estimated to be greater than one (showing benefits greater than $1 for each $1 of costs) when both restoration costs avoided and disruption costs avoided were taken into account. The benefit-cost analysis of seismic resilience of the Burnside Bridge is not included in the scope of this environmental impact assessment.

[2] Portland Saturday Market website, https://www.portlandsaturdaymarket.com/about/history/ (accessed December 2019).

this transportation option (for active transportation trips) as well as a loss of recreational benefits from using this facility.

- Cancellation of many events in Tom McCall Waterfront Park and the Vera Katz Eastbank Esplanade which would result in a reduction in fee revenues to PP&R as well as revenues to nearby retail and other businesses that benefit from various events. A reduction in the event-related expenditures and business activity may have further multiplier effects throughout the region.
- Disruptions to the Portland Rose Festival, an annual civic festival that includes Fleet Week[3] and the Grand Floral Parade. Each year the festival is estimated to generate $65 million in business revenues across the Portland metro region (Portland Rose Festival 2018). If the festival appears to be less attractive because of the disruptions, festival attendance and visitor expenditures could decrease.

During the construction period, project construction would provide a boost to the local, regional, and state economies through construction activities. Industries that would benefit include the construction industry and various other industries that provide supplies and services to this industry as well as consumer goods to their workers. The location and number of jobs and business revenues would depend on the build alternative selected and on the locations of builders and suppliers awarded the contracts. As an approximation, over the construction period, the impacts in Multnomah County are estimated to exceed a total of 1,500 job-years and $670 million in business revenue (or an equivalent of over 400 jobs and $170 million in business revenues annually). For the entire state of Oregon, the impacts are estimated to exceed 4,100 job years and $1 billion in business revenues (or an equivalent of over 1,000 jobs and $250 million in business revenues annually). The specific impacts for build alternatives without a temporary bridge are shown in the Table 3.5-2 and Table 3.5-3 below.[4]

Table 3.5-2. Economic Impact of Construction without a Temporary Bridge for Multnomah County, Total Over Construction Period

Alternative	Overall Construction Time (Years)	Business Revenue ($M)	Employment Income ($M)	Employment (Job-Years)	Value Added ($M)
Enhanced Retrofit	3.5	$ 676	$ 86	1,580	$ 359
Replacement, Short-span	4.5	$ 746	$ 95	1,743	$ 396
Replacement, Long-span	4.5	$ 746	$ 95	1,743	$ 396
Replacement with Couch Extension	4.5	$ 771	$ 98	1,802	$ 409

Note: Monetary values are in millions of 2017 dollars. Total impacts displayed in the table include direct, indirect, and induced impacts. $M = millions of dollars

[3] http://www.rosefestival.org/event/fleet-week

[4] Impacts for the build alternatives with a temporary bridge are somewhat higher due to higher construction costs but of a similar magnitude and therefore not reported here.

Table 3.5-3. Economic Impact of Construction without a Temporary Bridge for Oregon, Total Over Construction Period

Alternative	Overall Construction Time (Years)	Business Revenue ($M)	Employment Income ($M)	Employment (Job-Years)	Value Added ($M)
Enhanced Retrofit	3.5	$ 1,012	$ 206	4,130	$ 538
Replacement, Short-span	4.5	$ 1,116	$ 227	4,556	$ 594
Replacement, Long-span	4.5	$ 1,116	$ 227	4,556	$ 594
Replacement with Couch Extension	4.5	$ 1,154	$ 234	4,711	$ 614

Note: Monetary values are in millions 2017 dollars. Total impacts displayed in the table include direct, indirect, and induced impacts. $M = millions of dollars

3.5.4 Impacts from Potential Off-Site Staging Areas

Based on the four sample sites identified, the types of impacts that could occur from off-site staging include the following, both of which could result in delays to other traffic using the respective facility:

- Increased truck traffic on roads directly leading to the sites resulting in increased congestion on those roads.
- Increased traffic on the navigation channel with possible closures and restrictions when moving large volumes of materials and equipment.

3.5.5 Impacts from Construction Traffic Management Options

Impacts without a temporary bridge are the same as those described above in Section 3.5.2. The temporary bridge options offer a possibility to reduce traffic delay impacts to the users of the Burnside Bridge and in the project vicinity. However, there would be construction-related disruptions due to the additional work elements needed to construct the temporary bridge that would intensify the economic impacts of the Project and add an additional 1.5 to 2 years of construction. Additional disruptions could include:

- Closure time of the esplanade would increase by about 4 months under each alternative, which could further impact events and event revenue.
- Two additional closures on the Willamette River navigation channel of up to 2 weeks each would occur which could increase costs to shipping and cruise operations, but only by a small amount.
- Longer access restrictions in Tom McCall Waterfront Park could further impact PP&R revenue.
- Longer closure or temporary relocation of PSM would likely be required which could further impact PP&R and vendor revenue.

The temporary bridge could reduce the impact on the annual Portland Rose Festival parade. The Grand Floral Parade, with its traditional route over the Burnside Bridge, could potentially be re-routed to the temporary bridge with only small impacts to the character of that parade (subject to review of feasibility).

3.5.6 Mitigation

For all the build alternatives, mitigation measures to reduce the negative economic impacts could include a combination of signage and advanced information about detours and closures to allow travelers to plan their trips in advance, signage and other communications directing customers of affected businesses to alternate access points, relocation assistance to displaced businesses, and development of construction approaches that could reduce the overall extent and duration of construction noise, street closures, park closures, and crossing closures. Mitigation measures specific to other resources could benefit economic resources as well.

3.6 Public Services

This section identifies existing public service resources and outlines anticipated project impacts to those resources. More detail can be found in the *EQRB Public Services Technical Report* (see Attachment D).

3.6.1 Affected Environment

The API for the public services analysis extends approximately 0.5 miles out from the project area. Public service resources in the API include Portland Fire and Rescue, the Portland Police Bureau, the University of Oregon, American Medical Response, and the Multnomah County Sheriff's Office River Patrol Unit (see Figure 3.6-1 and Figure 3.6-2).

Public Safety and Emergency Response

Portland Fire and Rescue (PF&R) – PF&R provides fire, emergency medical, and special response services to approximately 583,830 people covering an area of approximately 152 square miles. Station No.1 is home to the only technical rescue team in the project area. This team has special training and special apparatuses in their vehicles, including those that assist in high-angle rope rescue. The next closest technical rescue team is Station No.12, which is outside the API at Sandy Boulevard and NE 87th Avenue. According to the *Portland Fire & Rescue Strategic Plan/Coggle 2017–2020* (City of Portland 2017), the goal for response time to an emergency (the time from dispatch to arrival on the scene) is 5 minutes 20 seconds or less, 90 percent of the time. Response times when the Burnside Bridge is open or closed are generally the same. In the event of a bridge closure or bridge lift, PF&R would dispatch from an alternate location with better access.

Portland Police Bureau (PPB) – PPB is composed of 23 units and provides law enforcement and response to 911 emergency calls throughout the city of Portland. Crimes are tracked on a monthly basis and reported using the National Incident-Based Reporting System maintained by the Federal Bureau of Investigation. The Central Precinct is located on the border of the API at 1111 SW 2nd Avenue. In addition, portions of four different police districts are located within the API: District 830 (southwest portion of the API), District 711 (east and southeast portions of the API), District 690 (northeast portion of the API), and District 822 (northwest portion of the API). The average response time for high-priority incidents is approximately 8 minutes, approximately 17 minutes for medium-priority incidents, and approximately 45 minutes for low-priority incidents. No designated standard operating procedures for emergency response are in place, and the route taken to address a call is at the officer's discretion.

American Medical Response (AMR) – AMR is a privately owned medical transportation service with locations nationwide. The AMR building in Portland is located at 1 SE 2nd Avenue. A portion of this facility is directly under the east approach of the existing Burnside Bridge. The building is used as a communication and dispatch center for crews and ambulances for Multnomah, Clackamas, and Clark Counties, as well as for vehicle maintenance and administrative offices for Multnomah County. Approximately 100 vehicles are dispatched out of this facility, and the branch employs approximately 290 people, 40 of whom hold administrative positions. It is estimated that AMR vehicles cross the Burnside Bridge approximately 20 to 50 times per day; however, that number fluctuates based on several variables. Conversations with AMR representatives indicated that vehicles are dispatched from this location in a system status format, where units regularly cross the Burnside Bridge and are constantly moving through the area depending on 911 call volume and ambulance availability. While there are no pre-determined routes, AMR attempts alternate access whenever necessary. Similar to PF&R, in the event of a bridge closure or bridge lift, AMR attempts to dispatch from locations with better access (McDonald 2020).

Figure 3.6-1. Direct Impact API

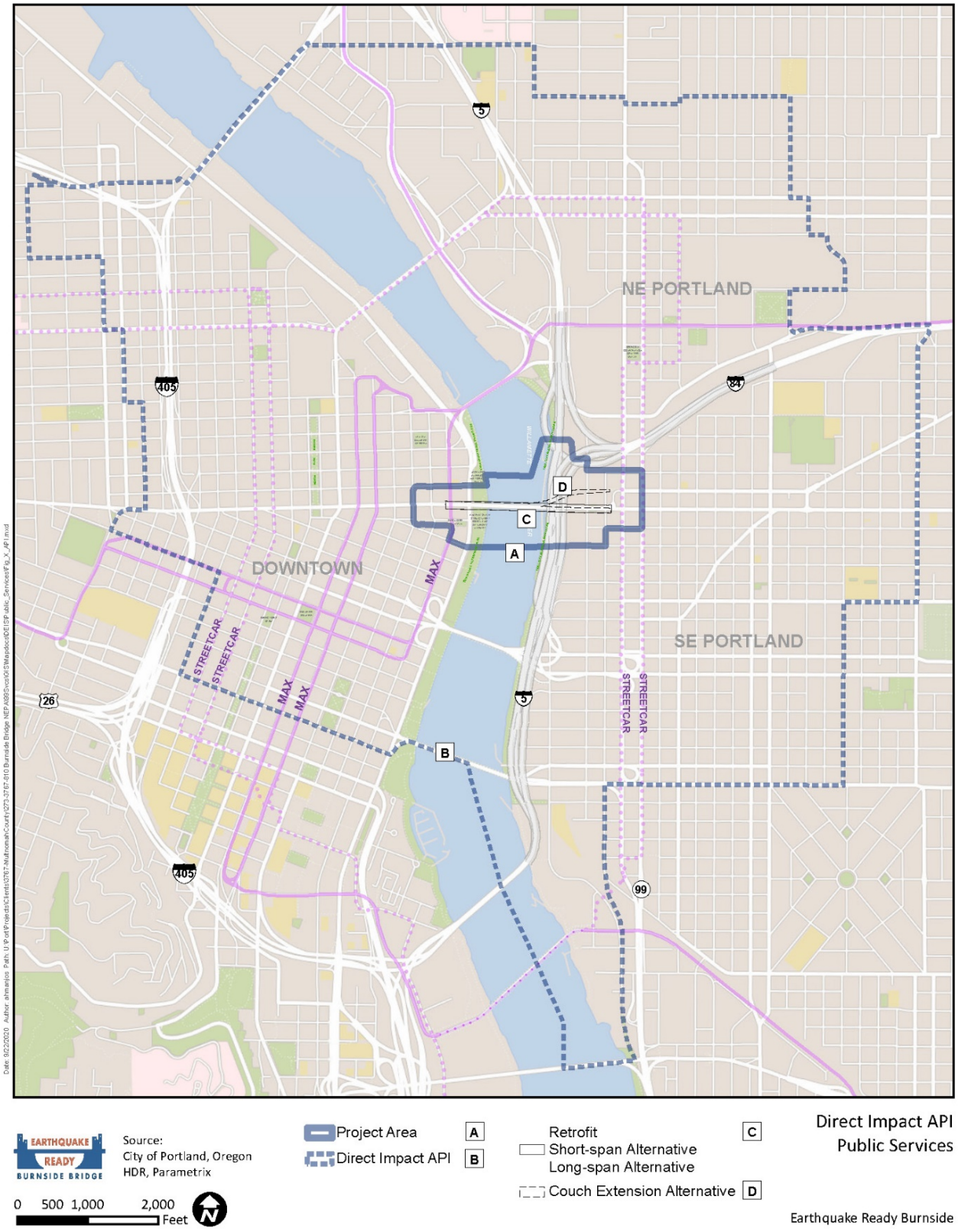
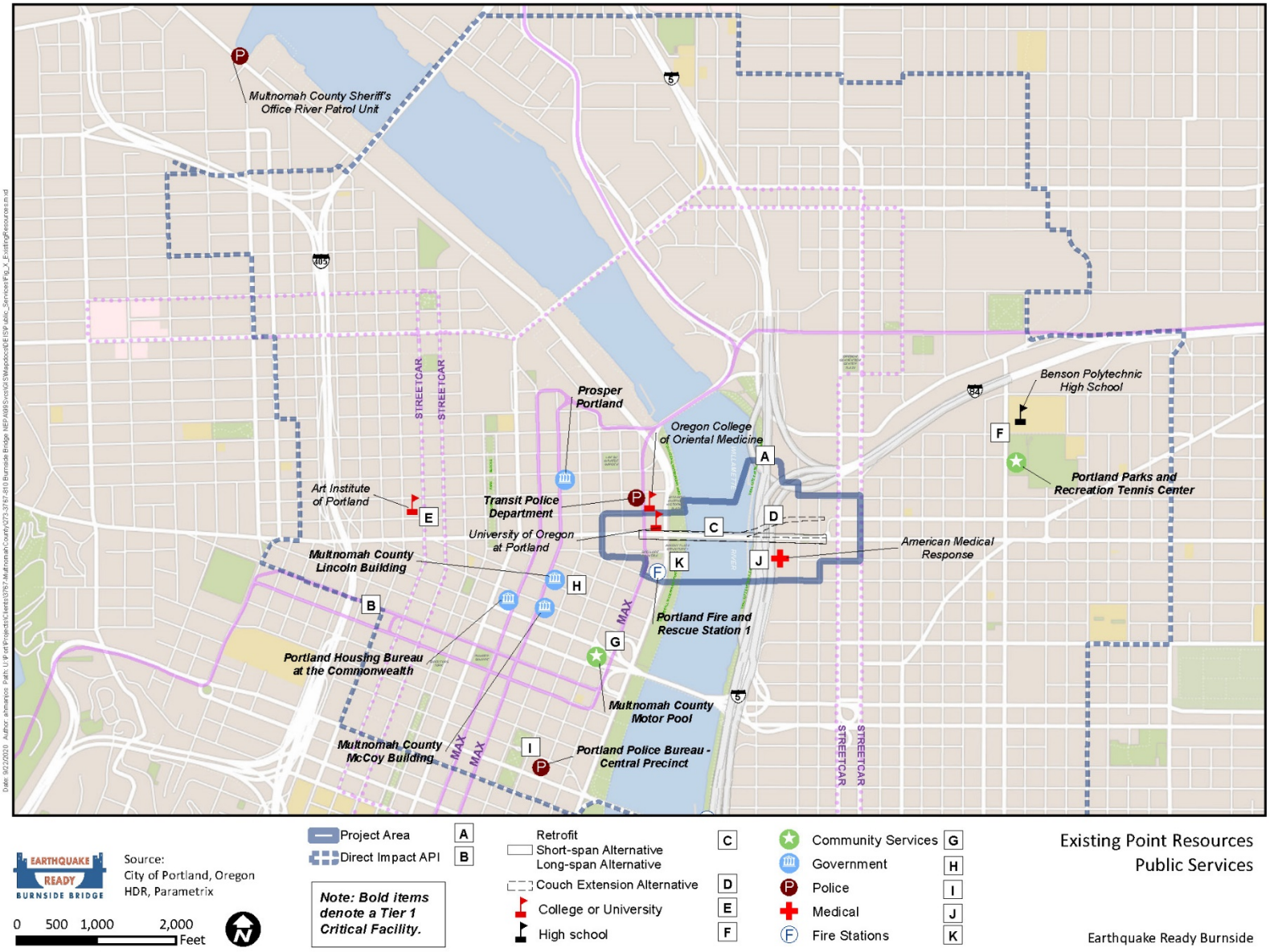


Figure 3.6-2. Existing Point Resources



Multnomah County Sheriff's Office River Patrol Unit – The Multnomah County Sheriff's Office River Patrol Unit is located at 2200 NW Front Avenue. While the office itself is not located in the Direct Impact API, portions of the Willamette River that are patrolled by this unit are. The Sheriff's River Patrol Unit partners with the Oregon State Marine Board (OSMB), the Port of Portland, and the US Coast Guard to provide safe commercial and recreational access and passage to the 110 miles of county waterways along the Columbia River, Willamette River, Sandy River, and Multnomah Channel (Multnomah County Sheriff's Office n.d.). Marine deputies respond to all life-threatening marine calls for service such as boat collisions, drowning, missing persons, and environmental hazards. Deputies also provide boater safety education and intervention through classroom instruction, boat inspections, and enforcement activities. This unit provides critical infrastructure security protection along Multnomah County waterways. The River Patrol Unit is key to emergency preparedness on/near the regional waterways and it participates in numerous agency collaborations.

Educational Resources

Founded in 1851, Portland Public Schools (PPS) currently enrolls over 49,000 students at 81 schools and employs approximately 8,400 people in the city of Portland. One PPS school, Benson Polytechnic High School (grades 9 to 12), is located within the API on the east side of the Willamette River. Benson is scheduled to be renovated from the summer of 2021 to 2024 and would operate from another location (outside the API) during that time period, which is expected to overlap with project construction. No PPS buses use the Burnside Bridge (Nevius 2020).

Two public higher education facilities are located within the API on the west side of the Willamette River: Portland Community College (PCC) – Downtown Center, and the University of Oregon at Portland campus. PCC is located at 722 SW 2nd Avenue, southwest and outside of the project area and is therefore not discussed further in this report.

The Portland Art Institute and Oregon College of Oriental Medicine are also located within the API; however, these are private education facilities and are therefore not discussed further in this report.

University of Oregon – The University of Oregon at Portland campus, an extension of the main campus in Eugene, is located in the White Stag building, just northwest of the Burnside Bridge and within the project area, and the 109 NW Naito Building, just outside of the project area. An additional public parcel at the west approach leased by the University of Oregon is currently developed as retail space. The University of Oregon at Portland uses approximately half of the White Stag building for classrooms, laboratories, meeting rooms, offices, and event spaces. Approximately 400 students and 100 staff members use the building daily.

Hospitals and Clinics

Public hospitals that provide emergency services are located on both sides of the Willamette River, but none is located within the API. Because these facilities are located outside the API and there are multiple routes from which to access them, further discussion of hospitals and clinics is not included in this report.

Post Offices

There are no US Post Offices in the project area. Three post offices are in the API (outside the project area) at 204 SW 5th Avenue, 1020 SE 7th Avenue, and 715 NW Hoyt Street.

Waste Disposal

Businesses and residents can subscribe to solid waste disposal services (garbage, recycling, and compost) from a permitted collection company. For businesses, rates are not set by the City of Portland, and

businesses are able to negotiate service level, frequency, and cost. For residential collection services, the City sets rates and service options and oversees the permitted collection companies.

3.6.2 Impacts from Bridge Alternatives

No-Build Alternative Impacts

Transportation infrastructure damaged by an earthquake impairs the long-term ability of a region to recover economically and socially after a disaster. The transportation network is a critical factor in providing public services, particularly in providing emergency and police services. Lack of a resilient river crossing would inhibit the ability for emergency response to act in a timely manner and would lead to delays in the long-term recovery rate. Delayed recovery would result in delayed return of jobs and population, which in turn would potentially result in lowered school enrollment; increased demand for police, fire, and other emergency services; and lower revenue to fund these services.

Prior to the next major earthquake, the No-Build Alternative would cause no permanent conversion of public service uses to another use, and no changes in permanent access from the Burnside Bridge to the public service resources would occur.

This alternative assumes regular maintenance would continue to occur on the bridge, and in some cases, this maintenance work would occur over and adjacent to areas of the University of Oregon retail space and the AMR building. In general, agencies could attempt to schedule maintenance work that would temporarily restrict access to the least busy times of the year for these facilities, but as the bridge ages and maintenance needs become more frequent and widespread, that may not be possible.

Impacts Common to All Build Alternatives

Direct – All the build alternatives would permanently impact one public school site (the standalone University of Oregon retail space) and one emergency response facility (AMR). While the impacts vary slightly across the alternatives, they would all ultimately require the University of Oregon retail space and the AMR to relocate.

Indirect – All the build alternatives would provide an east-west connection over the Willamette River to speed the movement of emergency services, goods, and recovery throughout the wider Portland region. In general, the build alternatives would significantly improve post-earthquake traffic mobility and access because the bridge would remain functional; thus, response times for mobile public services relying on the Burnside Bridge would be positively affected compared with No-Build Alternative post-earthquake conditions. Compared to the No-Build, the build alternatives would allow normal day-to-day life, including public services, to return at a faster rate and would reduce the potential for lowered school enrollment and long-term loss of jobs, commerce, and revenue.

Public service providers evaluate future population growth and calculate needed future service increases such as increased numbers of police officers, new equipment, or new station locations. Because the Project would not change the location or capacity of the crossing, no induced changes are anticipated to density in downtown Portland, and therefore, the Project would not impact individual long-range service plans in a pre-earthquake scenario.

Temporary – All the build alternatives would require temporary highway lane closures in order to demolish and replace the Burnside Bridge over I-5 and I-84. Lane closures are anticipated to occur during limited evening hours or on weekends, with dozens of closure sessions anticipated. Up to 10 weekend closures could be required, depending on the specific alternative.

All the build alternatives would require a temporary construction easement (TCE) for the University of Oregon White Stag building directly north of the west approach. This impact would occur only during

construction, and is the same for all the build alternatives without a temporary bridge. The addition of a temporary bridge to all the build alternatives would not result in additional impacts to public service facilities; however, it would extend the length of time that construction-related river safety and security measures would need to be enforced by the River Patrol Office and the OSMB, as a temporary bridge expands the Boundary of Potential Construction Impacts to include an additional area in Waterfront Park, south of the bridge, for all the build alternatives. The specific build alternative construction activities and duration of construction time vary within this boundary, but this is the area where public service users and employees could expect to encounter altered or restricted access to respective public service facilities during construction. The discussion below identifies temporary impacts to specific public service resources affected.

Portland Fire Station No.1 – During construction of any of the build alternatives, there would likely be short-term restrictions on Naito Parkway, but direct access to Naito from the fire station would be maintained throughout construction. Short-term restrictions during construction could block direct access from the fire station to northbound Naito Parkway, but southbound access to other routes would always be maintained. While there are no designated routes per se, Portland Fire Station No.1 does not typically use northbound Naito Parkway to reach destinations north of the bridge; rather, they exit their facility by heading south on Naito Parkway first before heading north. Therefore, closure of the bridge during construction is not anticipated to affect response times.

Portland Rescue Mission – Emergency services visit the PRM multiple times per week via one of their access doors on Burnside Street. A minor TCE at this location would be required under all the build alternatives for staging and/or bridge construction; this would impact ambulance services that need to access this location. It could be possible for ambulances to access the building from the corner of Burnside Street and NW 2nd Avenue while the bridge is closed to traffic. For more information regarding PRM, please refer to the Section 3.8, Social and Neighborhood Resources. For more information regarding road closures, please refer to Section 3.1, Transportation.

Willamette River – During construction of any of the build alternatives, the Willamette River navigation channel would remain open except for short-term closures. For boater safety, the project team would create an exclusion area, which would be approved by the US Coast Guard, to restrict recreational boaters from entering dangerous active construction zones. This would generally include a 200-foot area around all active construction components including the work bridges, barges, piers, etc. It is too early in project planning to specify exactly when and how long each instance of exclusion would last; however, it is estimated that each closure could be up to 3 weeks in duration, and the number of closures could range from 2 to 10 over the full length of construction depending on the type of bridge lift chosen. A vertical lift would require fewer river closures while a bascule lift would require more. Closures would apply to all vessels; however, accommodations would be made for emergency vessels. Boater restrictions would be communicated with OSMB staff and the River Patrol Unit more than 30 days prior to the added restrictions that are needed to allow for the agencies to develop necessary regulations and notices. Boater communication could also be disseminated through the US Coast Guard weekly Local Notice to Mariners.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would require a permanent easement at the retail space leased by University of Oregon and owned by the City. As with the other alternatives, this alternative would require this facility to relocate.

Replacement Alternative with Short-Span Approach Impacts

Compared to the permanent easement required by the Retrofit Alternative, the Short-span Alternative would require a permanent full acquisition of the retail space that is currently leased by the University of Oregon. As with the other alternatives, this alternative would require this facility to relocate.

Replacement Alternative with Long-Span Approach Impacts

Impacts to public service facilities would be the same as for the Short-span Alternative.

Replacement Alternative with Couch Extension Impacts

Impacts to public service facilities would be the same as for the Short-span Alternative.

Impacts from Potential Off-Site Staging Areas

Based on the representative sites identified, the types of public service impacts that could occur from off-site staging include additional areas of Willamette River recreation boating restrictions. These could be limited to restricted areas near the shore of staging areas and around construction barges moving to and from the staging areas. If a contractor chooses to use a Willamette River staging option, coordination with OSMB and the River Patrol Unit would be required to implement and enforce regulations regarding boater safety.

3.6.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, public services that use the Burnside Bridge would need to redirect their cross-river response and service trips onto adjacent bridges during construction or use alternative facilities on either side of the bridge. While traffic detours would cause periodic delays for general traffic, the impacts to emergency service response are anticipated to be small. As described above, many services can dispatch vehicles from either side of the river, and because motorists are required to yield right-of-way to emergency response vehicles that are using audible and/or visual signals, emergency vehicles would be substantially less affected by congestion compared to other motorists.

PF&R and AMR – PF&R response times when the Burnside Bridge is open or closed are generally the same, and in the event of a bridge closure, PF&R would dispatch from an alternate location with better access to the destination. Furthermore, access to destinations north of the Burnside Bridge is achieved using alternate routes via southbound Naito Parkway, as described above.

As with PF&R, vehicles that are dispatched from the AMR location regularly cross the Burnside Bridge and are constantly moving through the area depending on 911 call volume and ambulance availability. While there are no pre-determined routes, AMR and PF&R use alternate access whenever necessary.

Based on this information, response times under a scenario without a temporary bridge would be anticipated to be similar to those with a temporary bridge; however, the potential for increased congestion is greater under the option without a temporary bridge.

University of Oregon, White Stag Building – All the build alternatives would require a TCE for access to the White Stag building directly north of the west approach. None of the other public services in the project area would require a TCE.

With a Temporary Bridge

The temporary bridge (regardless of the travel mode option selected) would add 1.5 to 2 years to project construction duration. Most of the effects to public services during construction would be similar to those

without a temporary bridge. Response times would be similar with and without a temporary bridge. Cross-river emergency response trips would be able to occur with the temporary bridge option; however, given that the temporary bridge would have, at most, one lane in each direction, emergency vehicles could still choose to use one of the other bridges that has more lanes and, therefore, greater ability for motorists to move to the side and allow responders to pass.

3.6.4 Mitigation

Long-term impact mitigation for each alternative is summarized in Table 3.6-1.

Table 3.6-1. Long-Term Impact Mitigation

Alternative	Long-Term Impact Mitigation
Enhanced Retrofit	Displacement of the AMR building and the University of Oregon retail space would be mitigated by relocating the use or, functionally, by replacing the property acquired with another facility that would provide equivalent use. Compensation and relocation assistance described in Section 3.3, Acquisitions and Relocations, would mitigate the effects to AMR and the University of Oregon. Coordination with AMR and the University of Oregon would continue as project design progresses.
Replacement, Short-span	Mitigation would be the same as under the Retrofit Alternative.
Replacement, Long-span	Mitigation would be the same as under the Retrofit Alternative.
Replacement with Couch Extension	Mitigation would be the same as under the Retrofit Alternative.

To mitigate for temporary construction activities affecting public services, detailed coordination regarding construction locations and phasing would be required with the appropriate parties including fire departments, emergency response services, school transportation services, and law enforcement. In addition, the County would avoid bridge capital projects, other than emergency work, that would cause long-term lane closures on other downtown bridges during the Burnside Bridge closure.

Mitigation for impacts to Willamette River recreational boaters would primarily be in the form of early and frequent communication with OSMB and law enforcement agencies to ensure boaters are aware of restrictions due to construction. Restrictions would be communicated to river users via signage and all media channels including the OSMB and River Patrol Unit websites, which list regulations and closures in a geographic format. Funding for signage and the location of any restricted areas would be worked out as the design progresses.

For all the build alternatives, a pre-construction communication plan would be developed with all affected emergency response groups and other public service agencies detailing how detour and road closure information would be provided to the services. The County would continue to address the fire, life, safety, and security concerns associated with post-earthquake conditions. This would include a safety and security management plan that was developed in accordance with federal requirements and in close coordination with the transit agencies, the City of Portland, and all associated police and fire departments. This coordination would take place during final design, construction, and operation of the project improvements. The plan would provide emergency access, develop alternate plans or routes to avoid delays in response times, and institute other features as necessary so that safety and emergency services are not compromised.

Where construction activity would require detours on routes typically used by the public to access public service locations (police and fire stations, public schools, and post offices), detour signs would be provided. Specifically, short-term restrictions during construction could block direct access to northbound Naito Parkway, but southbound access would always be maintained. The County is also planning to invest in

capital improvement projects such as replacing the failing movable span deck on the Broadway Bridge and the cracking trunnions on the Hawthorne Bridge. These improvements would minimize peak-hour lane closures and congestion on the Steel and Morrison Bridges, which would serve as alternative transportation routes during construction.

Additional information and coordination with PF&R, PPS, PPB, OSMB, AMR, and the University of Oregon would be needed as design progresses to further define impacts and potential mitigation.

3.7 Utilities

This section describes existing conditions and outlines anticipated project impacts to publicly and privately owned utilities. More detail can be found in the *EQRB Utilities Technical Report* (see Attachment D).

3.7.1 Affected Environment

Utility impacts are analyzed by right-of-way, utility type, and provider for the area directly impacted by the bridge reconstruction or replacement.

The project area (or direct API) extends for several blocks around the existing bridge and includes all areas where utility realignments and upgrades would be required. Utilities within the project area occur in public street rights-of-way, as well as on private properties and the bridge itself. These utilities exist below ground, on the river bottom, on poles, and are attached to existing structures. They include communication and power lines; water, wastewater, and stormwater facilities; and transportation-related devices. Twenty-one utility owners were identified by contacting the Oregon Utility Notification Center and reviewing other relevant resources. These owners and their mapping availability are listed in Table 3.7-1. Subsurface investigations and surveys were not performed as part of this analysis.

Table 3.7-1. Project Area Utility Owners

Utility Owner	Utility	Mapping Provided by Oregon Utility Notification Center or other sources
Comcast Cable Communication Management	Communication	Yes
CenturyLink	Communication	Yes
Verizon	Communication	Yes
AT&T	Communication	No
Zayo (formerly Electric Lightwave, Inc.)	Communication	Yes
Henkels & McCoy	Communication	No
Level 3 (now CenturyLink)	Communication	No
MCI (now Verizon)	Communication	No
Wave Broadband	Communication	Yes
NW Natural	Natural Gas	Yes
Portland General Electric	Power	Yes
Oregon Department of Transportation	Multiple	Yes
TriMet	Multiple	Yes
City of Portland, Portland Streetcar	Multiple	Yes
City of Portland, Bureau of Maintenance	Multiple	No
City of Portland, Water Bureau	Water	Yes
City of Portland, Bureau of Environmental Services	Multiple	Yes
City of Portland, Bureau of Transportation	Multiple	Yes
City of Portland, Portland Parks and Recreation	Multiple	Yes

Utility Owner	Utility	Mapping Provided by Oregon Utility Notification Center or other sources
City of Portland, Bureau of Technology Services	Multiple	Yes
Multnomah County Bridge Section	Multiple	Yes

The build alternatives would require relocating utilities. Federal, state, and local regulations dictate the obligations for utility accommodations and the requirements for utility relocations associated with the Project. Design standards associated with the location, separation, and cover of utilities, among others, would also be followed. Lastly, depending on location and ownership, reimbursement for utility impacts would be required as part of the Project.

3.7.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

With the No-Build Alternative, existing utilities and usage would continue with changes occurring as demanded by other projects, technology changes, unexpected failures, or population growth. In the event of a major CSZ earthquake, the No-Build Alternative would result in bridge failure and collapse, damaging utility infrastructure. Aging utilities could also be affected by ground shaking and movement. It would likely be months before crews could make all repairs.

Impacts Common to All Build Alternatives

Direct Short-Term – The impacts described are based on current bridge designs and existing information. Additional surveys and design refinements could change these impacts. All the build alternatives would require the relocation of utilities on and adjacent to the bridge structure. Of the 16 utility providers that provided mapping information, all would be impacted by the build alternatives to some extent. Of these common impacts, the following would result in the largest potential disruptions to users and costs for relocation or mitigation.

- BES stormwater and sewer lines – Several 24-inch-diameter and larger stormwater and sewer lines extend from the Ankeny Pump Station in Tom McCall Waterfront Park under the river to NE Lloyd Boulevard. Where feasible, design modifications would be implemented to avoid or minimize impacts to these facilities. Any riverside impacts to these lines, especially to the 30-inch-diameter and 42-inch-diameter sewer lines, are anticipated to warrant a complete pipe replacement.
- CenturyLink communication cables – Several large transmission cables run along the bridge and then along the river bottom between lift spans. These lines may serve the Federal Aviation Administration and 911 circuit. Due to the nature and duration of the relocation work, it is not anticipated that CenturyLink would relocate back onto the bridge once completed.
- NW Natural gas line – A 20-inch-diameter high-pressure line running along Naito Parkway should be avoided if possible. NW Natural would require 12 months or more to relocate this line if avoidance is not possible.

For specific impacts by utility, see Table 3.7-2.

Table 3.7-2. Build Alternative Short-Term (Construction) Impacts

Utility Owner	Category	Mapping Provided by Oregon Utility Notification Center or other Sources	Affects Portland Metro Region	Warrants Special Consideration	Enhanced Retrofit Potential Impact	Short-span Potential Impact	Long-span Potential Impact	Couch Extension Potential Impact	Additional with Temporary Bridge Potential Impact
BES	Pump station, multiple utilities	Yes	Yes	Yes	Protect	Protect	Protect	Protect	Protect
BES	Pipe, multiple utilities	Yes	Yes	Yes	7070 ft	1420 ft	1420 ft	2030 ft	405 ft
BES	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$1,980,000	$660,000	$660,000	$940,000	$360,000
BES	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
CenturyLink Local	Underground communication	Yes	Yes	No	630 ft	510 ft	510 ft	810 ft	50 ft
CenturyLink Local	Submarine communication	Yes	Yes	Yes	400 ft	400 ft	400 ft	400 ft	None
CenturyLink Local	Communication attached to the bridge	Yes	Yes	Yes	1,490 ft	1,490 ft	1,490 ft	1,490 ft	None
CenturyLink Local	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$300,000	$300,000	$300,000	$300,000	None
CenturyLink Local	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$960,000	$900,000	$900,000	$1,040,000	$50,000
AT&T LNS	Communication	No	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
CenturyLink National	Communication	No	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Multnomah County Bridge[a]	PVC water pipe	Yes	No	No	All	All	All	All	All
Multnomah County Bridge[a]	Electrical conduits	Yes	No	No	All	All	All	All	All
Multnomah County Bridge[a]	Streetlight conduit	Yes	No	No	All	All	All	All	All
Multnomah County Bridge[a]	Fiber optic communication conduit	Yes	No	No	All	All	All	All	All

Table 3.7-2. Build Alternative Short-Term (Construction) Impacts *(continued)*

Utility Owner	Category	Mapping Provided by Oregon Utility Notification Center or other Sources	Affects Portland Metro Region	Warrants Special Consideration	Enhanced Retrofit Potential Impact	Short-span Potential Impact	Long-span Potential Impact	Couch Extension Potential Impact	Additional with Temporary Bridge Potential Impact
Comcast	Overhead communication	Yes	No	No	300 ft	300 ft	300 ft	300 ft	None
Comcast	Underground communication	Yes	No	No	None	None	None	370 ft	60 ft
Comcast	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Comcast	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$70,000	$70,000	$70,000	$240,000	$30,000
Zayo	Communication	Yes	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
City of Portland Traffic & Lighting	Overhead utilities	Yes	Unknown	Unknown	50 ft	50 ft	50 ft	50 ft	None
City of Portland Traffic & Lighting	Underground utilities	Yes	Unknown	Unknown	2,050 ft	1,160 ft	1,160 ft	2,130 ft	None
City of Portland Traffic & Lighting	Underground fiber	Yes	Unknown	Unknown	600 ft	400 ft	400 ft	400 ft	None
City of Portland Traffic & Lighting	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$830,000	$720,000	$720,000	$1,150,000	None
City of Portland Traffic & Lighting	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$390,000	$390,000	$390,000	$390,000	None
NW Natural	Natural gas service/meter	Yes	No	No	None	2 EA	2 EA	5 EA	1 EA
NW Natural	Natural gas pipe	Yes	Yes	Yes	600 ft	400 ft	600 ft	1000 ft	200 ft
NW Natural	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
NW Natural	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$200,000	$140,000	$240,000	$380,000	$90,000
ODOT	Underground	Yes	No	No	100 ft	100 ft	100 ft	100 ft	None
ODOT	Underground fiber	Yes	No	No	200 ft	None	None	None	None
ODOT	Pipe	Yes	No	No	None	None	None	100 ft	None

Table 3.7-2. Build Alternative Short-Term (Construction) Impacts *(continued)*

Utility Owner	Category	Mapping Provided by Oregon Utility Notification Center or other Sources	Affects Portland Metro Region	Warrants Special Consideration	Enhanced Retrofit Potential Impact	Short-span Potential Impact	Long-span Potential Impact	Couch Extension Potential Impact	Additional with Temporary Bridge Potential Impact
ODOT	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
ODOT	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$140,000	$50,000	$50,000	$100,000	None
PGE	Overhead power	Yes	No	No	None	None	None	None	None
PGE	Underground power	Yes	No	No	1,660 ft	1,110 ft	1,110 ft	1,490 ft	510 ft
PGE	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$480,000	$300,000	$300,000	$300,000	$190,000
PGE	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$270,000	$210,000	$210,000	$380,000	$50,000
Portland Streetcar	Rail – multiple utilities	Yes	Yes	No	None	None	None	None	None
Portland Streetcar	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Portland Streetcar	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
PP&R	Electric	Yes	No	No	790 ft	790 ft	790 ft	790 ft	400 ft
PP&R	Gas, 2 in	Yes	No	No	None	None	None	None	130 ft
PP&R	Lighting	Yes	No	No	460 ft	460 ft	460 ft	460 ft	None
PP&R	Sanitary, 4 in	Yes	No	No	200 ft	200 ft	100 ft	200 ft	None
PP&R	Storm	Yes	No	No	390 ft	180 ft	170 ft	180 ft	860 ft
PP&R	Irrigation	Yes	No	No	130 ft	None	None	None	410 ft
PP&R	Fountain	Yes	No	No	None	None	None	None	790 ft
PP&R	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$530,000	$460,000	$440,000	$460,000	$630,000
PP&R	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$200,000	$200,000	$200,000	$200,000	None

Table 3.7-2. Build Alternative Short-Term (Construction) Impacts *(continued)*

Utility Owner	Category	Mapping Provided by Oregon Utility Notification Center or other Sources	Affects Portland Metro Region	Warrants Special Consideration	Enhanced Retrofit Potential Impact	Short-span Potential Impact	Long-span Potential Impact	Couch Extension Potential Impact	Additional with Temporary Bridge Potential Impact
BTS	Underground fiber	Yes	No	No	250 ft	None	120 ft	120 ft	280 ft
BTS	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$120,000	None	$60,000	$60,000	$60,000
BTS	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
PWB	Water main	Yes	No	No	1,630 ft	1,500 FT	1,440 ft	1,820 ft	None
PWB	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$510,000	$450,000	$430,000	$520,000	None
PWB	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
TriMet	Trackwork	Yes	Yes	Yes	150 ft	None	None	None	None
TriMet	Power distribution	Yes	Yes	Yes	150 ft	150 ft	150 ft	150 ft	None
TriMet	Communications	Yes	Yes	Yes	150 ft	150 ft	150 ft	150 ft	None
TriMet	Fare collection	Yes	Yes	Yes	4 ea	2 ea	2 ea	2 ea	None
TriMet	At-grade station	Yes	Yes	Yes	1 ea	1 ea	1 ea	1 ea	None
TriMet	TDB cost	Not Applicable	Not Applicable	Not Applicable	$4,550,000	$2,290,000	$2,290,000	$2,290,000	None
TriMet	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
TriMet	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Verizon	Underground communication	Yes	No	No	300 ft	400 ft	400 ft	400 ft	200 ft
Verizon	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None

Table 3.7-2. Build Alternative Short-Term (Construction) Impacts *(continued)*

Utility Owner	Category	Mapping Provided by Oregon Utility Notification Center or other Sources	Affects Portland Metro Region	Warrants Special Consideration	Enhanced Retrofit Potential Impact	Short-span Potential Impact	Long-span Potential Impact	Couch Extension Potential Impact	Additional with Temporary Bridge Potential Impact
Verizon	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	$140,000	$180,000	$180,000	$180,000	$90,000
Henkels & McCoy	Underground communication	No	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Henkels & McCoy	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Henkels & McCoy	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Wave Broadband	Overhead communication	Yes	No	No	Unknown	Unknown	Unknown	Unknown	Unknown
Wave Broadband	Underground communication	Yes	No	No	Unknown	Unknown	Unknown	Unknown	Unknown
Wave Broadband	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Wave Broadband	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Burnside Skatepark	Lighting	Yes	No	Yes	100 ft	None	None	None	100 ft
Burnside Skatepark	Reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	None
Burnside Skatepark	Non-reimbursable cost	Not Applicable	Not Applicable	Not Applicable	None	None	None	None	$50,000

Table 3.7-2. Build Alternative Short-Term (Construction) Impacts *(continued)*

Utility Owner	Category	Mapping Provided by Oregon Utility Notification Center or other Sources	Affects Portland Metro Region	Warrants Special Consideration	Enhanced Retrofit Potential Impact	Short-span Potential Impact	Long-span Potential Impact	Couch Extension Potential Impact	Additional with Temporary Bridge Potential Impact
Total Length of Relocated Utilities[b]	Not applicable	Not Applicable	Not Applicable	Not Applicable	**19,600 ft**	**12,020 ft**	**12,050 ft**	**15,670 ft**	**4,180 ft**
Total TBD Cost	Not applicable	Not Applicable	Not Applicable	Not Applicable	**$4,550,000**	**$2,290,000**	**$2,290,000**	**$2,290,000**	**None**
Total Reimbursable Cost	Not applicable	Not Applicable	Not Applicable	Not Applicable	**$4,750,000[c]**	**$2,890,000**	**$2,910,000**	**$3,730,000**	**$1,310,000**
Total Non-Reimbursable Cost	Not applicable	Not Applicable	Not Applicable	Not Applicable	**$2,370,000**	**$2,140,000**	**$2,240,000**	**$2,910,000**	**$360,000**

[a] Multnomah County was not included in this evaluation, as its cost is part of the Project.

[b] BES relocation costs include $1,000,000 for protecting the 30-inch and 42-inch deep bore pipes under the river. Relocation costs for the two pipes are estimated at an additional $15,000,000.

[c] $19,630,000 if 30-inch and 42-inch deep bore pipes are relocated.

Notes: BES = Bureau of Environmental Services; BTS = Bureau of Technology Services; ea. = each; ft = feet; in = inches; LNS = local network services; ODOT = Oregon Department of Transportation; PGE = Portland General Electric; PP&R = Portland Parks and Recreation; PVC = Polyvinyl chloride; PWB = Portland Water Bureau; UG = underground.

The associated costs for relocating utilities would differ by build alternative and are included in Table 3.7-2. For comparison purposes with the utility relocation costs by alternative in Table 3.7-2 , if all the utilities within the project area required relocation, the reimbursable relocation cost would be $150 million, and the non-reimbursable cost would be $17 million. For costing methodology and assumptions, see the *EQRB Utilities Technical Report* (see Attachment D).

Indirect – Given that the Project would not change traffic capacity on the bridge, the build alternatives are not anticipated to result in indirect land use changes that would place substantial induced demand on utilities or otherwise substantially affect utilities. However, bridge construction would require acquiring and removing a relatively small number of existing buildings on parcels that would not be permanently required by the Project. If these newly vacant parcels are redeveloped at higher densities, this could result in higher demand on utilities than the current uses, requiring an expanded utility infrastructure. Any increased demand would likely be small compared to existing demand in the project area.

Temporary – Utility relocation prior to and during construction could result in interruptions of service. Potential disruptions are expected to be minimal for most of the utilities, with utility providers scheduling outages to accommodate cut-overs. Temporary connections would likely be established before relocating the utility.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have the following impacts and distinctions:

- Affect the highest number and longest length of utilities primarily due to having the most bridge bents.
- Result in the highest utility relocation costs mainly due to impacts to large sewer and stormwater pipes owned by BES and utility relocations associated with the TriMet MAX lines on NW/SW 1st Avenue.
- Require the removal of the Burnside Skatepark and associated utilities (all other build alternatives would avoid this).

Replacement Alternative with Short-Span Approach Impacts

In addition to the impacts common with all the build alternatives, the Short-span Alternative would have the following impacts and distinctions:

- Affect the lowest number and shortest length of utilities primarily due to the ability to limit the work within the crossing streets for the foundation construction work.
- Result in the lowest relocations costs.
- Reduce the likelihood that temporary relocations would be needed when compared with the Retrofit Alternative.

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following impacts and distinctions:

- Increase by less than 1 percent the total utility length impacted compared with the Short-span Alternative (second lowest among all build alternatives)
- Increase relocation cost by less than 2 percent compared with the Short-span Alternative (second lowest among all build alternatives)

- Require one less bent in Tom McCall Waterfront Park and instead would have a larger foundation just east of Naito Parkway. This larger foundation would impact additional electrical, gas, and communications infrastructure as compared with the smaller Short-span Alternative foundation at the same location.

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the other replacement alternatives, with the following impacts and distinctions:

- Increase total length of utilities impacted compared with the other replacement alternatives but would be 25 percent lower than with the Retrofit Alternative.
- Increase utility relocation costs compared with the other replacement alternatives but would be 31 percent lower than with the Retrofit Alternative.

Impacts from Potential Off-Site Staging Areas

Based on the four sample sites identified, the types of impacts that could occur from off-site staging include:

- Damage to existing utilities due to stockpiling, construction loading, or equipment.
- Temporary maintenance inaccessibility from burying or blocking access points with materials or equipment.

If the contractor chooses to use an off-site staging area, then the contractor would be responsible for the coordination and mitigation of utility impacts from the use of any off-site staging area. It is not expected that there would be additional local, state, and federal regulations related to utilities that would apply for off-site staging areas.

3.7.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

The No Temporary Bridge Option would result in no additional utility impacts.

With a Temporary Bridge

The temporary bridge would increase the number of utilities impacted as well as the total length of utilities requiring relocation. The largest impacts imposed by the temporary bridge would be to sewer and stormwater lines owned by BES and PP&R within Tom McCall Waterfront Park. These large impacts in addition to smaller ones and the added construction time would result in $1,670,000 higher utility relocation costs compared with the No Temporary Bridge Option.

3.7.4 Mitigation

Build Alternatives

Table 3.7-3. Potential Mitigation for the Build Alternatives

Description/Impact to Resource	Potential Mitigation Measure
Disruption to Utility Service	• Apply mitigation protection measures by utility as described in the *EQRB Utilities Technical Report* (see Attachment D). • Coordinate with NW Natural to accommodate cut-overs during warmer months when use is lowest. • Relocation plans would be prepared and service disruptions approved by affected utility providers before construction begins. • Coordination would occur with utility owners to ensure that contingency plans for management of potential utility service disruptions during construction are accommodated. • During the final design phase, the relocation sites for affected utilities would be mapped and the effects of the relocation actions confirmed.
Relocation of Utilities	• Obtaining vertical and horizontal limits of key underground utilities could occur early in design and the recommended actions included as part of the early design package.

3.8 Social and Neighborhood Resources

The social and neighborhood analysis addresses how the Project would directly and indirectly affect neighborhoods, community gathering spaces, social interaction, and community cohesion. This section identifies existing social and neighborhood resources and outlines anticipated project impacts to those resources. More detail can be found in Section 3.9, Environmental Justice, and the *EQRB Social/Neighborhood Technical Report* (see Attachment D).

3.8.1 Affected Environment

The API for the social/neighborhood analysis assesses long- and short-term environmental impacts using a 0.5-mile buffer from the project area. The entirety of all census tracts and block groups intersecting the 0.5-mile buffer were selected to constitute the Direct API, denoting the area where direct environmental impacts are likely to occur as a result of the Project. Therefore, API and Direct API are used interchangeably as environmental effects are considered for all intersecting census geographies even if partially located outside the strict 0.5-mile buffer. Figure 3.8-1 shows the 0.5-mile buffer and Direct API boundary resulting from the selected census geographies. Any impacts outside of the Direct API are considered indirect project impacts.

Social/neighborhood resources in the API that provide opportunities for community gathering and social interaction include Governor Tom McCall Waterfront Park (Waterfront Park), the Japanese American Historical Plaza, Ankeny Plaza, the Vera Katz Eastbank Esplanade (Eastbank Esplanade; includes the Kevin J. Duckworth Memorial Dock), the Burnside Skatepark, the Japanese American Museum of Oregon, Portland Saturday Market (PSM), the University of Oregon Portland, Portland Rescue Mission (PRM), Central City Concern (CCC), the Salvation Army, Because People Matter (Night Strike), and Mercy Corps (see Figure 3.8-2). Emergency services are discussed in Section 3.6, Public Services.

Parks, Trails, and Recreation Facilities

Parks within the API include Waterfront Park, the Japanese American Historical Plaza, Ankeny Plaza, the Eastbank Esplanade, and the Burnside Skatepark. More detailed discussion of the parks and recreation resources described below can be found in Section 3.10, Parks and Recreation.

Community Centers and Facilities

Japanese American Museum of Oregon – (formerly the Oregon Nikkei Legacy Center) at 121 NW 2nd Avenue is a museum preserving and sharing the history and culture of the Japanese American community. It also administers the Japanese American Historical Plaza.

Portland Saturday Market – PSM is located under the west approach of the Burnside Bridge and extends into Ankeny Plaza. The market occurs every Saturday and Sunday from March through Christmas Eve. Market administration has offices and storage facilities at 2 SW Naito Parkway.

University of Oregon Portland – located on the west end of the bridge in the White Stag Block (70 NW Couch Street) and 109 NW Naito buildings. The Portland campus includes the schools of business and architecture, as well as technology laboratories, a branch of the university library, a school gift shop, and other amenities. Community events are hosted frequently at both buildings.

Figure 3.8-1. Direct Impact API

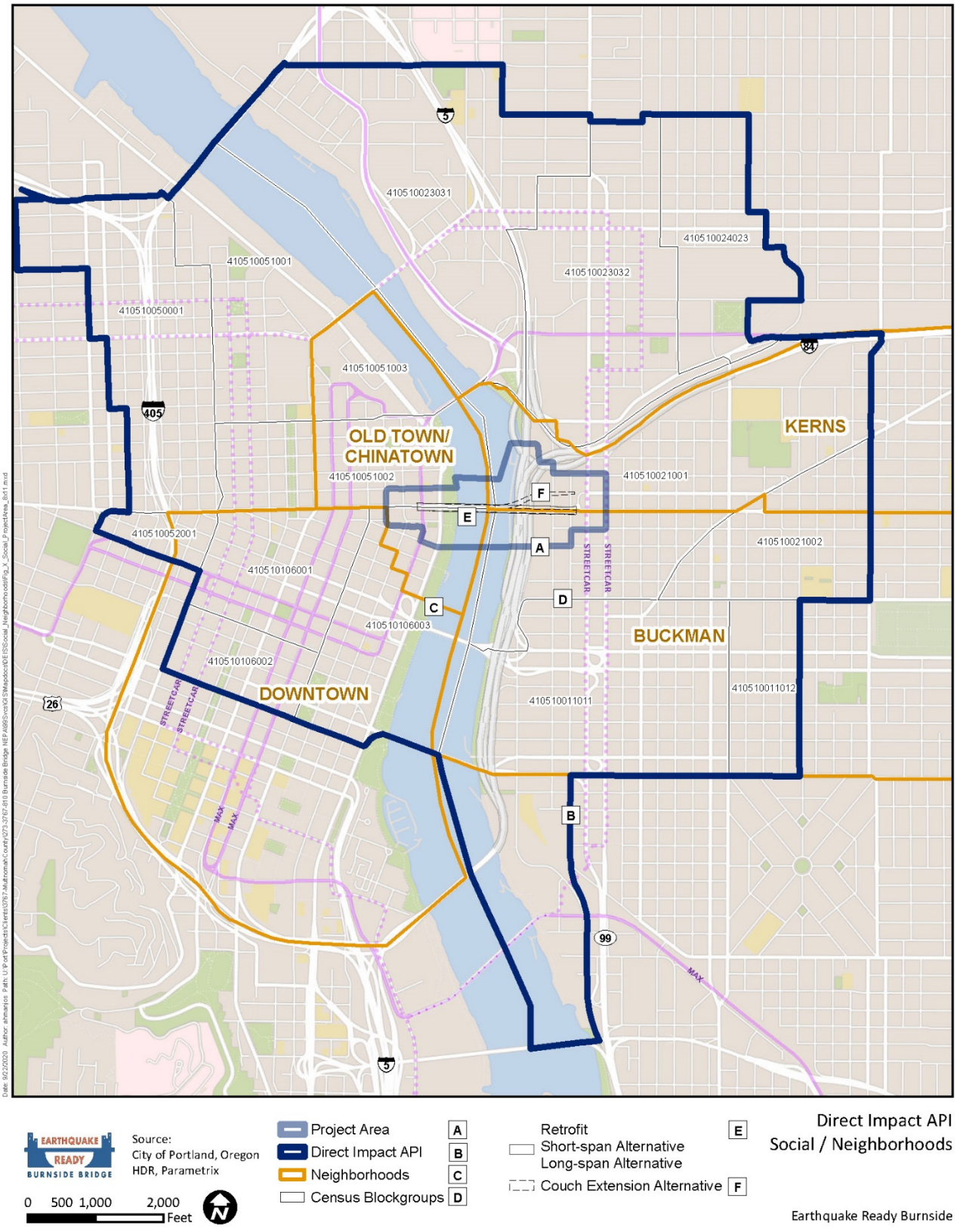
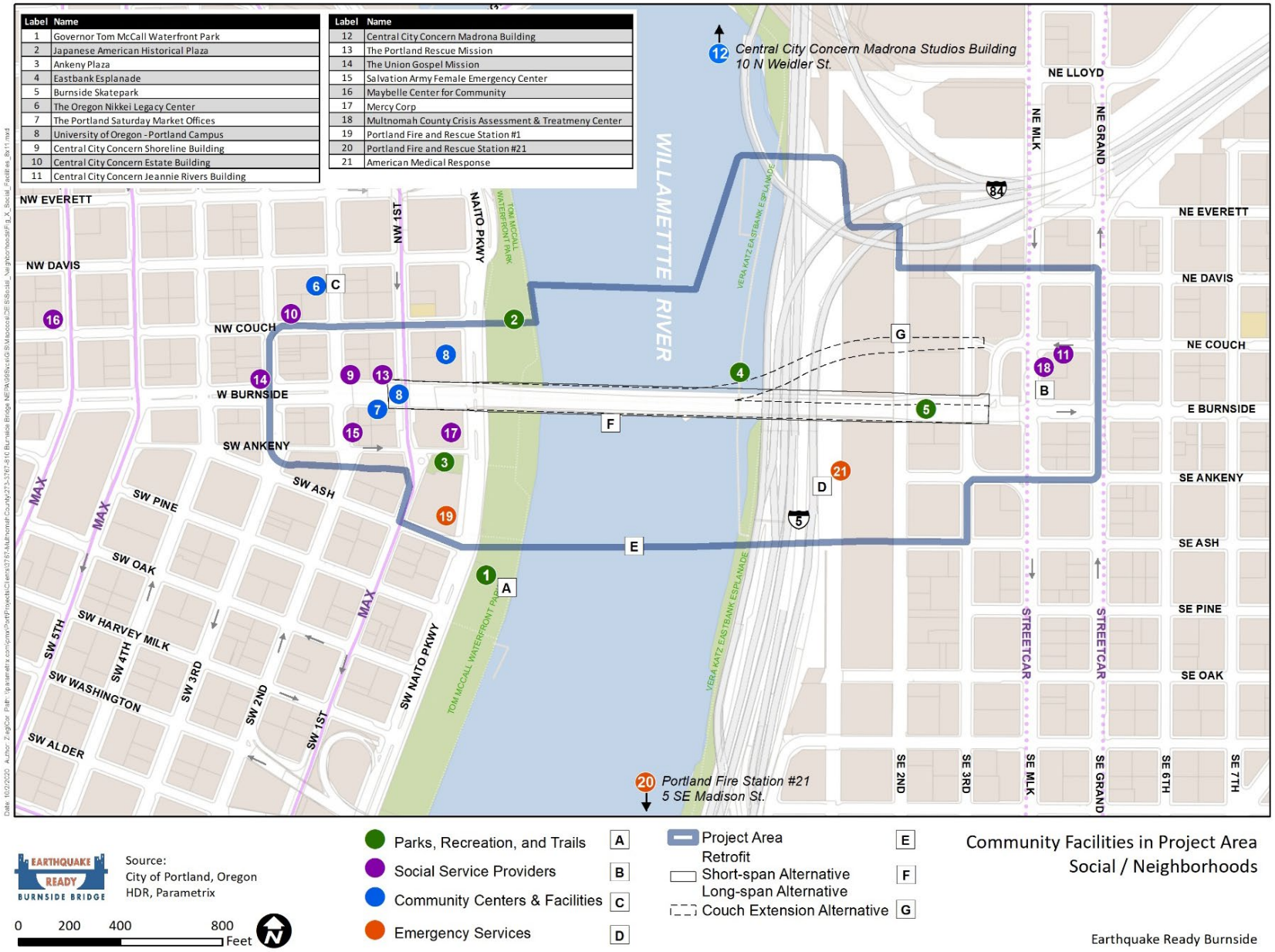


Figure 3.8-2. Community Facilities in Project Area



Portland Rescue Mission – Provides shelter and services to the unhoused population. The shelter serves 21,000 to 25,000 meals per month, shelters approximately 200 people per night, and provides a warming/cooling center, laundry facilities, and 24-hour supervised restrooms. This shelter is the only building with 24-hour emergency access for houseless or other individuals in need in Portland. PRM has a door on the west side of the CCC Shoreline Building that provides access from Burnside Street.

Central City Concern – CCC aids over 13,000 single adults and families annually in the Portland metropolitan region through a network of facilities and services. Within the project area and API, CCC operates numerous facilities and services, including the Shoreline Building, the Estate Building (225 NE Couch Street), the Jeannie Rivers Building (444 NE Couch Street), and the Madrona Studios Building (10 N Weidler Street). The only CCC facility that would experience project impacts is the Shoreline Building, described below.

The Shoreline Building at 123 W Burnside Street is a three-story structure that includes the Employment Access center on the lower floors of the building; access is on NW 2nd Avenue. This center provides employment assistance to approximately 1,300 individuals per year. Access to the facility for non-residents is available only via Burnside Street. Sixty-two transitional apartment units are located on the upper floors, accessed from the north side sidewalk on the western approach. These units provide short-term transitional housing to approximately 300 people per year for an average period of 3 to 4 months, and are accessible to residents and staff 24 hours, 7 days per week.

Salvation Army – The Salvation Army has a Female Emergency Center at 30 SW 2nd Avenue that offers emergency shelter for women and assists in finding permanent housing solutions.

Because People Matter (Night Strike) – Because People Matter operates Night Strike which meets weekly at the Liberation Street Church, and services are provided under the Burnside Bridge. Night Strike uses the full width under the bridge from the Waterfront Trail to Naito Parkway. Volunteers provide meals, haircuts, shaves, foot washes, and clothing/sleeping bag replacements.

Mercy Corps – The international headquarters is located immediately south of the west approach at 45 SW Ankeny Street. While they do not generally provide daily social services at this location, the building is used to coordinate humanitarian responses to international disasters and crises such as food or water crises. Additionally, Mercy Corps Northwest provides assistance to low-income citizens in Oregon and Washington by providing resources and support to help increase economic self-sufficiency and community integration.

3.8.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

Pre CSZ Earthquake – Under the No-Build Alternative there would be no proposed permanent conversion of social/neighborhood uses to another use, and no changes in permanent access from the Burnside Bridge to these uses would occur. No properties would be acquired and thus no residents, businesses, or community facilities would be displaced, and no disproportionate impacts to low-income and minority populations are anticipated. Overall, neighborhood cohesion, quality of life, community facilities, and social service providers would continue to exist as they are today, with some localized changes over time as residents and businesses relocate for other reasons.

This alternative assumes regular maintenance would continue to occur on the bridge, and in some cases this maintenance work would occur over and adjacent to community gathering locations, community facilities, and social service providers, and could require temporary access restrictions to ensure user safety. As the bridge ages and maintenance needs become more frequent and/or widespread, some events could potentially be canceled or rescheduled, resulting in the disruption of social and neighborhood cohesion.

Post CSZ Earthquake – During and after a CSZ earthquake, bridge collapse could result in severe damage to, and potential collapse of, several unreinforced masonry buildings at the west approach. There are no social services housed in unreinforced masonry buildings directly adjacent to the east approach. Without definitive engineering studies showing otherwise, this damaged state is assumed to apply to the PSM administration offices, the Salvation Army building, and the CCC Shoreline Building. In addition to building damage from shaking alone, a CSZ earthquake would be anticipated to result in the collapse of the Burnside Bridge onto the properties below the west approach, the Ankeny Plaza Structure, and Waterfront Park. At the east approach, the bridge would likely fall onto I-84, I-5, and the UPRR right-of-way. This assessment does not include properties outside of the approach, which would have shared impacts across all build alternatives and the No-Build Alternative.

Access to community facilities and social services near the approaches from both E and W Burnside Street would be closed. The collapse of the CCC and Salvation Army buildings would result in a significant adverse impact to unhoused populations within the API and surrounding region. The potential loss of social services would have a disproportionate impact on the quality of life for many residents and individuals who use them. Damage caused by the earthquake would result in fragmentation of the neighborhood, reducing the quality of life and opportunities for social interaction for many residents and users of this area.

For details of the access and other transportation-related conditions and impacts of the No-Build Alternative post CSZ earthquake, see Chapter 1, Purpose and Need; Chapter 2, Project Alternatives; and Section 3.1, Transportation. For additional details on the effects to sensitive populations and uses post CSZ earthquake, see Section 3.4, Land Use; Section 3.6, Public Services; and Section 3.9, Environmental Justice.

Impacts Common to All Build Alternatives

Direct – Two social service providers and community facilities would be permanently impacted by the proposed Project, including the University of Oregon retail space and the PSM storage and administration offices; the remaining direct impacts to social/neighborhood resources are temporary and would occur during construction. No long-term direct effects are anticipated to Ankeny Plaza or Willamette River recreational boating, including use of the Willamette River Water Trail, on-water events, or the Kevin J. Duckworth Memorial Dock under any of the build alternatives. Certain events typically held in Waterfront Park and the Eastbank Esplanade could permanently relocate; if this happens, it could impact neighborhood and social cohesion since these events are part of what defines the area.

As part of all the build alternatives, the staircase connection from the south side of the Burnside Bridge to the Eastbank Esplanade would be replaced with a bike, pedestrian, and ADA-accessible ramp connecting the bridge to the Esplanade. This would improve the safety, access, and convenience for users. However, because the ramp would pose impacts to natural resources and potential safety impacts, the project team is considering only replacing the existing stairs with new stairs and potentially adding an elevator (see Connection to Eastbank Esplanade in Section S.5; Section 3.16, Vegetation, Wildlife, and Aquatic Resources; and Section 3.4, Land Use).

Given the demographics within the API, the proposed enhancements are unifying features that would improve connections among individuals living in and traveling through the area. Bicycle and pedestrian improvements are expected to result in greater cyclist and pedestrian comfort, which in turn would promote the use of these modes of travel and would provide the opportunity for improved connections throughout these neighborhoods. These benefits would particularly affect younger, able-bodied residents who use active forms of transportation and low-income individuals who may not always be able to pay for vehicle or transit use. Similarly, the addition of ADA-accessible facilities would support movement of disabled and elderly residents. Combined, these elements would promote interactions between these populations and across neighborhood boundaries, further integrating these groups. It is anticipated that the proposed improvements could have a more positive impact on social interaction than would occur under No-Build Alternative conditions.

University of Oregon Retail Space – All the build alternatives would require a full acquisition of the retail space that is currently being leased by the University of Oregon. This facility would be permanently displaced from its current location. It is not anticipated that the permanent relocation of this facility would alter social interactions, cohesion, or the overall character of the neighborhood.

Portland Saturday Market Storage and Administration Offices – All build alternatives would require a full acquisition of the PSM administration offices. This facility would be permanently displaced from its current location. It is not anticipated that the permanent relocation of this facility would alter social interactions, cohesion, or the overall character of the neighborhood as long as suitable replacement space is found. The PSM would only be temporarily displaced from its market location on the waterfront (temporary impacts are described further below).

PSM indicated that its office space requirements are relatively small and could be potentially accommodated through a lease agreement with another organization in the area; however, PSM also needs storage space for vendor equipment, which is currently leased from Portland Parks and Recreation (PP&R). While the impacts on PSM administration are anticipated to be minor, finding suitable storage near the area where the market takes place could be challenging. If the PSM relocation is not within PP&R properties, it would have an impact on PP&R revenues (economic impacts are discussed further in Section 3.5, Economics).

Long-term permanent impacts are summarized in Table 3.8-1.

Table 3.8-1. Impacted Properties – Long-Term

ID	Tax Lot ID	Property Name	Retrofit	Short-Span Alternative	Long-Span Alternative	Couch Extension
3	1N1E34DB-01500	Portland Saturday Market Storage (City of Portland)	Easement	Easement	Easement	Easement
4	1N1E34DB-01400	University of Oregon Retail Space (City of Portland)	Full	Full	Full	Full
5	1N1E34DC-00800	Saturday Market Administration Offices (Skidmore Fountain Plaza, LLC)	Full* with 1 business displacement	Full* with 1 business displacement	Full* with 1 business displacement	Full* with 1 business displacement
12	1N1E34DB-01300	Japanese American Historical Plaza (City of Portland)	Easement	Easement	No Impact	Easement
13	1N1E34DC-03600	Ankeny Plaza Structure (City of Portland)	Easement	Easement	No Impact	Easement

Note: Easement = Permanent Easement | Full = Full Acquisition | Partial = Partial Acquisition

* Saturday Market would be permanently displaced from its administration offices but would only be temporarily displaced from the market location on the waterfront.

Indirect – The build alternatives are not anticipated to alter neighborhood cohesion and social interaction, change the demand for community facilities and social services, or cause other indirect adverse effects to social/neighborhood resources, relative to the No-Build Alternative.

Temporary – The majority of impacts to social/neighborhood resources from the build alternatives would occur during construction and would end after construction is complete. A summary of temporary construction impacts is provided below in Table 3.8-2. The discussion below identifies specific temporary impacts for the affected social/neighborhood resources.

Table 3.8-2. Impacted Properties – Temporary

ID	Tax Lot ID	Property Name	Retrofit	Short-Span Alternative	Long-Span Alternative	Couch Extension
1	1N1E34CA-09200	Central City Concern (Shoreline Building)	No Impact	TCE Access	TCE Access	TCE Access
2	1N1E34DB-0900	Portland Rescue Mission	TCE Access[1]	TCE Access	TCE Access	TCE Access
6	1N1E34CD-00300	Salvation Army	No Impact	TCE Access	TCE Access	TCE Access
10	1N1E34DB-00600	University of Oregon (White Stag Building)	TCE Access	TCE Access	TCE Access	TCE Access
11	1N1E34DC-90000	Mercy Corps	TCE	TCE	TCE	TCE
12	1N1E34DB-01300	Japanese American Historical Plaza (City of Portland)	TCE	TCE	TCE	TCE
13	1N1E34DC-03600	Ankeny Plaza Structure (City of Portland)	TCE	TCE	TCE	TCE
B	Not Applicable	Vera Katz Eastbank Esplanade (City of Portland)	TCE	TCE	TCE	TCE

TCE = Temporary Construction Easement | TCE Access = TCE for access only.

[1] Under the Retrofit Alternative the Portland Rescue Mission would require temporary relocation for 2 to 3 months during construction due to its primary access being blocked.

Unhoused individuals who have established temporary residence under the Burnside Bridge would be displaced during construction. The number of individuals that would experience displacement is unknown; social service facilities would be accessible to those who use them throughout construction.

All the build alternatives would require a temporary construction easement (TCE) for the Mercy Corps building and the Eastbank Esplanade, and a TCE for access to PRM and the University of Oregon White Stag Building. These construction impacts would be temporary and are not expected to contribute to long-term changes in social cohesion or neighborhood quality of life.

Portland Saturday Market – PSM would need to operate at another location for the duration of construction, which could temporarily reduce opportunities for social interaction in the area. The PP&R lease agreement with PSM would need to be adjusted. If the PSM relocation is not within PP&R properties, it would have an impact on PP&R revenues. Closure of PSM would mean a loss of income for the participating vendors, as well as temporary loss of a city institution and tourist attraction. Economic impacts are discussed in Section 3.5, Economics.

Parks and Recreation Resources – Portions of Waterfront Park, the Eastbank Esplanade, and the Burnside Skatepark would be closed intermittently under each build alternative. Specific impacts and closures to these resources are described in detail in Section 3.10, Parks and Recreation. Impacts to the Burnside Skatepark vary with the build alternatives and are discussed below, as well as in Section 3.11, Historic and Archaeological Resources.

Construction impacts have the potential to temporarily disrupt social interaction associated with the use of the parks and recreation facilities in the project area. Events that are typically held in parks within the project area would likely be disturbed by intense construction and noise on the bridge unless they occurred on weekends or at times when no major construction would occur. Reduction in the perceived attractiveness of events could reduce attendance and opportunities for social interaction. Depending on the type of event,

some would need to use designated detour routes. The impact construction would have on the surrounding neighborhood could make use of these areas less enjoyable than usual. This is likely to cause some reduction in the number of users and visitors in the area, temporarily altering the feel of the neighborhood.

Post CSZ Earthquake – All of the build alternatives are designed to remain fully operational and accessible for vehicles and other modes of transportation following a CSZ earthquake. Additionally, all the build alternatives include providing clearance between the bridge and adjacent buildings to allow independent movement during a seismic event.

Compared with the No-Build Alternative, a retrofitted or replaced bridge would not fall onto Waterfront Park or the Eastbank Esplanade or block north-south trails that are parts of these resources. It would also not collapse onto the current site of the Burnside Skatepark. A retrofitted or replaced bridge would result in fewer injuries and less loss of life within the neighborhood's resources during the seismic event, and less need for reconstruction and debris removal after the event. The portions of the trails underneath the Burnside Bridge would be available to bicyclists and pedestrians to access the bridge or other destinations to the extent that debris does not block passage north and south of the bridge.

An earthquake-resilient Burnside Bridge could increase the attractiveness of potential development and redevelopment sites in the API after a major earthquake, as those locations would be near the only functioning bridge crossing. Any such indirect impacts would likely be very small on the east end given that it has already been rapidly redeveloping. On the west end, the bridge is surrounded by two historic districts with older, unreinforced masonry buildings that could suffer significant damage. If buildings that provide affordable housing and social services are lost, the functioning bridge would be just one of many factors that would influence whether those uses are re-established or replaced by other uses.

Research shows that seismically resilient transportation infrastructure, such as the proposed Burnside Bridge build alternatives, can benefit the long-term ability of a region to recover economically and socially after a major disaster. Retention of the Burnside Bridge after a CSZ earthquake would help preserve cohesion, maintain neighborhood interactions, and ultimately reestablish normalcy (OSSPAC 2013; Madhusudan and Ganapathy 2011).

Enhanced Seismic Retrofit Impacts

In addition to the impacts common to the build alternatives described above, the Retrofit Alternative would have the following impacts:

- One of the main access doors to PRM from the sidewalk along W Burnside Street would be temporarily inaccessible for approximately 2 to 3 months, which would require closure and temporary relocation of PRM for 2 to 3 months during construction due to its primary access being blocked. This is expected to temporarily disrupt neighborhood cohesion and cause inconvenience and confusion to people residing in the affected buildings or visiting the area.
- This alternative would have the highest number of bridge support columns in Waterfront Park, resulting in the least amount of space for community gathering and socialization.
- The Burnside Skatepark would be permanently demolished and not replaced (all other alternatives would avoid this). This loss would reduce cohesion and social interaction for the affected community.
- On the west approach, this alternative would temporarily obstruct pedestrian access to the Mercy Corps Condominium, a garage door at the University of Oregon White Stag Building, and two access points from the White Stag Building to the west approach. On the east approach, construction would affect buildings located on the corner of 3rd Street and the south side of Burnside Street. This is expected to temporarily disrupt neighborhood cohesion and cause inconvenience and confusion to people residing in the affected buildings or visiting the area.

- Maintenance is expected to be more frequent and widespread than with the replacement alternatives, thus causing more frequent disruption to bridge use and neighboring uses. While negligible, this would potentially result in reduced quality of life for residents in the area.

Replacement Alternative with Short-Span Approach Impacts

In addition to the common impacts, the Short-span Alternative would have the following impacts:

- There would be three fewer piers within Waterfront Park compared with the Retrofit Alternative, providing a more open experience to the water from the park and increasing usable park space. More open space would result in greater opportunities for social interaction, as it would benefit PSM weekly stall locations, a portion of the Willamette River Water Trail, and weekly Night Strike gatherings.
- The Burnside Skatepark would be intermittently unavailable during construction (4 to 8 months total closure) but would not be demolished and would remain relatively unchanged.
- A TCE for access would be required at the CCC Shoreline Building and the Salvation Army. This is expected to temporarily disrupt neighborhood cohesion and cause inconvenience and confusion to people residing in the affected buildings or visiting the area.
- Less frequent and extensive long-term maintenance would have fewer noise and access effects on the community resources in the API compared with the Retrofit Alternative. Similarly, this alternative would provide an even greater reduction in the potential risk of seismic damage compared to the Retrofit Alternative.

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following differences:

- There would only be one bridge support within Waterfront Park, at the west property boundary of the park along Naito Parkway. This would provide the most open space, access, and views across the park, resulting in even more space for activities to be hosted by social services and neighborhood organizations (Night Strike, PSM, etc.) under the bridge, facilitating increased foot traffic in the area.
- One in-water pier/bent would be removed near the east shoreline between the Eastbank Esplanade and the shore creating an uninterrupted area with no bridge supports. The lack of infrastructure in the river at this location would lead to a more open feeling for users on the Esplanade, effectively enhancing neighborhood cohesion and opportunities for social interaction.
- No construction impacts would occur within Ankeny Plaza or the Japanese American Historical Plaza under this alternative. Neighborhood cohesion and social interaction would remain unchanged.
- This alternative would provide the highest reduction in potential risk overall, which would potentially enhance long-term quality of life for users and residents in the project area.

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following differences:

- To accommodate the extension of the Couch Street couplet, bike and pedestrian traffic would be re-routed, resulting in an additional 0.15 mile (approximately 790 feet) of out-of-distance travel for pedestrians and bicyclists. This resulting out-of-distance travel could have a potential impact on low-income, minority, and/or unhoused individuals living or working in the area who may be disproportionately burdened by transit fares, are less likely to have access to a personal vehicle or bicycle, or who may have disabilities. This would make it more difficult for these individuals to access the services provided by the social and community service providers in the API.

Impacts from Potential Off-Site Staging Areas

At the current level of design, a final location for off-site staging has not been determined; however, none of the potential sites identified for construction staging is occupied by social services and no temporary displacements of social service providers would be anticipated due to staging. Based on the representative sites identified, the types of neighborhood impacts that could occur from off-site staging include additional areas of Willamette River recreation boating restrictions. These could be limited to restricted areas near the shore of staging areas and around construction barges moving to and from the staging areas. If any trails are located on or near the staging areas, detours would need to be established to maintain connectivity for residents, visitors, or others commuting through the neighborhood. Detours would provide a transportation mitigation, but would not mitigate for lost recreation use.

3.8.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, the intensity of cross-river access impacts would be greater, but the duration of construction impacts on access, noise, and air quality would be 1.5 to 2 years shorter. The No Temporary Bridge Option would make it more difficult for clients to cross the river to access the PRM and CCC. See Section 3.8.4 for a discussion of options to maintain access during construction. Without a temporary bridge, active transportation users who would normally cross on the Burnside Bridge would instead divert their trip to another bridge – most likely the Steel or Morrison Bridges – or possibly switch modes. Please refer to Section 3.1, Transportation, for additional information regarding traffic impacts.

With a Temporary Bridge

The temporary bridge (regardless of the travel mode option selected) would add an additional 1.5 to 2 years of construction time (see Table 3.8-1). Differences in impacts to social/neighborhood resources with a temporary bridge are described below:

- A temporary bridge would reduce out-of-direction travel associated with full closure of the crossing. As a result, pedestrian and bicycle volumes on the downtown bridges would be expected to be the same as during existing conditions.
- Neighborhood and social impacts under the Temporary Bridge Option would have less of a disproportionate impact on individuals that normally travel in and through the neighborhood, especially for those individuals with disabilities.
- For all the alternatives except the Couch Extension, the Temporary Bridge Option would result in longer closures for PSM. It would also require up to two additional 2-week-long closures of the Willamette River, impacting opportunities for river recreation.
- TriMet bus lines 12, 19, and 20 would be able to continue their service in this area, effectively mitigating disruptions in access to services and amenities typically accessed by foot or by transit, such as the Salvation Army and Mercy Corps.
- Noise, vibration, and air pollution from installation of the temporary bridge itself would be greater and of longer duration with the temporary bridge than without it. This could be a concern for people with disabilities living in CCC, PRM, and Salvation Army housing, as well as for elderly residents and unhoused individuals who may find it difficult to navigate through the area during construction.

3.8.4 Mitigation

Build Alternatives

Long-term impact mitigation for the build alternatives is summarized below:

- The displacement of the PSM administration offices and the University of Oregon retail space would be mitigated by relocating the uses or, functionally, by replacing the property acquired with another facility that would provide equivalent uses. Compensation and relocation assistance described in the Section 3.3, Acquisitions and Relocations, would mitigate the effects on PSM administration offices and the University of Oregon retail space. Coordination with PSM and the University of Oregon would continue as project design progresses.
- Please refer to Section 3.11, Historic and Archaeological Resources, for specific monitoring recommendations for sites with historic or cultural significance.

Short-term impact mitigation for the build alternatives is summarized below:

- Mitigation measures for organizations that provide housing, including CCC, PRM, and Salvation Army, would include additional funding for counseling and outreach due to construction and its impacts on the vulnerable populations the organizations serve. Similarly, because construction noise and air pollution are causes of concern for people with disabilities, noise and air pollution should be considered from a trauma-informed approach. It is recommended that an advocacy group or hotline to answer questions be made available. In addition, resources for houseless people who live in the area under the bridge could be provided. Coordination with these organizations would be ongoing for the duration of the Project.
- Air filters and air-conditioned spaces would be provided for impacted residents and workspaces where opening a window is the only way to cool indoor spaces. Additional information regarding potential mitigation for dust and emissions during construction is described in Section 3.19, Air Quality.
- Construction noise would be monitored if the City requires it via the variance process. The loudest work would be completed during slow times (summer) to reduce impacts to residents and users of the area. Additional information regarding mitigation for these impacts is provided in Section 3.18, Noise and Vibration.
- The Burnside Skatepark, which would be partially demolished by temporary bridge construction, would be rebuilt after project construction was complete. This would reverse the temporary impacts to social interaction and neighborhood cohesion incurred by the Project. Reconstruction would include close coordination with skatepark managers and City of Portland representatives (the skatepark could not be rebuilt with the Retrofit Alternative).
- Mitigation for impacts to community facilities, including parks and recreation resources, would primarily include returning them to their pre-construction or better condition, as well as the provision of detour routes to ensure north-south bike and pedestrian connections remain usable. This includes a need for close coordination with all of the organizations listed in this section. The project team would need to follow PP&R landscape design guidelines and Bureau of Development Services' mitigation requirements for work within the Greenway Overlay Zones. Additional information regarding potential mitigation for parks and recreation resources is described in Section 3.10, Parks and Recreation.
- Mitigation for impacts to Willamette River recreational boaters would primarily be in the form of early and frequent communication with the Oregon State Marine Board and law enforcement agencies to ensure boaters are aware of restrictions due to construction. Restrictions regarding river use would be communicated with Oregon State Marine Board staff more than 30 days prior to the added restrictions being needed to allow them to develop the necessary regulations and notices.

- Multnomah County and agency partners are considering the provision of free or reduced-price transit tickets to offset the negative impacts of out-of-direction travel during construction. If Multnomah County and agency partners agree to provide this transit subsidy, it would be recorded in the Final EIS and would be counted as a beneficial mitigation measure to offset negative project impacts on environmental justice populations.

Construction Traffic Management Options

Mitigation approaches for the Temporary Bridge and No Temporary Bridge Options remain the same as those described above including close coordination with PSM, Night Strike, PP&R, and Burnside Skatepark managers to ensure the spaces are returned to the same or better conditions.

See Section 3.10, Parks and Recreation, Section 3.18, Noise and Vibration, Section 3.1, Transportation, and Section 3.19, Air Quality, for additional recommended mitigation measures for construction impacts within or near social/neighborhood resources.

3.9 Environmental Justice

This section identifies existing environmental justice (EJ) populations and outlines anticipated project impacts to EJ groups.

3.9.1 Environmental Justice Background and Definition

The EJ analysis focused on identifying and addressing disproportionately high and adverse human health or environmental effects resulting from the Project's programs, policies, and activities on minority populations and/or low-income populations to the greatest extent practicable and permitted by law.

This analysis has been prepared to meet the federal requirements defined by EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, dated February 11, 1994, US Department of Transportation (DOT) Order 5610.2(a), and FHWA Order 6640.23A, effective June 14, 2012.

Minority and/or low-income populations are protected by EJ policies and guidance. For the purposes of EJ, DOT and FHWA define minority populations as Black, African American or of African descent, Hispanic or Latino origin, Asian American, American Indian, Alaskan Native, Native Hawaiian, or Pacific Islander.

To identify low-income populations, the United States Department of Transportation (USDOT) and FHWA use the Department of Health and Human Services poverty guidelines. Low-income is defined in the US Census as a person whose household income is at or below the US Department of Health and Human Services poverty guidelines of $25,750 (2019 guidelines) for a family of four. For the purposes of this analysis, to account for a higher regional cost of living, the threshold for low-income is considered to be double this guideline, $51,500.[1] Doubling the guideline also helps account for future inflation and further increases in the regional cost of living.[2]

More detail regarding the EJ analysis can be found in the *EQRB Environmental Justice Technical Report* (Multnomah County 2021j). Information about specific social service and neighborhood impacts is discussed in Section 3.8, Social and Neighborhood Resources.

3.9.2 Regulatory Context

Executive Order 12898

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations – directs federal agencies to "achieve environmental justice by identifying and addressing disproportionately high and adverse human health and environmental effects including the interrelated social and economic effects of their programs, policies, and activities on minority populations and low-income populations in the United States."

[1] This methodology is consistent with demographic variables used by US EPA EJScreen reporting, which uses 200 percent of the Federal Poverty Level (FPL). Detailed information about this methodology can be found in EPA EJScreen Technical Documentation: https://www.epa.gov/sites/production/files/2017-09/documents/2017_ejscreen_technical_document.pdf

[2] This methodology is also consistent with the *Poverty in Multnomah County* (2019) report developed by the Multnomah County Department of County Human Services and County Commission for Economic Dignity. The official poverty rate, which is defined as households with incomes below 100 percent of the FPL, is the only measure of poverty for which detailed and comprehensive data are available, but it significantly undercounts the number of people experiencing poverty. Many people with incomes above the official poverty rate are still unable to meet their basic needs, and many more do not have sufficient resources to achieve their full potential or participate as full and equal members of society.

FHWA Order 6640.23A

FHWA Order 6640.23A specifically details the FHWA's responsibilities in complying with EO 12898 as well as Title VI of the Civil Rights Act of 1964 (Title VI). Under Title VI, FHWA managers and staff must administer programs in a manner to ensure that no person is excluded from participating in, denied the benefits of, or subjected to discrimination under any program or activity of FHWA because of race, color, or national origin. Under EO 12898, FHWA must administer their programs to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of FHWA programs, policies, and activities on minority populations and/or low-income populations. When determining whether an action will have a disproportionately high and adverse effect, FHWA will consider mitigation and enhancement measures. In determining whether a mitigation measure or alternative is "practicable," the social economic (including costs) and environmental effects of avoiding of mitigating the disproportionately high and adverse effects will be considered.

FHWA Guidance on Environmental Justice and NEPA

The EJ analysis followed the procedures recommended in the FHWA NEPA Guidance memorandum as summarized below.

The information contained in FHWA memorandum Guidance on Environmental Justice and NEPA (Guidance) dated December 16, 2011, advises on the process to address EJ during NEPA review, including documentation requirements. The Guidance defines the process for identifying minority populations and low-income populations, documenting public participation, and identifying disproportionately high and adverse effects. The Guidance directs the agency to use localized census tract data and other relevant information sources to list any readily identifiable groups or clusters of minority and/or low-income persons in the EJ study area. Small clusters or dispersed populations should not be overlooked. The Guidance also directs FHWA to include a discussion of major proactive efforts to ensure public participation, the view of the affected population(s), and steps being taken to resolve any controversy that exists. Lastly, the Guidance provides a step-by-step procedure for summarizing beneficial and disproportionately high and adverse effects, comparing impacts on the minority and non-minority populations and low-income and higher-income populations, and the consideration of mitigation measures if necessary.

3.9.3 Methodology and Data Sources

In conformance with EO 12898, FHWA Order 6640.23A, and FHWA Guidance memorandum, American Community Survey (ACS) data was used to determine if there are any readily identifiable groups of minorities and/or low-income persons who live in the study area. The 2018 5-Year Estimates were used for this analysis. This dataset provides the most recent and reliable data at the census tract and block group level.

The assessment involved four basic steps:

1. Identify the study area to be considered for EJ screening (affected environment);
2. Compile race, ethnicity, and poverty status data for the study area to identify any minority and/or low-income populations;
3. Evaluate if benefits and/or disproportionately high and adverse effects on minority and/or low-income populations exist as a result of the Project; and
4. If disproportionately high and adverse effects exist, identify and address whether there are any disproportionately high and adverse effects on minority and/or low-income populations after such effects have been mitigated. This includes comparing disproportionately high and adverse effects on the

minority and/or low-income population with those on the non-minority and/or higher-income populations within the study area to determine if there is a disproportionately high and adverse effect.

3.9.4 Public Involvement

The EJ analysis was also informed by Multnomah County's broader equity, inclusion, and public engagement program for the Project. Between 2016 and 2020, Multnomah County and local partners solicited comments from the general public and key stakeholders, including low-income and/or minority people and organizations that directly serve or represent low-income and/or minority people.

Multnomah County implemented an inclusive public and stakeholder outreach process by offering a variety of ways for people to participate in project conversations. The following public engagement methods were used with an emphasis on directly reaching low-income and minority populations within the API:

- Interviews
- Community briefings
- Focus groups and working groups (some targeted specifically on low-income individuals)
- Committee representation
- Open houses
- Email updates
- Tabling at community events (i.e., markets)
- Field surveys
- Website/online engagement tools (i.e., videos)
- Social media engagement
- Newsletters and mailers
- Translated materials in languages other than English to reach minority populations

In addition, Multnomah County partnered with the Community Engagement Liaisons (CELs) Program to facilitate direct engagement with low-income and minority populations within a one-mile radius of the project area using several of the methods above, including in-person business canvassing, field surveys, and community briefings. Liaisons obtained feedback from Black and African American, Native American, Vietnamese, Chinese, Latinx, Japanese, Arabic, and Russian and Ukrainian communities within the API, of which some were also low-income individuals. In-person and online surveys used to collect feedback from the general public during this time also captured demographic information to track low-income and minority representation in the responses. In the most recent round of survey outreach conducted in 2020, minorities (all but White, non-Hispanic individuals) accounted for approximately 21 percent of all survey responses. Respondents with household incomes of $30,000 per year or less also accounted for approximately 21 percent of all survey responses.[3]

In addition, two working groups with members of the EJ community were formed to provide detailed input on the planning process and bridge alternatives. The Social Services working group is represented by individuals from the Portland Rescue Mission (PRM), Central City Concern (CCC), Bridgetown Night Strike, and Ride Connection, which directly serve the low-income and unhoused population in the API. Unhoused

[3] For comparison, the median household income of Multnomah County residents (2013–2017 ACS) was $60,369. Therefore, an annual household income of $30,000 represents approximately 50 percent of the median household income in Multnomah County.

low-income individuals are generally more difficult to engage through traditional outreach means than the general public, so the Social Services working group played a critical role in helping the County understand the potential for disproportionately high and adverse effects on low-income populations living or accessing social services in the vicinity of the Burnside Bridge. The Social Services working group raised several important issues pertaining to the analysis of disproportionately high and adverse effects on low-income populations including temporary access impacts at homeless meal and recovery centers, safety considerations related to the number of columns at Waterfront Park, and fare subsidies to support transit-dependent low-income individuals accessing social services in the west approach area. Input from the Social Services working group contributed to the selection of the Preferred Alternative and generation of mitigation ideas to minimize impacts to EJ and other historically disadvantaged groups.

The Diversity, Equity, and Inclusion (DEI) working group consisted of individuals representing the City of Portland, ODOT, Metro, and TriMet and provided insight on DEI best practices and lessons learned amongst agencies. This group discussed how agency equity lenses are applied to projects and provided insight on the relationship between these equity lenses, environmental justice, and project outcomes.

In addition to the working groups, Multnomah County, ODOT, and FHWA conducted direct outreach with other organizations that directly serve or advocate for low-income and minority populations. For example, Multnomah County met with organizations including the National Association for the Advancement of Colored People (NAACP), Coalition of Communities of Color, Native American Youth and Family Center, Native American Rehabilitation Center, Voz, Vancouver Avenue Baptist Church Immigrant and Refugee Community Organization, Asian Pacific American Network of Oregon (APANO), and Verde. Meetings with these organizations were held to share information and gather feedback on alternative concepts, potential impacts to low-income and minority populations, and mitigation strategies to inform selection of the Preferred Alternative. ODOT and FHWA also met with the Confederated Tribes of the Grand Ronde Community of Oregon, Confederated Tribes of Siletz Indians, Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, and Nez Perce Tribe in 2019. These meetings provided an opportunity for the tribes and agencies to discuss alternatives proposed for the Project, cultural resource surveys, and potential effects of the Project, and mitigation strategies. These tribes are recognized as a Participating Agency for the NEPA process.

The Public Involvement program is also supported by the EQRB Diversity, Equity, and Inclusion plan, which was developed based on feedback from early EJ interviews, a DEI working group, and project area demographics analysis on other DEI plans to implement engagement strategies and recommendations that would bring the voices of low-income and minority populations to the project planning and allow for influence in decision-making.

In addition to the working groups, Multnomah County, ODOT, and FHWA have conducted additional outreach with other organizations that represent EJ populations. For example, Multnomah County has engaged broader organizations such as the National Association for the Advancement of Colored People (NAACP) to share bridge alternative concepts and gather feedback on the Preferred Alternative. ODOT and FHWA also met with the Confederated Tribes of the Grand Ronde Community of Oregon, Confederated Tribes of Siletz Indians, Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, and Nez Perce Tribe in 2019. These meetings provided an opportunity for the tribes and agencies to discuss alternatives proposed for the Project, cultural resource surveys, potential effects of the Project, and mitigation strategies. These tribes are recognized as a Participating Agency for the NEPA process.

The EJ analysis builds on these past and ongoing outreach efforts to assess the potential for disproportionately high and adverse environmental effects resulting from the Project. More detailed discussion about the public engagement process is documented in Attachment K, *Summary of Public Involvement and Agency Coordination*.

3.9.5 Affected Environment

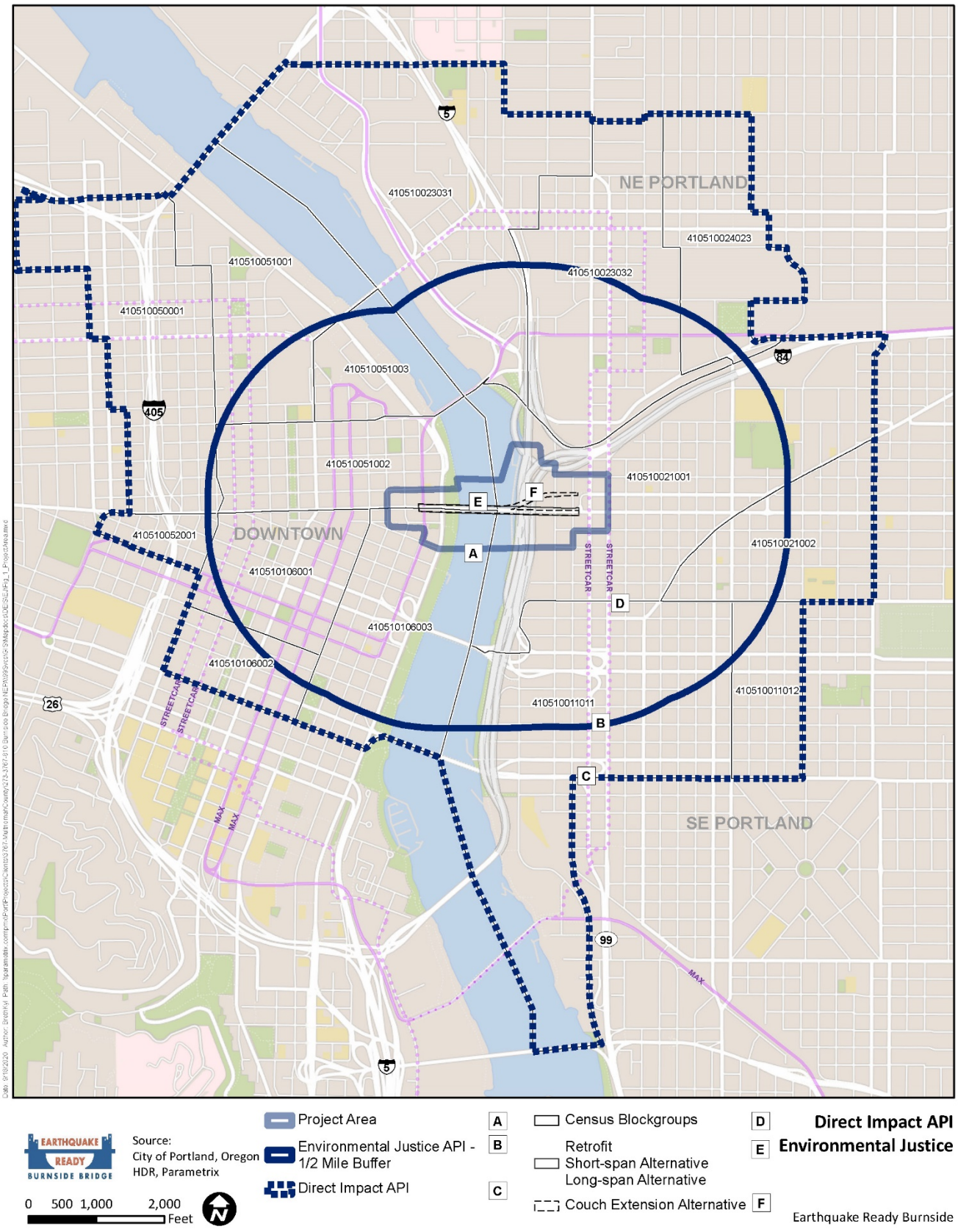
EJ impacts and benefits are inclusive of long- and short-term direct, indirect, and cumulative impacts. The API used for the EJ analysis of long- and short-term environmental impacts includes a 0.5-mile buffer from the project area. Using this buffer, the entirety of all census tracts and block groups intersecting the 0.5-mile buffer were selected to constitute the *Direct API*, denoting the area where direct environmental impacts are likely to occur as a result of the Project. Therefore, *API* and *Direct API* are used interchangeably throughout the report, as environmental effects are considered for all intersecting census geographies even if partially located outside the strict 0.5-mile buffer. Figure 3.9-1 shows the 0.5-mile buffer and Direct API boundary resulting from the selected census geographies.

The Direct API for the EJ analysis is broader than the API for some of the other environmental topics and is substantially broader than the immediate project area. The Direct API captures broad potential effects including direct physical impacts and infrastructural changes, transportation network changes, short-term construction impacts, changes to access in the area, and other network effects as a result of the Project. An analysis of existing EJ populations within the API considers information obtainable via census data.

Impacts outside of the Direct API are considered indirect project impacts. Analysis of indirect impacts is primarily qualitative and based on historical and current development and population trends in the region. Therefore, the assessment of indirect impacts considers reasonably foreseeable project actions that would result in disproportionately high and adverse effects on low-income and minority populations within the Portland metropolitan region as a whole, such as those that would occur later in time or further in distance from the Direct API.

Analysis of cumulative impacts considers the incremental impact of project effects outside of the Direct API combined with the effects of other past, present, and reasonably foreseeable future actions within the Portland metropolitan region that could result in disproportionately high and adverse impacts on environmental justice populations.

Figure 3.9-1. Direct Impact API



Environmental Justice Populations

Minority Populations

Table 3.9-1 compares the proportion of minority residents within the API to those living in Multnomah County as a whole. Table 3.9-2 reports minority populations within API census tracts to show where concentrations of different minority groups exist. Figure 3.9-2 displays the same information to show where minority population concentrations reside within API census tracts.

Table 3.9-1. Minority Populations within the API and County

Minority persons as percent of total population within API census tracts

Demographics	API	Multnomah County
Total Population	1,643	811,880
Hispanic (all races)[1]	6.1%	11.7%
White Non-Hispanic	76.1%	68.9%
Black Non-Hispanic	6.4%	5.4%
American Indian – Non-Hispanic	0.6%	0.8%
Asian Non-Hispanic	4.9%	7.8%
Pacific Islander – Non-Hispanic	1.1%	0.7%
Two or More Races – Non-Hispanic	4.6%	4.3%
Total Minority	**23.7%**	**30.8%**

Source: US Census Bureau, American Community Survey - 2014-2018 5-Year Estimates (US Census 2019)

[1]Note: Hispanic origin is generally not considered to be a racial group but is considered a minority. For the purposes of this evaluation, all individuals identifying as non-white races combined with those of Hispanic origin (of any race) together make up the minority population.

Table 3.9-2. Minority Populations within Census Tracts

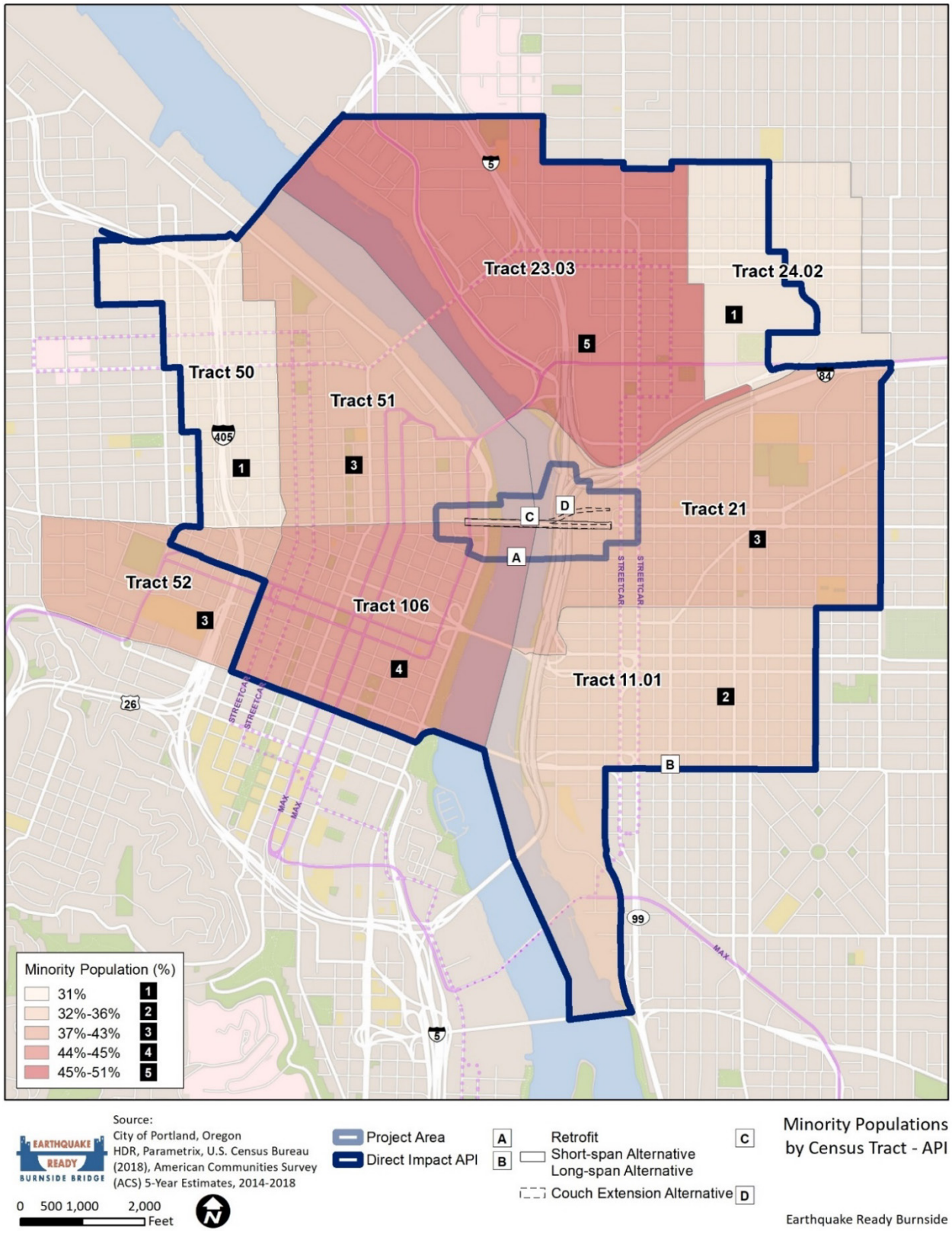
Percent of total population within API census tracts

Census Tract	Total Population	Hispanic (all races) (percent)	White Non-Hispanic (percent)	Black Non-Hispanic (percent)	American Indian – Non-Hispanic (percent)	Asian Non-Hispanic (percent)	Pacific Islander – Non-Hispanic (percent)	Two or More Races – Non-Hispanic (percent)	Total Minority (percent)
11.01	2,473	2.8	80.7	8.0	0.4	2.7	0.0	5.3	19.3
21	2,694	2.9	76.0	4.8	1.9	3.9	4.1	5.3	23.0
23.03	2,555	5.8	71.5	12.5	0.4	3.4	0.0	6.4	28.5
24.02	1,188	8.2	80.2	4.4	0.0	5.7	0.0	1.5	19.8
50	3,326	3.0	82.5	2.1	0.0	7.8	0.0	4.6	17.5
51	8,148	7.5	74.7	6.2	0.4	5.3	1.6	4.2	25.3
52	1,003	15.2	70.6	1.8	0.7	3.6	2.8	5.4	29.4
106	3,144	7.7	73.6	8.8	1.6	4.3	0.0	4.0	26.4
API Total	**24,531**	**6.1**	**76.1**	**6.4**	**0.6**	**4.9**	**1.1**	**4.6**	**23.7**
Multnomah County Total	**811,880**	**11.7**	**68.9**	**5.4**	**0.8**	**7.8**	**0.7**	**4.0**	**30.5[a]**

Source: US Census Bureau, American Community Survey – 2014–2018 5-Year Estimates (US Census 2019)

[a] This table reports a Multnomah County total percentage of minority populations that is 0.3 percent lower than EJ populations due to minor discrepancies in the margin of error between census block groups and census tracts.

Figure 3.9-2. Minority Populations by Census Tract



As shown in Table 3.9-1, the API has lower minority representation than Multnomah County as a whole. However, the API has slightly higher concentrations of three minority groups: Black and African American, Native Hawaiian or Pacific Islander, and two-or-more-race residents. As shown in Table 3.9-2, concentrations of minority residents within the API are relatively even across census tracts and range from a low of 17.5 percent in census tract 50 to a high of 29.4 percent in census tract 51.

As shown in Figure 3.9-2, the greatest concentration of the minority population resides in census tract 23.03, located east of the Willamette River along the I-5 corridor, north of I-84. The two largest minority groups in the API are Hispanic or Latino and Black or African American residents, which comprise 6.1 percent and 6.4 percent of the total population, respectively. Tracts 52 and 23.03 contain the highest concentrations of Hispanic or Latino and Black or African American individuals. Hispanic or Latino residents account for 15.2 percent of the total population in census tract 52, while Black or African American residents account for 12.3 percent of the total population in census tract 23.03.

Low-Income Populations

Table 3.9-3 shows the percentage of the population considered to be low-income within the API and Multnomah County. Figure 3.9-3 summarizes the low-income population concentrations living within API census tracts.

As indicated in Table 3.9-3, the percentage of low-income individuals in the API (38 percent) is higher than that found in the county (28 percent). The majority of the tracts have a substantially higher percentage of low-income individuals than Multnomah County as a whole, particularly census tract 106 (65 percent). Census tract 106 represents the area west of the Willamette River and south of W Burnside and includes the hub of social service providers in the west approach area.

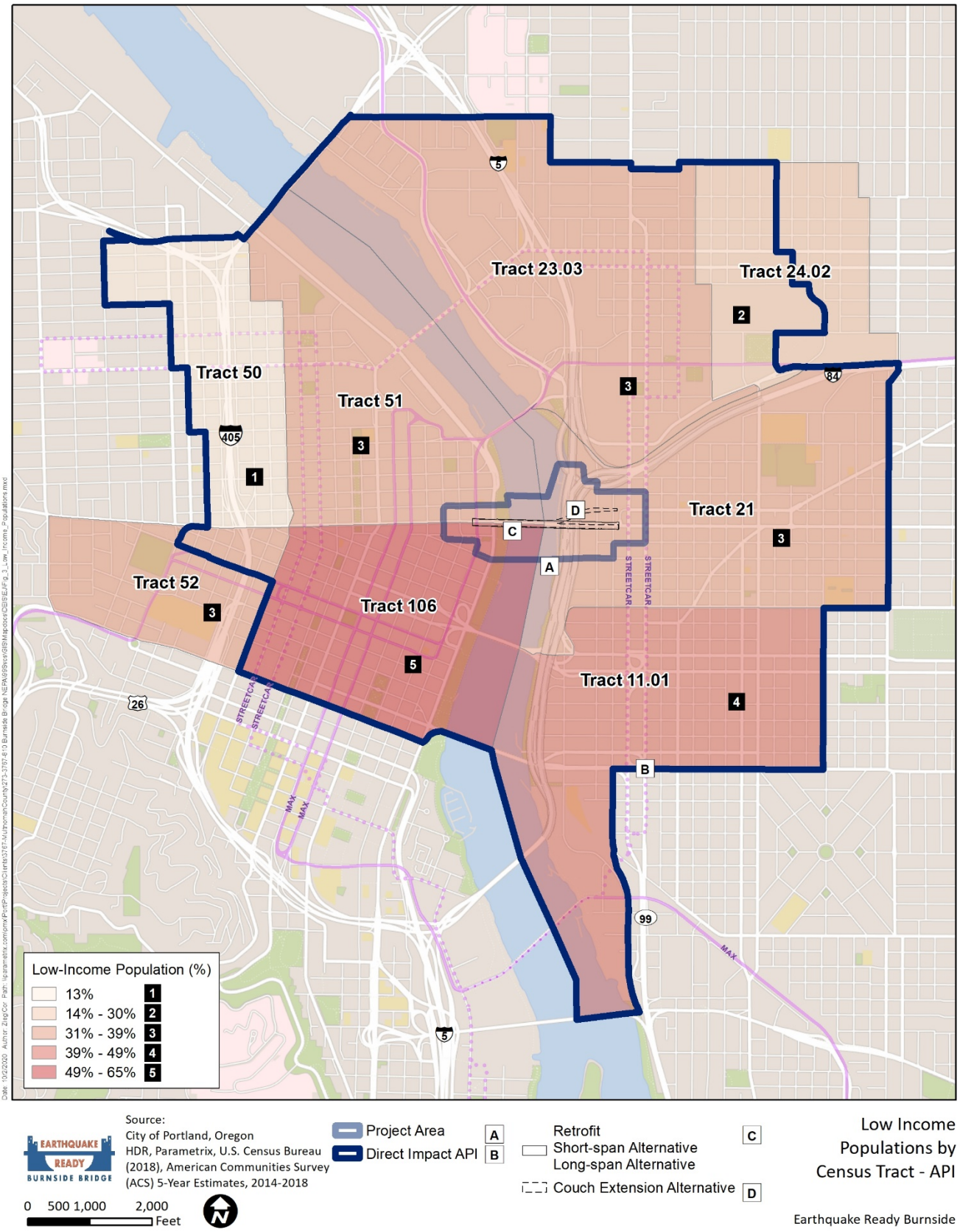
Table 3.9-3. Low-Income Populations within the API and County

Percent of total population considered low-income in census tracts

Tract	Total Population	Low-Income Population	Low-Income Population (percent)
11.01	2,473	1,202	48.6
21	2,660	1,040	39.1
23.03	2,480	906	36.5
24.02	1,753	539	30.8
50	3,326	456	13.7
51	8,040	2,997	37.3
52	664	258	38.9
106	2,640	1,726	65.4
API Total	**24,036**	**9,124**	**38.0**
Multnomah County Total	**811,880**	**226,522**	**27.9**

Source: US Census Bureau, American Community Survey – 2014–2018 5-Year Estimates (US Census 2019)

Figure 3.9-3. Low-Income Populations by Census Tract



Homeless Populations

The EJ analysis used other localized and relevant information sources to identify groups or clusters of minority or low-income persons that may be underrepresented in US Census counts. Specifically, additional analysis assessed disproportionately high and adverse effects on low-income persons that may be also experiencing homelessness. For the purposes of this EJ analysis, homeless individuals are considered a subset of the low-income population.

This analysis was based primarily on the 2019 Point-in-Time Count of Homelessness study (the Count) conducted by Multnomah County and Portland State University.[4] Additional information published by the Multnomah County Office of Homeless Services and the US Environmental Protection Agency's (EPA) EJScreen tool was used to inform the analysis of homeless individuals living or accessing services within the API. Public outreach to social service organizations that directly serve the homeless such as PRM and Night Strike was completed to inform the analysis of disproportionately high and adverse effects on homeless and low-income individuals that would occur as a result of the Project.

The 2019 Count identified 2,037 people who were unsheltered, 1,459 people sleeping in emergency shelters, and 519 people in transitional housing.[5] In all, the Count found 4,015 people who met the US Department of Housing and Urban Development's (HUD's) definition of homelessness.[6]

Of this amount, 435 were counted in the SE Portland area (Willamette River to 2nd Avenue) and 413 were being counted in the Downtown/Old Town/Pearl neighborhoods. These two locations, both of which intersect with the API, had the highest share of the unsheltered population compared to the other listed locations.

The 2019 Count was also used to address the undercounting of minority populations in US Census data. The Count determined that minorities (all except White-Alone respondents) accounted for 38.1 percent of the homeless population in Multnomah County. When compared to the concentration of minorities within Multnomah County as a whole (30.8 percent), these findings indicate a relatively high concentration of minorities among the Multnomah County homeless population.

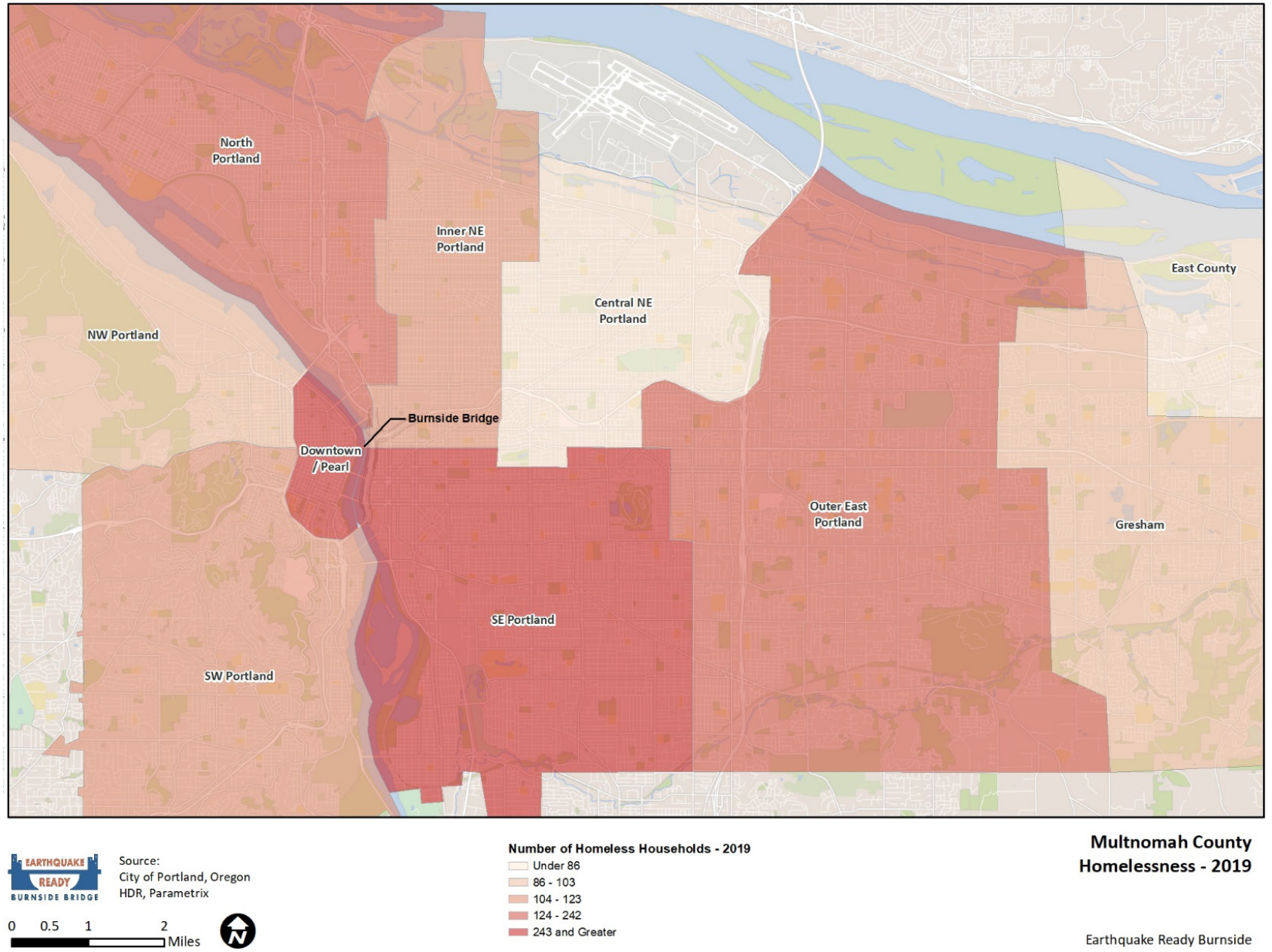
Figure 3.9-4 below displays neighborhood-level counts of homelessness for 2019. Concentrations of homeless individuals are highest in Downtown/Pearl District/Old Town and SE Portland which intersect the Direct API.

[4] The Point-in-Time Count of Homelessness Study provides a bi-annual snapshot of the individuals and families experiencing homelessness on a given night in the City of Portland and Multnomah County. The 2019 study provides a count of homelessness for January 23, 2019.

[5] In 2019, 707 individuals did not wish to participate in the street count portion of the Count, so it these findings underestimate the true number of homeless individuals in Multnomah County.

[6] HUD defines homeless individuals and families as those…"who lack a fixed, regular, and adequate nighttime residence and includes a subset for an individual who is exiting an institution where he or she resided for 90 days or less and who resided in an emergency shelter or a place not meant for human habitation immediately before entering that institution…" The full definition can be found at https://www.hud.gov/sites/documents/PIH2013-15HOMELESSQAS.PDF

Figure 3.9-4. Point-in-Time Homeless Count Estimates by Neighborhood (2019)



While there is a high concentration of homeless individuals within Downtown/Pearl District/Old Town and Southeast Portland, there has been a greater percent change of homelessness in neighborhoods outside of the Direct API—namely in North Portland and Central NE Portland. This suggests that disproportionately high and adverse effects on homeless populations within the API are more likely to occur as a result of shorter-term construction impacts. Neighborhoods outside the Direct API may capture a larger share of the city's homeless population in the future, reducing the potential for long-term disproportionately high and adverse effects on low-income populations living in the vicinity of the Burnside Bridge.

Social and Emergency Service Providers

Social and emergency service providers are discussed in this chapter for directly serving low-income and minority populations within the API and project vicinity. The area surrounding W Burnside from NW/SW 1st Avenue to NW/SW 3rd Avenue is a hub for social services with CCC, PRM, Union Gospel Mission, and the Liberation Street Church located on W Burnside, and the Salvation Army located on W Burnside and SW 2nd Avenue. These organizations provide overnight shelter, food, and access to health/social services to homeless, low-income, and minority individuals within the API.

On the east side, providers and service centers include Harry's Mother Run-Away Youth, Independent Living Resources (help resources for persons with disabilities), Multnomah County Department of Human Services Child Welfare Office, and two locations of the Salvation Army. In addition, AMR provides ambulance services (dispatch and fleet maintenances) to Multnomah County, Clackamas County, and Clark County.

Additional information about social and public service resources is provided in Section 3.8, Social and Neighborhood Resources, and Section 3.6, Public Services. Figure 3.8-2 in Section 3.8 depicts the location of social and emergency service providers relative to the project area.

3.9.6 Impacts from Bridge Alternatives

The potential for disproportionately high and adverse impacts to EJ populations were determined by considering the following factors:

- Concentrations of EJ populations within the Affected Environment
- An assessment of environmental impacts caused by the Project that would be predominately borne by low-income and/or minority populations compared the non-minority or non-low-income population
- Project mitigations, enhancements, and offsetting benefits
- Anecdotal information gleaned from the public involvement process

A summary of potential environmental impacts for all build alternatives can be found in Table 5 of the *EQRB Environmental Justice Technical Report* (Multnomah County 2021j).

No-Build Alternative Impacts

Pre CSZ Earthquake – Under the No-Build Alternative, the Burnside Bridge would not be retrofitted or replaced. The Burnside Bridge would remain seismically vulnerable. The No-Build Alternative also assumes future projects and land use changes would occur that are anticipated in adopted transportation and land use plans.

Under this alternative, TriMet transit service would not be temporarily affected by project construction and impacts to MAX service are not anticipated; however, while not affected by project construction, impediments to transit service would still occur. Multnomah County and TriMet project that the No-Build Alternative would result in more extensive and more frequent maintenance and repair actions on the bridge. Depending on the type of repairs or maintenance actions, their number, and frequency, these actions could

cause varying degrees of transit trip delays to bus Lines 12, 19, and 20, particularly during evening peak hours. Because low-income populations are typically more dependent on public transit than the general population, these delays and longer transit travel times would result in disproportionately high and adverse effects on low-income individuals. Depending on the type of repair or maintenance actions, their number, and frequency, this would affect the use of the bridge by these populations.

Post CSZ Earthquake – The immediate effects of a CSZ earthquake under the No-Build Alternative would likely include severe damage to, and potential collapse of, several unreinforced masonry buildings at the west approach, independent of the bridge collapse itself. Without definitive engineering studies showing otherwise, this damaged state is assumed to apply to several buildings that provide direct lifeline services to low-income and minority populations, including the Salvation Army building and the CCC Shoreline Building. The collapse of these buildings would result in the loss of critical services, housing, and employment within the API and surrounding region, as well as the potential loss of life. There are no social services housed in unreinforced masonry buildings directly adjacent to the east approach; however, in the weeks, months, and potentially years following a CSZ earthquake, access to community facilities and social services near the bridgehead from both E and W Burnside Street would be closed. Additionally, access to some businesses on NE 2nd Avenue and NE 3rd Avenue below the east bridgehead, and Naito Parkway and NW 1st Avenue below the west bridgehead, would be lost due to the bridge's collapse.

Impacts Common to All Build Alternatives

Direct – All build alternatives would produce minimal long-term impacts on traffic circulation, volume, noise, and the bridge footprint. The analysis of right-of-way also suggests that there would be a few long-term changes in access points to buildings and services in the project area that may require longer walk times and cause inconvenience to low-income and minority pedestrians. Overall, long-term impacts to environmental justice populations resulting from the build alternatives are relatively minimal, especially when compared to the disproportionately high and adverse effects that would occur under the No-Build Alternative in a post-earthquake scenario. The primary source of direct impacts to EJ populations would result from property displacements and acquisitions.

All build alternatives would need to acquire property adjacent to the existing right-of-way either for construction or permanent use by the Project. Due to their localized impact, property displacements and acquisitions have the potential to result in disproportionately high and adverse effects on EJ populations within the API. See Section 3.3, Acquisitions and Relocations, for property impacts related to the project construction for the various alternatives.

Table 3.9-4 below summarizes the number of affected properties and displacements by each build alternative. There would be no residential displacements associated with any of the alternatives.

Table 3.9-4. Displacements and Acquisitions by Alternative

Alternative	Fee Full Acquisition	Fee Partial Acquisition	Easement[a]	Temporary Construction Easement[b]	Permanent Business Displacements	Temporary Business Displacements
Retrofit	6	2	6	14	6	1[c]
Short-Span Alternative	6	2	6	17	6	0
Long-Span Alternative	6	2	1	17	6	0
Couch Extension	8	4	7	20	6	0
Temporary Bridge Option	+0	+0	+0	+2	+0	1

[a] Includes Permanent Easements for bridge facilities
[b] Includes temporary construction easements for staging and work as well as building access closures.
[c] Closure to the PRM expected to be 2 to 3 months during construction.

Indirect – Future No-Build and build alternatives would provide the same capacity as the existing condition; therefore, indirect transportation impacts related to the permanent condition are not anticipated. Property acquisitions and business displacements associated with the build alternatives would not have indirect impacts on other uses within the API, as similar uses exist within the API that provide comparable services. No significant indirect EJ impacts are expected as a result of the build alternatives.

Short Term – Because social service organizations that provide direct service to EJ populations exist within the project area, short-term access impacts to social services have the potential to impact EJ populations to a higher degree than the general population. However, short-term impacts have been mostly avoided through the design process.

Homeless individuals who have established temporary residence under the Burnside Bridge would be displaced during construction of all the build alternatives. The number of individuals that would experience displacement is unknown; however, social service facilities would be accessible to those who use them throughout construction.

Bridge demolition and replacement for all the build alternatives would require weekend or evening I-5 and I-84 lane closures. However, such lane closures are not anticipated to result in disproportionately high and adverse effects on EJ populations compared to impacts on Burnside Bridge users as a whole.

In addition, construction trucks would be traveling to and from the site throughout the construction phase, contributing to the traffic delays. These traffic delays are not considered disproportionately high and adverse effects on EJ populations.

Post CSZ Earthquake – With all of the build alternatives, the bridge would be designed to remain fully operational and accessible for vehicles and other modes of transportation following a major CSZ earthquake event. Additionally, all the build alternatives would provide clearance between the bridge and adjacent buildings to allow independent movement during a seismic event. A seismically resilient Burnside Bridge would minimize the potential for disproportionately high and adverse effects on environmental justice populations caused by the collapse of the Burnside Bridge.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have the following impacts:

- Analysis of right-of-way suggests that a temporary construction easement (TCE) would disrupt pedestrian access to the PRM for approximately 3 months during the construction period. This construction easement would result in a disproportionately high and adverse effect on low-income and minority populations accessing PRM services within the API.
- A TCE would also obstruct pedestrian access to the Mercy Corps building for a portion of the construction period. This obstruction would result in a disproportionately high and adverse effect on low-income and minority populations accessing Mercy Corps services within the API.

Replacement Alternative with Short-Span Approach Impacts

This alternative would have the same impacts as the Retrofit Alternative, with the following differences:

- None of the replacement alternatives would close or obstruct the PRM access doors on Burnside Street.

- There would be three fewer pier locations within Governor Tom McCall Waterfront Park, providing a more open experience to the water from the park and increasing usable park space for all park users, including EJ populations. This would enhance personal security, facilitate maintenance work, enhance access to a part of the Portland Saturday Market weekly stall locations and a portion of the Willamette River Water Trail, and serve as a space for weekly Night Strike gatherings.
- The replacement alternatives are anticipated to require less frequent and extensive long-term maintenance and would have fewer noise and access effects on the community resources in the API compared with the Retrofit Alternative. Similarly, the replacement alternatives would provide an even greater reduction in the potential risk of seismic damage compared to the Retrofit Alternative.
- A TCE would limit pedestrian access to the CCC Shoreline Building and the Salvation Army, making it more difficult for low-income and minority populations to access these critical services. These short-term access impacts would result in a disproportionately high and adverse effect on EJ populations accessing these services within the API.
- A TCE at the PRM would be required for staging and/or bridge construction, which would limit pedestrian access to low-income and minority populations seeking PRM services. Staging and bridge construction would also inhibit ambulance access to PRM. Reportedly, emergency services provide frequent first-response services to PRM more than once a week via the access door at Burnside Street.[7] Therefore, a TCE at the PRM is anticipated to result in a disproportionately high and adverse effect on low-income and minority populations accessing social services within the API.

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following differences:

- Removal of five footings within Governor Tom McCall Waterfront Park at the west approach would result in improved visibility and a safer environment for all users of the park, including EJ populations. The removal of footings in the park is considered a safety and visibility benefit to low-income and minority users of the park.

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following differences:

- The Pacific Coast Fruit Company, which is considered as a potential EJ resource for potential employment of low-income and minority workers, would be permanently displaced.[8] However, workforce demographics of the Pacific Coast Fruit Company are not known at the time of this writing; therefore, impacts to the Pacific Coast Fruit Company were included in this analysis for broad consideration alone. The business would be anticipated to operate in a different location.
- The existing pedestrian and bicycle facility on the Couch Street alignment would be removed to accommodate the extension of the Couch Street couplet. Bicycle and pedestrian traffic would be re-routed, resulting in an additional 0.15 miles (approximately 790 feet) of out-of-distance travel for pedestrians and bicyclists. This would have a potential disproportionately high and adverse effect on EJ populations living or working in the area, making it more difficult to access the services provided by social and community service providers in the API.

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[7] For more information regarding PRM, please refer to Section 3.8, Social and Neighborhood Resources. For more information regarding emergency services see Section 3.6, Public Services.

[8] For more information on employee displacement impacts, refer to the *EQRB Acquisitions and Displacements Technical Repor*t (Multnomah County 2021b).

Impacts from Potential Off-Site Staging Areas

For any of the alternatives, the construction contractor would use one or more off-site staging areas outside the project area to store and and/or assemble materials that would then be transported by barge to the construction site. Whether, where, and how to use such sites would be the choice of the contractor, and therefore, the actual sites are unknown at this time. Based on a review of four representative sites, the impacts resulting from off-site staging areas are anticipated to have little to no disproportionately high and adverse effect on EJ populations. However, actual impacts would depend on the site(s) selected.

Without a Temporary Bridge

Without a temporary bridge, individuals without a vehicle would need to take alternative walking, biking, or transit routes – most likely the Steel or Morrison Bridges – or possibly switch modes to access services on the opposite side of the river. This is anticipated to have a disproportionately high and adverse effect on low-income individuals who walk or bike across the river to access dining halls, temporary shelter, and social services such as PRM. The duration and intensity of cross-river access impacts would be greater without the temporary bridge; however, the duration of construction impacts to access, noise, and air quality would be 1.5 to 2 years shorter. Please refer to Section 3.1, Transportation, for additional information regarding traffic impacts.

With a Temporary Bridge

The temporary bridge (regardless of the travel mode option selected) would add an additional 1.5 to 2 years of construction time. Differences in impacts to EJ populations with a temporary bridge are described below:

- A temporary bridge would provide both individuals without a vehicle and service providers with a more direct route for accessing services on both sides of the river.
- EJ impacts would have less of a disproportionate impact on individuals that normally travel in and through the neighborhood, especially for those individuals with disabilities.
- TriMet bus Lines 12, 19, and 20 would have only minor increases in travel time because they would not need to detour to the Steel Bridge.
- Installation of the temporary bridge itself is expected to cause the highest level of construction noise, exposing people living, working, and visiting the area to noise for a longer period of time. This is a particular concern for low-income and minority populations living in CCC and PRM housing or who may find it difficult to navigate through the area during construction, as discussed in Section 3.18, Noise and Vibration.

3.9.7 Project Benefits

The following are elements that would benefit EJ populations and would be included in all build alternatives:

- Seismic resiliency – All build alternatives would minimize disproportionately high and adverse effects on low-income and minority populations in a post CSZ earthquake scenario, including the likely collapse of the CCC and Salvation Army Buildings. All build alternatives would mitigate the collapse of these buildings which would result in the loss of critical services, housing, and employment within the API and surrounding region, as well as the potential loss of life.
- All the build alternatives would provide access across the bridge for the same transportation modes that presently use the bridge. Additionally, all the build alternatives would be designed to accommodate potential future streetcar expansion on the Burnside Bridge as is planned in the adopted *Portland Streetcar System Concept Plan* (City of Portland 2009).

- Improved access to the Vera Katz Eastbank Esplanade and the Skidmore Fountain MAX Station – The current stairwell from the south side of the east approach to the esplanade and the stairs from the west approach to the Skidmore Fountain MAX Station would be replaced with an Americans with Disabilities Act–accessible facilities, likely a ramp and stairwell combination. Reconstructed access from the north side of the east approach to the esplanade is not currently proposed under any alternative.
- Lighting – Lighting would meet local standards for illumination of eastbound and westbound roadways and pedestrian and bicycle lanes. Lighting under publicly accessible portions of the bridge approaches would also be installed consistent with local standards. Based on community feedback, project lighting elements are expected to result in safety and visibility benefits for EJ populations using active transportation facilities, parks, and recreational resources.

3.9.8 Mitigation

Mitigation measures are similar across all the build alternatives except where noted below.

Community Engagement and Communications – As part of the EQRB DEI program, Multnomah County, ODOT, and FHWA have conducted direct outreach with organizations that directly serve or advocate for low-income and minority populations. A major component of this outreach is to identify implementable mitigation actions to offset disproportionately high and adverse effects on low-income and minority populations, including long- and short-term direct, indirect, and cumulative effects. This outreach will continue to inform the reporting of impacts and identification of actionable mitigation measures in the Final EIS.

Sustained public outreach and coordination with community stakeholders during construction activities will also play an important role in mitigating disproportionately high and adverse effects on environmental justice populations. For example, signage and advanced information about detours and closures would allow EJ populations to plan their trips in advance, avoid confusion, and additional delays. This kind of information would be critical for social service providers who would be able to relay short-term construction impacts to the community members they serve. As appropriate, coordination and assistance to establish alternative access points to buildings where access would be made more difficult would be considered, and those access changes would be communicated clearly and in advance to affected EJ populations.

Economic – To offset negative temporary impacts and ensure project benefits are being distributed fairly, Multnomah County and agency partners would work together to ensure that the economic benefits of project construction reach low-income and minority workers, and disadvantaged, small, woman, or minority-owned business enterprises. Such collaboration would involve union representatives, minority contractors, pre-apprenticeship training programs, Multnomah County officials, and non-profit workforce development organizations to ensure EJ populations have expanded and equal opportunities to participate in the work program. Refer to Section 3.5, Economics, for more information about mitigation related to economic impacts.

Transportation – If the No Temporary Bridge Option is selected, free or reduced-price transit passes would be provided to those who qualify to offset the negative disproportionate impacts of out-of-direction travel during construction. Passes would be distributed by direct service providers with insight into the specific transportation needs of the individuals they serve. The County would also coordinate with TriMet on transit mitigation measures during construction. See Section 3.1, Transportation, for more information about transportation-related mitigation.

Acquisition and Displacement – The ongoing design process would attempt to reduce property impacts where possible. Where impacts and displacements are not feasible, the property acquisition and relocation assistance process, summarized in Section 3.3, Acquisitions and Relocations, would be conducted in accordance with the Uniform Relocation and Real Property Acquisition Policy Act of 1970 (49 CFR Part 24).

3.10 Parks and Recreation

This section identifies existing parks and recreation resources and outlines anticipated project impacts to those resources. More detail can be found in the *EQRB Parks and Recreation Technical Report* (Multnomah County 2021r). Impacts related to recreational resources protected by Section 4(f) of the Transportation Act are discussed in Attachment M, Draft Section 4(f) Analysis. Preliminary determinations of Section 4(f) use are provided in this section.

3.10.1 Affected Environment

The API for the parks and recreation analysis is limited to the areas (on, under, and adjacent to the bridge) that would be permanently or temporarily impacted by each alternative. Park and recreation resources in the API include Willamette River recreation, the Willamette River Greenway Trail, the Vera Katz Eastbank Esplanade (Eastbank Esplanade) (including the Kevin J. Duckworth Memorial Dock), Governor Tom McCall Waterfront Park (Waterfront Park), Ankeny Plaza, and the Burnside Skatepark (see Figure 3.10-1).

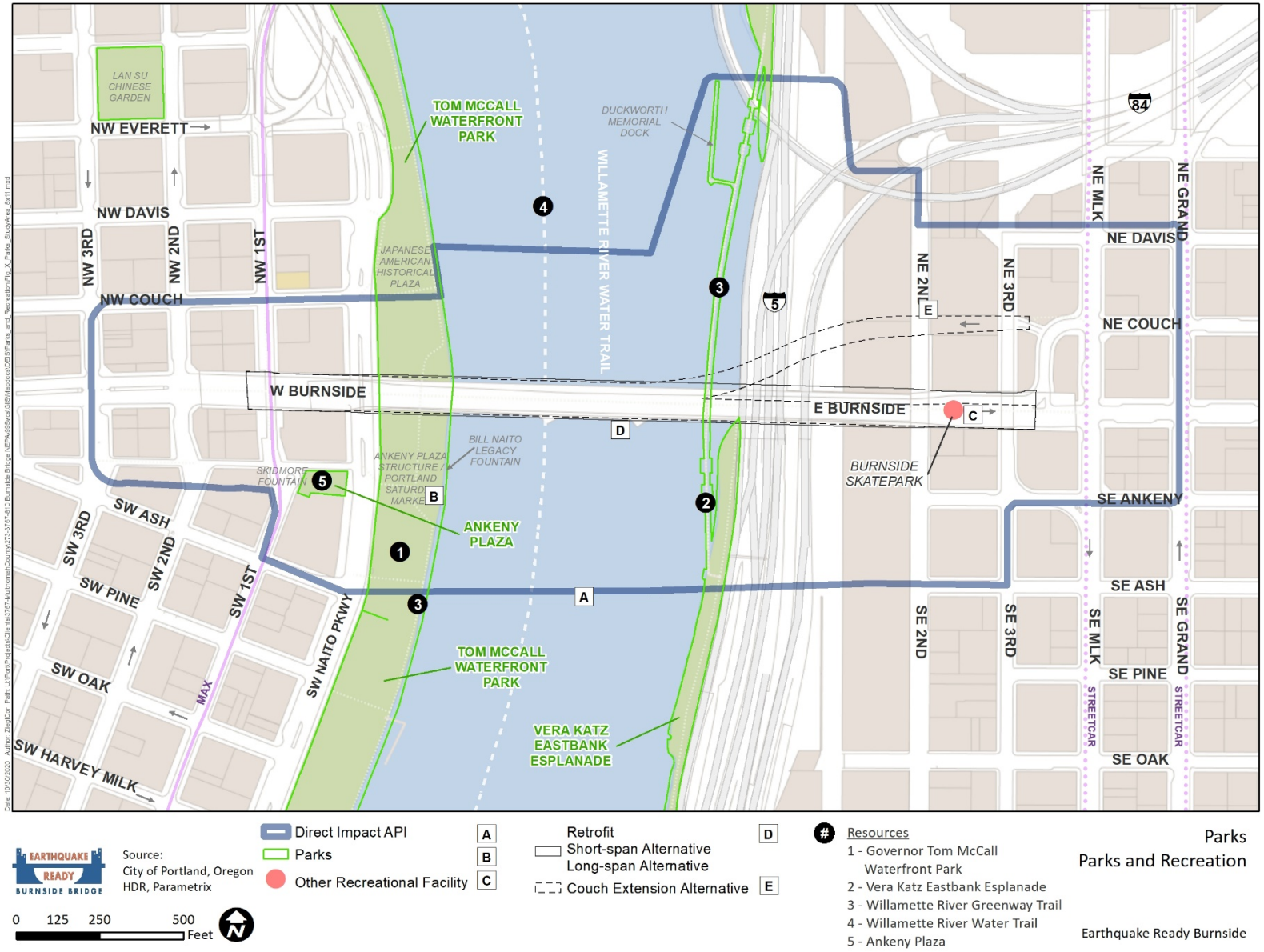
There is an indication that some recreational lands partially in the API could be subject to Section 6(f) of the Land and Water Conservation Fund (LWCF) Act; however, LWCF funds were not applied within the API. Coordination with the Oregon Parks and Recreation Department (OPRD) LWCF program, the National Park Service (NPS), and the City of Portland is ongoing to identify the extent of the site purchased and/or developed using LWCF monies and could result in recommendations for mitigation that could be applied to reduce, avoid, or offset impacts. The official boundary determination of LWCF grant monies that could apply to the project has not yet been received from NPS, however OPRD has preliminarily indicated that LWCF Section 6(f) will not apply. The Final EIS will include Section 6(f) analysis and compliance information.

Willamette River Recreation – The Oregon State Marine Board (OSMB) oversees recreational boating in Oregon, develops boating regulations, and collects river use data. According to the OSMB, the API includes a stretch of the Willamette River that receives over 250,000 boater use days (196,460 motorized boats and 53,995 non-motorized boats), making it the most-used section of water in Oregon for recreational boaters (OSMB 2017). The area directly around the Burnside Bridge acts primarily as a pass-through from one part of the river to another, rather than as a destination. However, in addition to individual recreational boating, on-river events are held on the Willamette River annually including The Big Float and the Portland Bridge Swim, among others. One public dock, the Kevin J. Duckworth Memorial Dock, and the Willamette River Water Trail (WRWT) are also within the affected environment.

Willamette River Water Trail – Managed by the Oregon Parks and Recreation Department, the WRWT is a 216-mile-long water-based trail. It does not encompass a specific location or route within the river, but as the Willamette passes under the Burnside Bridge, the WRWT does as well. Users tend to be human powered vessels such as canoes and kayaks, and no designated access points are located in the API.

Vera Katz Eastbank Esplanade – A City of Portland structure, the 1.5-mile-long Eastbank Esplanade extends north from the Hawthorne Bridge, past the Morrison and Burnside Bridges, and terminates at the Steel Bridge, with connections to eastside neighborhoods as well as across the river to Waterfront Park. The City of Portland developed the Esplanade after its completion of the Eastbank Riverfront Park Master Plan (City of Portland 1994). Construction was completed in May 2001. Features in the API include all-hour, all-day access; a floating walkway; stairs connecting to Burnside Bridge; a multi-use pedestrian and bicycle trail with occasional benches; and the Kevin J. Duckworth Memorial Dock. The Esplanade is also part of the Willamette River Greenway Trail.

Figure 3.10-1. Parks



Governor Tom McCall Waterfront Park – Owned and managed by the City of Portland, this 36-acre park is located between the Willamette River and downtown Portland. It was constructed between 1974 and 1978. Features in the API include the Willamette River Greenway Trail; the Japanese American Historical Plaza; Ankeny Plaza Structure/Portland Saturday Market Location; and The Meadow and Bill Naito Legacy Fountain.

Ankeny Plaza – The City of Portland owns and manages this 1.33-acre park property just south of the Burnside Bridge between SW 1st Avenue and SW Naito Parkway, adjacent to SW Ankeny Street. Features in the API include a hardscape plaza that features historic building material components, wrought iron details, and rows of deciduous trees. Skidmore Fountain is a prominent feature in the plaza and is known as Portland's oldest existing piece of public art. The plaza is used by the Portland Saturday Market.

Burnside Skatepark – Independently funded, maintained, and operated, Burnside Skatepark is located beneath the east end of the Burnside Bridge on SE 2nd Avenue on City of Portland right-of-way. The skatepark was developed in 1990 without public funding and without permission from the City of Portland or Multnomah County, but has been acknowledged as an important recreational feature in the city. There is no admission fee for use, and the facility is funded by donations.

In addition to the physical features of the parks described above, up to 70 cultural, recreational, and community events are held within Waterfront Park, the Eastbank Esplanade, and on the Willamette River Greenway Trail annually. Some of the more prominent events include the annual Portland Rose Festival, Fleet Week, Oregon Brewer's Festival, and the Bite of Oregon. Many organized walks and runs use the Willamette River Greenway Trail and depend on passage through the API as part of their routes.

3.10.2 Impacts from Bridge Alternatives

No-Build Alternative Impacts

Under the No-Build Alternative there would be no permanent conversion of park and recreation uses to another use, and no changes in permanent access from the Burnside Bridge to the recreation features would occur.

This alternative assumes regular maintenance would continue to occur on the bridge, and in some cases, this maintenance work would occur over and adjacent to areas of Waterfront Park, the Eastbank Esplanade, and Burnside Skatepark and could require temporary access restrictions to ensure recreation user safety. In general, agencies may attempt to schedule maintenance work, that would temporarily restrict access, to the least busy times of the year with respect to scheduled events in Waterfront Park and the Eastbank Esplanade, but as the bridge ages and maintenance needs become more frequent and or widespread, that may not be possible. It could be necessary to cancel or reschedule events during maintenance activities, including events that rely on ship mooring access along Waterfront Park.

Impacts Common to All Build Alternatives

Direct – No permanent conversion of publicly owned and operated park property to a transportation or other use would occur under the any of the build alternatives. The majority of direct impacts would be temporary and would occur during construction. No long-term direct effects are anticipated to Ankeny Plaza or Willamette River recreational boating, including use of the WRWT, on-water events, or the Duckworth Dock under any of the build alternatives.

As part of all the build alternatives, the staircase connection from the south side of the Burnside Bridge to the Eastbank Esplanade would be replaced with an improved bicycle, pedestrian, and ADA-accessible connection. Options with stairs and elevators and options with ramps are being considered (see figures in

Draft EIS Attachment G and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memo* (Multnomah County 2021a).

Impacts to the Eastbank Esplanade from the access options are focused on the duration and extent of temporary closure of the Esplanade and permanent changes to the Esplanade.

Options with stairs and an elevator (no ramps) would not require additional temporary closure duration of the floating portion of the Esplanade compared to the 18 months needed to construct the Long-span Alternative without a temporary bridge. Options with ramps would require an additional 2 to 3 years of closure for construction, meaning it would be closed for the full duration of bridge construction.

Options with stairs and an elevator would not require additional physical impacts to the Esplanade compared to those identified with the Long-span Alternative without a temporary bridge. Options with ramps would require additional impacts including removal and replacement of the floating bridge leading from the at-grade section down to the floating section of the Esplanade.

Indirect – Parks and recreation resources can experience indirect effects from public infrastructure projects when those projects change the demand for parks and recreation in some way. This could mean increased or decreased usage and, hence, changes to maintenance needs or overall park service needs. The bridge capacity and modal use are not proposed to change, and the Project would not provide a new connection that would be likely to alter existing travel patterns (and noise impacts), thus no park demand changes are anticipated under any of the build alternatives.

Temporary – The majority of impacts to park and recreation resources from all the build alternatives would occur during construction and would not be permanent after construction is complete. The area expected to be impacted by construction activities is shown on Figure 3.10-2 as the Boundary of Potential Construction Impacts. The area is the same for all the build alternatives without a temporary bridge. With a temporary bridge, the Boundary of Potential Construction Impacts is expanded to include an additional area in Waterfront Park, south of the bridge for all build alternatives. The build alternative–specific construction activities and length of construction time vary within this boundary (see Table 3.10-1), but this is the area where the public can expect to encounter altered or restricted access to parks and recreation resources during construction. The discussion below identifies specific temporary impacts for each park and recreation resource.

Figure 3.10-2. Temporary Park Impact Areas

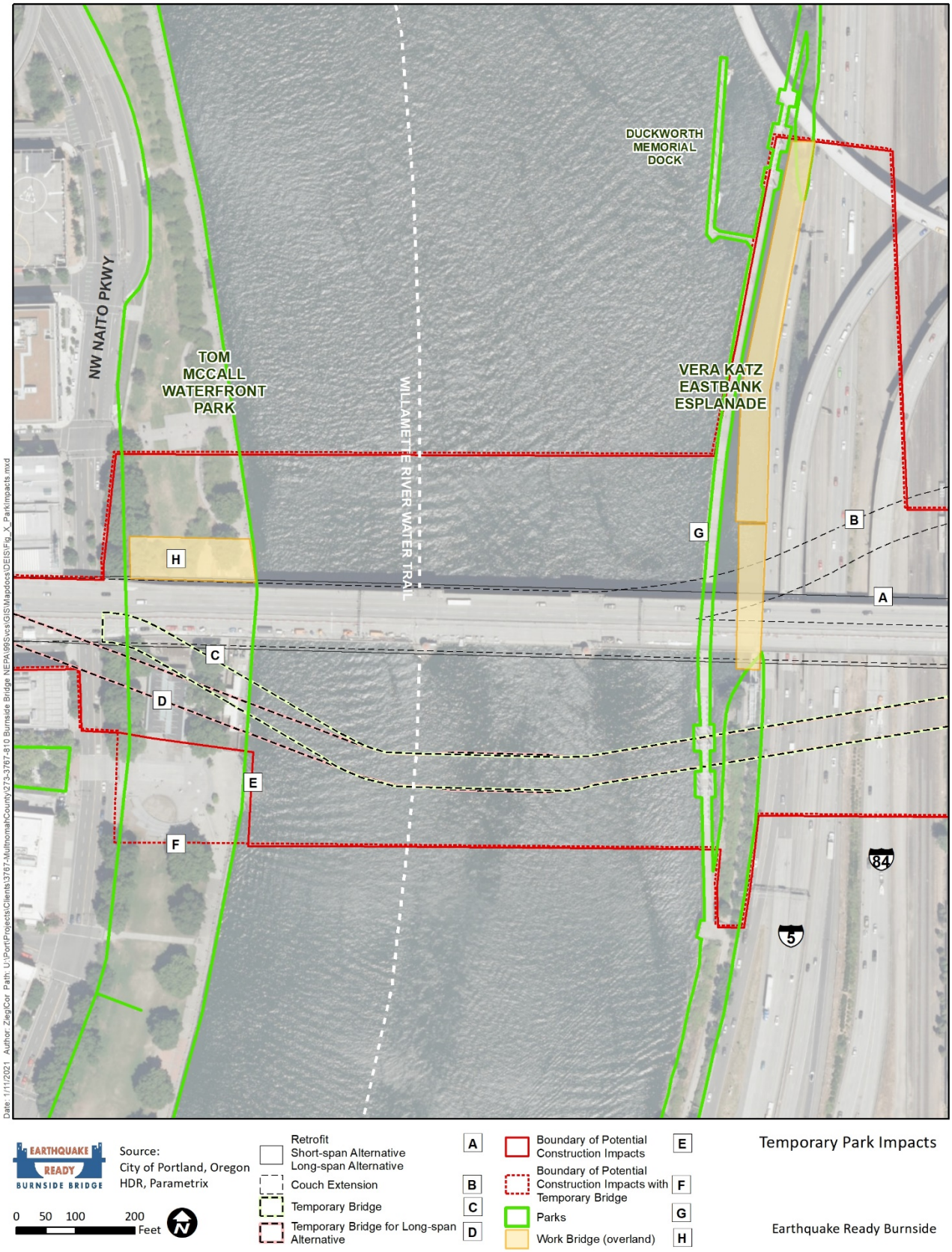


Table 3.10-1. Construction Timing with Parks and Recreation Resources

	Retrofit	Short-Span Alternative	Long-Span Alternative	Couch Extension
Overall Construction – No Temporary Bridge	3.5 years	4.5 years	4.5 years	4.5 years
Overall Construction – Temporary Bridge	5 years	6.5 years	6.5 years	6.5 years
Waterfront Park Restrictions – No Temporary Bridge	3.5 years	4.5 years	4.5 years	4.5 years
Waterfront Park Restrictions – Temporary Bridge	5 years	6.5 years	6.5 years	6.5 years
Willamette River Passage Under Bridge – No Temporary Bridge	6–10 weeks (intermittent)	6–10 weeks (intermittent)	6–10 weeks (intermittent)	6–10 weeks (intermittent)
Willamette River Passage Under Bridge – Temporary Bridge	8–12 weeks (intermittent)	8–12 weeks (intermittent)	8–12 weeks (intermittent)	8–12 weeks (intermittent)
Eastbank Esplanade Detour – No Temporary Bridge	26 months	30 months	18 months	30 months
Eastbank Esplanade Detour – Temporary Bridge	30 months	34 months	22 months	34 months
Burnside Skatepark Closure – No Temporary Bridge	Permanent	4 months	4 months	4 months
Burnside Skatepark Closure – Temporary Bridge	Permanent	8 months	8 months	8 months

Source: EQRB Parks and Recreation Technical Report (Multnomah County 2021r)

Willamette River Recreation – During construction of any of the build alternatives, the navigation channel would remain open except for short-term closures. Each closure could be up to 3 weeks in duration, and the number of closures could range from 2 to 10 closures over the full length of construction, depending on the type of bridge lift chosen. Installing a vertical lift would require a lower number of river closures than installing a bascule lift. During the majority of the construction period, a minimum width of 165 feet would be open to navigation. For boater safety during construction, the Project would create an exclusion area to restrict recreational boaters from entering dangerous, active construction zones. This would generally include a 200-foot area around all active construction components, including the work bridges, barges, piers, etc. It is too early in project development to specify when and the duration of each instance of exclusion. The intention is that recreational boaters would continue to be allowed to pass through the API for the majority of the construction period with all the build alternatives, with intermittent times of restricted access. Times for restrictions would be communicated to OSMB staff more than 30 days prior to allow OSMB to develop regulations and notices.

Waterfront Park – The portion of Waterfront Park within the Boundary of Potential Construction Impacts would be closed to recreation uses for the duration of each build alternative. Waterfront Trail users would either be flagged through the area or would be rerouted around the work site on the east lane of Naito Parkway, currently used for the Better Naito project (see Figure 3.1-8 and Figure 3.1-9 in Section 3.1 for bicycle and pedestrian detour routes). At most, the detour routes on the west side of the Willamette River are expected to add at most 2 minutes of detour travel for north-south Greenway Trail users.

The closure north of the bridge would require that a portion of the Japanese American Historical Plaza and Bill of Rights Memorial area be used for construction (Figure 3.10-3). All the trees in this area would likely be removed for construction access. Notably, this includes four large, mature deciduous trees (at least 40-year-old trees) and 20 ornamental flowering cherry trees adjacent to the plaza. After construction, the trees would be replaced with new trees according to City of Portland requirements for mitigation (Title 11 and Title 33). The full area from the north edge of the bridge to the south edge of the plaza would be cleared of pavers and used as a construction and staging area. This would include demolition/deconstruction of the arching slate-covered berm that makes up the southern half of the Japanese American Historical Plaza and Bill of Rights Memorial. The area would be returned to existing conditions after construction.

Portland Saturday Market (PSM) would need to operate at another location for the duration of construction. Portland Parks and Recreation's (PP&R's) lease agreement with PSM would need to be adjusted. If the PSM relocation is not within PP&R's properties, it would have an impact on PP&R revenues. For the duration of construction, the many events normally held in Waterfront Park could not occur within the Boundary of Potential Construction Impacts area. Events normally held in the Japanese American Historical Plaza could still use the unimpacted north half of the plaza; however, because these events are typically memorials, vigils, and remembrance days, their reflective, quiet nature would likely be disturbed by intense construction on the bridge unless they occurred on weekends when no major construction is anticipated to occur. Running and walking events that normally use the Willamette River Greenway Trail could continue to occur but would need to use the detour routes. The many events held in The Meadow and farther south in Waterfront Park could continue, but they would be restricted from park access within the Boundary of Potential Construction Impacts.

Some of the events held in Waterfront Park depend on much of the park being available for event use. PP&R is concerned that many events that use the area within the Boundary of Potential Impacts, even just for auxiliary event support functions, would choose to not use Waterfront Park at all during the full construction period, and may choose to permanently relocate to a new location. It is not possible to know with certainty that this would happen because of the many factors involved in event planning, space demands, ability to redesign features, etc. If events were to permanently relocate out of PP&R property, PP&R would lose a substantial source of revenue. These economic impacts are discussed further in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021h).

Vera Katz Eastbank Esplanade – The Boundary of Potential Construction Impacts for all the build alternatives encompasses approximately 80 percent of the length of the floating portion of the Eastbank Esplanade, including the Kevin J. Duckworth Dock (Figure 3.10-4). Because construction barges would need to access both sides of the Esplanade and extensive work would occur directly above and below the Esplanade, it would be impractical and unsafe to allow users access during construction. Intermittently during construction, portions of the floating structure would be disconnected and moved out of the way to allow barge movement and other construction activities, however the Duckworth Dock would remain in place and accessible. The amount of construction time would vary with each alternative. During these closures, bicycle and pedestrian trail users would need to use the proposed detour routes shown in Figure 3.1-8 and Figure 3.1-9 in Section 3.1, Transportation. Depending on the detour route taken, the added time would be 5 to 12 minutes for bicyclists and 10 to 15 minutes for pedestrians. Detour routes were identified as those which were the most reasonable routes and which would be easy to indicate with signage. In practice, some bicyclists and pedestrians are also anticipated to identify their own detour routes to meet their particular needs.

Figure 3.10-3. Governor Tom McCall Waterfront Park Improvements

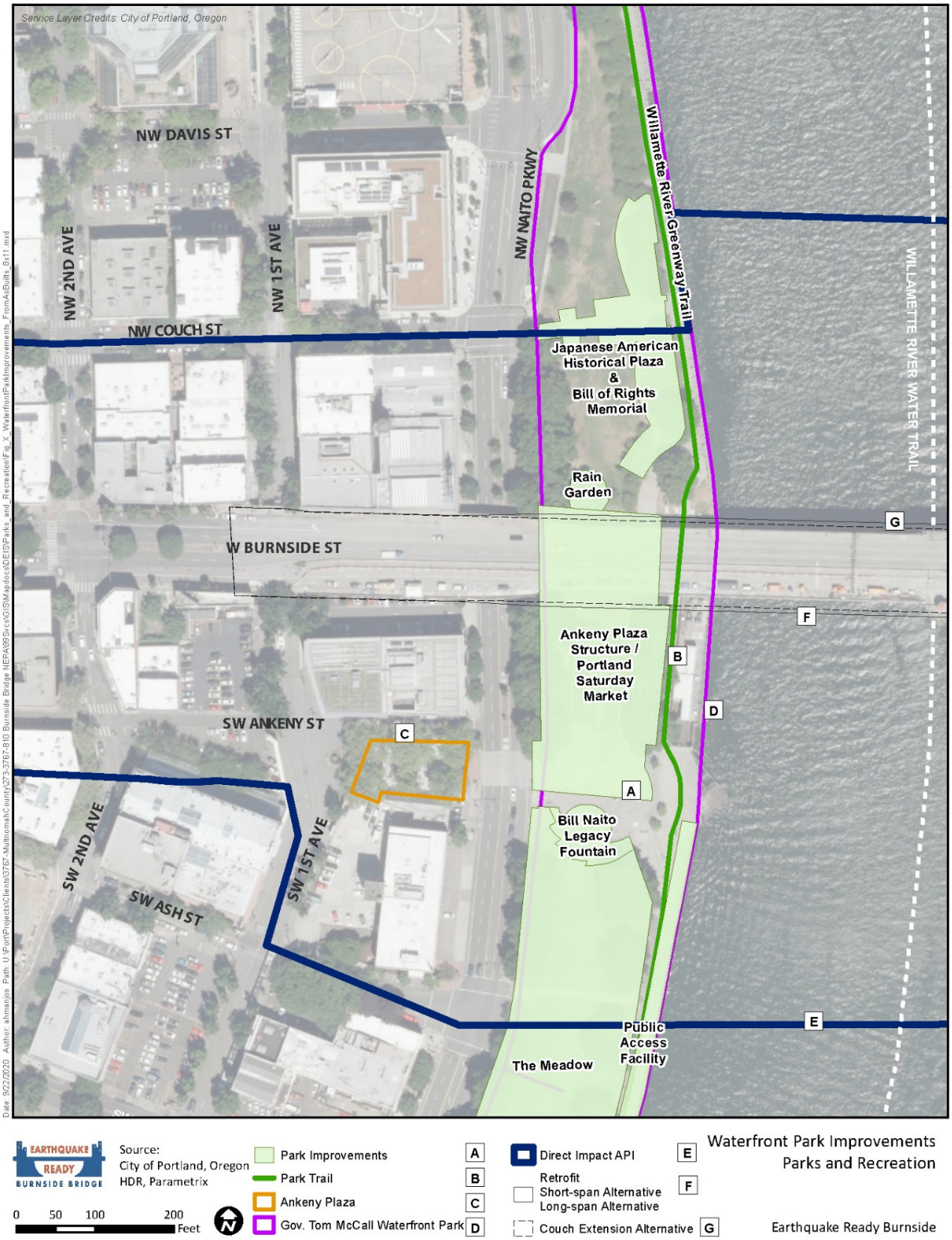
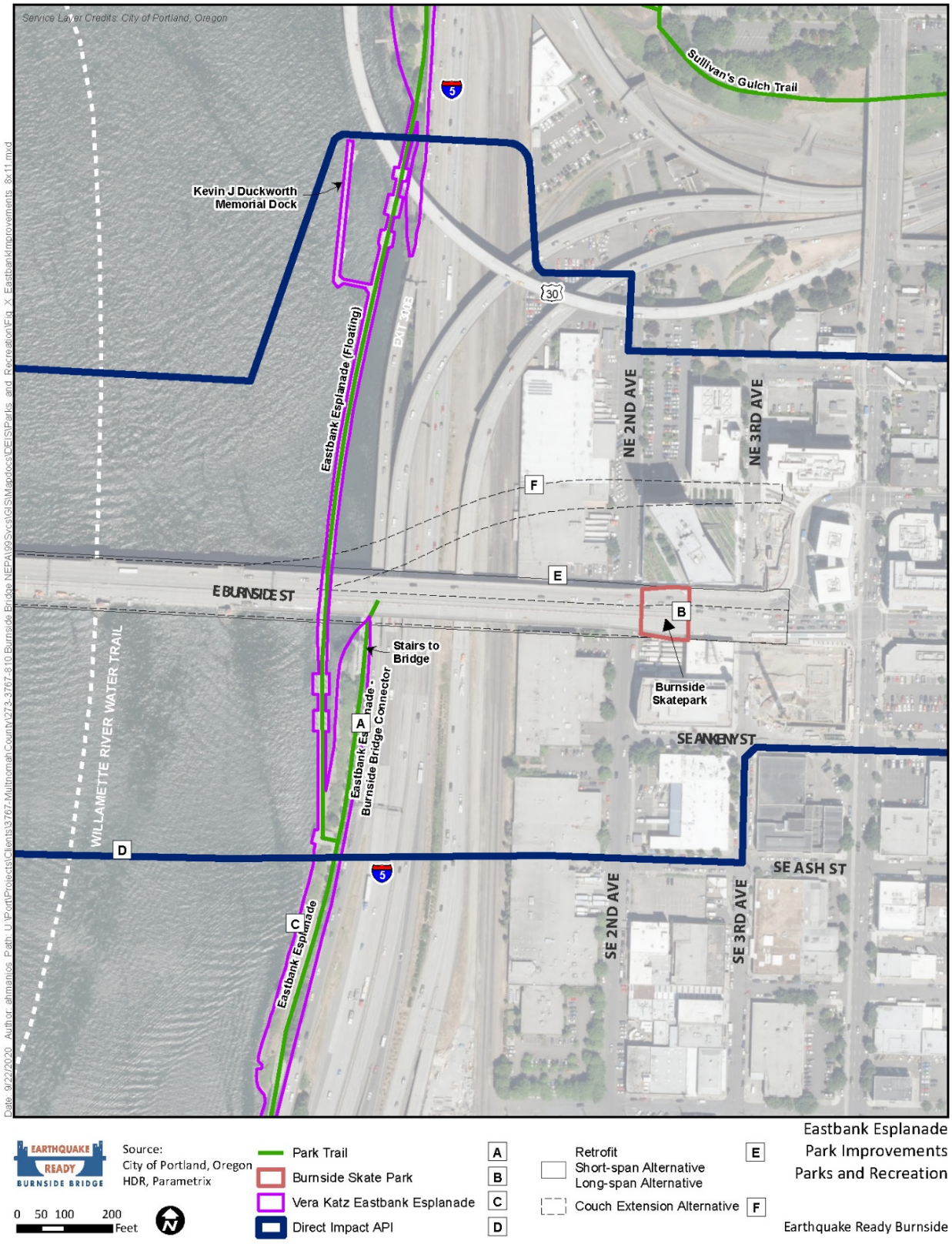


Figure 3.10-4. Vera Katz Eastbank Esplanade Park Improvements



As discussed above, many events (between 20 and 30) occur on the Eastbank Esplanade throughout the year, often creating a loop route by linking up with a portion of the Willamette River Greenway Trail on the west side of the river. As both of these trails would be impacted by construction, many of the typical annual events would either not occur or would need to use detour routes. Detours would affect the overall length of loop route events and would generally avoid the waterfront for part of an event route. Due to this, the detours do not fully mitigate for the lost recreational experience provided by the Esplanade. The economic impact of not hosting some of the typical events is discussed in the *EQRB Economic Impacts Technical Report* (Multnomah County 2021h).

Ankeny Plaza – No construction impacts would occur within Ankeny Plaza under any of the build alternatives.

Burnside Skatepark – Impacts to the Burnside Skatepark would vary by build alternative and are discussed below. In addition to the area that would be disturbed, temporary construction impacts that would occur with all the build alternatives include noise and air quality impacts.

All Park and Recreation Resources – The *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q) states that some phases of construction would result in relatively high construction noise levels with exceedances of the City of Portland's construction noise limits, but that these could be mitigated. See the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q) for additional information.

The *EQRB Air Quality Technical Report* (Multnomah County 2021c) states that emissions from construction activities would result in temporary and localized increases in carbon monoxide and particulate matter levels as a result of operating heavy construction equipment and vehicle travel to and from the site, and as well as increases in dust from demolition and ground-disturbing activities. That report describes mitigation practices that would be used to minimize these impacts.

Post CSZ Earthquake – All of the build alternatives are designed to remain fully operational and accessible for vehicles and other modes of transportation following a major CSZ earthquake event. Additionally, all the build alternatives include providing clearance between the bridge and adjacent buildings to allow independent movement during a seismic event. With the assumption that all the build alternatives are generally equal in seismic performance and transportation functionality, anticipated impacts to parks and recreation resources during and after a major seismic event are expected to be the same.

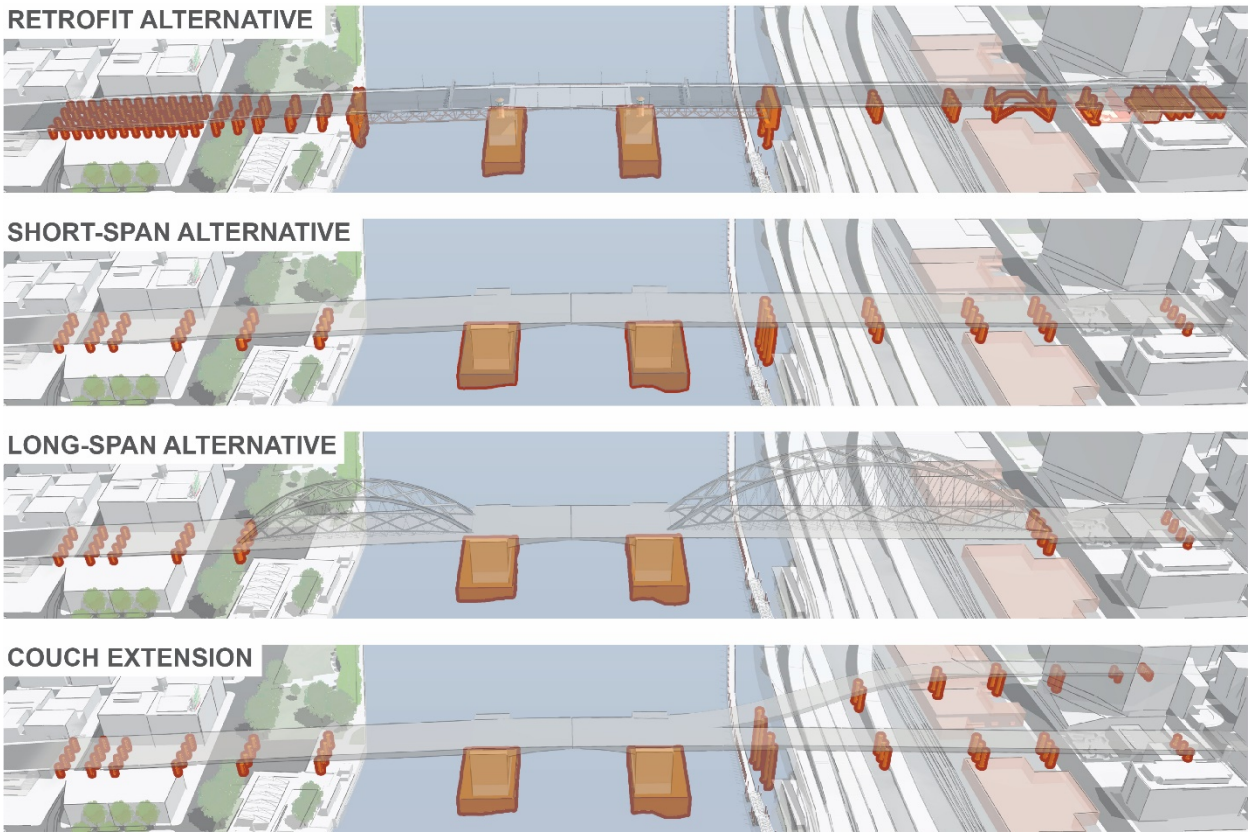
Compared with the No-Build Alternative, a retrofitted or replaced bridge would not fall onto Waterfront Park or the Eastbank Esplanade or block north-south trails that are parts of these resources. A retrofitted or replaced bridge would result in fewer injuries and less loss of life within the recreation resources during the seismic event, and less need for reconstruction and debris removal after the event. The portions of the trails underneath the Burnside Bridge would be available to bicyclists and pedestrians to access the bridge or other destinations to the extent that debris does not block passage north and south of the bridge.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have the following impacts:

- Bridge supports within Waterfront Park would remain in the same locations as the current condition, though there would be substantial alteration to Pier 1, adjacent to the harbor wall. Post-construction, conditions in the park would be returned to the same or better as existing conditions. All the other alternatives have fewer bridge supports within Waterfront Park (Figure 3.10-5).

Figure 3.10-5. Pier Locations in Governor Tom McCall Waterfront Park and near the Vera Katz Eastbank Esplanade



- Permanently remove the Burnside Skatepark (all other alternatives would avoid this).
- Regular maintenance would continue to occur on the bridge after the retrofit is complete. Maintenance is expected to be more frequent and widespread than with the replacement alternatives and cost from 1.25 to 1.35 times more than with the replacement alternatives.
- The estimated construction duration is 3.5 years; PSM would be relocated for 3.5 years (shortest duration among the build alternatives).
- Close the Eastbank Esplanade for 26 months (medium duration of closure compared to other alternatives).

Replacement Alternative with Short-Span Approach Impacts

In addition to the common impacts, the Short-span Alternative would have the following impacts:

- It would remove two large, mature deciduous trees immediately south of the bridge in Waterfront Park for bridge construction.
- There would be three fewer pier locations within Waterfront Park compared with the Retrofit Alternative, providing a more open experience, increased usable park space, and views to the water from the park. This would facilitate maintenance work, access to the Ankeny Pump Station, and access to underground utilities, as well as provide more space for the PSM weekly stall locations.
- The Burnside Skatepark would be intermittently unavailable during construction (4 months total closure) but would not be demolished and would remain relatively unchanged.
- The replacement alternatives are expected to have less frequent and extensive long-term maintenance and would have fewer noise and access effects on parks and recreation resources in the API as compared to the Retrofit Alternative.
- The estimated construction duration is 4.5 years, with a 30-month closure for the Eastbank Esplanade and a 4.5-year relocation of the PSM.

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following differences:

- There would only be one bridge support within Waterfront Park, at the west property boundary of the park, along Naito Parkway. This would provide the most open space, access, and views across the park.
- Removes an in-water pier/bent near the eastern shoreline between the Eastbank Esplanade and the shore creating an uninterrupted area with no bridge supports. The lack of infrastructure in the river at this location would lead to a more open feeling for users on the Esplanade.
- Potential for greater visual impacts to recreation users (both negative and beneficial) because of its tall above-deck structure.
- Close the Eastbank Esplanade for 18 months (shortest of all bridge alternatives).

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following differences:

- With the split configuration on the east side, there would appear to be two structures passing over the Eastbank Esplanade. The overall area of coverage and number of piers adjacent to the Esplanade would be approximately the same as with the Retrofit and Short-span Alternatives.

Impacts from Potential Off-Site Staging Areas

Based on the representative sites identified, the types of parks and recreation impacts that could occur from off-site staging include additional areas of Willamette River recreational boating restrictions. These would be anticipated to be limited to restricted areas near the shore of staging areas and around construction barges moving to and from the staging areas. If any trails are located on or near the staging areas, detours would need to be established. Detours provide a transportation mitigation, but do not fully mitigate for lost recreation use. A Non-Park Use Permit could be required if any staging were to occur on park land or public trails.

3.10.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

The No Temporary Bridge Option would increase trip times across the river for all modes of transportation. This is not expected to adversely impact park and recreation resources. Please refer to Section 3.1, Transportation, for additional information. Without a temporary bridge, construction time would be 1.5 to 2 years shorter than with a temporary bridge, reducing the time park and recreation impacts would be experienced.

With a Temporary Bridge

The temporary bridge (regardless of the travel mode option selected) would add an additional 1.5 to 2 years of construction time (see Table 3.10-1). Differences in impacts to park and recreation resources with a temporary bridge are described below:

Willamette River Recreation – The Temporary Bridge Option could require up to two additional closure periods of up to 2 weeks each. Additionally, the construction exclusion areas would extend farther south than with no temporary bridge to provide safety to water users and separation from construction activities.

Waterfront Park and Willamette River Greenway Trail – The construction of a temporary bridge would require an expansion of the area of the Boundary of Potential Construction Impacts to include additional active construction south of the bridge within Waterfront Park (see Figure 3.10-2). As a result, four mature trees south of Ankeny Pump Station would be removed and replaced after construction according to Title 11 and other City mitigation requirements. The Ankeny Plaza Structure would be deconstructed and stored. The structure would be reconstructed after bridge construction is complete.

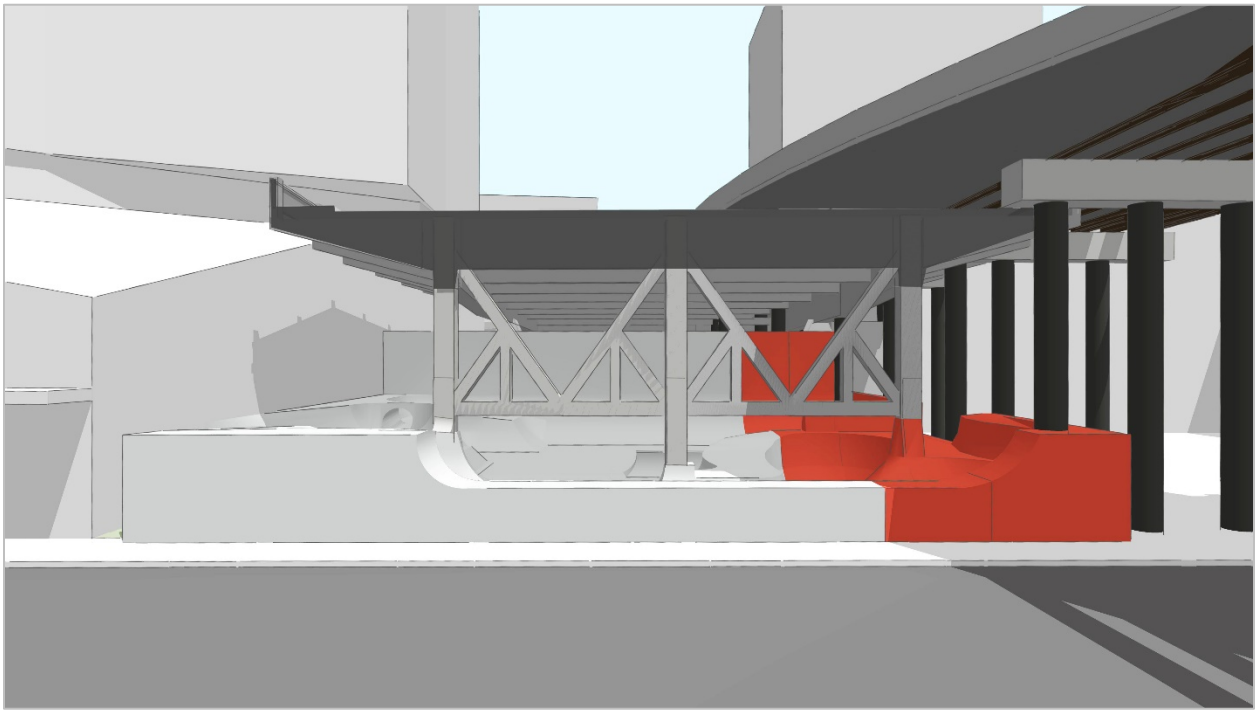
The Bill Naito Legacy Fountain and surrounding hardscape plaza area would be closed and non-operational for recreation use for the duration of construction. The hardscape and other features would be protected from construction impacts and returned to existing conditions after construction is complete. Waterfront Trail users would either be flagged through the area on the detour route or would be rerouted around the work site using the east lane of Naito Parkway, currently used for the Better Naito project.

The increased area of restricted access compared with the No Temporary Bridge Option has a greater potential to cause event managers to choose to not hold events in Waterfront Park because of the reduced space available. PP&R views this increased impact area as increasing the risk that the events would relocate away from Waterfront Park permanently (White 2020).

Vera Katz Eastbank Esplanade – With a temporary bridge there would be an additional structure over a portion of the Esplanade during construction and the Esplanade would be impacted for longer duration with a temporary bridge (see Table 3.10-1).

Burnside Skatepark – For all Replacement Alternatives with a temporary bridge, the east end tie-in with the permanent bridge structure would require placement of temporary bridge supports within the skatepark, causing damage to the current configuration of the skatepark that would be repaired or replaced after construction (see Figure 3.10-6). This is a more intense impact than without the temporary bridge. The temporary closure of the skatepark would be four months longer with as compared to without a temporary bridge (see Table 3.10-1).

Figure 3.10-6. Burnside Skatepark with Temporary Bridge Impacts



3.10.4 Section 4(f) Preliminary Determinations of Use

The Draft Section 4(f) Analysis, Attachment M to this Draft EIS, analyzes whether a Section 4(f) use will occur with each alternative (see Chapter 1 of the Draft Section 4(f) Analysis for details). Table 3.10-2 summarizes Section 4(f) uses by resource and alternative, and lists documentation needed with the Preferred Alternative: the Long-span Alternative without a temporary bridge.

Table 3.10-2. Summary of Section 4(f) Use Types and Documentation Type, by Alternative

Resource	Retrofit	Short-Span Alternative	Long-Span Alternative (Preferred Alternative)	Couch Extension	Temporary Bridge	Section 4(f) Documentation Type Needed for the Preferred Alternative
Willamette River Water Trail	No Section 4(f) Use (Temporary Construction Activity)	No Section 4(f) Use (Temporary Construction Activity)	No Section 4(f) Use (Temporary Construction Activity)	No Section 4(f) Use (Temporary Construction Activity)	No Change	Temporary Occupancy Letter
Gov. Tom McCall Waterfront Park	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	No Change	Individual 4(f) Evaluation
Vera Katz Eastbank Esplanade	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	No Change	Individual 4(f) Evaluation

Resource	Retrofit	Short-Span Alternative	Long-Span Alternative (Preferred Alternative)	Couch Extension	Temporary Bridge	Section 4(f) Documentation Type Needed for the Preferred Alternative
Willamette River Greenway Trail	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	No Change	Individual 4(f) Evaluation

Source: EQRB Section 4(f) Analysis, Draft EIS Attachment M

3.10.5 Mitigation

Build Alternatives

Long-term impact mitigation for each alternative is summarized in Table 3.10-3.

Table 3.10-3. Long-Term Impact Mitigation

Alternative	Long-Term Impact Mitigation
Enhanced Retrofit	The Burnside Skatepark would not be rebuilt at its current site with this alternative. Potential mitigation, which could include finding an alternate location, would need to be coordinated with skatepark managers and City of Portland representatives. Because of the grassroots nature of the skatepark, it is unclear whether a new park would be desirable as part of this process.
Replacement, Short-span	Waterfront Park would gain usable space underneath the bridge because of eliminated bridge supports. Coordination with City of Portland representatives would be necessary to ensure the finished design of the space after construction meets City design and maintenance preferences.
Replacement, Long-span	Mitigation would be the same as under the Short-span Alternative.
Replacement with Couch Extension	Mitigation would be the same as under the Short-span Alternative.

Source: EQRB Parks and Recreation Technical Report (Multnomah County 2021r)

Mitigation for temporary, construction-phase impacts would primarily include returning park facilities to their pre-construction (or better) condition. This would require close coordination with PP&R, the Japanese American Museum of Oregon, PSM, and the Burnside Skatepark managers. The Project would need to follow PP&R landscape design guidelines and Bureau of Development Services mitigation requirements for work within the River Overlay Zones (see Section 3.4, Land Use). During coordination for a Non-Park Use Permit, additional mitigation measures could be identified. Where no physical mitigation options are available to replace the temporary lost use of recreation activities, such as with the temporary closure of the Eastbank Esplanade, the City of Portland could consider a financial contribution into a recreation fund as mitigation. These measures apply to all build alternatives.

The southern portion of the Japanese American Historical Plaza within the Boundary of Potential Construction Impacts would be removed and reconstructed as part of the Project to allow access for construction under any build alternative. Some possible mitigation options could include the following:

- Carefully plan deconstruction to facilitate reassembly post-construction.
- Provide for a temporary exhibit in the unimpacted area of the plaza to highlight the information currently provided in the southern half of the memorial.

- Involve the Japanese Consul for replacement of removed ornamental flowering cherry trees.
- Involve designers and stone masons who worked on the original memorial during deconstruction and reconstruction.
- Coordinate closely with the Japanese American Museum of Oregon on the formation of these and other mitigation solutions.

Portions of the recreation resources described in this report would be unavailable for recreation use for the various durations described above, depending on the Alternative and options selected. Mitigation for restricted use is being provided in the form of detour routes for the Waterfront Park portion of the Willamette River Greenway Trail and Eastbank Esplanade portion of the Willamette River Greenway Trail to ensure these north-south bicycle and pedestrian connections remain usable. Additional mitigation measures should be considered to replace the recreation aspects of these trails lost during construction. Other mitigation for Waterfront Park would include allowing a PP&R vehicle to safely cross the closed section of Waterfront Park twice per day for parks maintenance activities.

Mitigation for impacts to Willamette River recreational boaters would primarily be in the form of early and frequent communication with OSMB and law enforcement agencies, as well as signage to ensure boaters are aware of restrictions due to construction.

Construction Traffic Management Options

With the Temporary Bridge Option, there are additional construction impacts in Waterfront Park and the Burnside Skatepark compared to construction without a temporary bridge (except that the skatepark would be eliminated under the Retrofit Alternative). However, mitigation approaches remain the same as those described above, including close coordination with PP&R and Burnside Skatepark managers to ensure the spaces are returned to the same or better conditions. The additional disturbance area in Waterfront Park would require replacement of the four mature trees that would be removed due to the temporary bridge. Replacement would follow City of Portland guidelines. See the *EQRB Noise and Vibration (*Multnomah County 2021q), *Transportation (*Multnomah County 2021z), and *Air Quality Technical Reports* (Multnomah County 2021c) for additional recommended mitigation measures for mitigating construction impacts within or near parks and recreation resources.

3.11 Historic and Archaeological Resources

This section identifies existing cultural resources and outlines anticipated project impacts to those resources. More detail can be found in the *EQRB Cultural Resources Technical Report* (Multnomah County 2021h). Impacts related to historic and archaeological resources protected by Section 4(f) of the Transportation Act are discussed in Attachment M, Draft Section 4(f) Analysis. Preliminary determinations of Section 4(f) use are provided in this section.

3.11.1 Affected Environment

Formal definition of the Area of Potential Effect (APE) has been made in consultation with the Oregon State Historic Preservation Office (SHPO). The APE encompasses the area where the project could physically alter historic properties, as well as where there could be effects from noise and vibration and changes to traffic patterns and the visual setting. The APE includes the maximum footprint of the bridge alternatives, including approaches and the temporary bridge proposed during construction. The APE has also been defined to include the New Chinatown/Japantown Historic District and the Skidmore/Old Town National Historic Landmark (NHL) District, as shown in Figure 3.11-1.

Archaeological Potential Areas

Four locations were identified as potential archaeological sites based on the current field conditions (i.e., relatively undeveloped land and not occupied by buildings or paved surfaces), a review of historic maps and other imagery, and associated landforms. Tribal consultation was initiated during the scoping process and continues. Tribes have been provided with copies of the draft technical report and Draft EIS for review and comment.

Two locations are on a small grassy slope near the intersection of NE 3rd Avenue and NE Davis Street. This area corresponds with or near to the historical high-water bank of the Willamette River and the mouth of a prominent but unnamed drainage (Figure 3.11-2). There is some potential for precontact archaeological deposits as these locations are situated at the top of the historic Willamette River riverbank where there is high potential for historic-period deposits from houses from the late 1800s to mid-1900s. An archaeological resource consisting of a few fragments of historic-period artifacts was identified on a small parcel at NE 3rd Avenue and NE Davis Street. This resource is an archaeological isolate and is recommended as not significant.

The third location is a small vacant property on W Burnside Street between SW 1st Avenue and SW 2nd Avenue. There is some potential for historic-period archaeological deposits associated with the businesses that occupied the property from the late 1800s to early 2000s. This property was not accessible during field survey (Figure 3.11-2).

The fourth location is Tom McCall Waterfront Park, which had extensive use as a location for commercial riverfront activity from 1844 to 1929. Harbor Drive occupied the area between the 1940s and the 1970s when Waterfront Park was constructed. There is moderate potential for historic-period archaeological deposits along the eastern portion and high potential for historic-period deposits along the western portion of the park, within 70 to 75 feet of SW Naito Parkway (Figure 3.11-2).

Figure 3.11-1. Cultural Resources Analysis APE Boundaries and Historic Districts

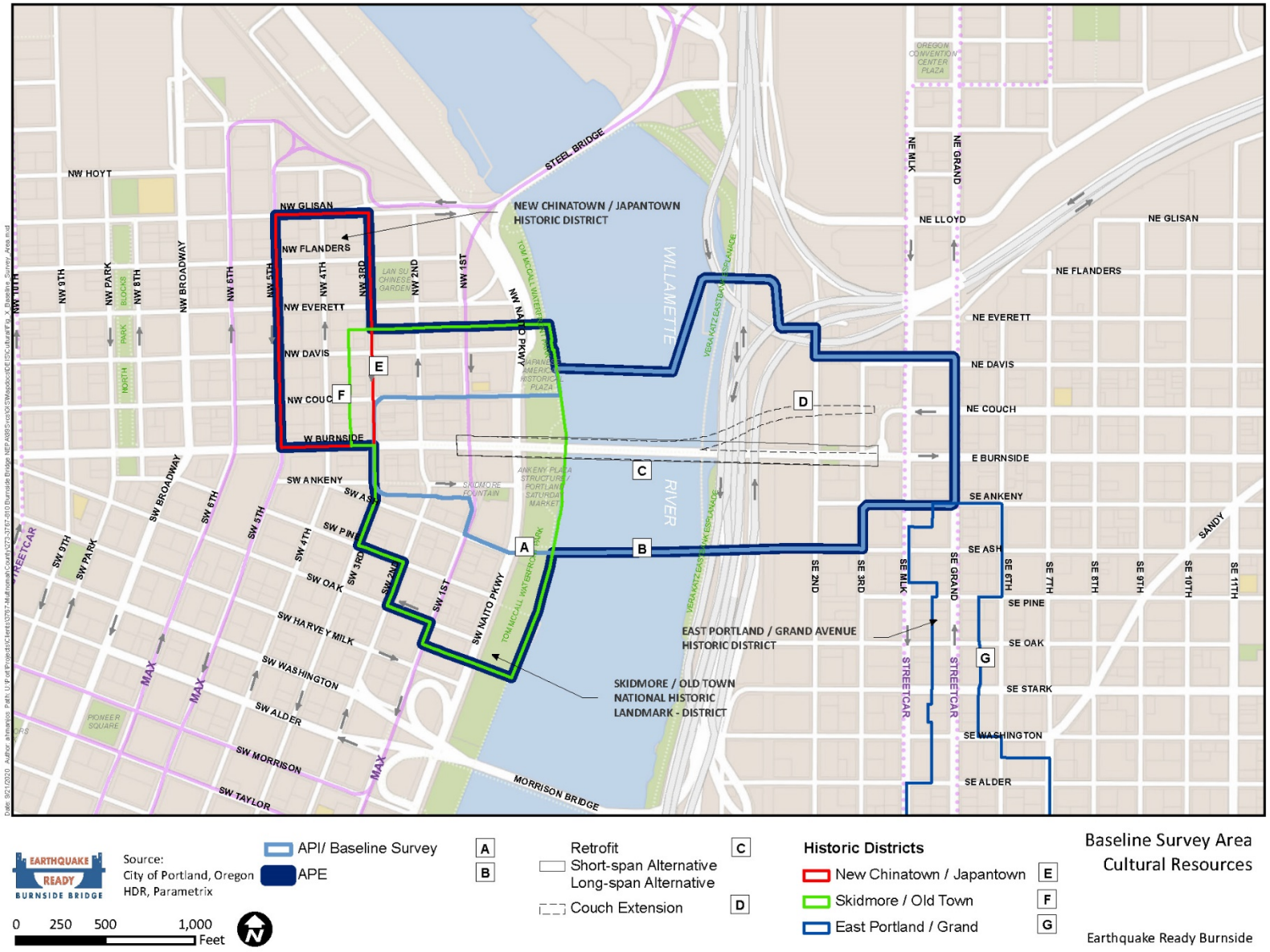
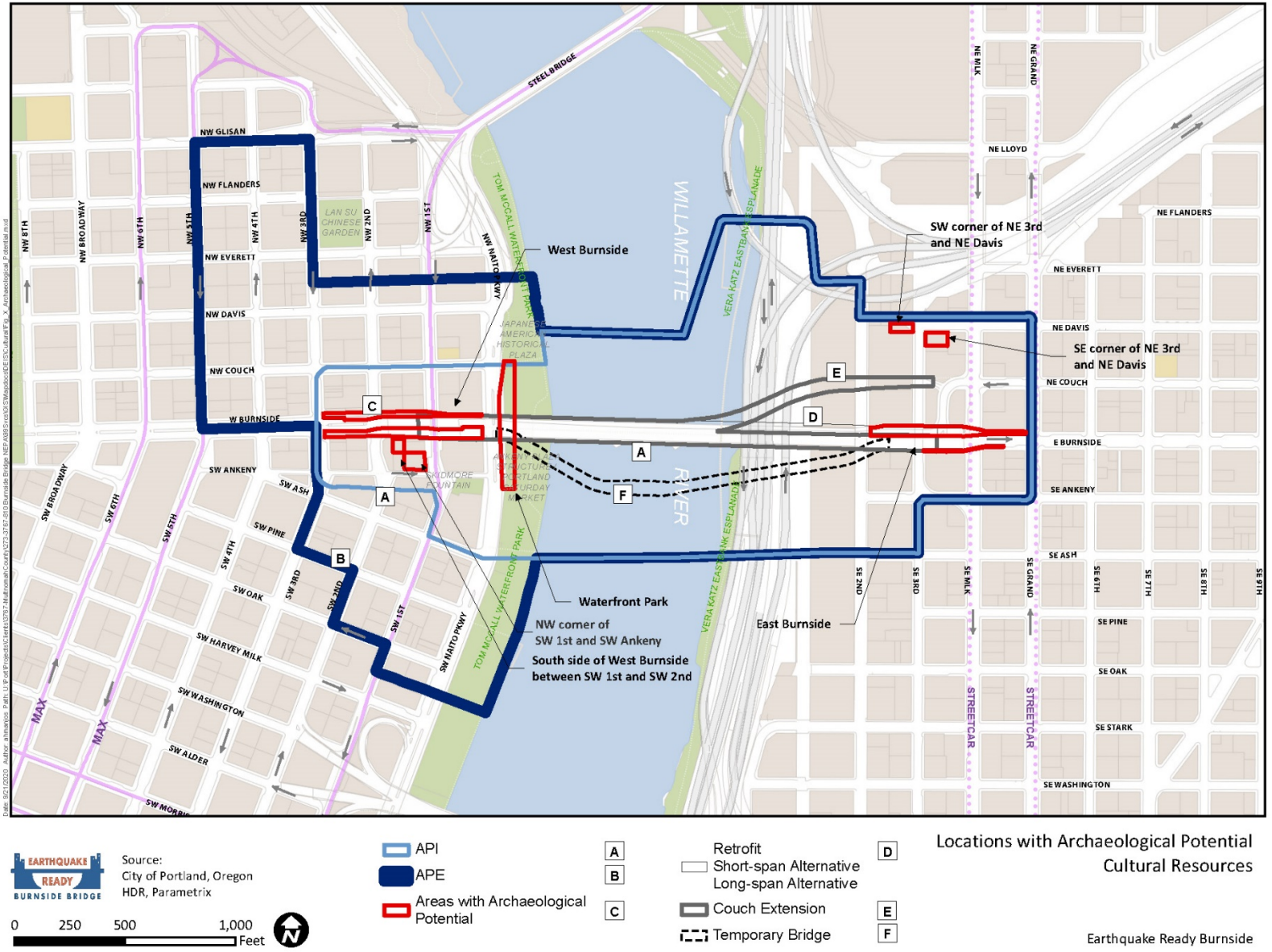


Figure 3.11-2. Locations with Archaeological Potential



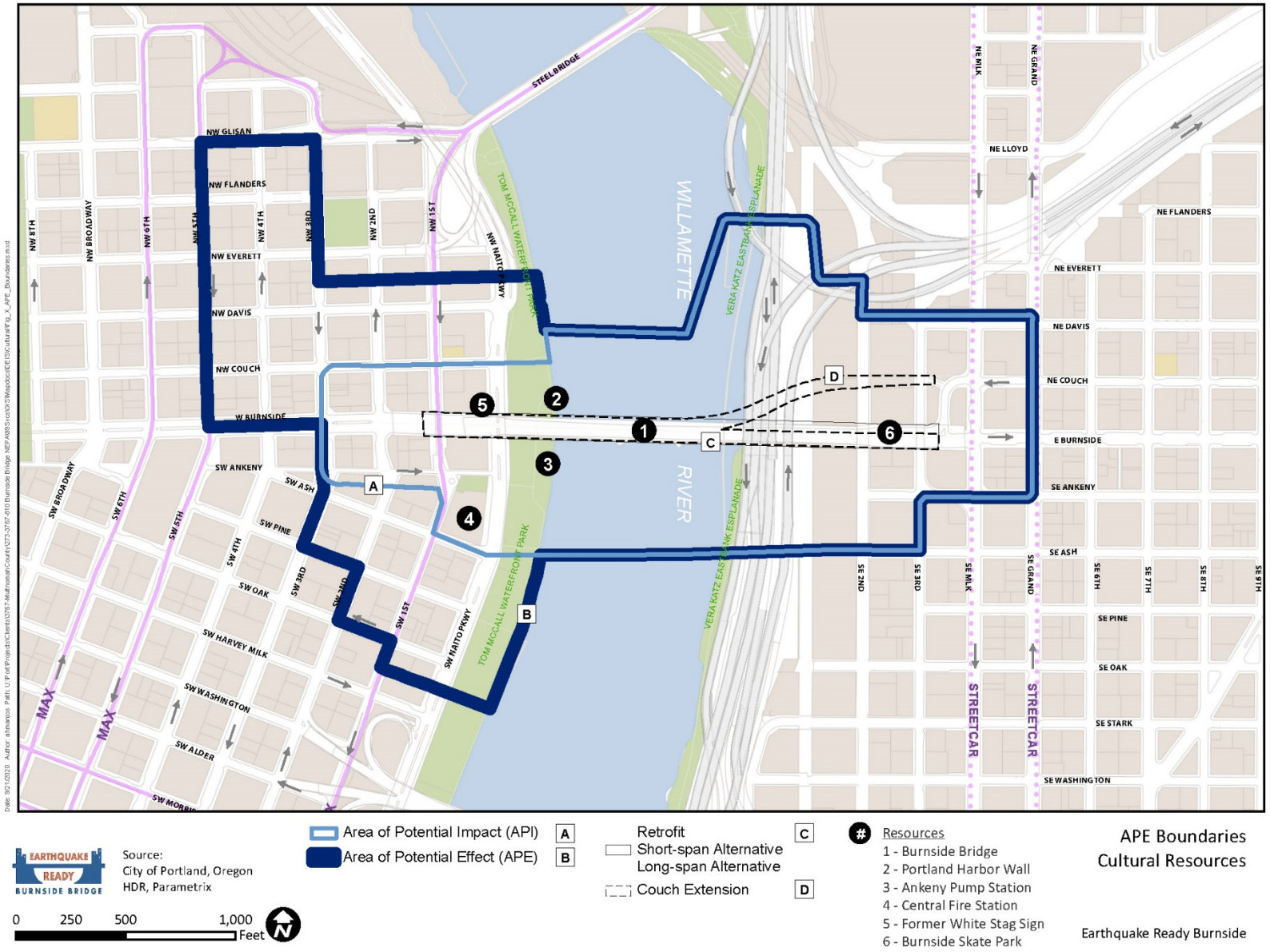
Historic Resources Baseline Survey

In consultation with SHPO, the baseline survey conducted in the API was considered sufficient to address project effects for the entire APE (Figure 3.11-3). A total of 50 historic resources were identified: 41 buildings, 4 sites, 3 structures, and 2 objects. Of these resources, 23 buildings and 1 object are currently listed as contributing resources in the Skidmore/Old Town NHL District; 4 buildings and 1 structure are individually listed on the National Register of Historic Places (NRHP); 9 buildings, 1 structure, 3 sites, and 1 object within the Skidmore/Old Town NHL District boundaries are non-contributing resources (the Burnside Bridge extends into the historic district but is listed on the NRHP as an individual resource); 1 building within the East Portland Grand Avenue Historic District is a non-contributing resource; 1 building not within any historic district is recommended not eligible to the NRHP; and 3 buildings, 1 site, and 1 structure not within any historic district are recommended eligible to the NRHP.

In total, there are 29 resources within the API currently listed on the NRHP as either contributing resources in the Skidmore/Old Town NHL District and 8 resources eligible for listing (see Appendix A of Attachment M, the Draft Section 4(f) Analysis). The historic districts and notable individual resources are described below (also see Figure 3.11-1 and Figure 3.11-3). Section 106 Determination of Eligibility Forms were prepared for those historic resources within the API that are more than 45 years old and not previously evaluated for NRHP eligibility.

SHPO has provided preliminary concurrence on eligibility, and formal concurrence is awaiting the submittal of revised Determinations of Eligibility. Full details for all of the evaluated resources are available in the *EQRB Cultural Resources Technical Report* (Multnomah County 2021h). The sections below highlight the resources most pertinent to the Project.

Figure 3.11-3. Location of Highlighted Resources



Burnside Bridge – The west approach of the Burnside Bridge (Figure 3.11-4), constructed in 1926, is within the Skidmore/Old Town NHL District boundaries (non-contributing), has been the subject of a Historic American Engineering Record (HAER) documentation (Wood Wortman 2006), and is listed individually in the NRHP in 2012 as a part of the Willamette River Highway Bridges Multiple Property District meeting the eligibility requirements under Criterion A and Criterion C1 (Kramer 2012). When it opened to traffic in 1926, the Burnside Bridge was acclaimed for its use of the double-leaf bascule while also employing a concrete deck for the movable span. The Burnside Bridge remains largely intact and continues to maintain its historic integrity and to convey its period of significance (Kramer 2012).

Figure 3.11-4. Burnside Bridge – Looking Northeast

Portland Harbor Wall – Portland Harbor Wall (Figure 3.11-5), also known as the Portland Seawall, is an approximately one-mile-long structure that was completed in 1929. The Portland Harbor Wall is recommended to be eligible for listing in the NRHP under Criteria A and C.

Ankeny Pump Station (historically known as the Ankeny Pumping Station) – The Ankeny Pump Station (Figure 3.11-5), completed in 1929 in the Art Deco style, was built by the City of Portland as part of an interceptor sewer project combining a sewer system, pumping station, and the Harbor Wall. The massive project was built to improve stormwater drainage in the city business center and to prevent flooding in the city's commercial core area which plagued Portland's waterfront. The Ankeny Pump Station is recommended to be eligible for listing in the NRHP under Criteria A and C.

[1] Evaluation criteria for the NRHP are found in 36 CFR 60. The criteria state that the quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and: Criterion A – That are associated with events that have made a significant contribution to the broad patterns of our history; Criterion C – That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Figure 3.11-5. Portland Harbor Wall and the Associated Ankeny Pump Station – Looking Southwest

Central Fire Station and Fire Station Museum/Station No. 1 – The Central Fire Station (Station No. 1) was constructed in 1951 (Figure 3.11-6). It replaced the previous Central Fire Station (which had been at a different location) consolidating several fire stations within one building, as well as adding administrative offices and a lecture hall for community meetings. A one-story addition was made circa 1980 to the north side of the building to house the museum. The architectural character of the 1951 building was reflected in the addition. The Central Fire Station is recommended to be eligible for listing in the NRHP under Criteria A and C.

Figure 3.11-6. Central Fire Station No. 1 – Looking West

White Stag Sign – Originally constructed in 1940, the metal-framed neon rooftop sign is situated on the historic Willamette Tent and Awning Building, now part of the White Stag Block (Figure 3.11-7). The sign is recognized as a City of Portland Historic Landmark. It is approximately 50 feet by 50 feet and faces east at the Burnside Bridge's west approach. It has portrayed several phrases starting with advertising the White Satin Sugar Co., and now reading Portland, Oregon. The White Stag Block has been seismically retrofitted, and the sign sits at least 40 to 50 feet above street level.

Figure 3.11-7. The White Stag Sign – Looking West

Skidmore/Old Town NHL District – The Skidmore/Old Town NHL District was first listed in the NRHP in 1975 and designated a NHL in 1977 (updated in 2008). In 2008, the historic district consisted of 57 contributing resources: 55 buildings, 1 structure, and 1 object. The district is in one of the oldest parts of the city situated partially in Portland's original townsite platted in 1845, and Couch's Addition, platted in 1850. The historic district extends westward from the west bank of the Willamette River, totaling 42 acres. The period of significance extends from 1857 to 1929, when the construction of the Portland Harbor Wall marked a pivotal point in the redevelopment of Portland's waterfront area.

New Chinatown/Japantown Historic District – The New Chinatown/Japantown Historic District was listed in the NRHP in 1989, within the boundaries of which were 45 buildings, 2 objects, and 6 vacant lots. The historic district's period of significance is from 1880 to 1943. When the district was recorded, there were 29 contributing resources. Three contributing buildings have been demolished since 2003.

Burnside Skatepark – The Burnside Skatepark (Figure 3.11-8) is a poured-concrete skatepark structure. Construction began in 1990 and has continued to evolve in design over time. It is situated on public property underneath the east approach of the Burnside Bridge, but it is not a public park. The skatepark is the first known do-it-yourself (DIY) poured-concrete skatepark built in the United States and was at the forefront of a trend in DIY skatepark design and community. The skatepark known internationally and draws skaters young and old, having built a reputation for its challenging features.

The local skater community accepts that the overall design is constantly evolving and appreciates that the park is not an official park. Although sanctioned by the City of Portland in 1992, the skatepark continues to be shaped by the skater community without City involvement (Bredesen 2019; Chemotti 2015). The

Burnside Skatepark is recommended to be eligible for listing in the NRHP under Criteria A and C and meets Criteria Consideration G.[2]

Figure 3.11-8. Burnside Skatepark – Looking West

3.11.2 Impacts from Bridge Alternatives

No-Build Alternative Impacts

Under the No-Build Alternative, no project direct impacts would occur to historic or archaeological resources. However, unrelated new construction would have the potential to encounter and impact archaeological resources. In addition, the Burnside Bridge is approaching 100 years old and would eventually need major retrofit and/or replacement of parts to remain safe and functional. Under the No-Build Alternative, the Burnside Bridge is projected to experience catastrophic failure in a CSZ earthquake, with both approaches collapsing and one or both bascule spans falling into the river. The east approach would collapse across the UPRR tracks and the Burnside Skatepark.

Impacts Common to All Build Alternatives

Direct – All of the build alternatives would have the potential to adversely affect historic properties and archaeological resources. The potential effects in common to all build alternatives would be:

- All the build alternatives would constitute an adverse effect to the Burnside Bridge. The Retrofit Alternative would have the least adverse effect because it would not completely replace the existing bridge.
- Placement of new bents and removal of old bents would have the potential to disturb or expose historic-period archaeological deposits, if present. That potential is highest in Waterfront Park and along W Burnside Street from Naito Parkway west to between 2nd Avenue and 3rd Avenue.
- Proposed grouting associated with some bents could potentially damage archaeological deposits, as well as cementing them in a way that would preclude future field investigations. The highest potential for

[2] Evaluation criteria for the NRHP are found in 36 CFR 60. In addition to the four Criteria for Evaluation, there are several Criteria Considerations for specific situations. Criterion Consideration G states that, “A property achieving significance within the past 50 years if it is of exceptional importance.”

this damage is in the areas referenced above, as well as around bents on the east side between SE 2nd Avenue and Martin Luther King, Jr. Boulevard. The Long-span Alternative would have the lowest potential for grouting impacts because it would require the least injection grouting.

Indirect– Indirect (or induced) effects are unlikely for both archaeological resources and historic buildings. The build alternatives are anticipated to have similar traffic capacity and travel patterns as the existing bridge and are, therefore, not expected to substantially induce new development or redevelopment.

Temporary – Vibration from bridge demolition and particular construction equipment/activities have the potential to damage historic buildings of unreinforced masonry. Damage to character-defining features or substantial compromises to integrity would constitute adverse effects. The Section 106 agreement will include conditions such as monitoring and the use of alternative construction techniques to avoid such impacts and adverse effects.

Post CSZ Earthquake – Most of the historic buildings would be badly damaged or destroyed since many are of them are of unreinforced masonry construction and only a few are known to have been seismically retrofitted. Non-structural architectural elements, such as the stucco veneer found on some of the historic buildings, are those most subject to failure in an earthquake even if they have been retrofitted. At least 12 buildings in the Skidmore/Old Town Historic District have been seismically retrofitted, of which 6 are within the project APE. Other historic buildings in the APE that have been seismically upgraded are the Central Fire Station, the Ankeny Pump Station, the Blake-McFall Building, and the Ira Powers Warehouse and Factory (Eastside Exchange). No seismic assessment is known to have been conducted of the Harbor Wall. However, in the event of its failure, substantial amounts of fill behind the wall would slough into the Willamette River. The fill is known to contain historic-period artifacts and features, so fill sloughing into the river would result in the loss of artifacts, damage or destruction of any existing features, and compromised integrity of the archaeological deposits not lost in the river.

With the build alternatives, the new Burnside Bridge would experience minimal damage. The 2-foot gap (with Replacement Alternatives) to separate the west approach from adjacent buildings could reduce earthquake damage to those buildings by reducing the bridge's potential to strike neighboring buildings while swaying during a seismic event. The UPRR tracks would likely fail/sink as they rest on liquefiable sediments and soils but would not have bridge debris on the tracks. The Burnside Skatepark would probably be substantially damaged (although not caused by debris from the bridge as would be the case under a No-Build Alternative). Both the UPRR tracks and skatepark could conceivably be rebuilt at their present locations after a CSZ earthquake. The Harbor Wall would likely fail or partially fail.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have the following impacts:

- This alternative would result in removal of the Burnside Skatepark, which has been recommended eligible for listing in the NRHP. Rebuilding the skatepark in this location would not be possible. Indirect effects from a permanent loss of the Burnside Skatepark are hard to define or measure. The impacts are more likely to be social rather than the loss of the physical skatepark.
- The proposed alterations at Pier 1 have the potential for adverse effects at the Harbor Wall. Although the Harbor Wall has been recommended as eligible for listing in the NRHP, removal of 150 to 175 feet (3 percent) of the wall is recommended under Section 106 as no adverse effect. However, the character/appearance of the reconstructed segment would need to be addressed in terms of its effects on the integrity of the remainder of the Harbor Wall.

Replacement Alternative with Short-Span Approach Impacts

In addition to the impacts common with all build alternatives, the Short-span Alternative would have the following impacts:

- All of the replacement alternatives avoid physical impacts to the Burnside Skatepark. However, the skatepark would be closed for up to 8 months during construction. Preliminary conversations with the skating community have indicated loss of access during construction could be considered an adverse effect.
- The Short-span Alternative could affect the Harbor Wall from possible use of grouting for Bent 7 at Pier 1. This is recommended as no adverse effect as it would impact only 3 percent of the Harbor Wall. However, the character/appearance of the reconstructed segment would need to be addressed in terms of its effects on the integrity of the remainder of the Harbor Wall.

Replacement Alternative with Long-Span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative, with the following difference:

- The Long-span Alternative would not require supports near the current Pier 1 location and would therefore not impact the Harbor Wall.

Replacement Alternative with Couch Extension Impacts

This alternative would have the same impacts as the Short-span Alternative.

Impacts from Potential Off-Site Staging Areas

Based on the four sample sites identified, the types of impacts that could occur from off-site staging primarily include the potential for affecting pre-contact or historic-period archaeological resources or both. No historic resources are known to be present at the four possible staging areas at this time.

3.11.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Project effects on archaeological and historic resources without a temporary bridge would be the same as described above for pre-earthquake impacts.

With a Temporary Bridge

Additional piers placed in Waterfront Park would have a substantial potential for affecting archaeological deposits, especially in the western portion of the park along the east side of SW Naito Parkway (see Figure 3.11-2).

With the replacement alternatives, construction of a temporary bridge would require not only temporary closure of the skatepark for about 8 months, but also closure of the southern portion of the skatepark for the full construction duration (about 5 years). The temporary bridge would require partial demolition of the southern portion of the skatepark in order to install a temporary support bent. The bent would be removed and the skatepark restored after the new bridge is opened. Demolition of the south portion of the skatepark would be an adverse effect, even if that portion could be rebuilt after construction.

3.11.4 Section 4(f) Preliminary Determinations of Use

The Draft Section 4(f) Analysis, Attachment M to this Draft EIS, analyzes whether a Section 4(f) use will occur with each alternative (see Chapter 1, Draft Section 4(f) Analysis for details). For those historic and

archaeological resources considered to be Section 4(f) properties, Table 3.11-1 summarizes Section 4(f) uses by resource, alternative, and documentation needed with the Preferred Alternative, the Long-span Alternative without a temporary bridge.

Table 3.11-1. Summary of Section 4(f) Use Types and Documentation Type, by Alternative

Resource	Retrofit	Short-Span Alternative	Long-Span Alternative (Preferred Alternative)	Couch Extension	Temporary Bridge	Section 4(f) Documentation Type Needed for the Preferred Alternative
Burnside Bridge	Section 4(f) Use (Permanent Incorporation)	Section 4(f) Use (Permanent Incorporation)	Section 4(f) Use (Permanent Incorporation)	Section 4(f) Use (Permanent Incorporation)	No Change	Historic Bridge Programmatic
Harbor Wall	None	None	None	None	No Change	Not applicable
Burnside Skatepark	Section 4(f) Use (Permanent Incorporation)	No Section 4(f) Use (Temporary Construction Easement)	No Section 4(f) Use (Temporary Construction Easement)	No Section 4(f) Use (Temporary Construction Easement)	Section 4(f) Use (Temporary Construction Easement)	Temporary Occupancy Letter
Ankeny Pump Station	None	None	None	None	No Change	Not applicable
UPRR Tracks	None	None	None	None	No Change	Not applicable
Unreinforced Masonry Historic Buildings	None	None	None	None	No Change	Not applicable
Skidmore/Old Town National Historic Landmark District	None	None	None	None	No Change	Not applicable
New Chinatown/ Japantown Historic District	None	None	None	None	No Change	Not applicable
East Portland Grand Avenue Historic District	None	None	None	None	No Change	Not applicable
Archaeological	None	None	None	None	No Change	Not applicable

UPRR = Union Pacific Railroad

Source: EQRB Draft Section 4(f) Analysis, Draft EIS Attachment M

3.11.5 Mitigation

To meet the requirements of the National Historic Preservation Act and 36 CFR 800 for any project adverse effects, FHWA would need to enter into a memorandum of agreement or Project Programmatic Agreement that defines how those adverse effects would be avoided or mitigated. The mitigation measures offered below are only possible measures. The determination of the measures to be implemented would be defined through consultation. Mitigation measures would be developed through discussions with consulting and other interested parties. Those parties and appropriate agencies would also be involved in development Programmatic Agreement that addresses project effects to both historic and archaeological resources.

Build Alternatives

Burnside Bridge – All of the build alternatives would constitute adverse effects for the Burnside Bridge, with the greatest impacts resulting from the replacement alternatives. Potential mitigation could include:

- For the Retrofit Alternative, retain as many of the original design and engineering features of the bridge as feasible. For example, retain the octagonal form and Italianate architectural style of the retrofitted operator towers.
- For all of the build alternatives, consult with SHPO to determine if the 2000 HAER documentation of the bridge should be updated. Alternatively, documentation of the bridge prior to any alterations would be state-level documentation in consultation with the SHPO.
- Provide interpretation and education measures as well as public art commemorating the bridge, for example:
    - Create brochures and other publications.
    - Develop a survey of historic events in the life of the Burnside Bridge.
    - Incorporate public art regarding the Bridge. For example, erect a cenograph (memorial) to the current Burnside Bridge.
    - Prepare an “obituary” of the Burnside Bridge.
    - Publish oral histories regarding the bridge, such as histories of the bridge operators.
    - Graphically illustrate for history’s sake the bridge’s engineering and construction features, including the timber piles and foundation design.
    - Commission a public work of art to commemorate the Burnside Bridge.
    - Engage Oregon’s poet laureate to commemorate the bridge.
    - Update and elaborate online encyclopedia submissions, such as the Wikipedia entry on the Burnside Bridge.
    - Create a museum exhibit. For example, curate a “memory book” of essays about the bridge by local citizens for public display.
    - Develop an education component for elementary school children; update existing Willamette River Bridges curriculum currently used in Portland metro schools.
    - Use historic bridge components in the new design or project area.
    - Update Historic American Engineering Record (HAER) documentation.
    - Provide interpretive panels about the bridge.
    - Support historic documentation efforts of local repositories.
    - Develop documentation of the history of Willamette River crossings.

Burnside Skatepark – Table 3.11-2 shows mitigation options for the Burnside Skatepark depending on whether it is demolished or only closed temporarily.

Table 3.11-2. Burnside Skatepark Potential Mitigation Measures

Potential Mitigation	Full Permanent Demolition	Temporary Closure (4 to 8 months)
Prepare extensive documentation of the skatepark in its current form, working with the skater community and others to recover and preserve as many images as possible of the evolution of the skatepark since 1990.	Yes	Yes
Record video documentation of activity at the skatepark.	Yes	Yes
Collect oral histories with past and present users of the skatepark about the history of the skatepark and its importance to the skating community, including Internet and social media postings, as well as outreach to other users who are not local residents.	Yes	Yes
Determine if there are other opportunities to either establish a new DIY skatepark that would be accessible to the skater community or if support could be provided to other existing DIY skateparks.	Yes	Yes
Develop appropriate interpretation and education measures: brochures and other publications, displays and exhibits, interpretive panels, websites, and mobile apps.	Yes	No
Hold events that recognize and celebrate the skatepark's history.	Yes	No
Explore design and/or construction approaches that would substantially reduce the duration of skatepark closure.	No	Yes

Historic Buildings of Unreinforced Masonry Construction – Unreinforced masonry buildings located adjacent to bridge demolition and other construction activities could experience damage during bridge demolition or construction activities that generate high levels of vibration. Mitigation measures to avoid such impacts include the following:

- Wherever practical, use construction equipment that minimizes vibration impact when within 100 feet of a historic property of unreinforced masonry construction.
- For those buildings with no available information on seismic retrofitting, contact building owners or managers to determine if seismic retrofitting has been undertaken or is planned.
- Conduct engineering assessments to better define the vulnerability to vibration damage for individual buildings.
- Further document those historic properties vulnerable to vibration impacts.
- Coordinate with the City of Portland and Prosper Portland on the *Old Town/Chinatown Five-Year Action Plan Extension, 2019–2024* (City of Portland and Prosper Portland 2014), which defines an objective of rehabilitating historic buildings of unreinforced masonry construction. Funding is potentially available for seismic retrofitting of some historic properties.
- Continuously monitor vibration levels and periodically check the condition of vulnerable buildings during construction; based on monitoring results, revise construction methods where necessary to avoid damaging structural integrity of these buildings.

Construction Traffic Management Options

No mitigation measures specific to construction traffic management are suggested.

3.12 Visual and Aesthetic Resources

This section identifies existing visual and aesthetic resources in the project area and outlines anticipated Project impacts to those resources. A complete inventory of existing conditions, more photos, and more evaluation detail can be found in the *EQRB Visual and Aesthetics Technical Report* (Multnomah County 2021cc), which follows the Federal Highway Administration's (FHWA) *Guidelines for the Visual Impact Assessment of Highway Projects* published in 2015 (FHWA 2015).[1]

3.12.1 Affected Environment

The Project's Area of Visual Effect (AVE) (see Figure 3.12-1) defines the space from which the proposed Project would be seen and the area that would be seen from the proposed Project.

Landscape Units

To conduct the visual analysis, three distinct project area landscape units were defined: West Approach, River Crossing, and East Approach (see Figure 3.12-2). Visual character, viewer groups, and visual quality—key aspects of understanding the landscape units' visual identities and how they would be affected by the Project—are summarized below.

Table 3.12-1. Visual Identity Aspects

Aspect	Description
Visual character	Description of the physical attributes of the Project's constructed elements.
Viewer groups	Neighbors have views of the bridge while travelers have views from the bridge.
Visual quality	Describes a viewer's relationship with their environment, and what they like or dislike seeing. Serves as a baseline for determining the degree of visual impacts.

West Approach

This urban downtown Portland environment is primarily defined by the views from and to the buildings surrounding Burnside Street west of the Willamette River. This unit's main visual distinction are the architectural styles of two National Register of Historic Places (NRHP) districts—New Chinatown/Japantown and Skidmore/Old Town—that flank the west end of the bridge. Comprised primarily of three- to four-story buildings, mostly built between the late 1800s and early 1900s, the predominant architectural styles include Italianate, Romanesque, late nineteenth/twentieth century. American, twentieth century, and commercial. Most building façades are pedestrian-focused with entrances facing the sidewalk and ample storefront windows. The unit also contains modern era mixed-use buildings with office space, residential, social services and higher education uses. Mature, well-established deciduous street trees line both W Burnside Street and adjacent surface streets. The iconic White Stag sign, a neon and incandescent-bulb sign, is directly north of the west bridge landing and faces east. It is one of the most recognizable elements of the Portland skyline, both day and night.

[1] The AVE, visual quality, visual impacts, and visual preferences are not intrinsic characteristics of the environment or people but, rather, result from the interactions between viewers and their surroundings. The FHWA Visual Impact Assessment (VIA) process is based on the scientific concept called *transactional perception*. This is an idea that perception (and therefore visual quality) is the result of an interaction between the viewer and the environment and can be described as a relationship between the viewer and the environment. The FHWA VIA guidelines assume that it is possible to discern what viewers value in their relationship with their environment and what they would think of the changes a proposed transportation project would make to that relationship (FHWA 2015).

Figure 3.12-1. Area of Visual Effect

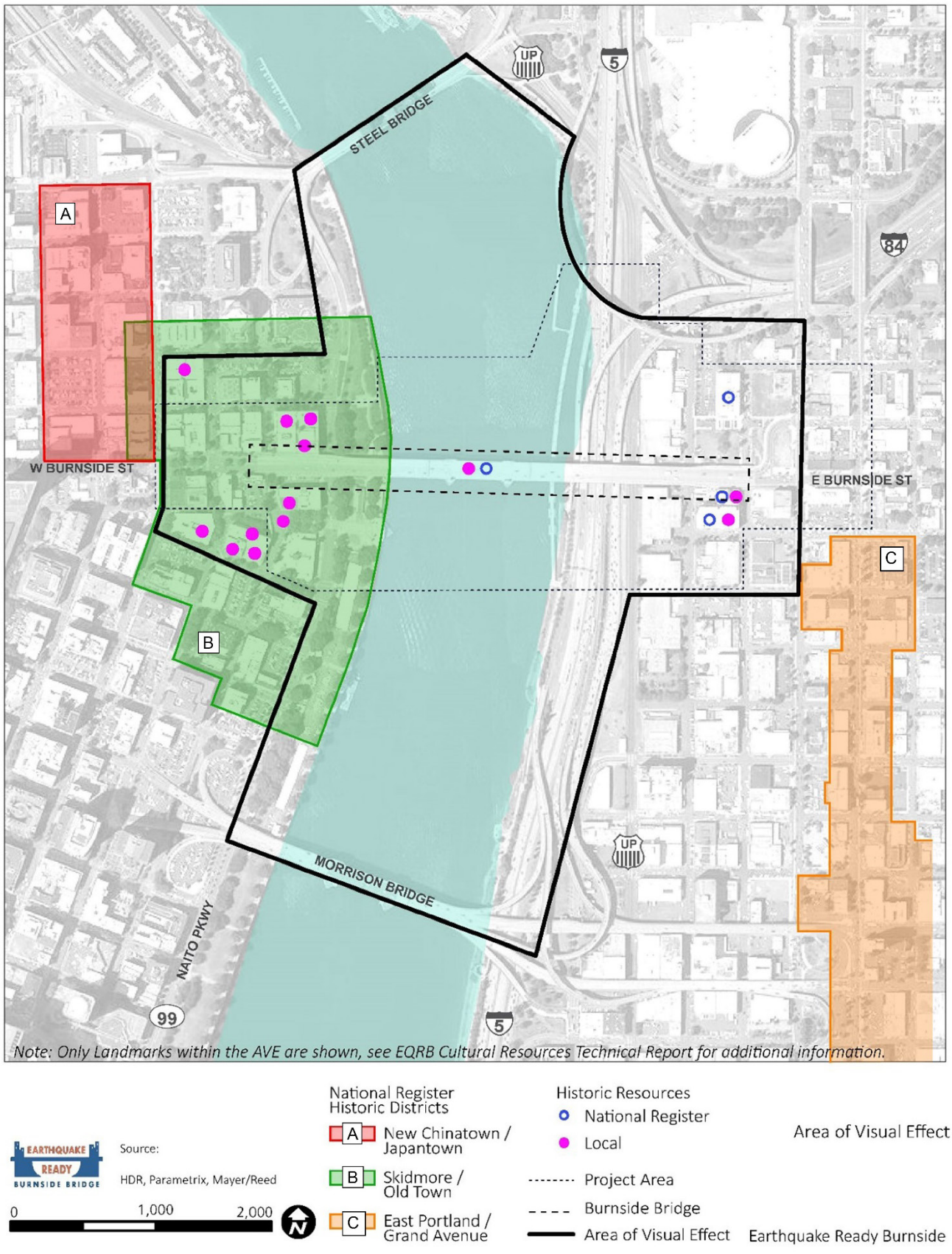
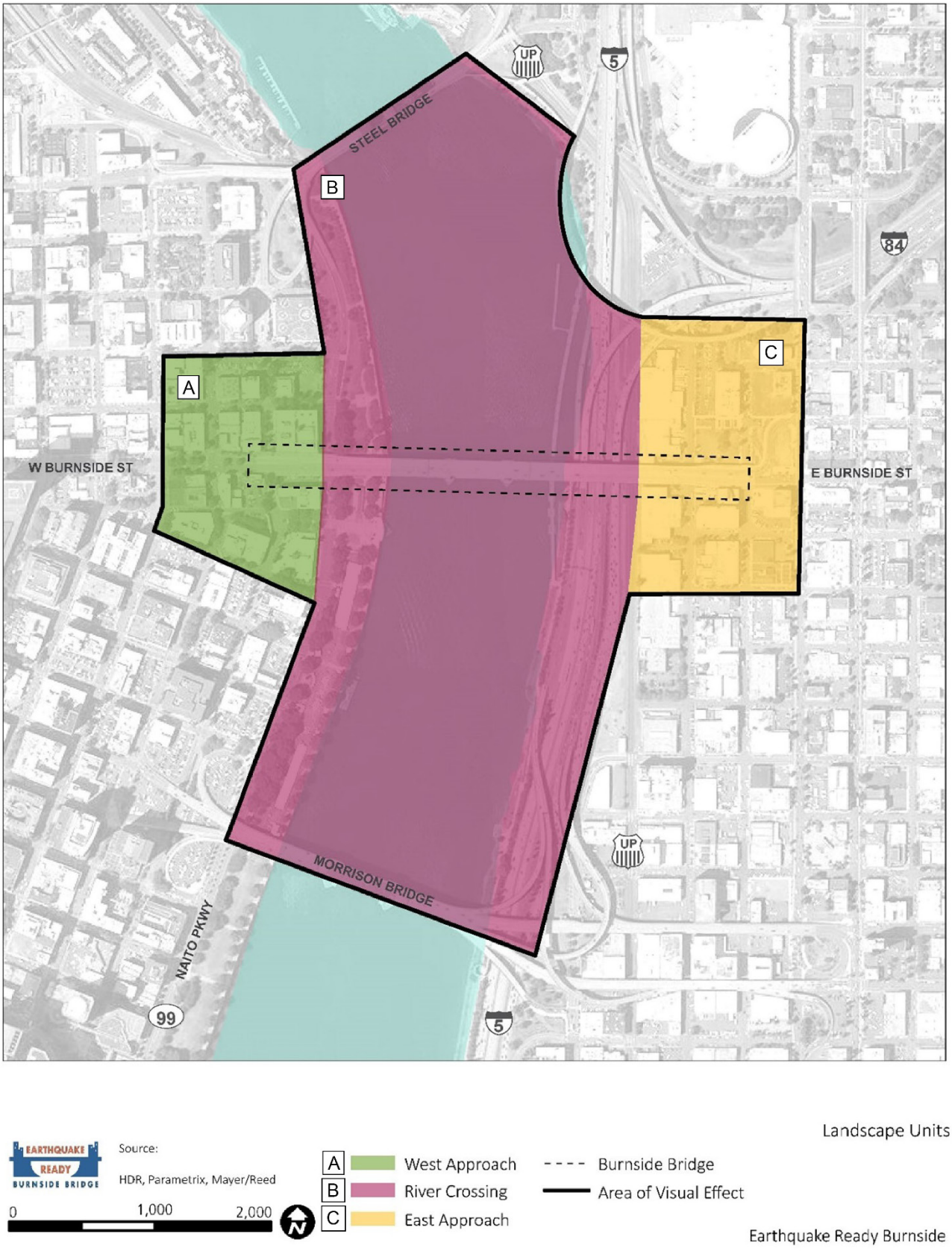


Figure 3.12-2. Landscape Units



The cohesive visual character of the unit creates a strong cultural order (see Section 3.12.2 for a description *cultural order*) and many vivid compositions. The historic buildings generally share a common scale, shape, and material palette. Modern buildings in the area also follow this district design aesthetic. Mature street trees provide a green canopy to many streets, softening the urban structure and offering shade to pedestrians. The historic buildings designed to support predominantly pedestrian traffic still offer human-scale façades today—ample storefront windows, doors at close intervals, façade ornamentation, and awnings. Because of the strong cultural order in this unit, any drastic change could be viewed negatively by neighbors.

River Crossing

This landscape unit is defined by views from or to the Willamette River and riverfront. The river, which flows in a gentle arc through the project area, is bounded on the west bank by a concrete seawall. The east bank of the river has also been heavily modified; it is reinforced with riprap and contains limited volunteer vegetation.

The Burnside Bridge, a concrete and steel structure with a double-leaf bascule movable span,[2] was listed on the NRHP in 2012 and is a City of Portland historic landmark. Two Italian Renaissance–style towers on the south side, decorative metal railings on the movable spans, and concrete balustrade railings are the only above-deck structures on the bridge. Sidewalks on both the north and south sides of the bridge offer pedestrians and bicyclists views of both riverbanks, downtown, the central eastside, and the river, up- and downstream. There are also streetlights, overhead traffic lights, and signage structures.

The Burnside Bridge passes over Governor Tom McCall Waterfront Park, the dominant element of the natural environment on the west bank of the river. This 36-acre public park includes lawn and trees, a hardscape plaza, the Bill Naito Legacy Fountain, and a multi-use path on top of a seawall. The Japanese American Historical Plaza, located directly north of the bridge, was designed by noted landscape architect Robert Murase, and dedicated in 1990. The space contains multiple sculptures and is lined with cherry trees along the waterfront path. The trees can be viewed from the Burnside and Steel Bridges and from across the river.

On the east bank of the river, the Burnside Bridge passes over Union Pacific Railroad track, I-5, the Vera Katz Eastbank Esplanade, and a multi-use path that runs between the riverbank and I-5. Under the bridge, the esplanade drops to the river surface on a floating pedestrian walkway which connects to the Kevin J. Duckworth Memorial Dock. The dock and esplanade are two of the four downtown locations that provide river access; both are close to the Burnside Bridge. Views to the bridge are uninterrupted with the downtown skyline as a backdrop.

The Willamette River is the visual anchor in this landscape unit. It is an important compositional element in most views from each environment type, providing a moving linear feature and a sense of openness with clear, wide views to the riverside landscapes. For example, there are several vivid, memorable, expansive, layered views including the Burnside Bridge terminating amongst the tree canopy of Governor Tom McCall Waterfront Park, with the skyline of downtown ascending to the West Hills beyond. There are uninterrupted views north to the Steel Bridge and south to the Morrison Bridge. These two bridges create visual barriers to the landscape beyond.

The combination of low bridge elevation and low building heights on the west side create an open view for westbound travelers, allowing taller elements to become iconic, elements such as the US Bancorp building, the White Stag sign, and the West Hills.

[2] See Chapter 2 for a description of a double-leaf bascule movable span.

East Approach

This landscape unit is the urban environment of the Central Eastside, defined by views from and to the buildings surrounding Burnside Street east of the river. The topography below the bridge on the east end drops quickly, placing the bridge deck elevation at the first and second floors of the adjacent buildings at the east bridge approach. The architecture in this landscape unit includes a mixture of light industrial and manufacturing, renovated warehouse, and modern mixed-use high-rise, with no cohesive style. Building façades are directly adjacent to the bridge, which creates a compressed view for motorists and pedestrians as they travel west toward the river. An S-curve approach links NE Couch Street with the westbound lanes of the Burnside Bridge.

The Burnside Skatepark, located below the bridge on the east side of E 2nd Avenue, features not only the unique skatepark but also murals and graffiti art, particularly on the E 2nd Avenue retaining wall. The western portion of this area includes freeway ramps that connect I-84 to I-5 north of the bridge.

This area is defined by its current state of transition. Remnant warehouses and industrial-use buildings remain, while new, high-density development is increasing. The new development uses bold form, color, and material choices that create a novel cultural order that is memorable. The new and changing nature of this area could mean future changes to the area would be seen as positive or neutral by neighbors. New development in the area has increased building heights thereby creating narrowed views, more shadows, and less tree canopy.

3.12.2 Impacts from the Bridge Alternatives

Impacts to visual quality are determined by examining how the proposed alternatives would affect or contrast with the existing visual character of the landscape units, and by determining the perceived level of sensitivity of viewers[3] to those changes. Visual quality impacts are based on the impacts to natural harmony, cultural order, and project coherence.[4]

For each of the above factors, the visual impacts analysis considered the perceptions of the two main viewer groups: travelers and neighbors (see Table 3.12-1). Each of these groups is further divided as noted in the text below.

Table 3.12-2. Aspects of Visual Perception

Aspect	Description
Natural harmony	Viewing the visual resources of the natural environment creates a sense of natural harmony in people. People interpret visual resources of the natural environment as being harmonious or inharmonious. The greater the degree to which the natural visual resources meet the viewer's preferred concept of natural harmony, the higher value the viewer places on those visual resources.
Cultural order	People interpret the visual resources of the cultural environment as being orderly or disorderly. The greater the degree to which the cultural visual resources of the AVE meet the viewer's preferred concept of cultural order, the higher value the viewer places on those visual resources.
Project coherence	People interpret the visual resources of the project environment as being either coherent (logical and consistent) or incoherent. The greater the degree to which the visual resources of the project environment meet the viewer's preferred concept of project coherence, the higher value the viewer places on those visual resources.

[3] This report uses the FHWA "Professional Observational Approach" to describe the visual quality of the project alternatives. Future public involvement will test these assumptions and be updated as necessary.

[4] A fourth concept—Landscape Composition and Vividness—is also part of the visual quality consideration but is less critical to this particular analysis. See the *EQRB Visual and Aesthetics Technical Report* (Multnomah County 2021cc) for discussion.

The description of impacts is organized by span—west span, mid-span, and east span—and is evaluated by impacts to landscape units and viewer groups. The impacts are summarized at the end of descriptions below (see Table 3.12-3).

The No-Build Alternative is expected to cause little change in the project area's visual environment, other than that which results from ongoing development and redevelopment trends, as noted above in Section 3.12.1.

Indirect visual effects are not expected. Post-earthquake visual effects are not discussed below because the visual impact of the next CSZ earthquake on the entire city and region is likely to overwhelm any variation in the build alternatives. The primary visual difference at the Burnside crossing will be that with the No-Build Alternative, much of the bridge would be collapsed onto the ground and into the river, whereas the build alternatives would still be standing.

West Span

Build Alternatives

For all of the build alternatives except the Long-span Alternative, existing views would remain largely the same (see Figure 3.12-3 at the end of this section). The low-profile structure would not impede views for travelers or neighbors. Neighbors are typically believed to have a strong preference to maintain existing conditions; therefore, the similar scale, form, and visual character are thought to please neighboring viewers.

The Long-span Alternative would have the highest potential (both adverse and beneficial) impact to views. The level of impact would vary by bridge type (options include through-truss, tied-arch, or cable-stayed bridge type, see Chapter 2); the bridge-type determination study is being conducted at the same time as the EIS process and will include public input.

A through-truss bridge would partially impede views of the river, downtown, the White Stag sign, and the hills, and could impede views of the river from West Approach recreational neighbor viewers. It would increase the vertical mass above recreational neighbors and commuting and touring travelers using Governor Tom McCall Waterfront Park. Typical through-truss bridges have an industrial aesthetic that is compatible with the character of the West Approach landscape unit.

A tied-arch or cable-stayed bridge type would impede views for travelers in the surrounding environment, such as of the White Stag sign, downtown, and the river—impacting natural harmony and cultural order. The height of the structure would impede views of the river from West Approach residential neighbors. The form of a tied-arch bridge and the modern form of a cable-stayed bridge would contrast with the character of the West Approach landscape unit and greatly increase vertical mass above recreational neighbors and commuting and touring travelers using Governor Tom McCall Waterfront Park. These contrasts could create a sense of project incoherence; however, the reduction of structural bents under the bridge would provide opportunities for greater occupiable space. Both of these bridge types have the potential to improve or enhance views and the viewer experience by creating view frames or thresholds. Tall elements have the potential to create a focal point in the River Crossing or iconic background for viewers in the West Approach landscape unit. They provide the greatest opportunity to create a crossing that activates new areas for public use, and the greatest opportunities to provide new views, iconic/demonstrative visual experiences, processional experiences, or new gateways.

Figure 3.12-3. Long-Span Alternative Looking West

Existing Condition

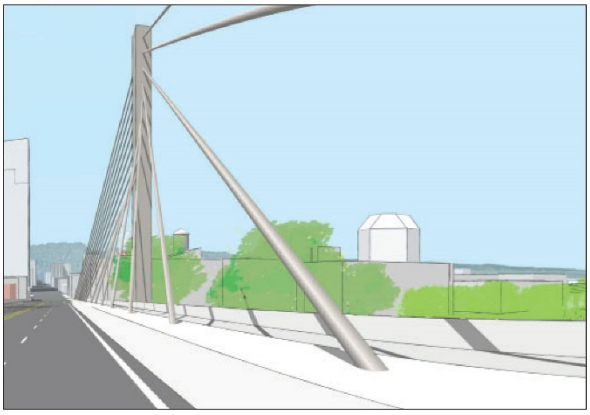
Enhanced Seismic Retrofit Alternative

Short-span Alternative and Couch Extension

Long-span Alternative / Through-truss

Long-span Alternative / Tied-arch

Long-span Alternative / Cable-stayed



Source:

HDR, Parametrix, Mayer/Reed

View from Burnside Bridge looking northwest

Pedestrian Access Point – All Alternatives[5]

Views from the bridgehead would be altered slightly with the removal of a building adjacent to the sidewalk on the south side of W Burnside Street, reducing the narrowed view and opening views to the south. Views from the south to the bridgehead would also be altered; the bridge deck would be visible to 1st Avenue neighbors.

Mid-Span

Retrofit Alternative

With no change in the movable span type (bascule leaf), existing views would remain the same as with the existing bridge. The low-profile structure would not impede views for travelers or neighbors. Neighbors are typically believed to have a strong preference to maintain existing conditions, therefore, it is thought the similar scale, form, and visual character of the Retrofit Alternative would please neighboring viewers.

Replacement Alternatives

The replacement alternatives could have either a bascule (like the existing bridge) or a vertical lift movable span. The low-profile bascule would not impede views. Clear sightlines at the center of the River Crossing landscape unit would provide views up, down, and across the river for travelers and neighbors, preserving the natural harmony of the environment. Alternatively, a vertical lift bridge would contrast with the existing low-profile form. The repeated vertical elements of the lift structure could provide thresholds or gateways for travelers as they pass over the bridge, as well as signify a bridge ahead upon approach, strengthening cultural order.

East Span

Figure 3.12-4 shows the east span as it could appear with the build alternatives.

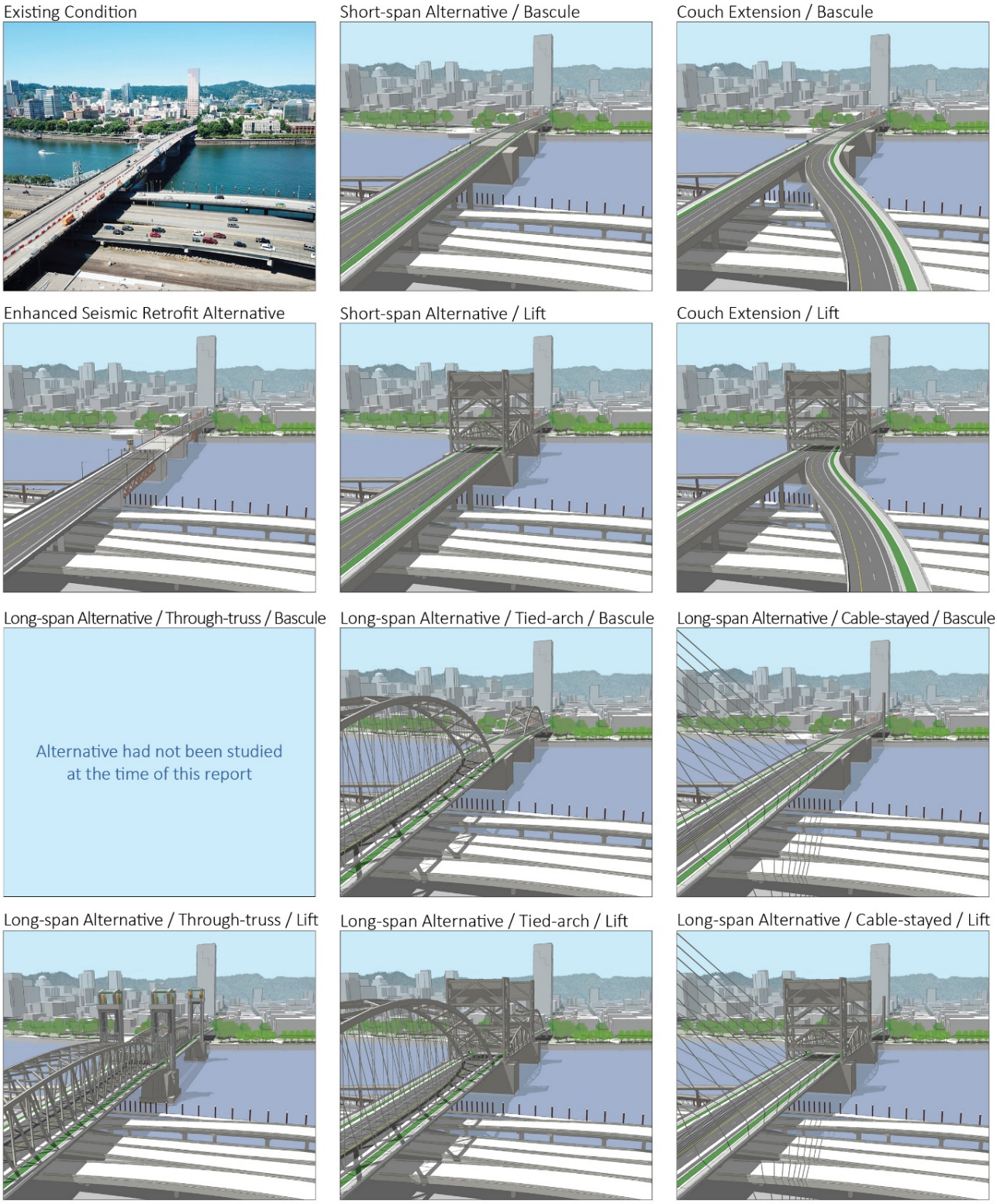
Retrofit Alternative and Short-Span Alternative

Existing views would remain the same. The low-profile structure would not impede views for travelers or neighbors. Neighbors are typically believed to have a strong preference to maintain existing conditions, therefore, it is thought the similar scale, form, and visual character of these two alternatives would please neighboring viewers.

These alternatives provide little opportunity to create a crossing that activates new areas for public use, or that creates opportunities to provide new views, iconic/demonstrative visual experiences, processional experiences, or new gateways.

[5] Pedestrian stair and ramp are conceptual designs. Engineering design had not been completed at the time of Draft EIS publication.

Figure 3.12-4. Renderings of Views Looking West



Note: Location of view is representative of East Side Neighbor. Views will vary based on elevation and sight lines.

Source:
HDR, Parametrix, Mayer/Reed

View from East Side High-rise Looking West

Couch Extension Alternative

Impacts from the Couch Extension Alternative would be associated with both the short-span connection to Burnside Street, as well as with the new connection to Couch Street. The low-profile structures would not impede views for travelers, and they could potentially improve views. However, impacts to views from adjacent residential neighbors could be substantial. Views from the West Approach landscape unit (Figure 3.12-5) might not be impacted given the surroundings on the east side of the river. A second bridge structure would double the area of under-bridge space.

Long-Span Alternative

Visual impacts from a through-truss, tied-arch, or cable-stayed bridge to the East Approach would be similar to the description above for the West Approach. The main differences would be in the viewers affected. A medium-height or tall structure could partially impede views of the river and beyond from travelers, and could impede views of the river and downtown from East Approach residential neighbors. The reduction of structural bents would increase opportunities for greater occupiable space under the bridge.

Esplanade Access Ramp – All Alternatives[6]

Options with stairs and elevators, and options with ramps are being considered for providing direct bicycle, pedestrian and ADA access between the Eastbank Esplanade and the Burnside Bridge deck (see figures in Draft EIS Attachment G and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memorandum* [Multnomah County 2021a]). The options with only stairs and elevator on one or both sides of the bridge would result in the least visual impact as they would be similar in character and scale to the existing stairs. The stairs with elevator options would include a new foundation structure in the river, although it would be substantially smaller than with options that include ramps instead of stairs and elevators.

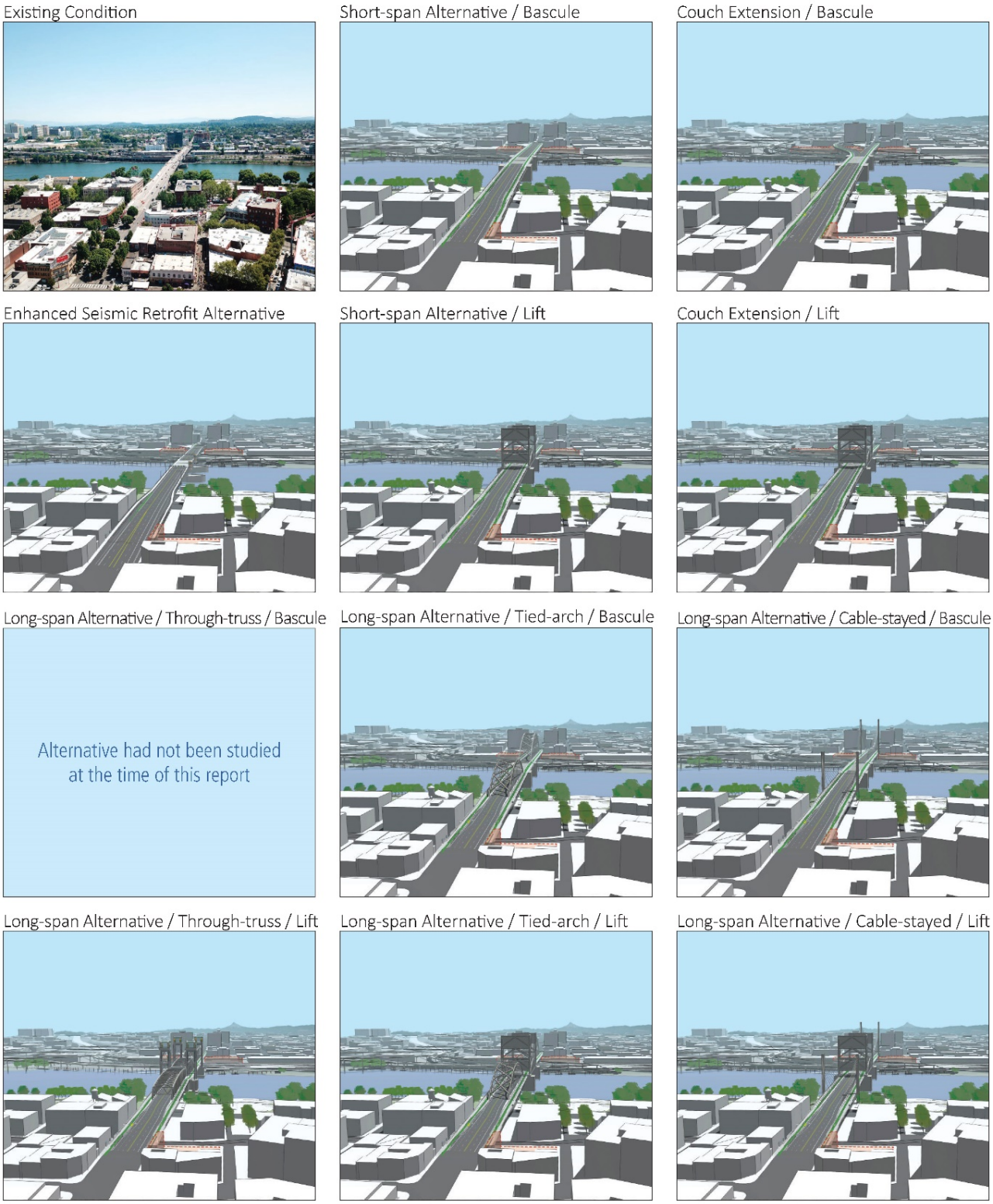
The expanded vertical profile of the ramp options (see example of a single ramp option in Figure 3.12-6) would alter views from the Vera Katz Eastbank Esplanade eastward and views from the bridge deck toward the southeast. The height and scale of the ramp structure(s) would alter views from the Eastbank Esplanade and from the west side of the river looking east. The greatest impact would be with ramps on both sides of the bridge.

The ramp footprint on the south side of the bridge would remove up to 20 existing trees on the east bank, greatly affecting the visual character, especially as viewed from the Esplanade or the eastbound bridge sidewalk. The fact that there are few trees along the Esplanade bestows each tree as a contribution to the visual character of the bank, providing shade and a sense of Natural Harmony to viewers.

Vehicular Travelers would be minimally affected by the ramp structures due to their rate of travel, but Pedestrian and Bicycle Travelers would view the structure for a longer duration. The ramp structures would be seen by Neighbors on the Vera Katz Eastbank Esplanade and Governor Tom McCall Waterfront Park. The increased footprint of the ramp structure(s) increases the distance from which they would be seen and the duration of time they would be seen. The added structure would detract from the natural aesthetics of the river. While the visual effects of the ramp options would be substantial for specific views, as noted above, the quality of the visual change for some views would depend in part on the detailed design of the ramp structures, including their compatibility with the Eastbank Esplanade and the Burnside Bridge. Blocking views to the freeway to the east may be seen as a beneficial impact. Another potential benefit of ramps would be added views and visual experiences for pedestrians and bicyclists on the ramps.

[6] Pedestrian stair and ramp are conceptual designs. Engineering design had not been completed at the time of Draft EIS publication.

Figure 3.12-5. Renderings of Views Looking East



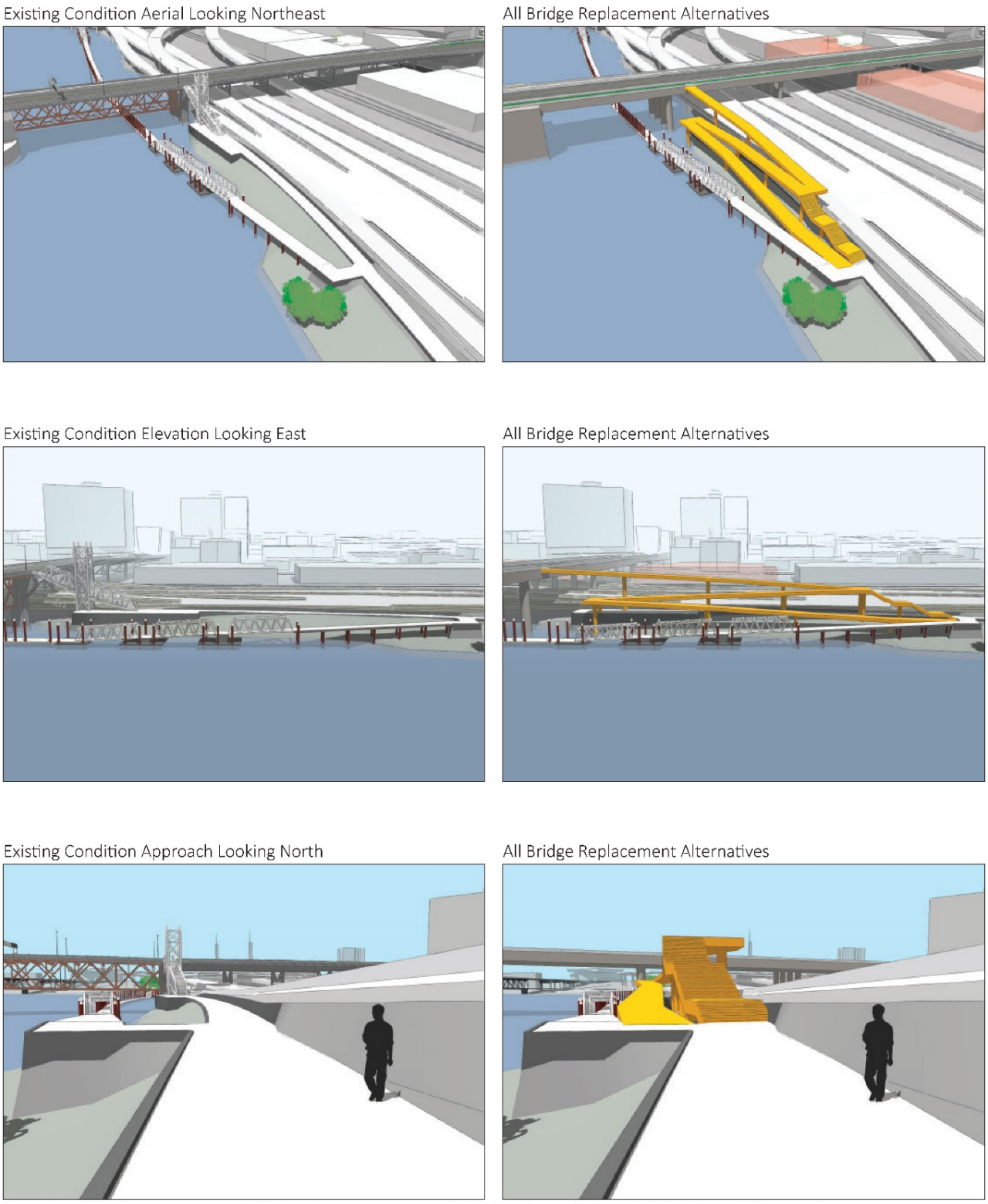
Note: Location of view is representative of West Side Neighbor. Views will vary based on elevation and sight lines.

Source:

HDR, Parametrix, Mayer/Reed

View from West Side High-rise Looking East

Figure 3.12-6. Proposed Eastbank Esplanade Access Ramp



Note: Renderings are conceptual. Stair and ramp components had not been designed at the time of this report.

EARTHQUAKE READY BURNSIDE BRIDGE

Source:

HDR, Parametrix, Mayer/Reed

Pedestrian Access on East Side

The impacts are summarized in Table 3.12-3 below. For more information about natural harmony, cultural order, and project coherence, see the descriptions at the beginning of Section 3.12.2.

Table 3.12-3. Summary of Impacts to Visual Quality

Bridge Span and Alternative Types	Natural Harmony – Traveler	Natural Harmony – Neighbor	Cultural Order – Traveler	Cultural Order – Neighbor	Project Coherence – Traveler	Project Coherence – Neighbor	Visual Quality for all Viewers
West Span Retrofit	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact
West Span Short-Span and Couch Extension	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact
West Span Long-Span Through-Truss	Moderate impact	Moderate to high impact	Moderate to high impact	Moderate impact	Moderate to high impact	Moderate to high impact	Moderate to high impact
West Span Long-Span Tied-Arch	Moderate to high impact	Moderate to high impact	Moderate to high impact	High impact	High impact	High impact	Moderate to high impact
West Span Long-Span Cable-Stayed	Moderate to high impact	Moderate to high impact	Moderate to high impact	High impact	High impact	High impact	Moderate to high impact
Mid-Span Retrofit Bascule	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact
Mid-Span Replacement Alternative Lift	Moderate impact	Moderate impact	Low to moderate impact	Low to moderate impact	Moderate impact	Moderate impact	Moderate impact
Mid-Span Replacement Alternative Bascule	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact
East Span Retrofit	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact
East Span Short-Span	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact	Low impact	Low to moderate impact
East Span Couch Extension	Low to moderate impact	Moderate to high impact	Moderate impact	Moderate to high impact	Moderate impact	Low impact	Moderate impact
East Span Long-Span Through-Truss	Moderate to high impact	Moderate to high impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact
East Span Long-Span Tied-Arch	Moderate to high impact	Moderate to high impact	Moderate impact	Moderate to high impact	Moderate impact	Moderate to high impact	Moderate impact
East Span Long-Span Cable-Stayed	Moderate to high impact	Moderate to high impact	Moderate impact	Moderate to high impact	Moderate impact	Moderate to high impact	Moderate impact

3.12.3 Impacts from Construction

Temporary impacts during construction would be similar for all of the build alternatives and would include removal of vegetation, installation and operation of work bridges and barges on the river, and the presence

of construction vehicles and temporarily stored materials on both sides of the river as well as at staging areas. Because the impacts would be temporary, and any removed vegetation would be restored, they are not considered to be significant. Mitigation for these impacts is described in Section 3.12.4.

A temporary bridge would add further impacts, including the removal of four additional mature trees from Governor Tom McCall Waterfront Park south of the Burnside Bridge. As with other vegetation that would need to be removed for construction, these trees would be replaced.

3.12.4 Mitigation

Visual and aesthetic considerations will be incorporated into all phases of project planning, including the EIS, the bridge type study, and later phases of design and construction. The following measures can be considered, where possible, during current and later project phases:

- Protect and maintain street and park trees where feasible, and replace any trees removed during the construction.
- Protect or replace pedestrian areas, including but not limited to the area used by the Portland Saturday Market, the Japanese American Historical Plaza, Governor Tom McCall Waterfront Park, the Burnside Skatepark, and the Vera Katz Eastbank Esplanade
- Minimize adverse impacts to existing views and view corridors by considering historic districts' design criteria and City-designated view corridors.
- Maximize the aesthetic experience for all users approaching, on, and under the bridge by considering opportunities related to scale, forms and materials, viewing, wayfinding, transitions to and from public spaces, lighting/shade/shadows, and activating areas for public use.
- Create the opportunity for a crossing that provides iconic/demonstrative visual experiences of and on the bridge by developing gateways, new views, and processional experiences.

Generally, options that introduce tall bridge elements (Long-span Alternative) impact a larger number of viewer groups than any other design components due to viewer exposure. Special care should be taken to mitigate adverse impacts through careful bridge type selection, bridge form design, and overall structure scale consideration. At the same time, the options that introduce elements of height could also provide greater opportunity to create new or enhanced visual experiences.

On a finer scale, material and color selection may help mitigate visual impacts to surrounding neighbors.

The mitigation measures outlined above are based on the current general bridge component alternatives. Upon selection and further refinement of the bridge type, mitigation measures will be further assessed and advanced. Local zoning codes, the City of Portland *2035 Comprehensive Plan* (CoP 2020), and the *Central City Fundamental Design Guidelines* (CoP 2001) will also be key during the design development of the project.

3.13 Geology

This section identifies and evaluates potential impacts to soils and geology within the project area. More detail can be found in the *EQRB Soils and Geology Technical Report* (Multnomah County 2021x) and the *EQRB Geotechnical Report* (Multnomah County 2021k).

3.13.1 Affected Environment

The API established for the soils and geology analysis includes an approximately 0.5-mile buffer from the centerline of the project area. This API allows for a comprehensive review of potential conditions near the project area that have potential for soil and geologic impacts. Figure 3.13-1 shows the API for the soils and geology analysis. The analysis in this section also discusses larger regional seismic hazards that are applicable to the geologic impact analysis.

The data required for evaluating how construction may be impacted by geologic properties and how the construction may impact geology were obtained from analysis conducted specifically for the EQRB Project, as well as existing technical reports, maps, and other publicly available information.

The API lies within a geologic area known as the Portland Basin, which is underlain by rock, such as basalt, derived from lava flows. Upper layers of soils and sediment are comprised of sand, gravel, and other deposits, with much of the modern land surface in the Portland Basin shaped by the Missoula Floods, a series of late Pleistocene era floods containing sediment-laden waters. The development of the City of Portland has included extensive placement of fill in areas adjacent to the Willamette River and in flood channels near the river.

Earthquake-hazard mapping in the Portland metropolitan area was initiated in 1990, identifying geologic units that have a high susceptibility for seismic hazards. The primary hazards within the API that may result from ground shaking are related to soil liquefaction, which is a drastic loss of soil strength that can accompany a moderate or strong seismic event. As a result, the soil moves like a liquid and is unable to support weight and can flow laterally in a manner known as lateral spreading. As shown on Figure 3.13-2, liquefaction susceptibility in the API is generally very high. Geotechnical investigations conducted for the Project corroborated this mapping, finding soils representing geotechnical hazard zones near the surface to be composed of artificial fill and fine-grained material that are highly susceptible to liquefaction. These conditions suggest that the presence of competent material (subsurface geology capable of supporting seismically stable bridge structures) may not be reached until depths beyond 40 feet below ground surface (bgs) on the west side to 140 feet bgs on the east side.

The topography within the project area is relatively flat but slopes gently toward the Willamette River on both sides. On the west side, the natural topography within much of the API near-shore was modified by placement of the existing harbor wall.

Groundwater conditions within the API were investigated, but no infiltration to groundwater is proposed and no impacts to groundwater related to geology are anticipated. Please see the *EQRB Soils and Geology Technical Report* (Multnomah County 2021x) for additional information.

Figure 3.13-1. Geology Analysis Direct Impact API

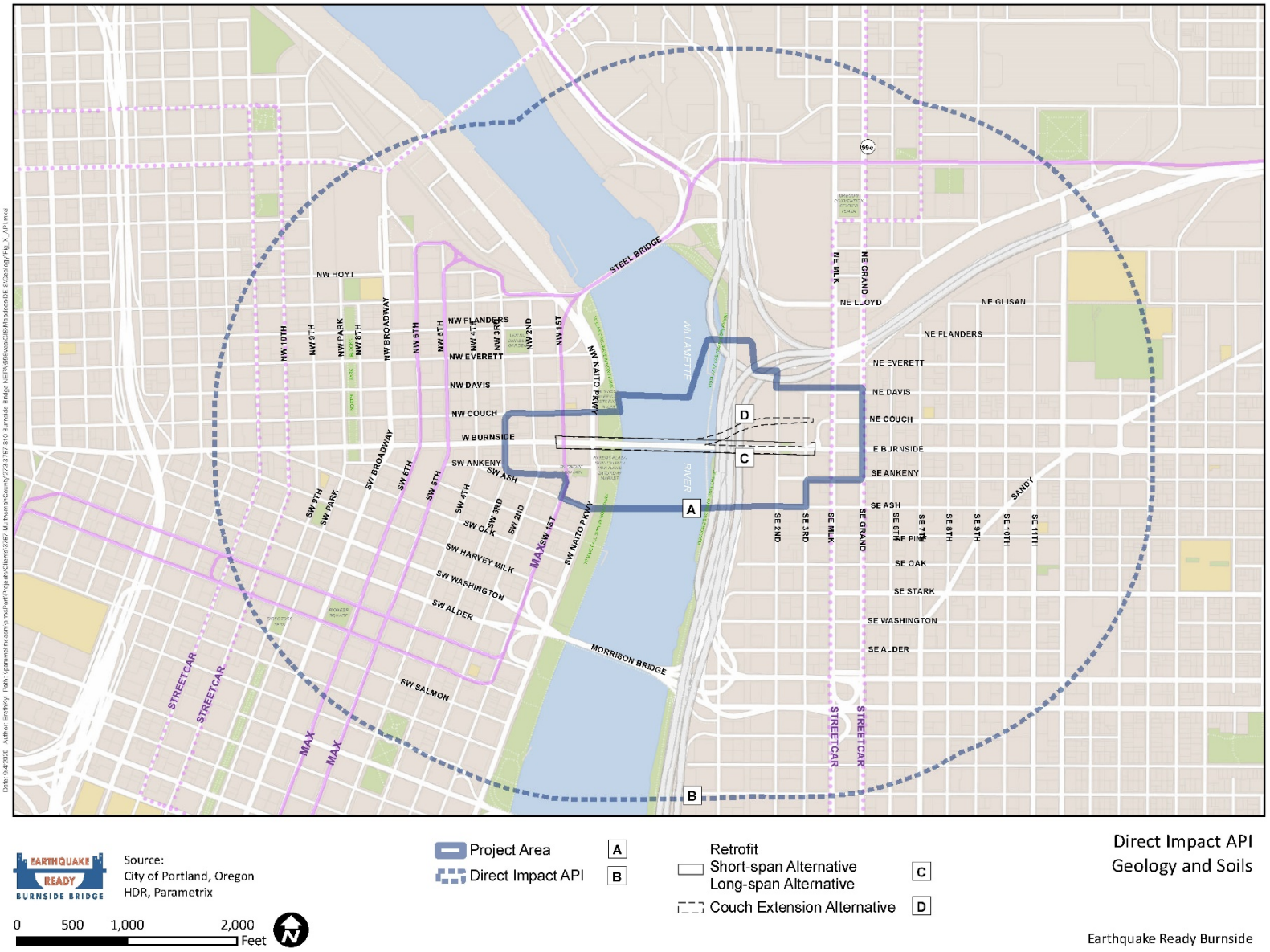
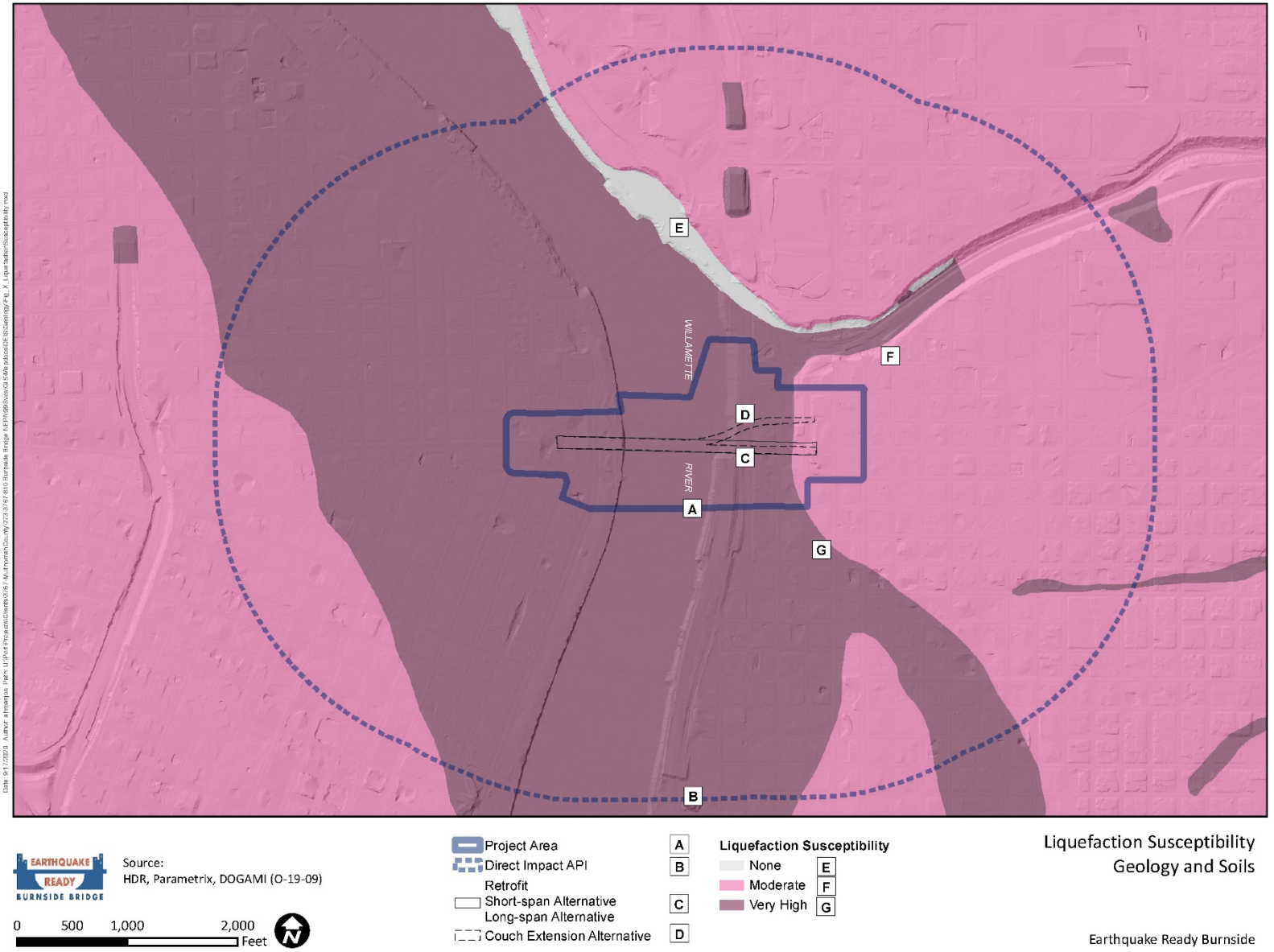


Figure 3.13-2. Liquefaction Susceptibility in the API



3.13.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

Soils and geology throughout the project area would not be disturbed under the No-Build Alternative; therefore, it would not be different from existing conditions. The existing earth-materials would remain in place except where disturbed by other non-project-related activities such as construction of new buildings or other works. There is potential that future maintenance in the project footprint could negatively affect earth-material present that may be associated with implementation of project construction.

The next CSZ earthquake is expected to cause extreme and prolonged shaking that would inflict extensive damage to the existing Burnside Bridge rendering it unusable. See Chapter 1, Purpose and Need, for additional discussion.

Impacts Common to All Build Alternatives

Direct – All the build alternatives would include earthwork and installation of deep foundation structures down to competent material both near-shore and in the water to create a seismically resilient bridge. Soil cementation would be performed for ground stabilization to avoid impacts related to soil settlement and upheaval. While each of the build alternatives would require differing amounts of earthwork and shaft drilling, the direct impacts related to soils and geology would be similar in nature. See Table 3.13-1 below for a comparison of these impacts among the build alternatives, including movable-span options.

Table 3.13-1. Comparison of Shafts Needed for Each Build Alternative

Alternative (Movable-Span Option)	Number of Shafts	Shaft Diameter (feet)	Shafts In Water
Enhanced Retrofit	78	8–12	52
Replacement, Short-span (Bascule Lift)	99	3–12	40
Replacement, Short-span (Vertical Lift)	91	3–12	32
Replacement, Long-span (Bascule Lift)	91	3–12	36
Replacement, Long-span (Vertical Lift)	83	3–12	28
Replacement with Couch Extension (Bascule Lift)	106	3–12	40
Replacement with Couch Extension (Vertical Lift)	98	3–12	32

Indirect – Over time, some elements of the build alternatives could create conditions that result in indirect impacts to earth-materials such as long-term erosion, scouring around in-water structures, and ground settlement in or adjacent to areas where excavation work is completed. (See Section 3.15, Floodplain and River Hydraulics, and Section 3.14, Water Quality.) The Project is not expected to affect travel patterns or land use developments in a way that would indirectly affect geologic resources.

Temporary – During construction, temporarily stored excavated earth-material and construction materials could experience erosion from wind and stormwater. Short-term storage of large quantities of earth-material and/or construction material needed to build new bridge structures could result in temporary compression of

shallow soil and geologic deposits located beneath the temporarily stored material. Following removal of temporarily stored materials, it would be anticipated that rebound would occur.

Post CSZ Earthquake – Direct impacts for a post-earthquake condition depend on the magnitude of the earthquake and the extent of liquefaction-induced effects. Assuming that the seismic event falls at or below the level of the design earthquake,[1] the build alternatives would sustain negligible or minimal damage immediately from an earthquake event. If the actual earthquake exceeds the design earthquake, then greater soil displacements than anticipated could occur with potential to damage the bridge.

Enhanced Seismic Retrofit Alternative Impacts

The Retrofit Alternative would increase and improve bridge foundations and footings at locations identified as having poor soil strength and potential for liquefaction in response to an earthquake event. Proposed retrofit and enhancement elements would require excavation of poor-strength soils or completion of improved ground stabilization measures. Drilling would be performed to excavate for the construction of improvements including installation of deep foundation structures. The Retrofit Alternative would require the least number of drilled shafts out of the build alternatives but would require the most within the Willamette River (see Section 3.17, Wetlands, for more information regarding near-shore and in-water impacts).

Replacement Alternative with Short-span Approach Impacts

The Short-span Alternative would require new drilled shafts and earthwork to construct the support structure for a replacement bridge. Its vertical and bascule lift options would require more drilled shafts than the Retrofit Alternative and the respective lift options for the Long-span Alternative but fewer than the respective options for the Couch Extension Alternative.

Replacement Alternative with Long-span Approach Impacts

The Long-span Alternative would require drilling and earthwork similar to the Short-span Alternative, but due to its longer span lengths, less shaft drilling and earthwork would be required. Both of its movable-span options would have fewer in-water shafts than the Retrofit or the respective lift options for the other replacement alternatives. Additionally, with the fewest number of supports within geotechnical hazard zones, it may perform better during a seismic event than the other build alternatives.

Replacement Alternative with Couch Extension Impacts

Due to the need for additional support structures within geotechnical hazard zones on the east side, the Couch Extension Alternative may have additional seismic performance risk compared to the Short-span Alternative. Because of the Couch Extension's proximity to additional buildings, there is an increased risk of building structures impacting this alternative compared to the other build alternatives.

Impacts from Potential Off-Site Staging Areas

The types of impacts to soils and geology that could occur due to off-site staging could be similar to the temporary construction-related impacts discussed above. It is currently assumed that an off-site staging area would be located adjacent to the Willamette River to allow for transport of materials by barge to and from the construction site. This type of off-site staging location would likely have a similar soil profile and geologic condition as described for the API. The locations would also be highly susceptible to liquefaction.

[1] The design earthquake is the earthquake severity the build alternatives are designed to withstand.

3.13.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, no additional impacts beyond those described above are anticipated.

With a Temporary Bridge

While most impacts associated with soils and geology would begin during construction, they could continue long after construction is completed and are, therefore, included in the discussion of direct impacts above. Soils and geology impacts associated with the temporary bridge would be similar in type to those identified for the main bridge, but with additional volume and magnitude due to the added columns and foundation work that would need to be completed to construct the temporary bridge. For example, a temporary bridge would require up to 180 additional temporary piles in the river with an additional area of 570 square feet of temporary disturbance.

3.13.4 Mitigation

Excavation activities would address how to manage and control poor-strength soil and generally saturated earth-material while bridge foundations and other structures are constructed. Excavation (drilling) activities would also need to be managed in a manner such that contaminant-containing stormwater runoff is not introduced into the ground, groundwater, and surface water. Site-control measures would also be needed to ensure open excavations are secure and do not pose a risk to human health or ecological health. Prior to the start of construction, an approved erosion and sediment control plan would be required. During construction, best management practices listed in the current version of the City of Portland *Erosion and Sediment Control Manual* (City of Portland 2008a) would be implemented to prevent runoff with sediment or other pollutants from reaching drainage systems or the Willamette River. Measures for minimizing these types of impacts are also discussed in detail in Section 3.14, Water Quality, and Section 3.20, Hazardous Materials. Potential mitigation for impacts related to scour are discussed in Section 3.15, Floodplain and River Hydraulics.

3.14 Water Quality

This section identifies water quality within and adjacent to the project area and outlines anticipated project impacts to this resource. More detail can be found in the *EQRB Stormwater Technical Report* (Multnomah County 2021y). Related effects to water resources and associated habitat can be found in in Section 3.17, Wetlands; Section 3.16, Vegetation, Wildlife, and Aquatic Resources; and Section 3.15, Floodplain and River Hydraulics.

3.14.1 Affected Environment

The API for the water quality analysis includes the project area and all the areas that drain directly to the project area, both within and outside the right-of-way, that could be considered contributing impervious area[1] (CIA) for any of the alternatives (Figure 3.14-1). CIA would be created by any alternative that proposes to create additional impervious area, reconstruct areas of impervious surface, realign the existing roadway or other impervious surface areas, modify existing drainage patterns, modify an existing conveyance system, or create new discharge locations.

Existing conditions and management resources for water quality within the API were characterized using a variety of published sources and databases. Existing topographic information and GIS data were used to estimate drainage patterns and CIA of the build alternatives for stormwater analysis. The build alternatives were compared with the No-Build Alternative (baseline conditions) to determine how the Project could affect stormwater quality and flow volumes in receiving waterbodies or drainage systems.

Additionally, field visits were conducted to verify geospatial data of existing stormwater management facilities and outfalls. Field observations were also used to determine if additional stormwater management facilities had been constructed since the time the available geospatial data were last updated.

The Willamette River flows through the middle of the API. According to DEQ, the Willamette River is listed as an impaired waterbody under Section 303(d) of the Clean Water Act for multiple biological and chemical pollutants, as well as temperature. Of these pollutants, only bacteria, dichlorodiphenyltrichloroethane (DDT), dieldrin, dissolved oxygen, mercury, temperature, and turbidity have currently approved total maximum daily loads.[2] Stormwater that is directly discharged into the Willamette River or into a storm sewer that discharges to the Willamette River must be treated to ensure that these pollutants would not exceed the TMDL.

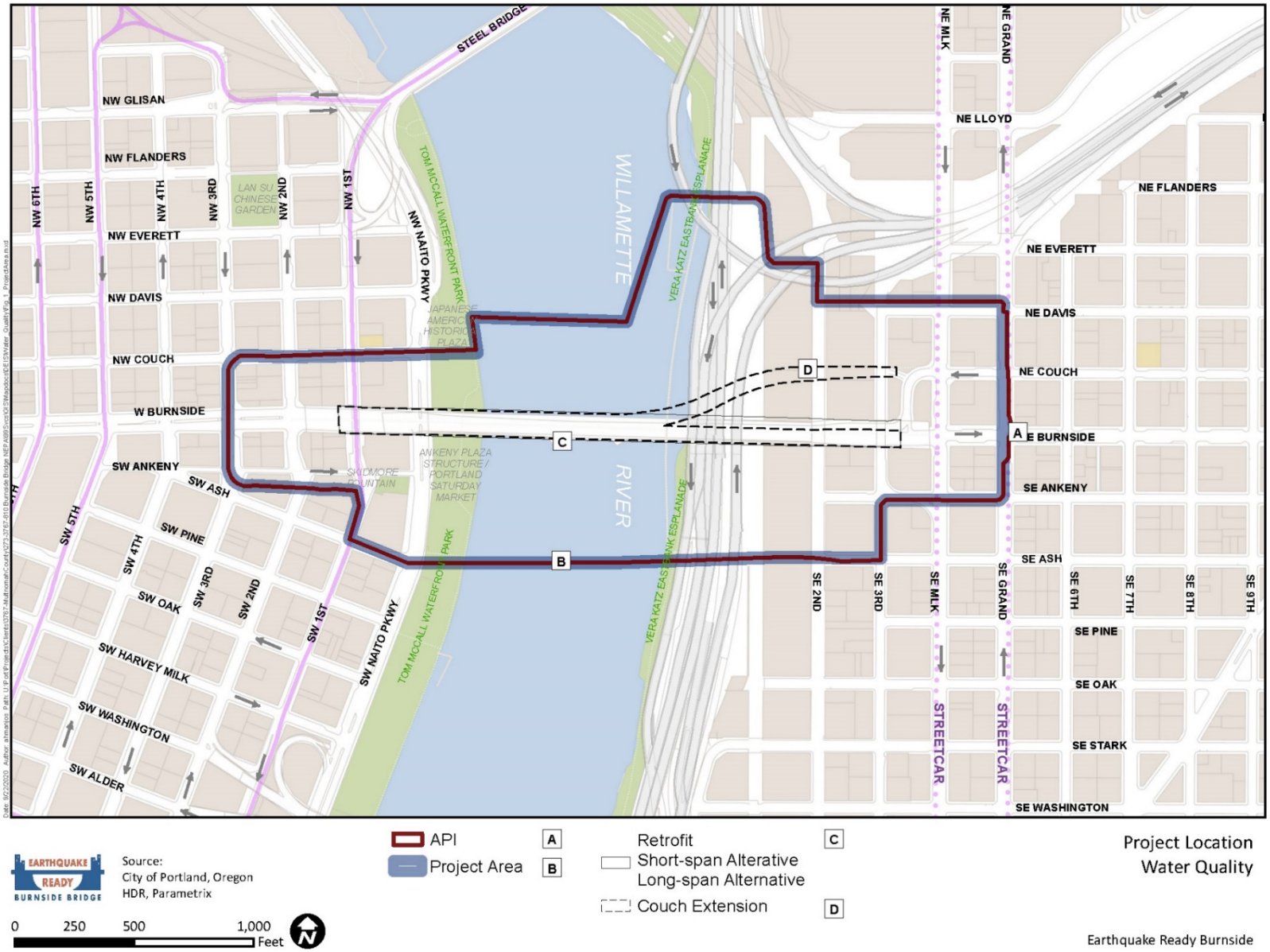
Potential stormwater impacts to the Willamette River downstream from the project area and outside the API will be further addressed during Endangered Species Act consultation with the National Marine Fisheries Service (NMFS) and will be reflected in the biological assessment written for this Project. The NMFS action area for stormwater will extend to the Pacific Ocean but does not expand the project API for the purpose of this stormwater analysis.

No infiltration to groundwater is proposed, and no impacts to groundwater related to stormwater treatment are anticipated. Please see the *EQRB Stormwater Technical Report* (Multnomah County 2021y) for further details.

[1] Contributing impervious area – The impervious surface (surfaces that water cannot pass through) within the strict project limits, plus impervious surface owned or operated by Multnomah County, the City of Portland, or the Oregon Department of Transportation outside the project limits that drain to the project via direct surface flow or discrete conveyance (such as pipes and human-made ditches). Jurisdictional agencies use CIA to determine the quantity and type of stormwater treatment needed for regulatory permits and approvals.

[2] Total maximum daily load – The maximum amount of a pollutant that is allowed to be discharged into a receiving waterbody in order for that waterbody to meet and continue to meet water quality standards for that pollutant.

Figure 3.14-1. Water Quality Area of Potential Impact and Project Area



Stormwater System

Within the API, on the west side of the Willamette River, 7.1 acres of impervious surface generate stormwater managed by the City of Portland or Multnomah County. Stormwater collection and conveyance facilities within the API are present, but water quality treatment meeting NMFS standards for metals removal does not occur.

On the east side of the Willamette River, stormwater collection and conveyance systems are present within the API. A small portion of stormwater generated by impervious surfaces (0.5 of 10 acres of impervious surface) that is managed by the City or Multnomah County receives water quality treatment via stormwater planters. These planters are assumed effective at removing total suspended solids,[3] dissolved nutrients, and heavy metals.

Runoff from 1.6 acres of the existing bridge deck is currently collected by deck drains, treated in media cartridge filters, and then discharged directly to the Willamette River. Runoff from 1.1 acres of the existing bridge deck is discharged to the combined sewer overflow (CSO) system on the west bank, 1.0 acre is discharged to the stormwater-only system on the east bank, and 0.6 acres are discharged to the CSO system on the east bank. The existing stormwater treatment facilities on the bridge are effective at treating runoff for total suspended solids and phosphorous, but are not certified to remove heavy metals or other pollutants of concern. Table 3.14-1 summarizes the existing stormwater drainage system discharge acreages for the locations mentioned above. Figure 3.14-2 displays the areas drained by each of the existing stormwater drainage systems.

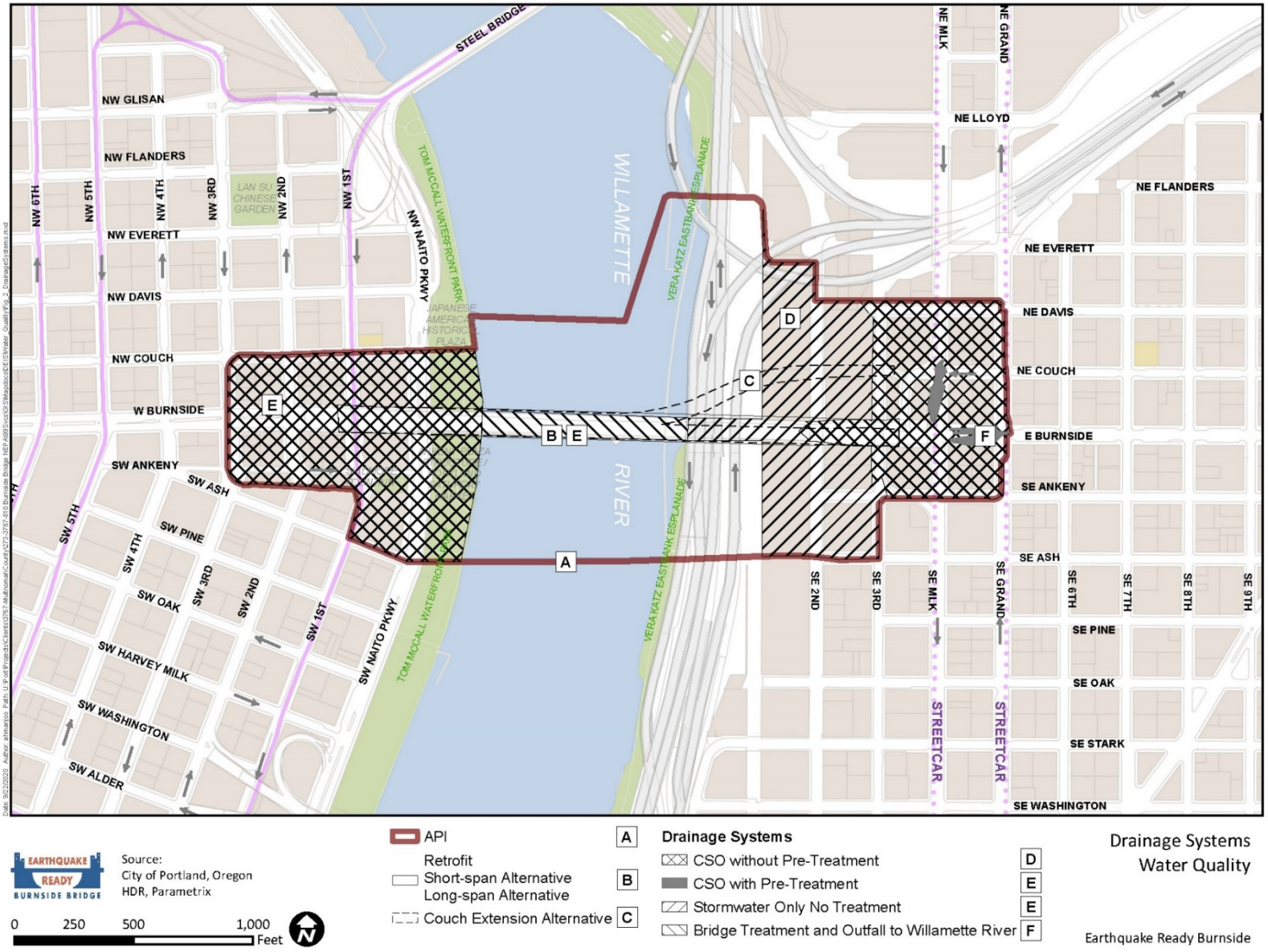
Table 3.14-1. Existing Stormwater Drainage Systems

	CSO without Pre-Treatment (acres)	CSO with Pre-Treatment (acres)	Stormwater-Only No Treatment (acres)[a]	Bridge Treatment and Outfall to Willamette River
West Bank	6.0	0.0	0.0	0.0
West Half Bridge Deck	1.1	0.0	0.0	0.8
East Half Bridge Deck	0.6	0.0	1.0	0.8
East Bank	5.2	0.5	2.7	0.0
Total within API	12.9	0.5	3.7	1.6

[a] Refers to area that drains directly to the storm system and then discharges to the Willamette River.

[3] Particles of material such as soil, organic materials or metal that are suspended in water.

Figure 3.14-2. Existing Stormwater Drainage Systems



3.14.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

The No-Build Alternative would continue to have direct adverse impacts on stormwater quality. It would continue to discharge stormwater runoff that does not meet the current minimum quality standards for new projects. None of the build alternatives would affect groundwater. There would be no stormwater facilities that include infiltration into the subsurface. See Table 3.14-2 for a summary of impervious surface area–related information by alternative.

Table 3.14-2. Net Increase in Impervious Surface and Acres of Treated and Untreated Impervious Area within the API

Alternative	Net Increase in Impervious Surface (acres)	Treated (acres)	Untreated (acres)
No-Build	0.0	0.5[a]	18.2
Enhanced Retrofit	0.0	6.3[a]	12.4[b]
Replacement, Short-span	0.9	7.5 [a]	12.1[b]
Replacement, Long-span	0.9	7.5[a]	12.1[b]
Replacement with Couch Extension	2.2	8.7[a]	11.3[b]

[a] Is currently or would be treated to current regulatory standards for transportation projects

[b] Impervious area within the API that is not considered CIA and therefore does not require water quality treatment (i.e., no new or modified impervious surfaces)

During and after a CSZ earthquake, bridge collapse or pier shift could greatly alter the riverbed and/or bank stability causing substantial erosion and sedimentation, at least in the days following the earthquake. Sediment and associated pollutants would become suspended in the river which would degrade water quality and aquatic habitat.

Impacts Common to All Build Alternatives

Direct – All the build alternatives would trigger stormwater management requirements and result in water quality improvements. Any existing impervious surface that is reconstructed or new impervious surface would require stormwater runoff treatment. For all build alternatives, this would result in a greater volume of treated stormwater runoff in comparison to the No-Build Alternative. The Retrofit Alternative would have no net increase in impervious surface. All replacement alternatives would have a net increase of impervious surface, which would result in increased runoff volumes. For the replacement alternatives, the two bridge lift variations, bascule or vertical lift, would have no difference in impacts. None of the build alternatives would affect groundwater. There would be no stormwater facilities that include infiltration into the subsurface. See Table 3.14-2 for a summary of impervious surface area–related information by alternative.

Indirect – The Project would neither induce development nor increase traffic in the API post construction. Therefore, there are no anticipated indirect effects to water quality from the build alternatives.

Temporary – All the build alternatives would have temporary impacts to stormwater management during construction. Construction activities including excavation and demolition, the usage of areas for access, and the temporary conversion of structures and parks into staging areas would create higher amounts of sediment and pollutants at these staging areas and on the existing roadways within the project area; this

would result in more pollutants being discharged through the stormwater system to the Willamette River from the project area. This impact could be offset by a reduction of vehicular traffic in the project area.

Post CSZ Earthquake – Under all the build alternatives, the bridge would not collapse, and stormwater runoff would continue to be conveyed off the bridge deck and routed through water quality treatment facilities. The proposed water quality facilities would discharge to the existing drainage infrastructure; however, existing drainage infrastructure was not built to withstand an 8+ CSZ earthquake. In the event of soil liquefaction, the existing drainage infrastructure (e.g., pipes and manholes) in the vicinity of the bridge could potentially float to the surface resulting in breaks and failures of the pipe joints, which would lead to failure of the drainage system. In the event that the existing drainage system fails, water quality treatment would no longer take place.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have no net increase in impervious surface and would treat 6.3 acres of CIA. Within the project area, the untreated area would be 12.4 acres versus 18.2 acres for existing conditions.

Replacement Alternative with Short-Span Approach Impacts

In addition to the common impacts described above, this alternative would have a net increase in impervious surface of 0.9 acres and would treat 7.5 acres of CIA. Within the project area, the untreated area would be 12.1 acres versus 18.2 acres for existing conditions.

Replacement Alternative with Long-span Approach Impacts

This alternative would have the same impacts as the Short-span Alternative.

Replacement Alternative with Couch Extension Impacts

In addition to the common impacts described above, this alternative would have a net increase in impervious surface of 2.2 acres and would treat 8.7 acres of CIA. Within the project area, the untreated area would be 11.3 acres versus 18.2 acres for existing conditions.

Impacts from Potential Off-Site Staging Areas

The four possible sites that have been identified represent a much broader range of potential sites where off-site staging might occur. While the contractor could choose to use one of these or another site, it is assumed that because of regulatory and time constraints on the contractor, any site they choose would need to be already developed with road and river access. It is also assumed that the contractor would be responsible for relevant permitting and/or mitigation that could be required for use of a chosen site.

The types of stormwater impacts that could occur from off-site staging include higher traffic volumes and higher pollutant loading on streets used to access the sites. The sites would see an increase in sediment and pollutants from construction activities that would occur at the sites. Local, state, and federal regulations would potentially apply including a 1200-C Construction Stormwater General Permit, as well as compliance with the City’s Phase I National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (MS4) Discharge Permit.

3.14.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, no additional impacts to water quality beyond those described above are anticipated.

With a Temporary Bridge

The use of a temporary detour bridge during construction would lead to additional temporary impacts to water resources (see Section 3.16, Vegetation, Wildlife and Aquatic Resources and Section 3.17, Wetlands and Waters). These impacts would be similar to the ones described in Section 3.14.2 above. The nature and extent of the impacts would not differ between the build alternatives. A temporary bridge that includes vehicular or transit traffic would be required to meet current water quality treatment standards. It would also reduce the foreseeable indirect impacts to the roads that make up the proposed detour routes for any of the build alternatives. A temporary bridge that only includes pedestrian and bicycle traffic would be required to meet current water quality treatment and volume control standards for the portion of the bridge located above land. No permanent water quality impacts are anticipated from construction or demolition of the temporary bridge.

Construction of either variation of the temporary bridge would extend the overall construction period by 1.5 to 2 years.

3.14.4 Mitigation

The mitigation measures planned for the build alternatives would minimize and compensate for impacts to water quality.

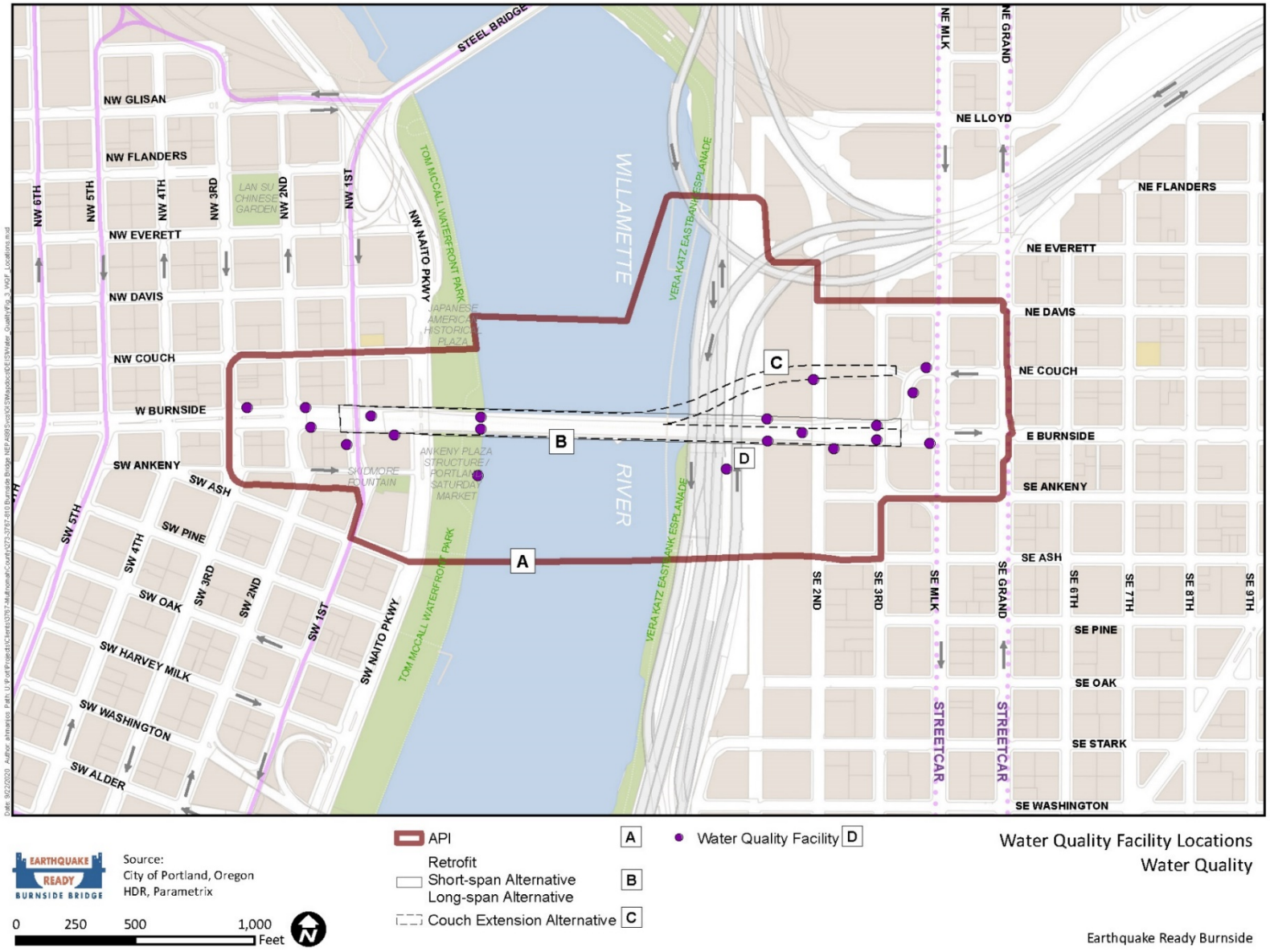
Water Quality Treatment and Surface Waters

Any new or modified impervious areas resulting from the build alternatives would be considered CIA. These areas would be mitigated using stormwater management facilities to reduce the levels of pollutants discharged to receiving waters. The stormwater quality measures considered were those approved for use by NMFS as the permitting agency with the assumption that the NMFS requirements would be more stringent than those of the City of Portland or DEQ. These measures include the potential use of underground stormwater treatment vaults on either side of the river and bioswales on the east bank (the use of the west bank is precluded due to inadequate space). Final stormwater facility designs would occur during the engineering phase of the project. Conceptual locations of the vaults provided for each of the alternatives are shown in Figure 3.14-3. See the *EQRB Bridge Replacement Technical Report* (Multnomah County 2021e) for more information.

Prior to construction starting, an approved erosion and sediment control plan would be required. During construction, best management practices listed in the most current version of the City of Portland's *Erosion and Sediment Control Manual* (City of Portland 2008a) would be implemented to prevent runoff containing sediment or other pollutants from reaching drainage systems or the Willamette River. Additionally, project construction would require a 1200-C Construction Stormwater General Permit from DEQ, which entails the implementation of best management practices and water quality monitoring to prevent untreated stormwater runoff from being discharged off-site. Project construction and operation would also be required to be compliant with the City's MS4 Discharge Permit.

For the portions of the project area that contribute to the City of Portland's CSO system, any increases in flow would be mitigated through detention using underground pipes or vaults. For any of the build alternatives, these facilities would be designed to meet the design criteria in the most current version of the City of Portland BES *Sewer and Drainage Facilities Design Manual* (City of Portland 2007).

Figure 3.14-3. Potential Water Quality Facility Locations



3.15 Floodplain and River Hydraulics

This section identifies existing river hydraulics conditions and outlines anticipated project impacts. Floodplain and river hydraulics refer to the movement of the river through the project area and how the water interacts with the soil and structures that it comes into contact with. More detail can be found in the *EQRB Hydraulic Impacts Analysis Technical Report* (Multnomah County 2021o).

3.15.1 Affected Environment

Background and Study Area

This area of the Willamette River floodplain has been highly modified by urban development over the past 100 years, and most of the original natural and beneficial floodplain values have been modified or diminished. Therefore, the hydraulic impacts analysis focuses mainly on the potential for increase of the FEMA base flood[1] (FEMA 2004, 2010) and scour compared to the existing bridge and channel. The API for hydraulics (Figure 3.15-1) extends along the Willamette River in line with the FEMA 500-year floodplain boundary[2] (FEMA 2004, 2010) upstream to the Marquam Bridge and downstream to the Fremont Bridge. The same API for hydraulics applies to all phases of the impact analysis (construction, operational, indirect, and cumulative) and always focuses on hydraulic conditions within the river channel and possible floodplain boundary changes. The width of the 100-year floodplain is shown on Figure 3.15-1, and relevant geometry of the existing bridge and other characteristics of the Willamette River that are important to hydraulics are discussed below.

Existing Bridge Geometry

The existing pier structures in the main channel are the west pier (Pier 1) adjacent to the harbor wall; the west and east bascule piers (Piers 2 and 3), each approximately 55 feet wide and equipped with cutwater bulwarks (tapered structures projecting into the direction of flow, meant to ease the current around each pier); and the east pier (Pier 4). In addition, the west approach has 19 smaller piers and the east approach has 15 smaller piers that are all above the ordinary high water mark[3] and likely do not have as much regular impact on the channel hydraulics. Many of the piers associated with the west and east approaches are located outside of the hydraulic API. The bridge is generally perpendicular to the flow of the channel in the Willamette River.

Existing Bridge Condition

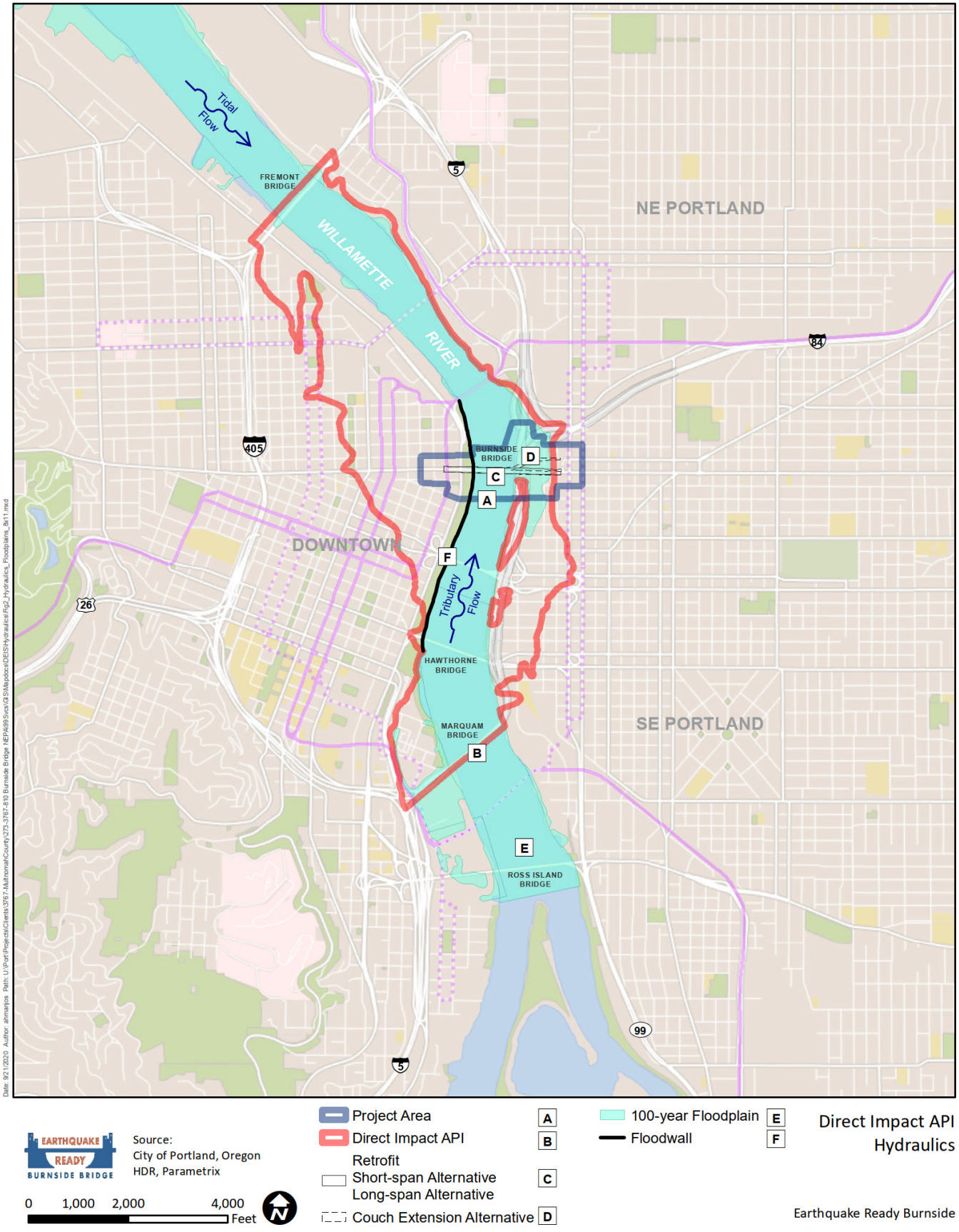
Based on results of Federal Highway Administration (FHWA) inspections in 2016 and 2017 and other data compiled in the National Bridge Inventory (NBI), the Burnside Bridge has been classified as scour critical, and the bridge foundations (piers or abutments) were determined to be unstable for calculated scour conditions (FHWA 1995, 2019).

[1] The base flood, or 100-year flood, has a 1 percent chance of being equaled or exceeded in any given year. The base flood elevation and 100-year floodplain are typically the primary regulated Federal Emergency Management Agency (FEMA) flood parameters.

[2] The 500-year flood is the flood event that has a 0.2 percent chance of being equaled or exceeded in any given year, which is less frequent than the base flood. The 500-year floodplain boundary is typically a larger area that includes the 100-year floodplain boundary within its border.

[3] The ordinary high water mark is a biological vegetation mark, defined by regulations, that scientists use to identify the most common high-water elevation that occurs in a channel.

Figure 3.15-1. Direct Impact API



ODOT also evaluates Oregon state highway system bridges every year using FHWA National Bridge Inspection Standards. The 2020 ODOT Bridge Condition Report lists the bridge as having a low service life, meaning the bridge may not provide the desired level of performance or functionality with any amount of repair or maintenance (ODOT 2020).

The Burnside Bridge Maintenance Project, which was completed in 2020, implemented hydraulic structural repairs on the bridge including repair of cracks in the piers, repair of the concrete columns that hold up the bridge, and strengthening of beams and girders which support the columns. These repairs were intended to keep the bridge working safely for another 15 to 20 years while an alternative plan is developed. (Multnomah County 2020).

Vera Katz Eastbank Esplanade

The Vera Katz Eastbank Esplanade is located within the channel. Attached to the esplanade on the north side of the Burnside Bridge is the Kevin J. Duckworth Memorial Dock, a floating dock that provides recreational boaters with short-term tie-up and access to enter the esplanade and the upland businesses. At the Burnside Bridge, the esplanade connector is held in place by pilings sunk into a concrete base. The location and the configuration of the Eastbank Esplanade affects the existing scour in the river, as discussed later in the Flow Dynamics, Scour Potential, and Contaminant Mobilization section.

Portland Harbor Wall

The Portland Harbor Wall runs along the west bank of the Willamette River in the study area from the Hawthorne Bridge to the Steel Bridge. The USACE National Levee Database lists the harbor wall as System ID Number 5005915401 and classifies it as “Locally Constructed, Locally Operated and Maintained.”

Flow Dynamics, Scour Potential, and Contaminant Mobilization

Scour is the erosion of the streambed from flow around structures and through the channel. The threshold for scour depends on several factors including riverbed material grain size and water velocity. The risk of scour is usually increased during the construction phase of in-water work. Scour is part of the hydraulics impact analysis because it can cause instability for structures anchored in the streambed. The hydraulic impacts analysis considers the three primary components of total scour:

- Long-term degradation – Long-term changes to streambed elevation due to natural or human-made causes that can affect the reach of river on which a bridge is located. Degradation involves the lowering or scouring of the streambed over relatively long reaches, which is generally due to the lack of sediment coming into the river from upstream. (Aggradation happens when mobilized sediments from an upstream area are deposited near a structure. Aggradation is more commonly associated with low velocity flows and is not considered as a component of total scour.)
- Contraction scour – Caused by a narrowing of the channel that increases the velocity of the water and shear stress on the riverbed, generally resulting in scour of material from the bed across all or most of the channel.
- Local scour – Caused by the water’s momentum being interrupted by a structure in its path and pressure differences that cause the flow to be pushed downward and scour holes near the structure. Local scour generally removes material from around the piers, abutments, spurs, and embankments of a channel. Local scour along the banks impacts overall channel hydraulics, and scour along bridge piers can impact bridge stability.

Velocities at the existing Burnside Bridge are generally low and are tidally influenced by the downstream Columbia River and Pacific Ocean. Typically, velocities in the outflow (downstream/northerly) direction are higher in the winter months, but inflow (upstream/southerly) velocities influenced by the tide are higher in the

summer. Based on the US Army Corps of Engineers Lower Willamette River Federal Navigation Channel maintenance dredging program (EPA 2020), the low velocities may be causing aggradation in this reach of the Willamette River.

Channel bed elevation patterns are shown in Figure 3.15-2. Elevation patterns show local scour at the existing Burnside Bridge that dissipates before reaching the Steel Bridge. The lowest part of the riverbed and strongest flow section (known as the thalweg) is visible from the bed elevations and bends around the east side of the channel at the Burnside Bridge. Also visible in Figure 3.15-2 is the increase in the local Burnside Bridge scour from the Vera Katz Eastbank Esplanade columns that likely create a flow constriction at the thalweg and associated eddy (water moving in the opposite direction of main channel flow) scour at the riverbend. Continuation of these scour patterns could lead to pier instability and have the potential to mobilize sediments, some of which have been identified as contaminated. See Section 3.14, Water Quality, and Section 3.20, Hazardous Materials, for more information.

3.15.2 Impacts from Bridge Alternatives

No-Build Alternative Impacts

The No-Build Alternative would not place additional structures in the channel and would not change the base flood elevation, floodplain width, or scour potential.

Impacts Common to All Build Alternatives

Direct – The proposed build alternatives would each replace or retrofit all piers on deep foundations and support the bents on both approaches by columns on drilled shafts. The level of seismic resiliency incorporated into each build alternative is expected to produce bridge structures that are insensitive to effects from local scour (i.e., changes in scour are not expected to weaken any of the build alternatives). Scour would be carefully assessed in the design stages and necessary countermeasures incorporated as needed. However, to meet seismic safety requirements, each build alternative would place a larger bridge structure in the floodway than is currently occupied by the existing bridge. As a result, the Project would be expected to increase the base flood elevation and could mobilize contaminated sediments through scour, with some alternatives having greater impacts than others. Meeting permitting requirements would require consideration of design refinements, detailed modeling analyses to evaluate potential changes to the base flood elevation, and incorporating floodplain impact mitigation into the Project. The project design would follow the requirements of 23 CFR 650 – Bridges, Structures, and Hydraulics, which outlines FHWA procedures for compliance with Executive Order 11988. A general comparison of the magnitude of floodway[4] impact for each build alternative is presented in Table 3.15-1, and the range of potential scour length increases for the proposed alternatives is presented in Table 3.15-2.

[4] The regulatory floodway is the channel of a river or other watercourse and the adjacent land areas that have been reserved in order to discharge the base flood without increasing the overall water surface elevation more than one foot, as based on computer modeling or other detailed calculations. The floodway impacts in this analysis are based on the cross-sectional areas of proposed bridge structures that would be placed in the FEMA-designated cross-sectional area of the Willamette River floodway.

Figure 3.15-2. Willamette River Depths and Scour Patterns

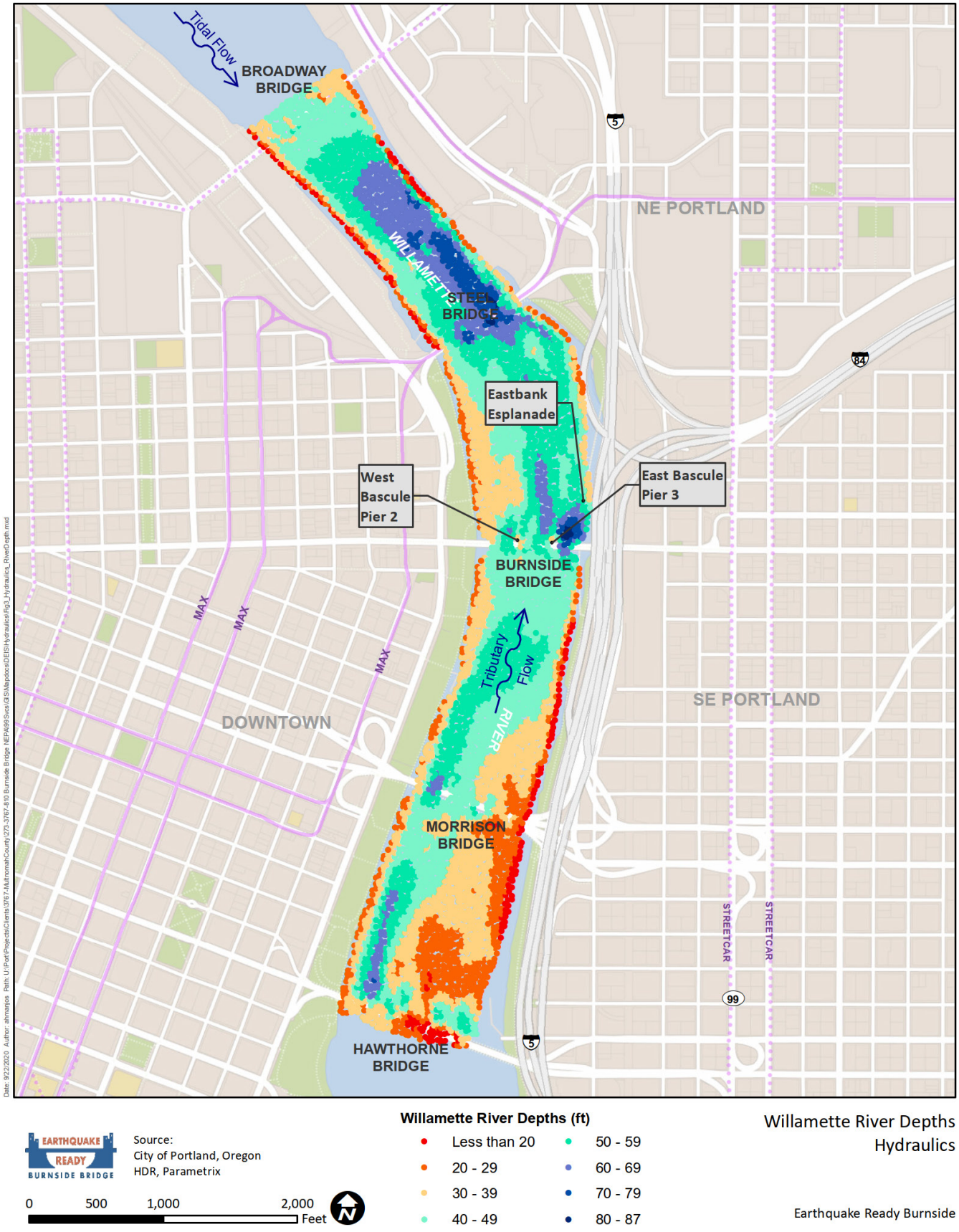


Table 3.15-1. Estimated Floodway Encroachment

Alternative	Total Lateral Surface Area (square feet)[a]	Change Compared to Existing (square feet)[b]	Floodway Cross-Sectional Area (square feet)	Floodway Occupied by Permanent Structures (percent)	Increase Compared to Existing (percent)
No Change: No-Build (existing)	11,213	Not Applicable	65,683	17	Not Applicable
Lower Impact: Retrofit	11,394	181	65,683	17	0
Lower Impact: Long-Span Alternative[c] Vertical lift	11,105	-107	65,683	17	0
Lower Impact: Short-Span Alternative Vertical lift	11,783	570	65,683	18	1
Lower Impact: Couch Extension Vertical lift	12,583	1,370	65,683	19	2
Medium Impact: Long-Span Alternative[c] Bascule lift	15,159	3,946	65,683	23	6
Medium Impact: Short-Span Alternative Bascule lift	15,447	4,234	65,683	24	7
Higher Impact: Couch Extension Bascule lift	15,428	4,216	65,683	23	6

Source: Existing base flood elevation of 32 feet (FEMA 2010).

[a] Total lateral surface area: In contact with the flow of the water at base flood elevation.

[b] Total increase in lateral surface area: difference between proposed lateral surface area and existing lateral surface area.

[c] The Long-span Alternative lift options were analyzed using the tied-arch configuration. Cable-stayed configurations would have similar impacts.

Table 3.15-2. Estimated Percent Increase in Scour Length

Alternative	Pier 1 [a]	Pier 2	Pier 3	Pier 4
No Change: No-Build (existing)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Lower Impact: Long-Span Alternative[b] Bascule lift	Not Applicable	15	15	-100
Lower Impact: Long-Span Alternative[b] Vertical lift	Not Applicable	15	15	-100
Medium Impact: Short-Span Alternative Vertical lift	Not Applicable	15	15	56
Medium Impact: Couch Extension Bascule lift	Not Applicable	43	43	109
Medium Impact: Couch Extension Vertical lift	Not Applicable	15	15	109

Alternative	Pier 1 [a]	Pier 2	Pier 3	Pier 4
Medium Impact: Short-Span Alternative Bascule lift	Not Applicable	43	43	56
Higher Impact: Retrofit	42	116	116	66

Source: Lengths sourced from respective design plan sets (Multnomah County).

Percent increase calculated based on percent increase in footing length compared to existing condition.

[a] The scour analysis is based on footprint size change to each pier. It is assumed for the replacement alternatives that Pier 1 would be cut off but that the footing would remain in place; therefore, no resulting change in scour is anticipated. For the Retrofit Alternative, Pier 1 would be extended and the estimated change in scour is shown in the table.

[b] Long-span Alternative lift options were analyzed using the tied-arch configuration. The cable-stayed configurations would be anticipated to have similar in-channel impacts.

The proposed bike, pedestrian, and ADA access ramp connecting the bridge to the esplanade would place structure below the ordinary high water mark that could also increase base flood elevation and scour.

Indirect – No indirect impacts to hydraulics are expected, other than the possibility of changes to the channel stability during future high-flow events. This potential will be evaluated in greater detail during the bridge type determination study.

Temporary – In-water work – including work for the proposed bike, pedestrian, and ADA access ramp connecting the bridge to the esplanade – would likely include the use of cofferdams and a seal course, pile driving, and the placement of support shafts. It would involve the excavation and removal of sediments in the main channel of the river and near the shore. These activities would temporarily increase the base flood elevation and the potential for contraction scour and mobilization of contaminated sediments.

Post CSZ Earthquake – The build alternatives, and especially the Long-span Alternative, are all anticipated to have the lowest risk for structural failure, resulting in the fewest hydraulic impacts from failure deposition of bridge material into the river channel. After initial life-saving measures have been concluded, debris clearing and inspections could be required to minimize the extent to which debris from upstream structural failures could create hazardous conditions or compromise accessibility around the new bridge alternatives.

Enhanced Seismic Retrofit Alternative Impacts

This alternative has similar amounts of lateral surface area in the floodway as the existing bridge piers, but it would have significantly larger footprint lengths that extend along the direction of the flow that could increase local pier scour.

Replacement Alternative with Short-Span Approach Impacts

The Short-span Alternative with either the bascule or vertical lift movable span would place a greater area of permanent structure in the floodway than the existing structure. The Short-span Alternative with bascule lift proposes both the largest footprint and lateral surface area in the main channel among all the replacement alternatives. The Short-span Alternative with a vertical lift would place a smaller volume of foundational structures in the river than the bascule option. Both lift options could constrict flows and increase the water velocity and shear stress on the riverbed . Also, the longer length of the footings has the potential to increase the local pier scour patterns, ultimately increasing the potential to mobilize contaminated sediments when compared with the No-Build Alternative.

Replacement Alternative Long-Span Approach Impacts

The Long-span Alternative would place fewer structures in the main river channel than the other build alternatives, but more than the existing bridge. The vertical lift option proposes the smallest permanent structure footprint among all build alternatives, which has the least potential for floodplain impacts and increasing scour (Table 3.15-3). The footings are longer in the direction of the flow and could increase pier scour compared to the No-Build Alternative. The impact from the Long-span Alternative would vary by bridge type.

Table 3.15-3. API Floodplain Encroachment (Outside of the Floodway)

Proposed Alternative	West Approach (feet)	East Approach (feet)	Design Total (feet)
No Change: No-Build (existing)	180	61	241
Lower Impact: Couch Extension	158	128	286
Lower Impact: Long-Span Alternative Cable-stayed	111	47	158
Lower Impact: Long-Span Alternative Tied-arch	106	12	118
Lower Impact: Short-Span Alternative	158	96	254
Higher Impact: Retrofit	299	125	424

Replacement Alternative with Couch Extension Impacts

The split configuration of the Couch Extension Alternative results in a slightly larger lateral surface area and foundational footprint than the Short-span Alternative. The Couch Extension with the bascule lift would have the second-highest change in lateral surface area in the channel cross section, resulting in one of the highest potentials for increasing the base flood elevation. The potential for scour and the impacts to the floodplain outside of the floodway would be lower when the Couch Extension is paired with a vertical lift movable span based on footing size and placement of fewer bents along the east and west approach floodplains.

Impacts from Esplanade Access Options

Options with combinations of stairs and elevators and options with ramps are being considered for providing direct bicycle, pedestrian, and ADA access between the Vera Katz Eastbank Esplanade and the Burnside Bridge deck (see figures in Draft EIS Attachment G and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memorandum* [Multnomah County 2021a]). These options would involve excavation of contaminated soils, placement of fill within the floodplain in the form of structural shafts, and would aim to avoid or minimize widening of the embankment. Permanent impacts resulting from the placement of structural support shafts include the potential to increase base flood elevations. In addition, the placement of structural support shafts at this location directly in the main flow section (thalweg) where the river bends around the east side of the Burnside Bridge would likely exacerbate the already increased local scour evident at the existing Eastbank Esplanade. This scour has the potential to affect local pier scour on the proposed bridge as well as mobilize contaminated sediments when compared to the No-Build Alternative.

Temporary construction of the options would involve the excavation and removal of contaminated soils and rip rap in the main channel of the river, along the embankment, and in the riparian areas. In-water work to construct the ramp could include the use of cofferdams and a seal course, pile driving, and the placement of

the support shafts. These activities would temporarily increase the potential for local scour and mobilization of contaminated sediments in the near-shore area during construction, in an area where previous scour effects have been noted.

Impacts would be greatest with the options involving ramps and would be lowest with the options involving only stairs and elevators.

Impacts from Potential Off-Site Staging Areas

All of the currently identified potential off-site staging areas would be located outside the hydraulic impacts API and the enclosed 100-year floodplain. However, it is assumed that any potential off-site staging area – whether inside or outside the hydraulic impacts API – would already be developed; no additional regrading or other fill would occur, and no hydraulic impacts are expected. If a contractor chooses to use an off-site staging area that is located within the 100-year floodplain, local, state, and federal regulations would apply.

3.15.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

The impacts would be as described above for the build alternatives.

With a Temporary Bridge

The impacts associated with the construction of a temporary bridge would include all the construction impacts described for the respective alternatives, plus the impacts for placement of an additional temporary detour bridge in the main channel of the river. The estimated amount of floodway encroachment associated with the temporary bridge is presented in Table 3.15-4.

In addition to the impacts during use of the temporary work bridge, the base flood elevation could increase for a time during construction of the temporary bridge. The temporary water surface elevation impacts would then likely decrease when temporary construction features are removed. Hydraulic modeling will be conducted at a later phase to calculate base flood elevation impacts during construction.

3.15.4 Mitigation

The structural needs to create a seismically resilient bridge require larger (wider and longer) in-water structures than the existing structure, which is expected to result in an unavoidable increase in the base flood elevation, scour at the piers or related in-water structures, and the potential to mobilize contaminated sediments. During informal scoping, several alternatives, such as tunnels, that could avoid any significant encroachment in the floodplain, were considered but were dropped because they either could not adequately meet the project purpose and need or were not practicable because of significant impacts or costs.

The level of seismic resiliency incorporated into each build alternative is expected to produce bridge structures that are insensitive to effects from local scour (i.e., changes in scour are not expected to weaken any of the build alternatives); however, scour would be carefully assessed in the design, and necessary countermeasures incorporated as needed.

There are limited opportunities to mitigate hydraulic impacts because the offsets need to occur at the same location as the bridge placement. The minimization measures for hydraulic impacts would focus on limiting an increase in base flood elevation and reducing scour potential that could impact habitat or mobilize contaminated sediment. This could be accomplished by minimizing the number of in-water piers and streamlining the pier shape. Appropriate countermeasures would be developed after a preferred alternative

is selected and completion of hydraulic design, detailed modeling, and scour analyses. The following are potential measures under consideration to minimize hydraulic impacts:

- Reduce the number of piers in the floodplain by selecting a longer rather than shorter span bridge.
- Size the bridge pier structures to minimize increase in water surface elevation for the 100-year peak flood discharge.
- Design pier shaping to minimize energy losses.

Countermeasures would decrease flow separation and the formation of local scour holes around piers. Countermeasures could include streamlining the pier nose shape, orienting the pier within 5 degrees of the flow direction to decrease scour depth, or using partially grouted rock protection around the piers to smooth flowpaths and minimize scour. Design modifications to pier type, span length, and pier location could also mitigate for the greatest effects from pier-related flow constrictions and reduce local scour. Longer spans and placement of solid piers outside the deepest part of the channel could also reduce flow obstruction, reducing the potential for debris to become lodged and exacerbate obstructions that cause scour. Additionally, measures could be taken to mitigate potential for scour of contaminated sediments during construction.

The project design would follow the requirements of 23 CFR 650 – Bridges, Structures, and Hydraulics, which outlines FHWA procedures for compliance with Executive Order 11988. Detailed modeling and scour analysis would be conducted before final design of the preferred alternative or bridge type to more precisely evaluate the potential impact on base flood elevation and the scour footprint. If modeling shows that the Project would result in an unavoidable increase to the base flood elevation, the project team could request a variance to the Portland Municipal Code no-rise standard based on PMC 24.50.060(D) Floodways and PMC 24.50.070 Appeals and Variances and could supply the City with information to apply to FEMA for a Conditional Letter of Map Revision under the provisions of 44 CFR 60.3(d)(4), 44 CFR 65.6, 44 CFR 65.7, and 44 CFR 65.12.

Coordination with the City of Portland has also identified that, separate from flood rise impacts and mitigation, the City of Portland requires a balance of cut and fill within the 100-year floodplain or the 1996 flood extent, whichever is more expansive.

Table 3.15-4. Estimated Temporary Floodway Encroachment

Alternative	Floodway Cross-Sectional Area (square feet)	Permanent Bridge: Total Lateral Surface Area (square feet)[a]	Permanent Bridge: Floodway Occupied (percent)	Temporary Bridge: Total Lateral Surface Area (square feet)	Temporary Bridge: Floodway Occupied (percent)	Work Bridge: Total Lateral Surface Area (square feet)[a]	Work Bridge: Floodway Occupied (percent)	Total Floodway Occupied[b] (percent)
No Impact: No-Build (existing)	65,683	11,213	17	Not Applicable	Not Applicable	Not Applicable	Not Applicable	17
Lower Impact: Retrofit	65,683	11,394	17	3,000	5	3,920	6	28
Lower Impact: Long-Span Alt.[c] Vertical lift *(lowest impact)*	65,683	11,105	17	3,000	5	3,640	6	28
Medium Impact: Couch Extension Vertical lift	65,683	12,583	19	3,000	5	3,780	6	30
Medium Impact: Short-Span Alt. – Vertical lift	65,683	11,783	18	3,000	5	3,640	6	29
Higher Impact: Couch Extension Bascule lift	65,683	15,349	23	3,000	5	3,780	6	34
Higher Impact: Long-Span Alt.[c] Bascule lift	65,683	15,159	23	3,000	5	3,640	6	34
Higher Impact: Short-Span Alt. Bascule lift	65,683	15,447	24	3,000	5	3,640	6	35

Source: Existing Base Flood Elevation of 32 feet (FEMA 2010).

[a] Total Lateral Surface Area: In contact with the flow of the water at base flood elevation

[b] Total Percent of Floodway Occupied: sum of proposed permanent and temporary lateral surface area floodway encroachments of floodway cross-sectional area.

[c] The Long-span Alternatives were analyzed using the tied-arch configuration. Cable-stayed support configurations would have similar impacts.

Alt. = Alternative

3.16 Vegetation, Wildlife, and Aquatic Resources

This section identifies existing vegetation, wildlife, and aquatic resources in the project area and outlines anticipated project impacts to these resources. More detail can be found in the *EQRB Vegetation, Wildlife, and Aquatic Species Technical Report* (Multnomah County 2021bb). Related effects to wetlands and waters can be found in Section 3.14, Water Quality, Section 3.17, Wetlands and Waters, and Section 3.15, Floodplain and River Hydraulics.

3.16.1 Affected Environment

The API for vegetation, wildlife, and aquatic resources extends beyond the project area to approximately 12,000 feet upstream and approximately 15,000 feet downstream on the Willamette River (see Figure 3.16-1). This distance accounts for potential hydroacoustic impacts (noise impacts underwater which can be injurious or lethal to aquatic organisms including fish and marine mammals), which can travel beyond the immediate vicinity of the construction activity. Potential downstream impacts resulting from stormwater effects extending outside the API will be further addressed during consultation with the National Oceanographic Atmospheric Administration (NOAA) Fisheries for species under its jurisdiction in accordance with the Endangered Species Act (ESA). The east-west boundaries of the API are the same as the project area.

Fish, wildlife, and aquatic resources within the API were characterized using a variety of published sources and databases. Field surveys were performed on June 7 and 19, 2019, to investigate existing vegetation and wildlife presence, species, and distribution. Baseline conditions determined by both the literature research and field surveys are described below.

Vegetation

Vegetation provides ecological functions to a variety of environments. It provides habitat and food sources for wildlife, improves air quality, provides in-stream shade, filters stormwater, and contributes to flood control. Even though the API is highly developed, the existing vegetation provides important functions to the immediate surroundings, affecting natural resources. The total amount of existing vegetation in the API is approximately 2.5 acres and approximately 325 trees (see Figure 3.16-2).

Given the impervious (meaning water cannot pass through) surfaces and harbor wall located immediately adjacent to the river on the west side, vegetation is primarily ornamental park trees, street trees, and turf within Governor Tom McCall Waterfront Park. On the east side of the river south of the bridge, there is a row of white ash trees along the Vera Katz Eastbank Esplanade. Along the steep riverbank, few large trees are present. Vegetation there is dominated by Himalayan blackberry, intermixed with some native and nonnative species of trees, some small patches of grasses, and some native riparian vegetation. Weedy species commonly found in disturbed areas are also present.

North of the bridge on the east side of the river underneath I-5, trees are scattered along the bank of the river. The riverbank is made up of gravel and cobble, with little to no other vegetation, except for sparsely scattered nonnative grasses and weed species east of I-5. Street trees, right-of-way medians, and green (or living) roofs are the only other existing vegetation in the API on the east side of the Willamette River.

No ESA-listed threatened or endangered plant species are known to be located within the API.

Wildlife Habitat

Wildlife habitat types within the API are a mix of riparian, urban, and aquatic. Riparian habitat is the transitional area present from the Willamette River to upland areas and provides important habitat and

Figure 3.16-1. Area of Potential Impact – Vegetation, Wildlife, and Aquatic Resources

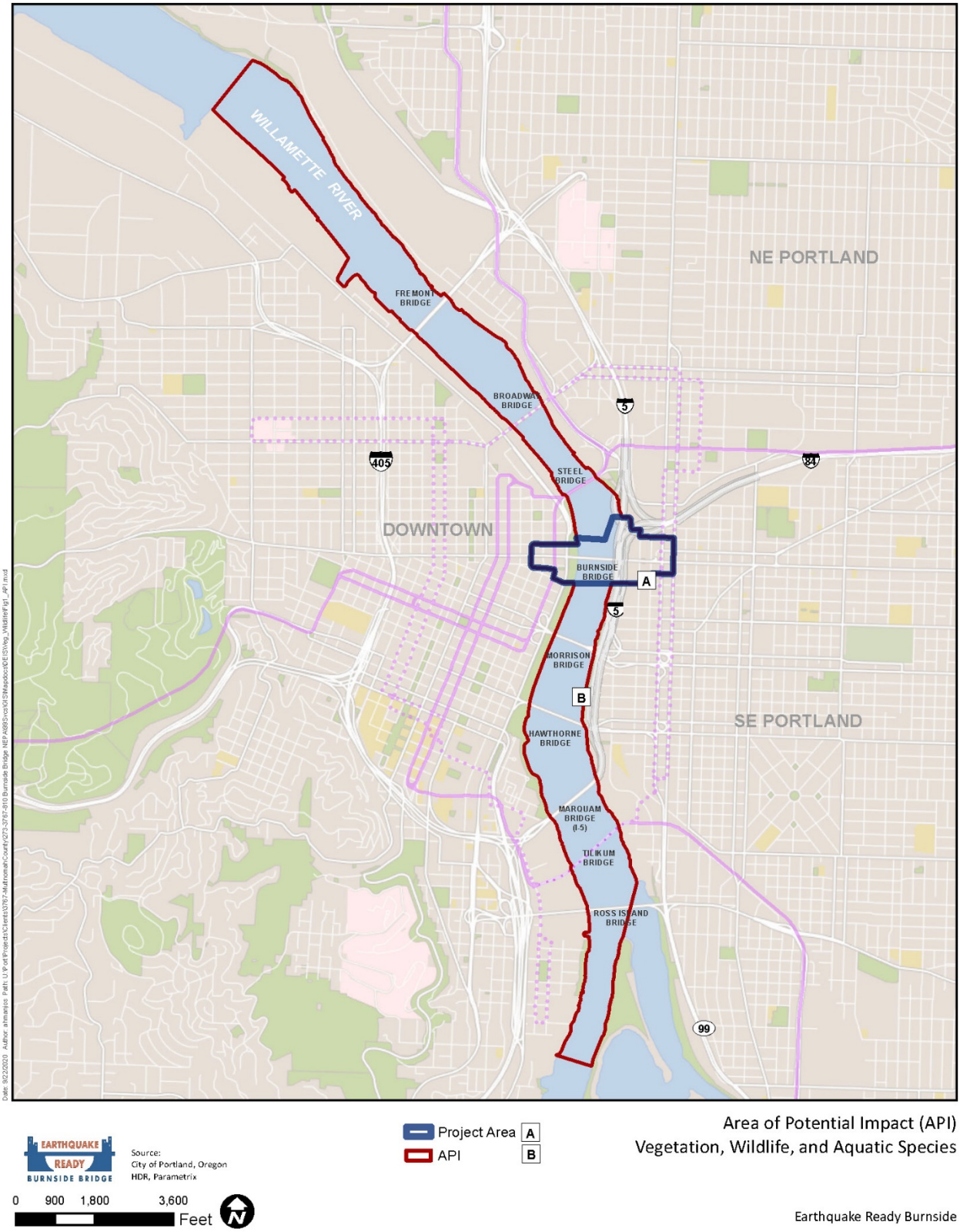
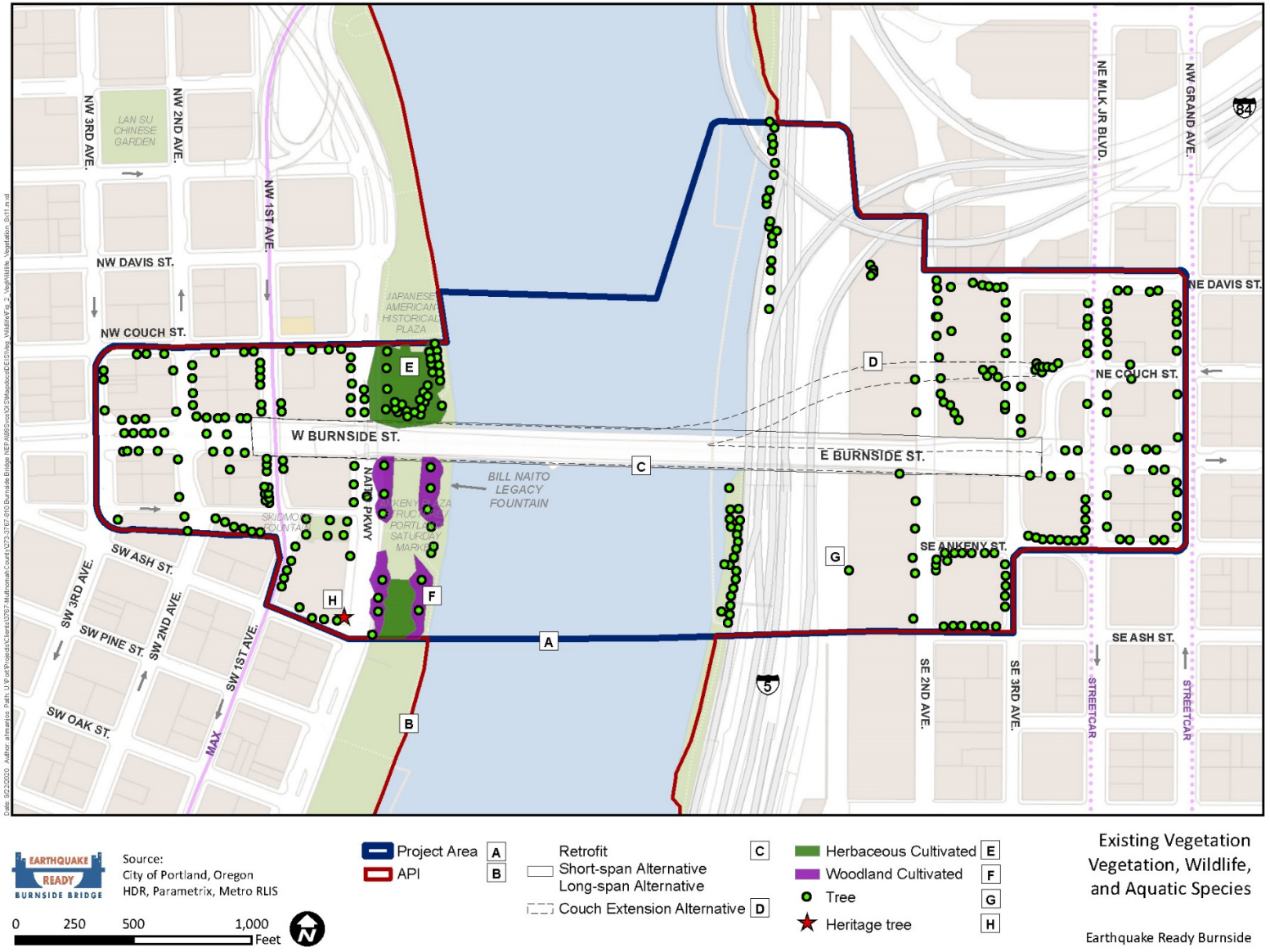


Figure 3.16-2. Existing Vegetation in the API



resources to birds and wildlife, even in the degraded conditions found in the API. The existing riparian area east of the river likely provides the most resources to wildlife within the API. However, it lacks diversity of vegetation; it is mostly made up of riprap[1] and invasive plant species and has been disturbed by freeway construction and operation. On the west side of the river, the vegetation at Governor Tom McCall Waterfront Park can be used by urban-adapted birds and wildlife for foraging and habitat resources. Due to the highly urbanized setting, habitat connectivity has been modified, and little other wildlife habitat exists in the API.

The Willamette River corridor is part of the Pacific Flyway, which is used by birds protected under the US Fish and Wildlife Service (USFWS) Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. During the field visits, no nests were observed in the structures supporting the bridge or in vegetation where viewing was accessible.

The API does not include suitable habitat for ESA-listed threatened bird species that could occur in the area and threatened bird species were not observed during field surveys.

No ESA-listed threatened or endangered wildlife species are present in the API. The Townsend's big-eared bat is a State sensitive species that may use the bridge for roosting, but none was observed during the field visits.

Frog and turtle species may use aquatic resources from the Willamette River and its riparian areas. Table 3.16-1 lists ESA-listed amphibians and reptiles that have a potential range in the API; none of which was observed during field visits. In addition to native species, there may also be nonnative amphibians present in the API.

Table 3.16-1. Species Status Amphibians and Reptiles with a Potential Range in the API

Common Name	Scientific Name	Threatened/Endangered Status
Northern red-legged frog	*Rana aurora*	Federal Species of Concern
Oregon spotted frog	*Rana pretiosa*	Federal Threatened
Western pond turtle	*Actinemys marmorata*	Federal Species of Concern

Source: OFWO 2020.

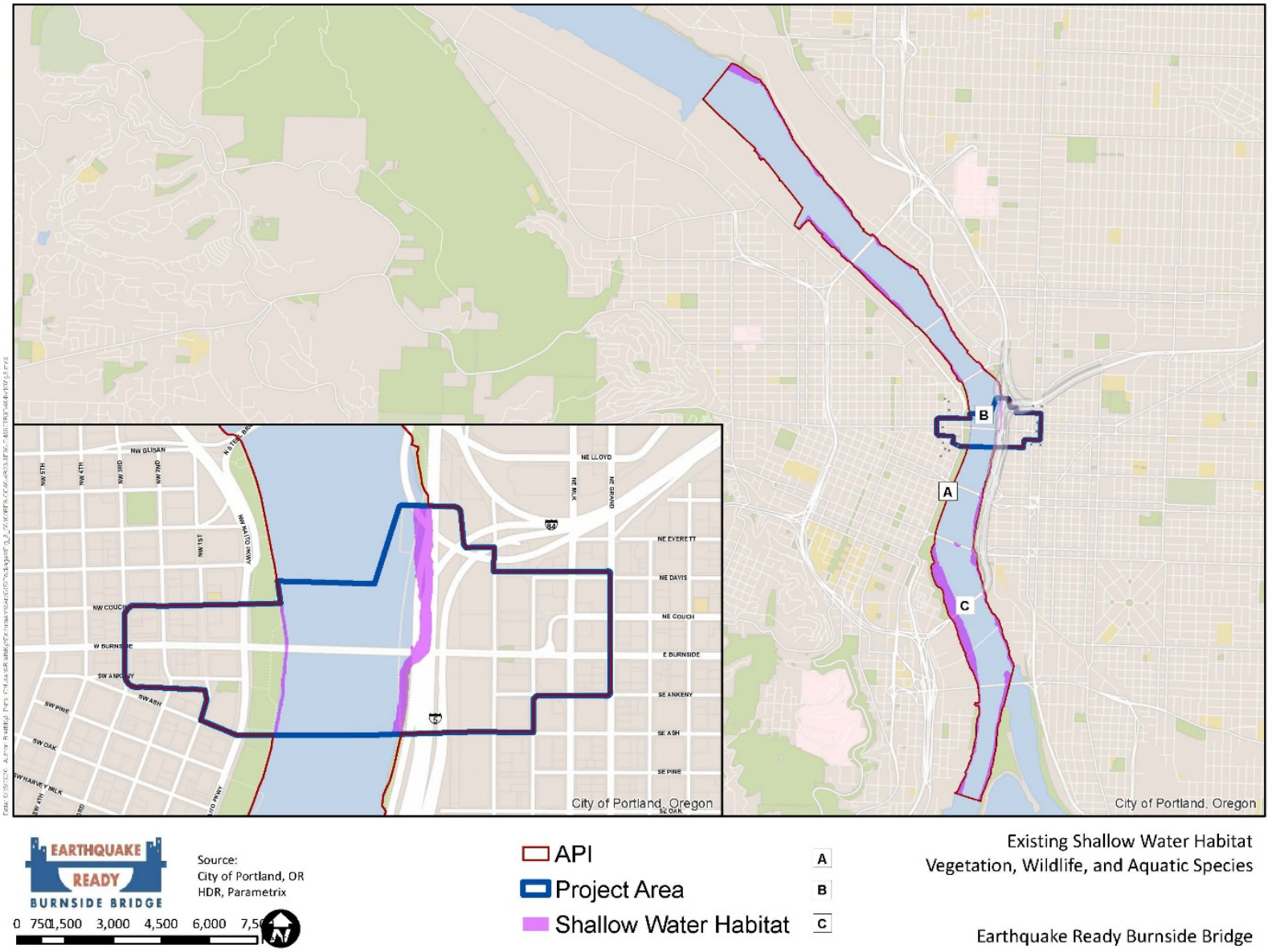
Aquatic Resources

The Willamette River has been substantially altered through years of filling, dredging, channeling, and other development. According to the City of Portland, approximately 85 percent of the banks of the Willamette River in the central city reach (extending from north of the Fremont Bridge to Ross Island Bridge) are armored with seawalls, pilings, rock/fill, or riprap.

This development has vastly decreased the amount of shallow water habitat, which is critical for migrating and rearing juvenile fish, including salmonids (including Pacific salmon). Shallow water habitat provides refuge from higher flows found in deep water and habitat for rearing and feeding. The majority of shallow water habitat within the API is located near the south waterfront on the west side and under the Hawthorne Bridge on the east side of the Willamette River. Within the project area, the existing amount of shallow water habitat is approximately 3.4 acres: 3.1 acres on the east side of the river and 0.3 acres on the west side. Within the API, the amount of shallow water habitat that currently exists is approximately 236 acres, see Figure 3.16-3.

[1] An intentionally placed layer of rock.

Figure 3.16-3. Existing Shallow Water Habitat in the Project Area and API



The Lower Willamette River provides habitat to nearly 50 species of native and non-native fish. Pacific salmon, which are listed as threatened, endangered, or candidate species under the ESA, can be present throughout the API. Three Pacific salmon species within the Lower Willamette River are listed under the ESA: Chinook, coho, and steelhead. These species have distinct population segments[2] (DPS) in the Lower Willamette River, which are shown in Table 3.16-2. Within the API, each DPS has designated critical habitat – specific areas that contain essential physical or biological features necessary for conservation of the species. Once an area is designated as critical habitat for a listed species, NOAA Fisheries and/or the USFWS regulates proposed project actions that could affect the critical habitat.

Table 3.16-2. ESA-Listed Threatened and Endangered Fish Species in the Lower Willamette River

Species	Scientific Name	Distinct Population Segment	ESA Status	Designated Critical Habitat in API
Chinook salmon	*Oncorhynchus tshawytscha*	Lower Columbia River; Upper Willamette River	Threatened	Yes
Coho salmon	*Oncorhynchus kisutch*	Lower Columbia River	Threatened	Yes
Steelhead	*Oncorhynchus mykiss*	Lower Columbia River; Upper Willamette River	Threatened	Yes
Eulachon	*Thaleichthys pacificus*	Southern	Threatened	No
Green sturgeon	*Acipenser medirostris*	Southern	Threatened	No

Source: NOAA Fisheries 2019b; OFWO 2020.
Notes: ESA = Endangered Species Act.

Non-salmonid-listed species that inhabit the API are Pacific eulachon, listed as threatened, and Pacific lamprey (*Entosphenus tridentatus*), listed as a species of concern. Both species are of particular cultural importance to the tribal community. Green sturgeon may be present in the API; the Southern DPS is ESA-listed as threatened but is not likely to occur in the API, while the Northern DPS is not ESA-listed or likely to be present in the API.

Because the Willamette River flows into the Columbia River, there may be additional ESA-listed fish species that stray into the Willamette River temporarily or while migrating, including Columbia River bull trout (*Salvelinus confluentus*) and other salmonid DPSs. These species use the Columbia River, and may use the Willamette River, as rearing habitat for juveniles migrating to the ocean and as migratory habitat for both juveniles and adults. Although they do not use the Willamette River as primary habitat, their presence during construction is possible.

Juvenile salmonids are present year-round in the Lower Willamette River, with peak abundance during winter and spring. The current in-water work window (IWWW) for the Lower Willamette River is from July 1 to October 31. The IWWW restricts any work that occurs directly in the water to that period to minimize potential impacts to sensitive fish species based on the timing of their life stages (migration, spawning, and rearing).

California sea lions (*Zalophus californianus*) and Steller sea lions (*Eumetopias jubatus*; Eastern DPS) use the Willamette River within the API as a migratory corridor. No marine mammals were observed during the field surveys, and there are no known haul-outs within the API (areas on land where marine mammals rest); California sea lions are known to haul-out and feed on salmonids at Willamette Falls, which is approximately 14 miles upstream from the project area. In addition to salmon and steelhead, California and Steller sea

[2] A distinct population segment (DPS) is defined as a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species.

lions prey on white sturgeon and lamprey in the Willamette River. Harbor seals (*Phoca vitulina*) have been observed in the Lower Willamette River, but their presence is rare and there are no known haul-out sites.

3.16.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

Under the No-Build Alternative, the only new impacts likely to occur to these resources prior to the next CSZ earthquake would be from maintenance activities, which would be more frequent than with the build alternatives. Following the next CSZ earthquake, the No-Build Alternative would collapse and cause substantial new impacts to aquatic habitat and upland habitat beneath the bridge.

Impacts Common to All Build Alternatives

Direct – Direct impacts to vegetation, wildlife, and aquatic species would result from construction activities under any of the build alternatives. The build alternatives differ in the magnitude of impacts, such as the size of cofferdams required or the number of drilled shafts, as well as the duration and timing of these impacts. Permanent effects that could occur include the potential impacts of vegetation removal including loss of vegetation and spread of invasive plant species, damage or replacement of habitat, reductions of species diversity, habitat connectivity impacts on birds and wildlife, stormwater impacts to aquatic species, potential wildlife impacts from bridge lighting, and modifications of fish habitat. For detailed descriptions of construction methods and schedules for each build alternative, refer to the *EQRB Construction Approach Technical Report* (Multnomah County 2021g).

Permanent impacts from the build alternatives would include a loss of habitat from the placement of structure. Permanent structure includes drilled shafts, bridge footings, seal courses from cofferdams, and permanent piling from the pedestrian ramp connection to the Vera Katz Eastbank Esplanade. Placement of structures within shallow water habitat that reduces the amount of available habitat decreases connectivity between refuge areas, making migration more difficult for aquatic species. An increase in impervious surface area would result from all build alternatives. However, stormwater runoff from this new area would be treated prior to discharge into the river. Because the Project would require stormwater treatment to current regulatory standards, overall water quality from stormwater runoff would improve. See Section 3.14, Water Quality, for additional information.

Indirect – No indirect impacts to vegetation or wildlife are anticipated. Potential indirect impacts to aquatic species from the build alternatives from hydrological changes due to an increase in impervious surfaces are anticipated to be negligible. Refer to Section 3.14, Water Quality, and Section 3.15, Floodplain and River Hydraulics, for more detailed discussions of stormwater and hydrology impacts.

Temporary – All build alternatives would have temporary construction impacts. These include impacts to water quality, ground disturbance effects on vegetation and wildlife, hydroacoustic (underwater noise) impacts to fish and marine mammals for in-water work, nighttime construction lighting impacts on wildlife, and impacts to wildlife and aquatic species from bridge demolition.

Construction activities that could impact vegetation include excavation, fill, grading, demolition, staging, and access. It is assumed that all existing vegetation within the area of direct temporary construction impacts would be removed during construction.

Hydroacoustic impacts from pile installation would occur during construction of the build alternatives. A portion of the necessary in-water work would take place within cofferdams, but additional pile driving and extraction would occur outside of the cofferdams. In-water work activities not occurring from within cofferdams would be restricted to working during the IWWW unless an extension is sought and granted. Work within cofferdams could occur at any time, including outside of the IWWW. The approximated

magnitude and area of temporary impacts below OHWM from work bridge pile installation are similar for all build alternatives, including approach span options and movable-span options.

Demolition of existing piers and bents would likely occur within cofferdams; however, barges would be required to support equipment needed for demolition and to transport the demolished structures. Use of barges can impact aquatic species through increased sedimentation during spud[3] installation, physical reduction of in-stream habitat, and increased risk of predation by fish that eat other fish.

Post CSZ Earthquake – Under all the build alternatives, the bridge would not collapse nor contribute to loss of vegetation, wildlife, or aquatic resources. In the area of the API outside of the anticipated area of temporary construction impacts, soil liquefaction likely would occur where soil improvements (jet grouting) were not performed leading to loss of riparian vegetation and increased turbidity within the river. This would result in a decrease of wildlife habitat, decrease in aquatic species' habitat quality, and a direct loss in the amount and diversity of vegetation.

Impacts That Vary Among Alternatives

Temporary Construction Impacts – The area in which temporary direct impacts from construction would occur is:

- Retrofit Alternative – 29.5 acres
- Short-span Alternative and Long-span Alternative – 30.7 acres
- Couch Extension – 34 acres

The Retrofit Alternative would have the least vegetation removal compared to all other alternatives. For the Short-span and Long-span Alternatives, two additional trees south of the bridge in Governor Tom McCall Waterfront Park would need to be removed. The Couch Extension Alternative would have the same vegetation impact on the west side of the river as the Short-span and Long-span Alternatives, but would remove additional street trees on the east side of the river. Because the Couch Extension has the largest anticipated area of temporary construction impacts, its potential direct impacts to vegetation are the highest.

The shorter construction duration (3.5 years) for the Retrofit Alternative versus 4.5 years for the replacement alternatives would reduce the duration of temporary loss of habitat and noise from construction activities. With the Long-span Alternative, no jet grouting below OHWM would be required, making the impacts to aquatic species the smallest when compared to the other build alternatives. The estimated amount of direct impacts to vegetation, wildlife, and aquatic species differs between the replacement alternatives' movable-span options (bascule or vertical lift). See Table 3.16-3 for a summary of temporary impacts by alternative.

[3] A spud is a shaft. usually made of steel, that is used to anchor or moor a barge to a particular area. The spud is driven into the soil or sand below the barge.

Table 3.16-3. Temporary Construction Activities Causing Impacts to Vegetation, Wildlife, and Aquatic Species for All Build Alternatives

Alternative with Lift Option	Piles below OHWM	Area of Piles below OHWM (square feet)	Piles in SWH	Area of Piles in SWH (square feet)	Cofferdam Area (acres)	Lost Vegetation /Wildlife Habitat (acres)	Trees Removed	Duration of Construction (years)
Retrofit	160–220	500–700	25–35	80–110	1.1	1.1	95	3.5
Short-span with Bascule Lift	160–220	500–700	25–35	80–110	1.5	1.3	97	4.5
Short-span with Vertical Lift	160–220	500–700	25–35	80–110	1.2	1.3	97	4.5
Long-span with Bascule Lift	160–220	500–700	25–35	80–110	1.1	1.3	97	4.5
Long-span with Vertical Lift	160–220	500–700	25–35	80–110	0.8	1.3	97	4.5
Couch Extension with Bascule Lift	160–220	500–700	25–35	80–110	1.6	1.3	124	4.5
Couch Extension with Vertical Lift	160–220	500–700	25–35	80–110	1.3	1.3	124	4.5

Notes: OHWM = ordinary high water mark; SWH = shallow water habitat

Permanent Impacts – The permanent impacts to shallow water habitat from the Retrofit Alternative are the same as from the Short-span and Long-span Alternatives (211 square feet), and smaller than from the Couch Extension (231 square feet). Although shallow water habitat is critical to juvenile salmonids, the permanent impacts are relatively minor when considering the amount of existing shallow water habitat in the project area (approximately 3.4 acres) and within the API (approximately 236 acres). This physical reduction in habitat would likely not affect fish long term due to nearby areas of shallow water habitat located in and adjacent to the project area, both upstream and downstream. However, these impacts could be exacerbated in the long term by changes in streamflow due to climate change.

The Retrofit Alternative would have 1.4 acres area of permanent structure below OHWM that could affect aquatic species by decreasing available habitat, or about 0.2 to 0.6 acres more than with the replacement alternatives, and about 1 acre more than the existing bridge.

The area of permanent ground improvements within shallow water habitat would be the same (3,500 square feet) for the Retrofit, Short-span Alternative, and Couch Extension. Total area below OHWM would be 14,400 square feet for the Short-span Alternative, Long-span Alternative, and Couch Extension, and would be higher (16,900 square feet) for the Retrofit Alternative.

The Long-span Alternative would not have any ground improvement (jet grouting) impacts below OHWM or within shallow water habitat. The Long-span Alternative would have the lowest overall impact to vegetation, wildlife, and aquatic resources. See Table 3.16-4 for a summary of permanent impacts by alternative.

Table 3.16-4. Permanent Impacts to Vegetation, Wildlife, and Aquatic Species for All Build Alternatives

Alternative with Lift Option	Area of Structure below OHWM[1] (acres)	Shafts below OHWM	Shafts in SWH	Area of Shafts within SWH (square feet)	GI Zone Area below OHWM (square feet)	GI Zone Area within SWH (square feet)
Retrofit	1.4	57	8	211	16,900	3,500
Short-span with Bascule Lift	1.2	45	6	211	14,400	3,500
Short-span with Vertical Lift	0.8	37	6	211	14,400	3,500
Long-span with Bascule Lift	1.1	41	6	211	0	0
Long-span with Vertical Lift	0.8	33	6	211	0	0
Couch Extension with Bascule Lift	1.2	46	7	231	14,400	3,500
Couch Extension with Vertical Lift	0.8	38	7	231	14,400	3,500

Notes: GI = ground improvement; OHWM = ordinary high water mark; SWH = shallow water habitat.
[1]Area of structure below OHWM includes drilled shafts, bridge footings, seal courses, and piles.

Impacts from Potential Active Transportation Access Options

Options with stairs and elevators and options with ramps are being considered for providing direct bicycle, pedestrian, and ADA access between the Vera Katz Eastbank Esplanade and the Burnside Bridge deck (see figures in Draft EIS Attachment G and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memorandum* [Multnomah County 2021a]). All of the options would require new fill in the river, although the options with only stairs and elevator(s) (no ramps) would require a much smaller footprint in the river, and substantially less impact to the riparian area and upland vegetation. The ramp options would remove up to 20 existing trees south of the bridge. The existing riparian area is generally low quality in this area.

All access options being considered would result in both temporary and permanent impacts below ordinary high water, affecting aquatic species. Floating dock piles would be temporarily removed and reinstalled with the ramp options. Removal of existing piles in the river could result in temporary increases in turbidity, resulting in behavioral responses in fish such as temporary avoidance of the area and temporary unavailability of habitat. The floating dock piles would be replaced after construction of access foundations is completed, which would entail pile driving. Pile driving creates underwater noise, a hydroacoustic impact that can affect fish in several ways. Hydroacoustic impacts can alter behavior in fish, result in physical injury, or result in direct mortality. When the floating dock piles are reinstalled, pile driving would take place, potentially impacting fish. Best management practices would be implemented as described in the mitigation section.

Option 2 (stairs and elevator on south side) would have the least amount of proposed permanent fill and temporary fill and would have the least impact on fish and aquatic habitat, followed by Option 1 (elevator and stairs on both sides of the bridge). Options 3 (ramps on both sides) and 4 (ramps on south side only) would have the same amount of proposed permanent and temporary fill, but Option 3 would result in approximately 10 percent more permanent fill placed within shallow water habitat. Option 3 would have the largest impact on both aquatic species and habitat.

Impacts from Potential Off-Site Staging Areas

The types of impacts that could occur from off-site staging include temporary vegetation removal (and thereby wildlife habitat removal), disruption from construction noise, and impacts to aquatic species from barge use. Wildlife could be affected by the use of an off-site staging area through temporary habitat displacement and reduction of food sources if vegetation is removed. Certain species could also be disturbed by construction noise from assembling or moving materials in the staging area. If a barge is used to transport materials and equipment from the staging area to the project area, aquatic species could be affected in the same ways as described for the build alternatives.

If a contractor chooses to use an off-site staging area, the same local, state, and federal regulations that would apply to the Project could also apply. Table 3.16-5 provides a list of permits, authorizations, and compliances that could apply to an off-site staging area.

Table 3.16-5. Required Permits, Compliance, and Authorizations Related to Vegetation, Wildlife, and Aquatic Species

Permit Type	Jurisdiction	Notes
Section 7 Consultation/Biological Opinion	NOAA Fisheries and USFWS	Required for impacts to ESA-listed species. A Biological Opinion would be written specifically for the Project.
Magnuson Stevens Act Essential Fish Habitat Consultation	NOAA Fisheries	Required for impacts to designated Essential Fish Habitat, which is present in the API
Marine Mammal Protection Act	NOAA Fisheries and USFWS	Compliance required due to marine mammal potential occurrence
Fish and Wildlife Coordination Act	USFWS	Compliance required due to modification of the Willamette River
Bald and Golden Eagle Protection Act	USFWS	Compliance required due to potential of species occurrence
Migratory Bird Treaty Act	USFWS	Compliance required to do potential of species occurrence
Section 404	USACE	Triggered by removal or fill in waters of the United States
Removal-Fill	DSL	Triggered by removal or fill in waters of the State
Oregon Endangered Species Act	ODA and ODFW	Potential impacts to species listed as threatened or endangered
Oregon Fish Passage Plan	ODFW	Triggered by projects with major structural upgrades
Title 11 – Tree Permit	City of Portland	All trees that would be disturbed or removed need a tree removal permit
Title 33 – Greenway Review	City of Portland	Requires review for impacts within greenway overlay zone
Title 33 – River Environmental Zone	City of Portland	Mitigation required for all impacts within River environmental zone

Notes: DSL = Oregon Department of State Lands; NOAA = National Oceanic and Atmospheric Administration; ODA = Oregon Department of Agriculture; ODFW = Oregon Department of Fish and Wildlife; USACE = US Army Corps of Engineers; USFWS = US Fish and Wildlife Service.

3.16.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, no additional impacts to vegetation, wildlife, and aquatic species resources beyond those described above are anticipated.

With a Temporary Bridge

Use of a temporary detour bridge during construction would lead to additional impacts to vegetation, wildlife, and aquatic species. The added impacts would be the same under each of the build alternatives, with the exception that the Retrofit Alternative with a temporary detour bridge would require the removal of one additional tree. Impacts from the temporary bridge would result from installation and removal of the bridge, and be limited to the area the bridge would occupy. The anticipated area of construction impacts of the temporary bridge is larger by 1.1 acres than with no temporary bridge. The temporary bridge would require an additional 1.5 to 2 years of construction time. Table 3.16-6 provides design features associated with a temporary detour bridge.

Table 3.16-6. Additional Approximate Temporary Construction Impacts with Use of Temporary Bridge

Bridge Type	Area of Piles below OHWM (square feet)	Piles below OHWM	Area of Piles in SWH (square feet)	Piles within SWH	Lost Vegetation/ Wildlife Habitat (acres)	Trees Removed (Retrofit Alternative)	Trees Removed (Replacement Alternatives)
All Modes	410–570	130–180	32	10	0.4	10	9
Transit, Bicycles, and Pedestrians Only	410–570	130–180	32	10	0.4	10	9
Bicycles and Pedestrians Only	220–290	70–90	32	10	0.4	10	9

Notes: OHWM = ordinary high water mark; SWH = shallow water habitat.

3.16.4 Mitigation

Mitigation measures would be implemented to avoid, minimize, reduce, or compensate for impacts to vegetation, wildlife, and aquatic species that would result from a build alternative, including the use of a temporary bridge option. Specific mitigation measures would be identified and implemented based upon input and requirements from regulatory agencies during procurement of the approvals and permits shown in Table 3.16-5. These mitigation measures would include addressing impacts from temporary activities (construction), as well as from the long-term operation of the new bridge.

During construction, best management practices would be implemented to minimize impacts and disturbance to vegetation, wildlife, and aquatic species from in-water work, disturbance to vegetation, erosion control, nighttime construction (lighting) and containment of construction materials. Actions including minimizing disturbance areas and cleaning plant materials from equipment and gear help would reduce the spread of invasive plant species. Riparian vegetation removed for construction would be replaced. City requirements include mitigating riparian impacts at a minimum 1.5:1 ratio, and replacing removed trees at a ratio of 2:1. Trees to be preserved in the API would be flagged during construction or have temporary fencing placed around them. Trees to be removed could potentially be preserved off-site during construction, with the possibility of being replanted on-site once construction has been completed. Although this approach would not be feasible for all trees anticipated for removal, it could be an option for some trees, pending further analysis.

For in-water work, cofferdams would isolate specific work areas within the river, reducing exposure of fish to high levels of underwater sound caused by pile driving during construction. In addition, bubble curtains, a system that releases a continuous stream of air bubbles in water, could be used during driving of steel pile by impact pile drivers outside of cofferdams to minimize in-water sound pressure levels. As required by NOAA Fisheries, prior to dewatering and project work within the cofferdams, fish removal would occur to minimize impacts to fish; these fish would be released downstream of the API. In addition, conducting in-water construction work during the IWWW would minimize potential impacts to migrating salmonids when their presence is expected to be lowest.

Because all of the build alternatives would increase the amount of contributing impervious area, stormwater treatment would be required, improving water quality from stormwater runoff that is currently not treated and discharged into the river. Additional stormwater management best management practices and mitigation measures are described in Section 3.14, Water Quality. Mitigation to minimize potential impacts from permanent bridge lighting would be determined during final design.

3.17 Wetlands and Waters

This section identifies existing wetlands and waters adjacent to the project area and outlines anticipated project impacts to these resources. More detail can be found in the *EQRB Wetlands and Waters Technical Report* (Multnomah County 2021dd). Related effects to water resources and associated habitat can be found in in Section 3.13, Water Quality, Section 3.15, Vegetation, Wildlife and Aquatic Resources, and Section 3.14, Floodplain and River Hydraulics.

3.17.1 Affected Environment

Wetlands and waters within the API were characterized using a variety of published sources and databases, as well as a field survey conducted on June 19, 2019, on the east bank of the Willamette River. No field survey was conducted on the west bank of the river since the area within the API there is comprised of the Portland Harbor Wall. The survey identified the Ordinary High Water Mark (OHWM) of the river, which establishes the limits of jurisdiction for wetlands and waters under federal (Section 404 of the Clean Water Act) and state (Oregon Removal/Fill Law) regulations. Additionally, the City of Portland uses the OHWM to determine the riverward edge of a 50-foot setback required by the City for buildings and other structures that are not river-dependent. The location of the OHWM on both banks of the river in the API is shown in Figure 3.17-1.

Wetlands

No wetlands occur within the API according to the National Wetland Inventory from the US Fish and Wildlife Service or the wetlands GIS data from the City of Portland. No hydric soils, which are soil types that develop under wetland conditions, are mapped within the API for Multnomah County Area, according to data from the Natural Resources Conservation Service. Review of recent aerial imagery indicates that no wetlands occur within the API. No wetlands were detected during the field survey.

Willamette River

The API includes a section of the Willamette River that is approximately 1,500 feet long at the west bank and approximately 2,250 feet long at the east bank. Piers 1, 2, 3, and 4 of the existing Burnside Bridge occupy approximately 15,400 square feet (0.35 acres) of the river. The Willamette River is a jurisdictional water under both federal and state law. No other waters are present.

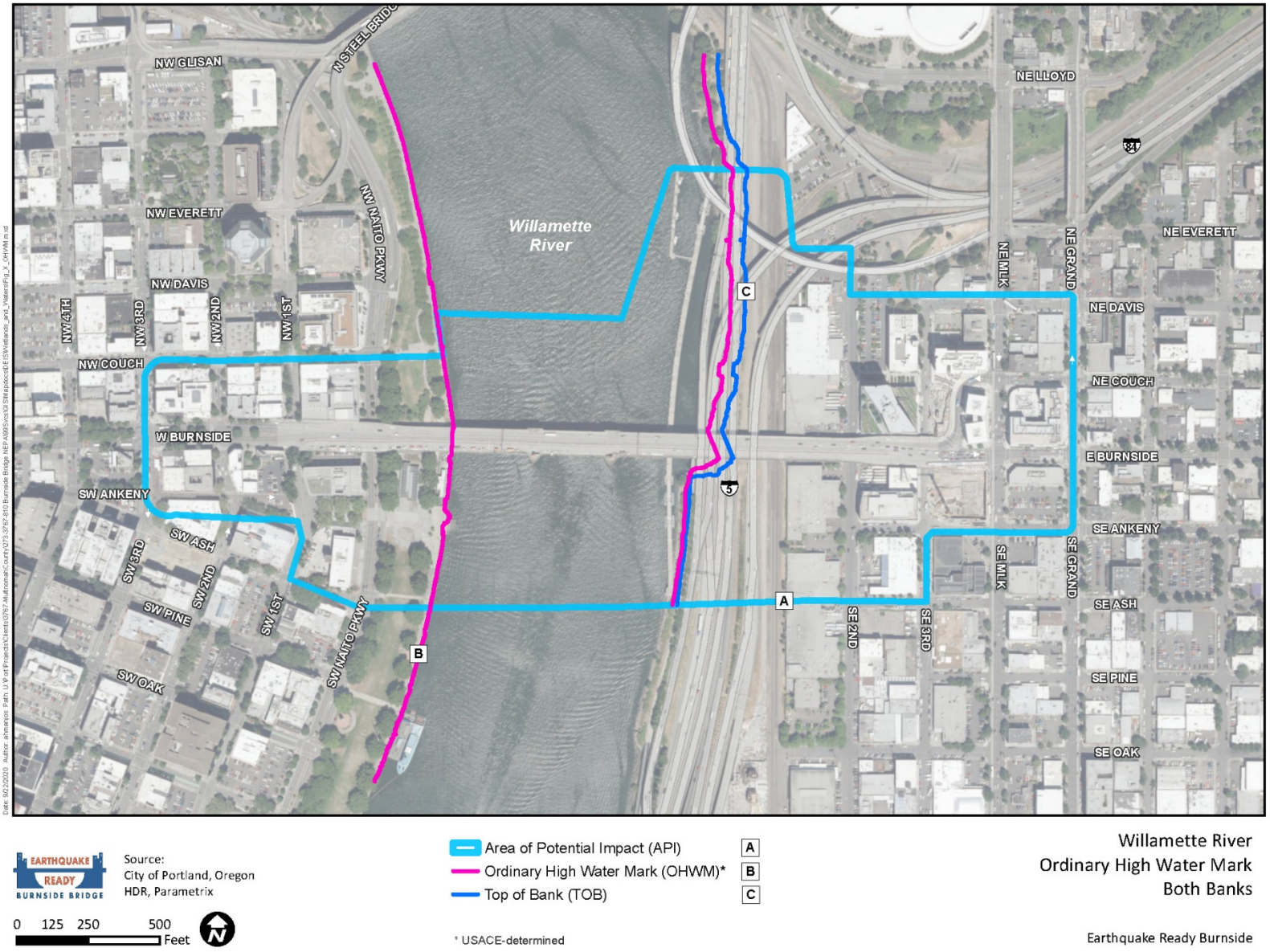
Direct impacts to wetlands and waters are not anticipated to extend beyond the API.

3.17.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

The No-Build Alternative would cause no new permanent or temporary impacts to waters prior to a CSZ earthquake. Existing conditions within the river would essentially remain as they are for the foreseeable future. The 0.35 acres of the bridge substructure located within the river would remain in place. A CSZ earthquake would have considerable direct impacts to water resources in the API if the No-Build Alternative is selected due to the bridge collapsing into the Willamette River and onto the adjacent shoreline.

Figure 3.17-1. Ordinary High Water Mark within the API



Impacts Common to All Build Alternatives

Direct – All build alternatives (see Table 3.17-1) would add permanent structure below the OHWM including retrofitted bridge piers (Retrofit Alternative) or replacement piers and shafts (replacement alternatives). All build alternatives would use the same chemically inert materials for the permanent structure below OHWM. All alternatives also propose to replace an existing staircase near the east end of the bridge with new bicycle and pedestrian access options (ranging from a staircase and elevator or an ADA-accessible ramp) from the south, or both the south and north, sides of the bridge to the Eastbank Esplanade. All options would require pier supports with fill below the OHWM. See figures in Draft EIS Attachment G and detailed descriptions of the options and impacts in the *EQRB Active Transportation Access Options Memorandum* (Multnomah County 2021a).

Table 3.17-1. Comparison of Permanent and Temporary Structures below the Ordinary High Water Mark

Alternative and Movable Span Option	Permanent Area of Structure (acres)	Permanent Number of Shafts	Temporary Area of Piles (square feet)	Temporary Number of Piles	Temporary Cofferdam Area (acres)
Existing/No Build	0.35	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Enhanced Retrofit	1.4[1]	57	500–700	160–220	1.1
Replacement, Short-span (Bascule)	1.2	45	500–700	160–220	1.5
Replacement, Short-span (Vertical lift)	0.8	37	500–700	160–220	1.2
Replacement, Long-span (Bascule)	1.1	41	500–700	160–220	1.1
Replacement, Long-span (Vertical lift)	0.8	33	500–700	160–220	0.8
Replacement, Couch Extension (Bascule)	1.2	46	500–700	160–220	1.6
Replacement, Couch Extension (Vertical lift)	0.8	38	500–700	160–220	1.3

[1] The permanent structure for the Retrofit Alternative would include the existing bridge structure below OHWM, which totals 0.35 acres.

Indirect – Because the Project would not affect traffic capacity or cause other growth or development-inducing changes (see Section 3.4, Land Use), it is not expected to have indirect effects on runoff into waterways. Further, all the build alternatives would be designed to maintain safe passage for all boats under the bridge in accordance with US Coast Guard requirements and thereby not affect the congestion or volume of boat traffic in the API. Thus, any potential indirect effects of the build alternatives to waters would be minimal.

Temporary – Construction activities would include temporary fill placement and removal within the river that would vary by alternative and option, including installation of temporary pilings, excavation of portions of the riverbed, and installation of temporary cofferdams. Temporary work bridges, installed for each of the build alternatives, would be installed on steel piles driven into the riverbed from equipment mounted on barges and/or from equipment mounted on the partially constructed work bridge. The barges would be held in place by vertical steel shafts known as spuds, which would cause minimal habitat displacement and sedimentation. Barges would also provide areas to store and/or pre-build materials and allow moving these materials in and around the construction area as needed. Additionally, the Eastbank Esplanade active

transportation options would require the installation of temporary piles and removal of riprap. If a temporary detour bridge option is selected, additional temporary piles would need to be driven (see Section 3.17.3).

Post CSZ Earthquake – All build alternatives would be designed and constructed to remain standing and functioning after a CSZ earthquake of up to a 9.0 magnitude, thereby avoiding the No-Build Alternative impacts which include bridge collapse into the river and shoreline.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have the following impacts:

- Partial demolition of the bridge substructure.
- Removal and reconstruction of a portion of the harbor wall to retrofit the bridge pier immediately adjacent to it.

The areal extent and quantities of permanent and temporary construction elements are shown in Table 3.17-1 below. See Figure 3.17-2 and Figure 3.17-3 for temporary and permanent impacts below the OHWM for the Retrofit Alternative.

Relative to the other alternatives, the Retrofit Alternative would require the highest number of permanent shafts and the greatest areal extent of new footings within the river.

Replacement Alternative with Short-Span Approach Impacts

In addition to the common impacts described above, the Short-span Alternative would include full demolition of the bridge substructure and erection of new permanent structures within the river for the new bridge, with both of these activities occurring within cofferdams.

The bascule and vertical lift options have a different areal expanse of permanent and temporary structures and associated magnitude of impact. See Table 3.17-1 for the anticipated total temporary and permanent impacts below OHWM, and how they would vary by the two bridge lift options. See Figure 3.17-4 and Figure 3.17-5 for temporary and permanent impacts below the OHWM for the Short-span Alternative.

Replacement Alternative with Long-Span Approach Impacts

The total area of permanent footings in the river would be similar to the Short-span Alternative but this alternative would require the fewest number of piers and shafts in the river, including eliminating the in-water pier/bent near the eastern shoreline. Table 3.17-1 provides the anticipated temporary and permanent impacts to water resources for the two bridge lift options. See Figure 3.17-6 and Figure 3.17-7 for temporary and permanent impacts below the OHWM for the Long-span Alternative.

Replacement Alternative with Couch Extension Impacts

This alternative would have similar impacts to the Short-span Alternative. The total area of permanent structure below OHW would be the same as the Short-span Alternative but would require more shafts in the river than the other replacement alternatives. See Table 3.17-1 for the anticipated temporary and permanent impacts to water resources for each of the two Couch Extension Alternative lift options. See Figure 3.17-8 and Figure 3.17-9 for temporary and permanent impacts below the OHWM for the Couch Extension Alternative.

Figure 3.17-2. Temporary In-Water Impacts – Enhanced Retrofit

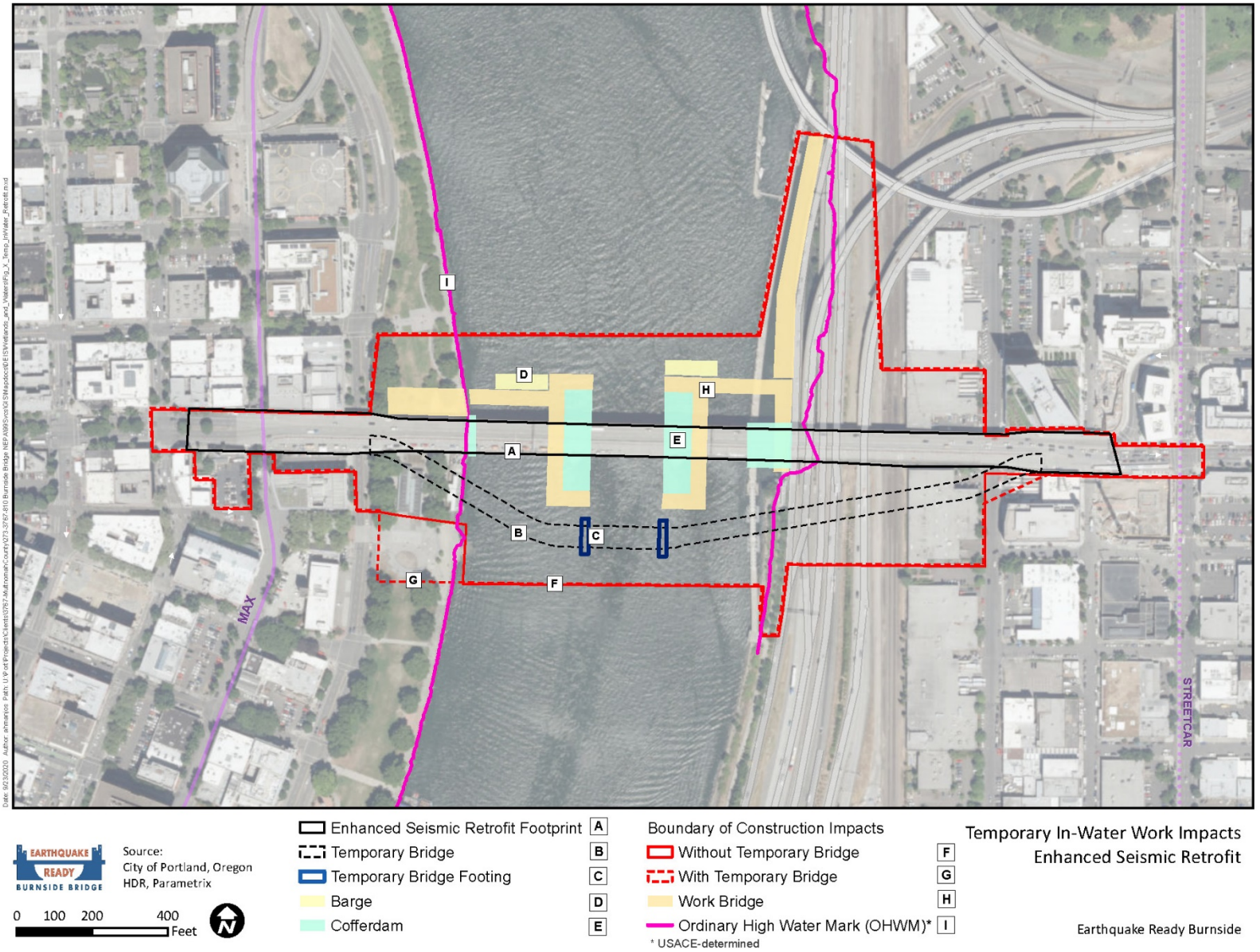


Figure 3.17-3 Permanent In-Water Impacts – Enhanced Retrofit

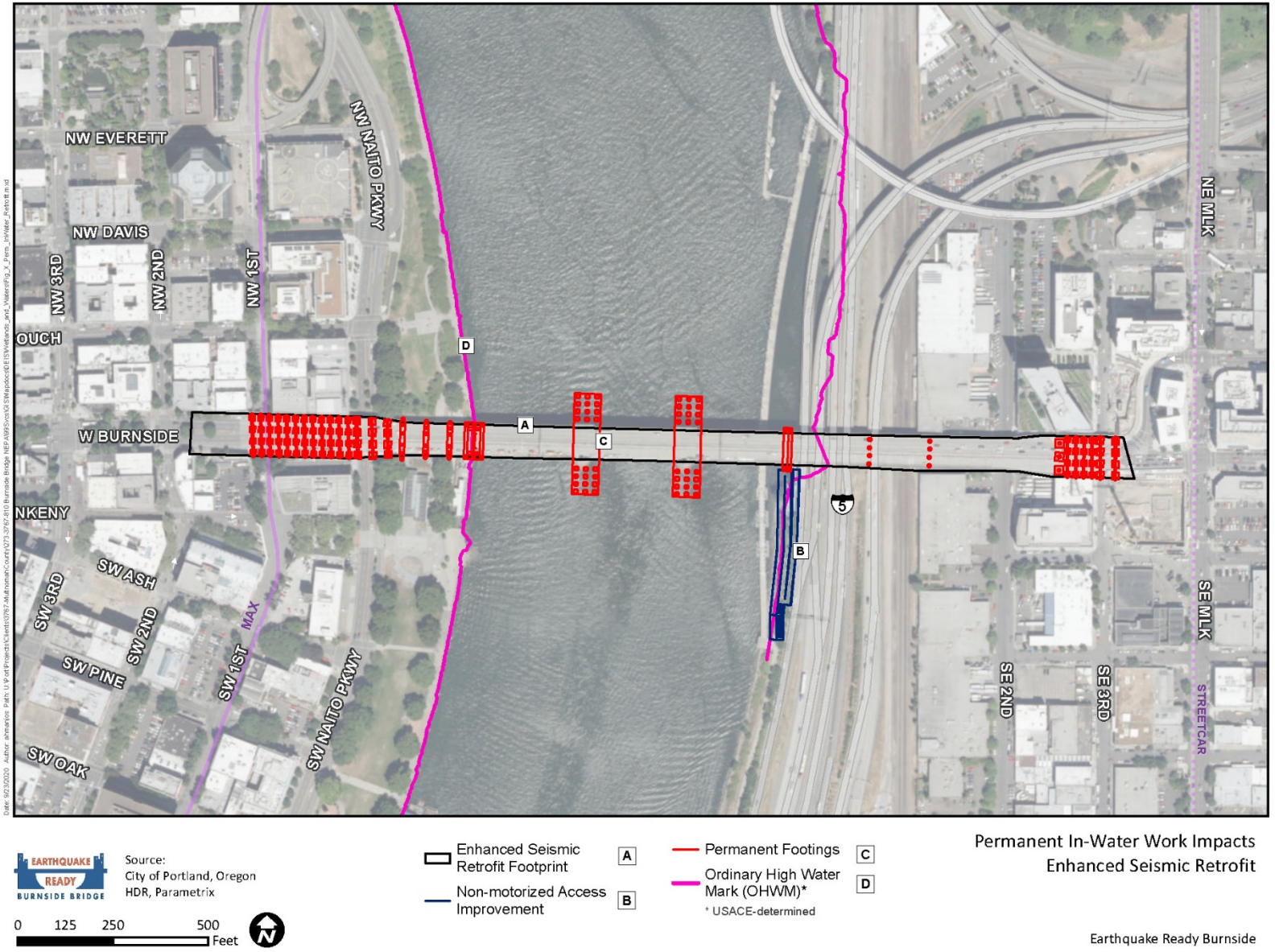


Figure 3.17-4 Temporary In-Water Impacts –Short-Span Alternative

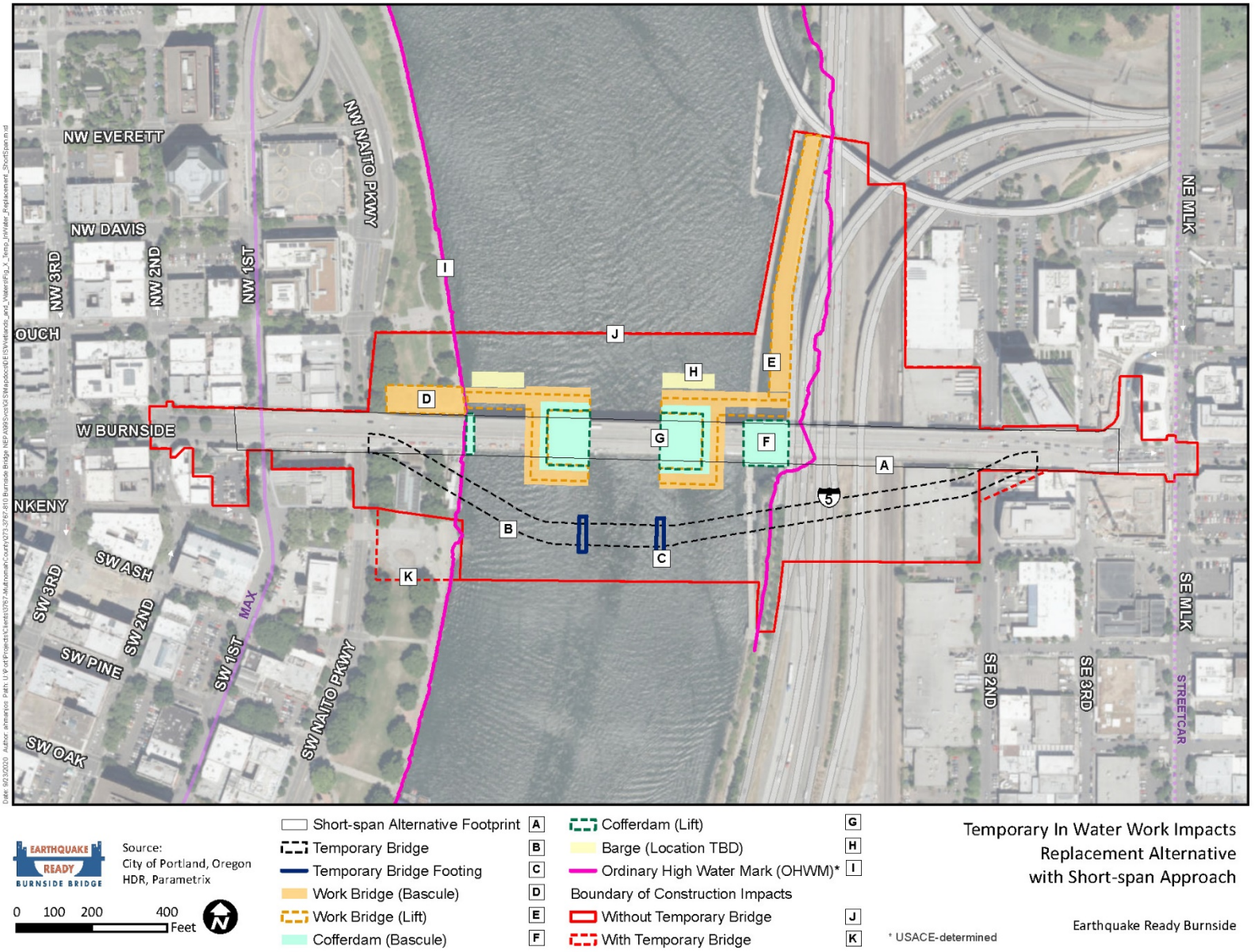


Figure 3.17-5. Permanent In-Water Impacts – Short-Span Alternative

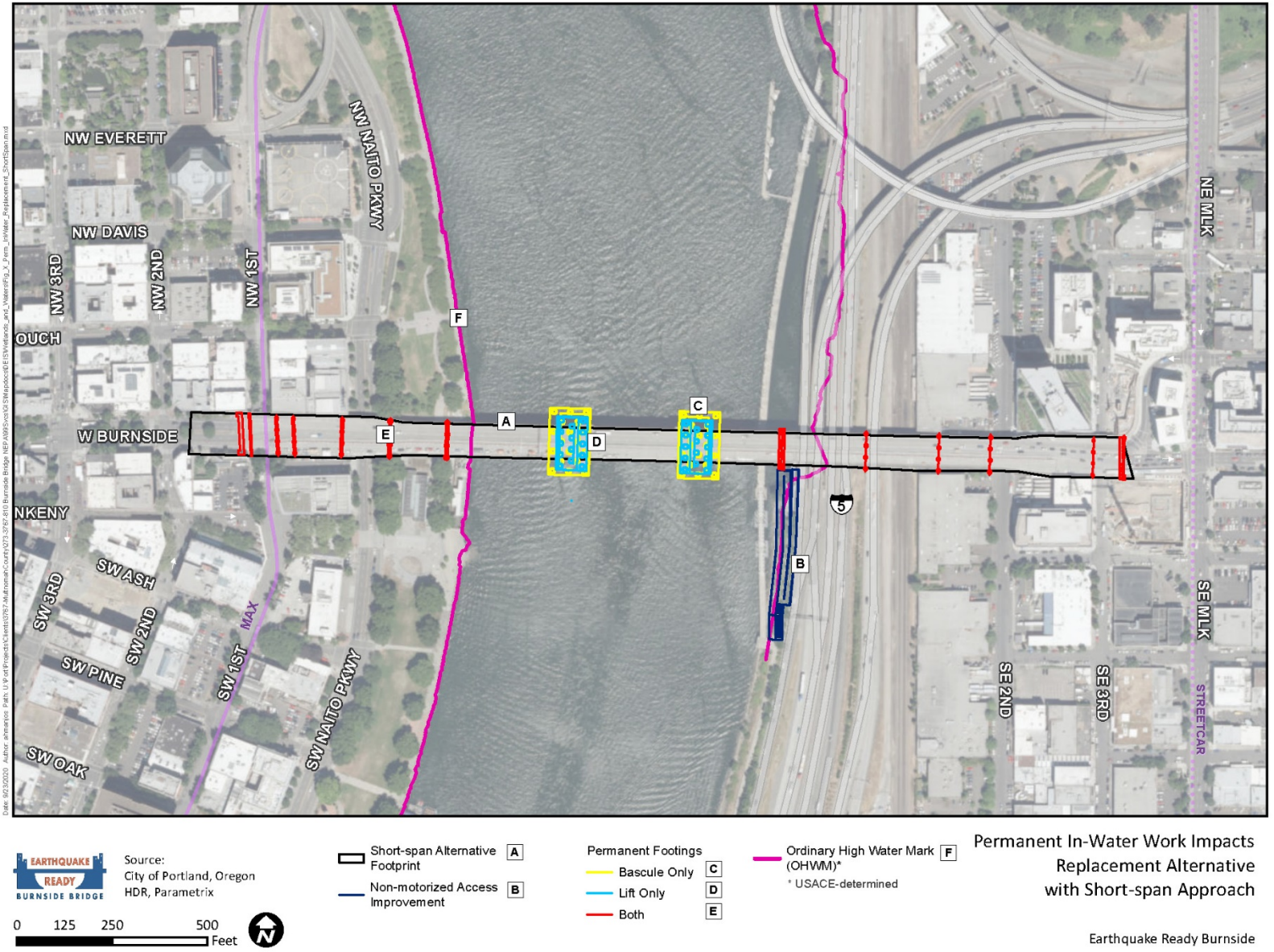


Figure 3.17-6 Temporary In-Water Impacts – Long-Span Alternative

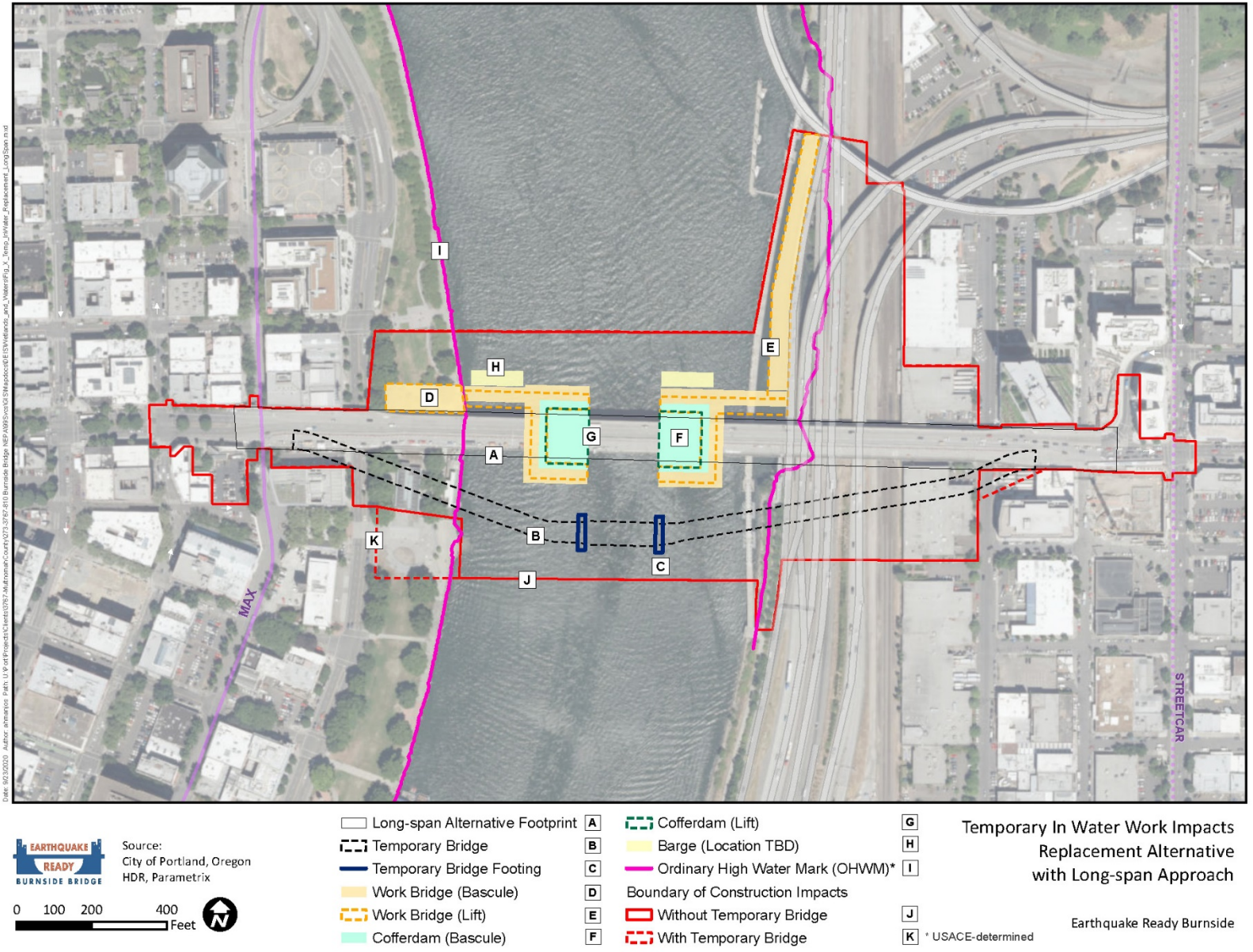


Figure 3.17-7 Permanent In-Water Impacts – Long-Span Alternative

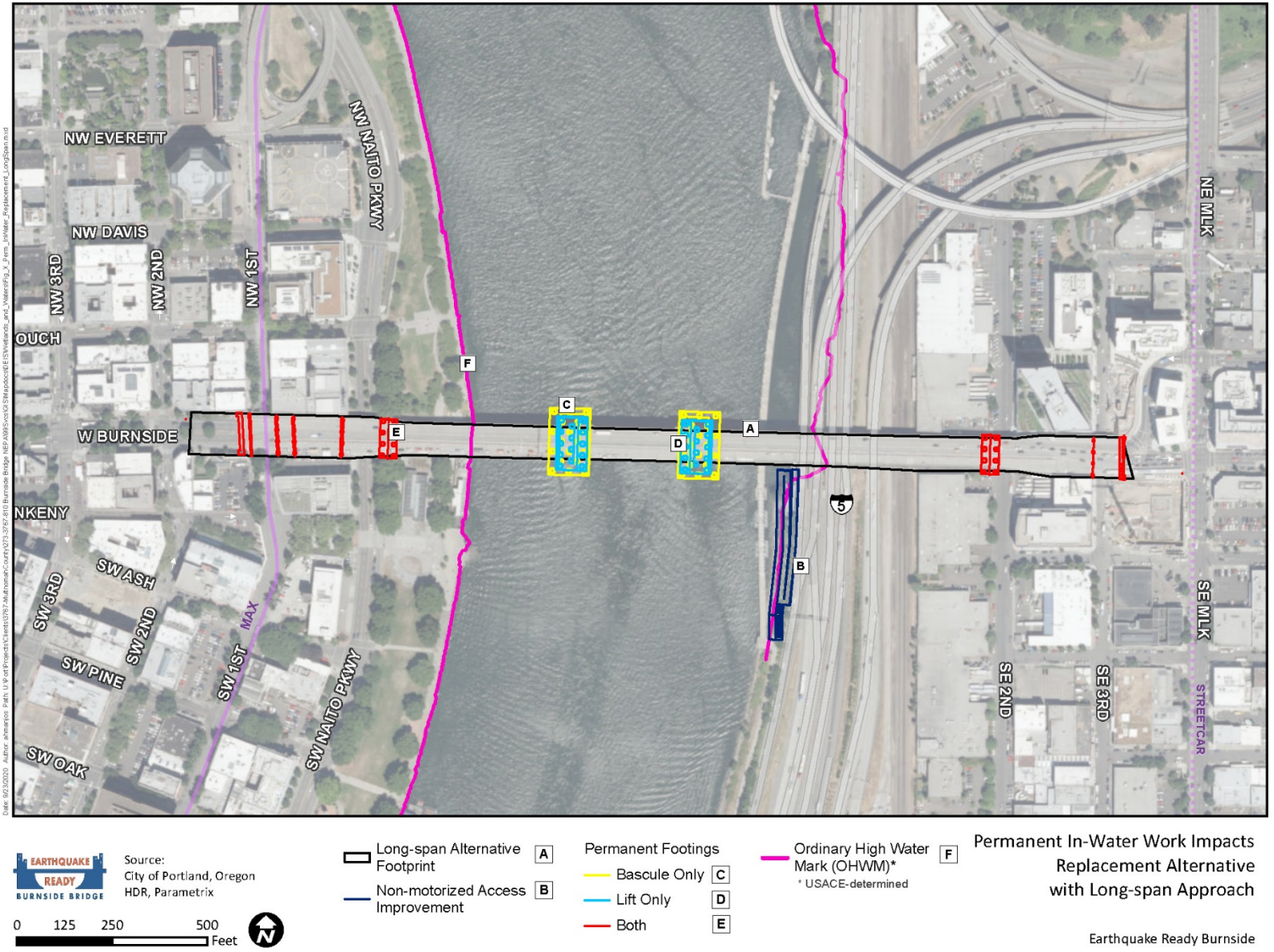


Figure 3.17-8 Temporary In-Water Impacts – Couch Extension

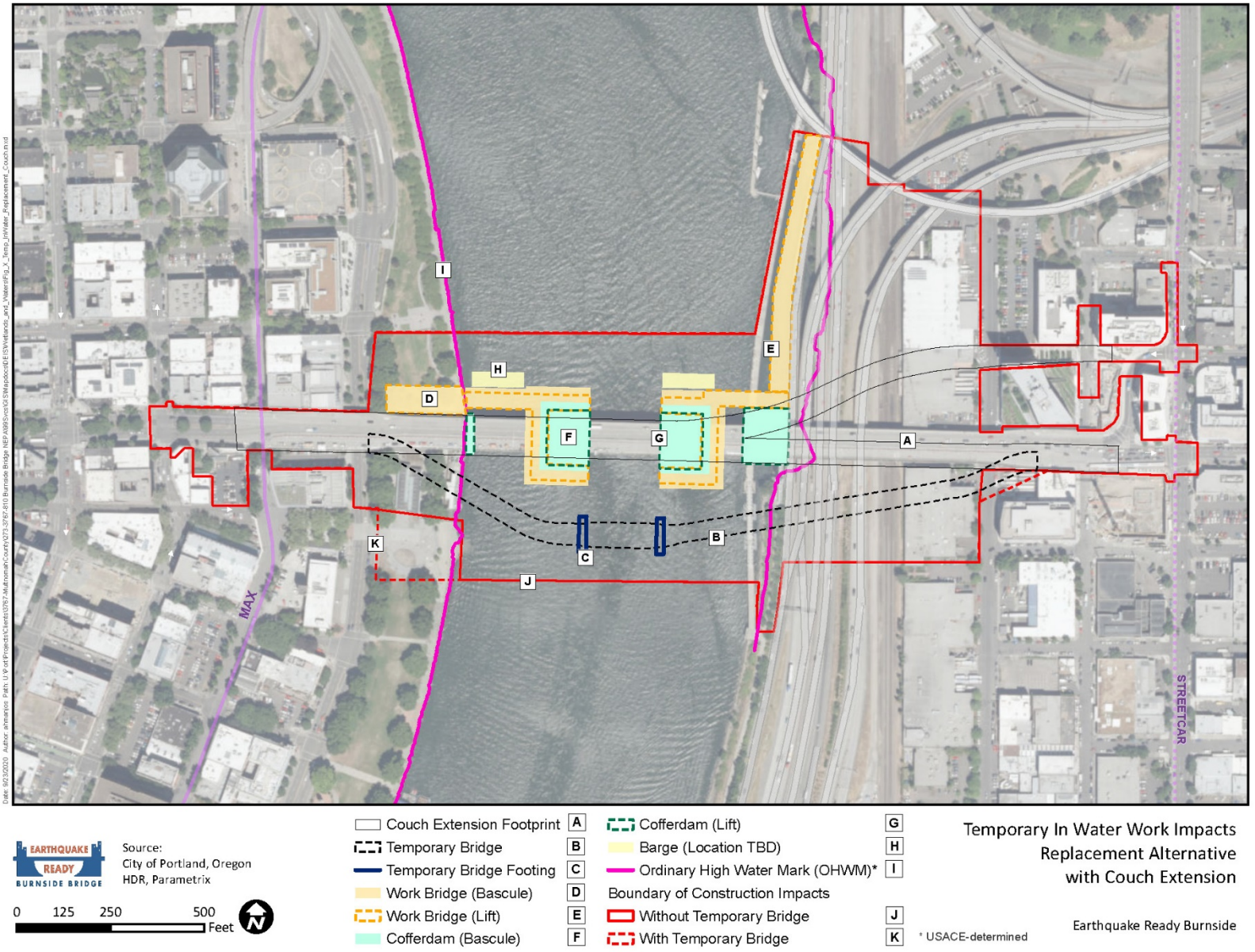
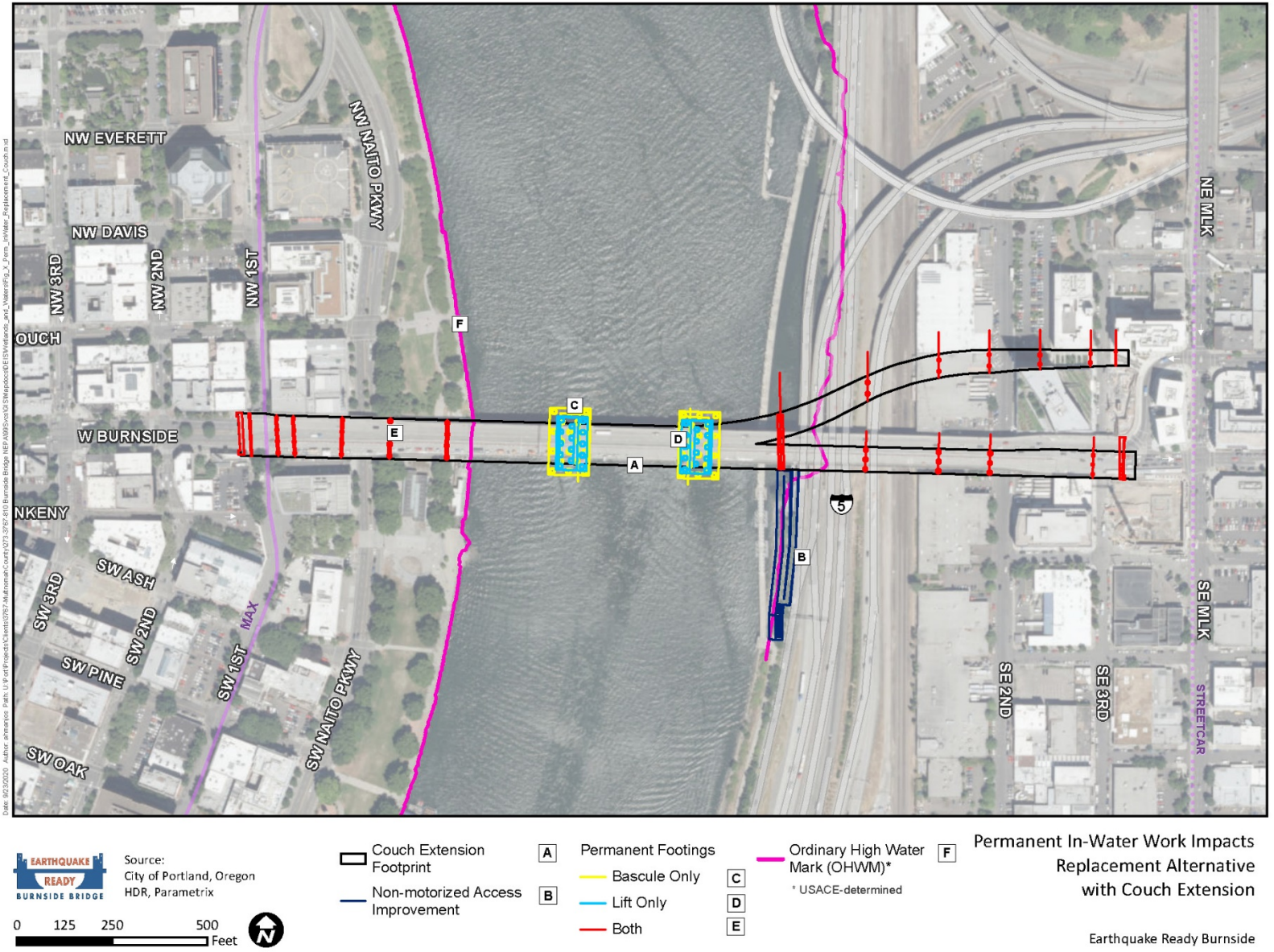


Figure 3.17-9 Permanent In-Water Impacts – Couch Extension



Impacts from Potential Off-Site Staging Areas

The four possible sites that have been identified represent a much broader range of potential sites where off-site staging might occur. While the contractor could choose to use one of these or any other site, it is assumed that because of regulatory and time constraints on the contractor, any site they choose would need to be already developed with road and river access. It is also assumed that the contractor would be responsible for site reconnaissance and delineation to determine if wetlands are present at the staging locations and any relevant permitting and/or mitigation that could be required for use of a chosen site.

3.17.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, no additional impacts to wetlands and water resources beyond those described above are anticipated.

With a Temporary Bridge

Use of a temporary detour bridge during construction would cause added temporary impacts to water resources similar to but greater in magnitude than those described in Section 3.17.2 above. If a temporary bridge were built, the first construction activity for any of the build alternatives would be to install temporary pilings, using a combination of vibratory and driving methods, both on land and in the river. The *EQRB Construction Approach Technical Report* (Multnomah County 2021g) describes in detail the potential methods for installing the temporary bridge. Removal of the temporary bridge would be the final construction activity.

The vehicular/pedestrian/bicycle variation of the temporary bridge would be wider than the pedestrian/bicycle only variation and thereby require more in-water structural support. Table 3.17-2 outlines the anticipated impacts associated with each variation of the temporary bridge.

Construction of either variation of the temporary bridge would extend the overall construction period for any of the build alternatives by 1.5 years.

Table 3.17-2. Temporary Bridge Construction Impacts

Bridge Variation	Area of Piles below OHWM (square feet)	Number of Piles below OHWM	Construction Time (years)
Vehicular/Pedestrian/Bicycle	410–570	130–180	1.5
Pedestrian/Bicycle	220–290	70–90	1.5

OHWM – ordinary high water mark

3.17.4 Mitigation

Avoiding impacts to waters is not feasible for the build alternatives due to the need for in-water work. Minimization would be achieved by constraining the in-water footprint as much as practicable (while still meeting the seismic resilience purpose of the Project) and implementation of construction best management practices.

Compensatory mitigation for impacts of the Project to waters below the OHWM would meet the requirements and guidance provided by the US Army Corps of Engineers, the Oregon Department of State Lands, and the City of Portland. The mitigation would compensate impacts to aquatic functions as required by the federal Final Mitigation Rule and Oregon's Aquatic Resource Mitigation Framework policy. Potential

compensatory mitigation sites have been identified. If feasible, a site or sites will be selected during project permitting. Once an alternative is selected, specific mitigation measures will be discussed with the City of Portland, the National Oceanic and Atmospheric Administration, and the Oregon Department of Fish and Wildlife. The required mitigation area will be calculated based on impacts to area and functions. See the *EQRB Wetlands and Waters Technical Report* (Multnomah County 2021dd) for more information regarding potential compensatory mitigation for unavoidable impacts to waters caused by the build alternatives. In addition to the option of performing mitigation, another opportunity would be to purchase mitigation credits from an existing mitigation bank. This would satisfy mitigation requirements for the Project through mitigation activities implemented off-site and before project construction began.

3.18 Noise and Vibration

This section identifies existing conditions for noise and vibration and outlines anticipated project impacts. More detail can be found in the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q). See Section 3.16, Vegetation, Wildlife, and Aquatic Resources, for construction noise–related impacts to the aquatic environment.

3.18.1 Affected Environment

The API for noise analysis includes noise-sensitive land uses located within approximately 750 feet of the project alternatives and within 500 feet of haul routes designated to haul material to and from construction sites (Figure 3.18-1). Because vibration attenuates more quickly with distance than noise does, the vibration API is smaller, within approximately 300 feet of areas where earth disruption or off-road construction equipment would be located. Trucks using haul routes are not typically sources of vibration impacts; therefore, there is no API for vibration associated with the haul routes. Figure 3.18-2 and Figure 3.18-3 show noise-sensitive lands in the Noise Study Area for noise.

Existing traffic noise levels range from 40 A-weighted decibels[1] (dBA) hourly equivalent sound level (Leq(h)) to 74 dBA Leq(h) and exceed the ODOT Noise Abatement Approach Criteria (NAAC) at 267 residences or shared outdoor recreation areas at apartments, and at additional locations within Tom McCall Waterfront Park and the Vera Katz Eastbank Esplanade, totaling 272 impacted locations. Traffic noise in the area is predominantly caused by traffic on I-5 and not from traffic on Burnside Street.

3.18.2 Impacts from Bridge Alternatives

No-Build Alternative Impacts

The No-Build Alternative would have traffic noise levels similar to the existing condition and with the same alignment. These levels would range from 40 dBA Leq(h) to 75 dBA Leq(h) and are predicted to exceed the NAAC at 267 residences or shared outdoor recreation areas at apartments, and at additional locations within Tom McCall Waterfront Park and the Vera Katz Eastbank Esplanade, totaling 275 impacted locations. Under the No-Build Alternative, noise levels are predicted not to change, on average, relative to the existing conditions. Vibration levels under the No-Build Alternative would remain unchanged relative to existing conditions.

Impacts Common to All Build Alternatives

Direct – All of the build alternatives would have the same traffic noise levels as the No-Build Alternative. These levels would range from 40 dBA Leq(h) to 75 dBA Leq(h). The number of locations predicted to exceed the NAAC is the same for the No-Build, Retrofit, Short-span, and Long-span Alternatives but differs slightly with the Couch Extension Alternative, as described below.

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[1] The relative loudness of sounds in air as perceived by the human ear. The noise level ranges presented here include interior and exterior levels, however there are no interior noise impacts predicted from this Project.

Figure 3.18-1. API for Noise and Vibration

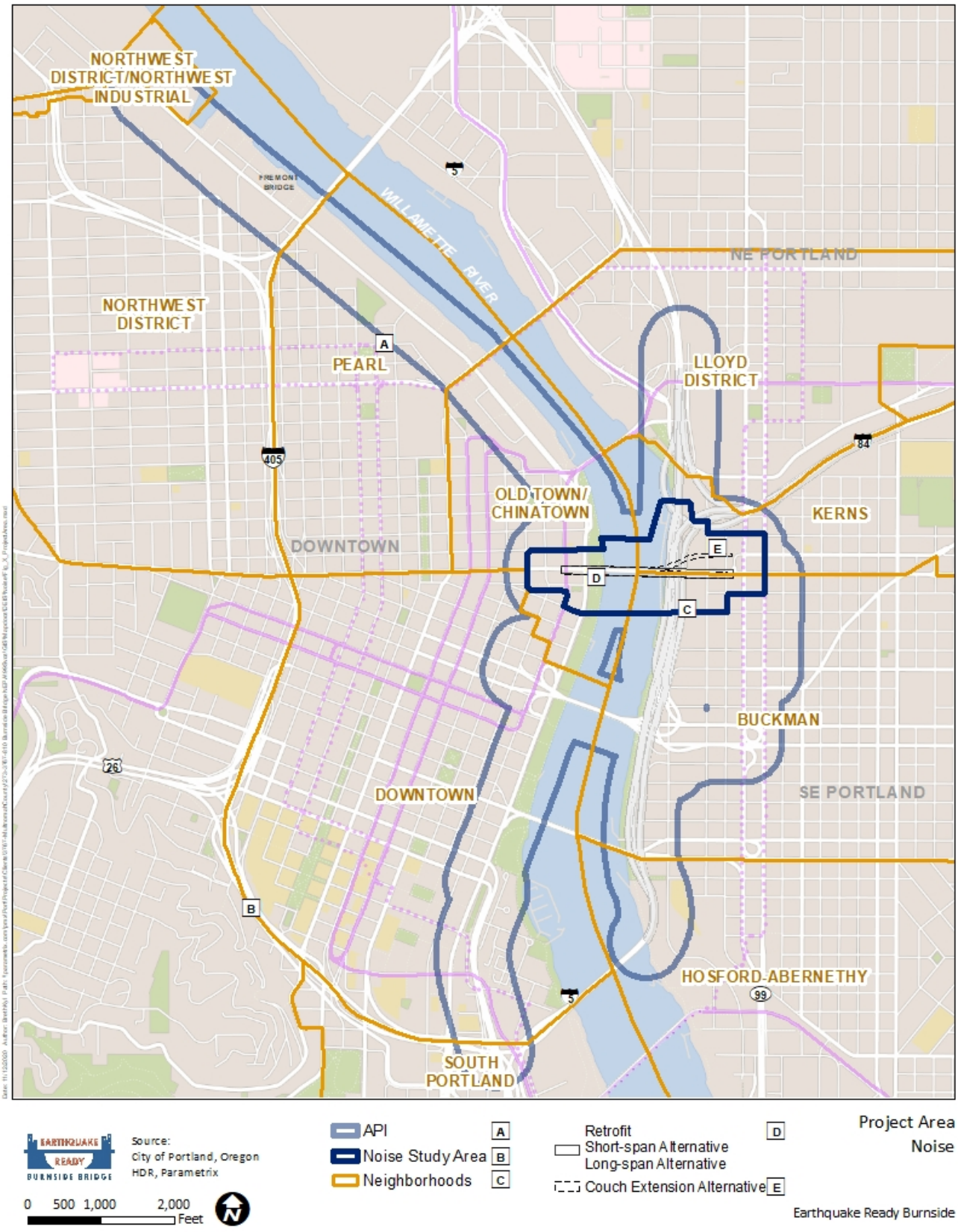
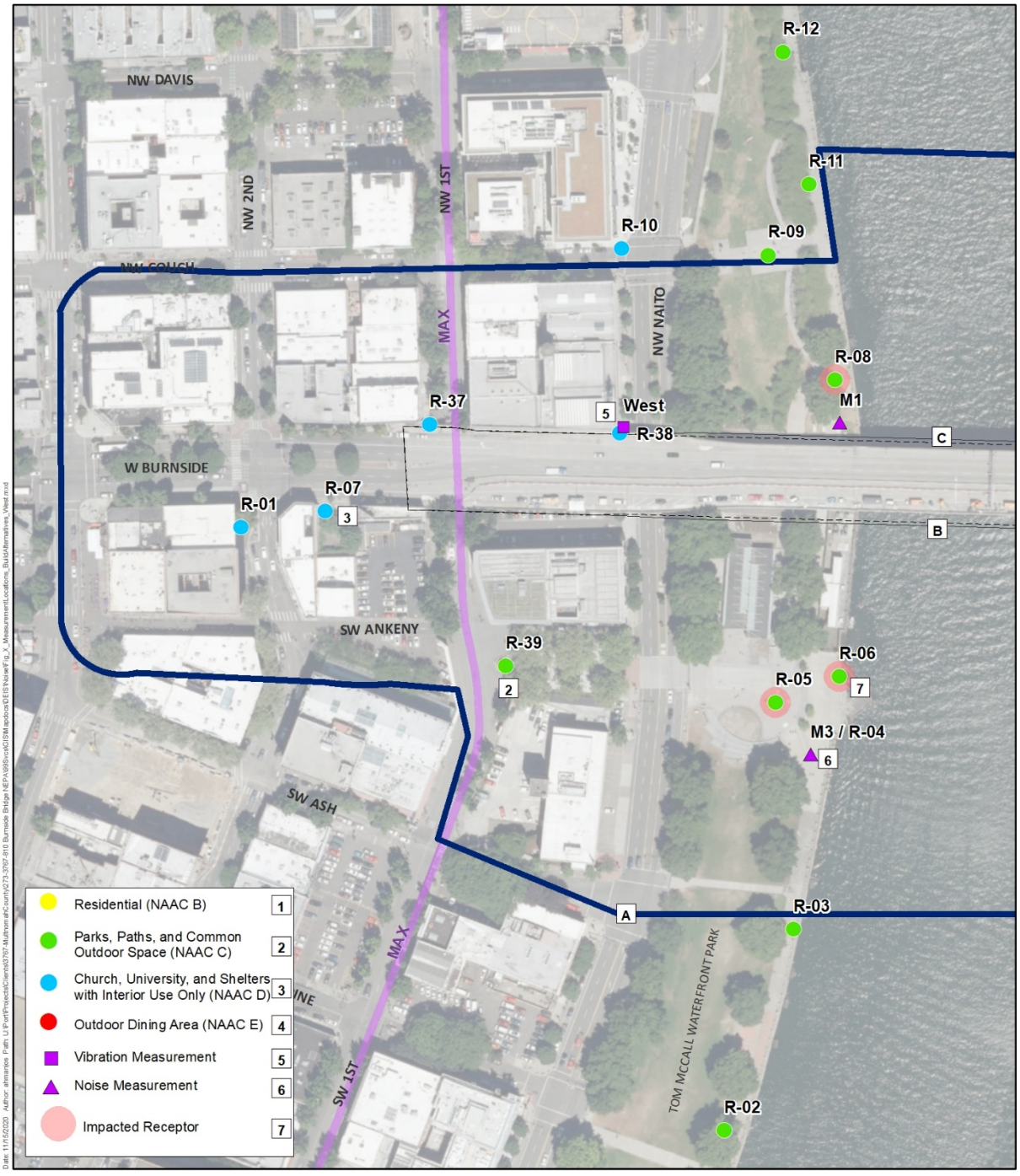
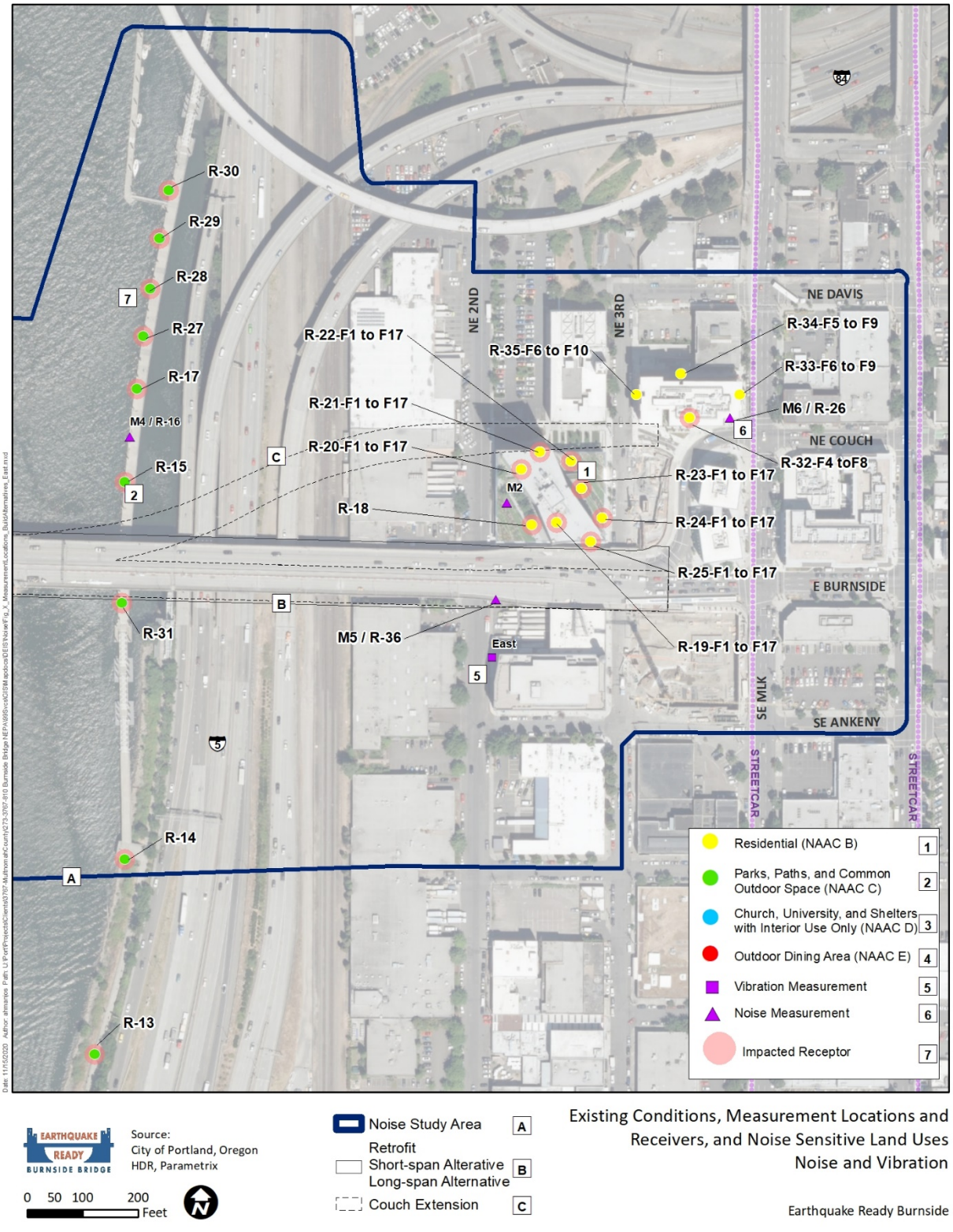


Figure 3.18-2. Existing Conditions, Measurement Locations and Receivers, and Noise-Sensitive Land Use Near West Approach



Note: Receiver ID numbers correspond to tables and text within the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q).

Figure 3.18-3. Existing Conditions, Measurement Locations and Receivers, and Noise-Sensitive Land Use Near East Approach



Note: Receiver ID numbers correspond to tables and text within the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q).

Indirect – Because no induced growth in traffic or induced change in land use are expected, there would be no indirect effects from the Project on noise. Impacts from other transportation projects and land use changes are included in the traffic data that were used in the long-term impact analysis for the project alternatives. No indirect noise impacts are anticipated. Vibration levels under the build alternatives would negligibly change relative to existing conditions.

Temporary – Construction noise and vibration impacts could result from project construction. Implementing the Oregon Standard Specifications for Construction (ODOT 2021) and other mitigation measures would reduce and/or eliminate some of the impacts. Additionally, the construction contractor would be required to comply with local noise regulations and to obtain a City of Portland noise variance permit, which would place restrictions on construction-related noise to protect the surrounding community. Finally, vibration from construction activities would be kept below the impact thresholds by using alternate construction methods, monitoring vibration levels when construction has the potential to damage structures, and/or by using hand tools where necessary.

The expected noise levels from construction activities needed as part of project construction are shown in Table 3.18-1.

Table 3.18-1. Construction Activities and Predicted Noise Levels

Activity	Noise Level dBA L_{eq}(h)
Demolition of the existing bridge and buildings	62–98
Detour bridge construction	72–105
Work bridge construction	57–105
Cofferdam installation	48–77
Construction of west side approach	63–96
River pier shaft installation	49–75
River pier ground improvements	33–76
Main span work	28–63
Construction of east side approach[2]	73–108
Roadway deck construction	64–95

Source: Table C-2, *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q).

Two pieces of construction equipment that present the highest potential for vibration damage and annoyance are impact pile drivers and vibratory rollers. Mitigation would be required for anticipated construction vibration (annoyance) impacts associated with project construction. Table 3.18-2 displays the vibration damage analysis and Table 3.18-3 displays vibration annoyance analysis results as they relate to specific construction equipment.

[2] The noise level ranges in Table 3.18-1 present a summary range using the most conservative values from Table C-2 in the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q). If the project proceeded with a build alternative other than the Couch Extension, the noise levels for the east side approach would be lower than those shown here.

Table 3.18-2. Distance from Construction for Potential Damage for Building/Structural Categories

Construction Equipment Description	Category 1 – Reinforced Concrete, Steel, or Timber (No Plaster) (feet)	Category 2 – Engineered Concrete and Masonry (No Plaster) (feet)	Category 3 – Non-Engineered Timber and Masonry Buildings (feet)
Pile driver (impact), upper range	53	75	100
Pile driver (impact), typical	30	43	55
Pile driver (sonic), upper range	33	46	60
Pile driver (sonic), typical	< 25	< 25	< 25
Clam shovel drop (slurry wall)	< 25	< 25	26
Hydromill (slurry wall), in soil	< 25	< 25	< 25
Hydromill (slurry wall), in rock	< 25	< 25	< 25
Vibratory roller	< 25	< 25	26
Hoe ram	< 25	< 25	< 25
Large bulldozer	< 25	< 25	< 25
Caisson drilling	< 25	< 25	< 25
Loaded trucks	< 25	< 25	< 25
Jackhammer	< 25	< 25	< 25
Small bulldozer	< 25	< 25	< 25

Source: Table 7, *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q).

Table 3.18-3. Distance from Construction for Potential Annoyance for Land Use Categories

Construction Equipment Description	Category 2 – Residences and Buildings Where People Normally Sleep (feet)	Category 3 – Institutional Land Uses with Primarily Daytime Use (feet)
Pile driver(impact), upper range	500	450
Pile driver(impact), typical	300	240
Pile driver (sonic), upper range	310	250
Pile driver (sonic), typical	125	100
Clam shovel drop (slurry wall)	140	110
Hydromill (slurry wall), in soil	< 25	< 25
Hydromill (slurry wall), in rock	< 25	25
Vibratory roller	140	110
Hoe ram	80	65
Large bulldozer	80	65
Caisson drilling	80	65
Loaded trucks	75	60
Jackhammer	40	35
Small bulldozer	< 25	< 25

Source: Table 8, *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q).

Post CSZ Earthquake – Although not a result of the build alternatives, debris removal, demolition and reconstruction following a major earthquake would generate substantial and widespread noise and vibration with all the alternatives. With the build alternatives, these noise levels would be lower but traffic noise would be higher when compared with the No-Build Alternative.

Enhanced Seismic Retrofit Alternative Impacts

In addition to the common impacts described above, the Retrofit Alternative would have the shortest duration of construction (3.5 years), and therefore the shortest overall duration of construction noise and vibration. Additionally, while the magnitude of noise from pile driving would be the same for this alternative relative to the others, fewer piles would be driven; therefore, pile driving noise would be of shorter duration. Long-term direct impacts would be the same as those for the No-Build Alternative.

Replacement Alternative with Short-Span or Long-Span Approach Impacts

In addition to the common build alternative impacts described above, the Short-span or Long-span Alternative would have the following impacts:

- Because construction duration would be one year longer for the Short-span or Long-span Alternative compared to the Retrofit, construction noise would also be experienced for a longer duration. See the *EQRB Construction Approach Technical Report* (Multnomah County 2021g) for additional detail.
- Long-term direct impacts associated with the Short-span or Long-span Alternative would be the same as those for the No-Build Alternative.

Replacement Alternative with Couch Extension Impacts

In addition to the impacts common with all the build alternatives, the Couch Extension would have the following impacts:

- The common short-term construction noise levels described above would occur for the duration of the 4.5 years needed to construct the Couch Extension. The difference in construction noise under this alternative would occur at the east end of the bridge where the connection with the existing street network would change. The Couch Extension would have construction noise on the north side of the Yard apartments which would result in higher noise levels on that side of the building and in the surrounding community.
- Impacts would occur at fewer residences or shared outdoor recreation areas at apartments with 261 locations rather than 267 under the No-Build, Retrofit, and other replacement alternatives. Including the locations within Tom McCall Waterfront Park and the Vera Katz Eastbank Esplanade, the Couch Extension would impact 269 locations. Relative to the existing conditions, some noise levels would increase or decrease by as much as 5 decibels (dB). The reason for these changes is due to changes in the roadway alignment such as moving the westbound travel lanes farther from and closer to sensitive receptors on the south and north sides of the Yard apartment high-rise, respectively.

Impacts from Potential Off-Site Staging Areas

The identified off-site staging areas would not result in noise impacts because there are no noise-sensitive receptors located close enough to be affected. If the contractor chooses to use an off-site staging area, local, state, and federal regulations regarding construction would apply.

3.18.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Predicted noise and vibration impacts without a temporary bridge would be negligibly different in some areas due to slight increases in traffic. Note that a doubling of traffic on an area roadway is required for a noticeable increase in traffic noise to occur.

With a Temporary Bridge

Including a temporary bridge would add between 1.5 and 2 years of construction time. For noise and vibration impacts that means sensitive land uses would experience approximately the same predicted construction noise and vibration levels described above, but for 1.5 to 2 years longer than without a temporary bridge.

Noise from traffic using the temporary bridge was analyzed using the FHWA Traffic Noise Model assuming existing conditions level of traffic. While there would be some changes in sound levels associated with using the temporary bridge, they represent increases of at most 5 dB compared to the existing conditions or the No-Build Alternative. As a result, it is anticipated that traffic noise on the temporary bridge would be noticeably higher than the existing conditions for some receptors. Decreases in sound levels of up to 3 dB are also predicted as a result of the location of the temporary bridge alignment's horizontal shift relative to the existing alignment. However, all other bridge construction noise levels would be the same and would be more impactful since they would last for 1.5 to 2 years longer in duration.

3.18.4 Mitigation

Build Alternatives

To avoid, minimize, and abate temporary adverse noise and vibration impacts, the following measures, as described in Section 290.32 of the *Oregon Standard Specifications for Construction*, should be implemented:

> **00290.32 Noise Control** - Comply with ORS 467, OAR 340-035, all other applicable Laws, and the following construction noise abatement measures:
>
> - Do not perform construction within 1,000 feet of an occupied dwelling on Sundays or legal holidays, or between the hours of 10:00 p.m. and 6:00 a.m. on other days, without the approval of the Engineer.
> - Use Equipment with sound control devices no less effective than those provided on the original equipment. Equipment with un-muffled exhausts is prohibited.
> - Use equipment complying with pertinent equipment noise standards of the Environmental Protection Agency.
> - Do not drive piling or perform blasting operations within 3,000 feet of an occupied dwelling on Sundays or legal holidays, or between the hours of 8:00 p.m. and 8:00 a.m. on other days, without the approval of the Engineer.
> - Mitigate the noise from Rock crushing or screening operations performed within 3,000 feet of all occupied dwellings by placing material stockpiles between the operation and the affected dwellings, or by other means approved by the Engineer.
>
> If a specific noise impact complaint occurs during the construction of the Project, one or more of the following noise mitigation measures may be required, at no additional cost to the Agency, as directed by the Engineer:

- Locate stationary construction Equipment as far from nearby noise sensitive properties as feasible.
- Shut off idling Equipment.
- Reschedule construction operations to avoid periods of noise annoyance identified in the complaint.
- Notify nearby residents whenever extremely noisy Work will be occurring.
- Install temporary or portable acoustic barriers around stationary construction noise sources.
- Operate electric-powered Equipment using line voltage power or solar power.

Multnomah County or its contractors would obtain construction noise variances as needed from the City of Portland. That would require implementation of specific mitigation measures to reduce and minimize construction noise to the extent practicable.

The construction contractor would need to identify alternative construction methods in some areas to avoid damage and annoyance threshold limits identified in Table 3.18-2 and Table 3.18-3 and monitor construction noise if the City requires it via the variance process. Potential mitigation strategies could include implementing caisson drilling rather than pile driving and using hand tools where it is not possible to construct with heavy machinery outside of the distances identified in Table 3.18-2 and Table 3.18-3. Additionally, vibration monitoring during construction would be implemented at vibration-sensitive structures to identify the onset of exceedance conditions so that the construction contractor could rectify any issues and avoid damage to nearby structures.

Noise abatement measures including speed restrictions, truck restrictions, alignment changes, and noise barriers were evaluated and found to not meet abatement criteria or were found to be ineffective or infeasible for this Project. For more details, see the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q).

Construction Traffic Management Options

Traffic patterns would shift with implementation of any of the temporary construction traffic management options; however, traffic would need to double or halve for a discernible difference in traffic noise to result. Traffic is not anticipated to change by this amount on any area roadways; therefore, there would be no noticeable impact.

3.19 Air Quality

This section identifies existing air quality conditions and evaluates air quality impacts within the project API.

3.19.1 Affected Environment

The project area encompasses a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from 3rd Avenue on the west side of the river and Grand Avenue on the east side. Several neighborhoods surround the area including Old Town/Chinatown, Downtown, Kerns, and Buckman. The API includes areas within the immediate vicinity of the project construction footprint and the roadways used for rerouting traffic.

The US Environmental Protection Agency (EPA) has designated the project area as being in attainment for meeting standards for all criteria pollutants.[1] Of primary concern for air pollutants from transportation sources are nitrogen oxides (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), particulate matter (PM_{10} and $PM_{2.5}$), and mobile source air toxics (MSATs). In the 1970s, pollution concentrations in the Metro area exceeded the CO National Ambient Air Quality Standards (NAAQS) frequently. Maintenance plans were enacted to help with reducing these emissions in combination with technology improvements. The area was re-designated as being in attainment for CO in 2017 after completing the 20-year maintenance plan; however, the maintenance plan is still in effect. A review of Oregon Department of Environmental Quality (DEQ) monitoring data for the most recent 3 years (2016 to 2018) indicated levels nearest the project area are below the corresponding NAAQS. Furthermore, DEQ 10-year monitoring data indicate that criteria pollutant concentrations have been decreasing in the Portland region. As with criteria pollutants, air toxics have also been declining since monitoring commenced in the area in 1999. The data indicate that most pollutants are trending downward; however, some such as benzene, are trending downward but still remain above the state's health benchmarks (i.e., a one in a million chance of developing cancer over an individual's lifetime). These benchmarks are for evaluation and planning purposes and not considered standards such as NAAQS. See the *EQRB Air Quality Technical Report* (Multnomah County 2021c) for details of the analysis.

3.19.2 Impacts from the Bridge Alternatives

No-Build Alternative Impacts

Under the No-Build Alternative, the proposed action is not implemented, and the area would remain in attainment with all NAAQS. Furthermore, with stricter EPA regulations for vehicle engines, fuels, and vehicle turnover over time, future pollutant emissions are expected to decrease compared to existing conditions. Finally, there would be no Burnside Bridge construction associated with the No-Build Alternative, therefore, no construction emissions would be expected. Emissions from maintenance activities would be higher and more frequent than with the build alternatives. No indirect air quality impacts are expected under the No-Build Alternative.

Impacts Common to All Build Alternatives

Direct – Long-term direct impacts from the build alternatives are expected to be the same as for the No-Build Alternative, as future traffic volumes are expected to remain the same for all alternatives (see Table 3.19-1)

[1] The EPA has established National Ambient Air Quality Standards (NAAQS) for six of the most common air pollutants – carbon monoxide, lead, ground-level ozone, particulate matter, nitrogen dioxide, and sulfur dioxide – known as "criteria" air pollutants (or simply "criteria pollutants"). https://www.epa.gov/sites/production/files/2015-10/documents/ace3_criteria_air_pollutants.pdf

Table 3.19-1. Annual Average Daily Traffic for Existing and Future Conditions

Roadway	Segment Description	AADT Existing Conditions (2019)	AADT Future No-Build and All Build Alternatives (2045)
Burnside St	EB b/w NW/SW 2nd Ave and MLK Jr Blvd	19,000	18,500
Burnside St	WB b/w NW/SW 2nd Ave and MLK Jr Blvd	16,000	15,500
Couch St	b/w Grand Ave and MLK Jr Blvd	12,700	13,600
Grand Ave	b/w Couch St and Burnside St	20,500	18,000
MLK Jr Blvd	b/w Couch St and Burnside St	24,900	20,800
Naito Pkwy	NB b/w Couch St and Ankeny St	6,840	7,000
Naito Pkwy	SB b/w Couch St and Ankeny St	8,105	8,200
NW/SW 2nd Ave	b/w Couch St and Burnside St	5,600	5,600
I-5	NB Mainline near Burnside Crossing	43,650	46,162
I-5	SB Mainline near Burnside Crossing	21,110	21,709
I-5	NB C-D to I-84 Interchange	44,580	47,145
I-5	SB I-5 Off-ramp to Morrison	14,930	15,354
I-5	SB C-D from I-84 Interchange	55,320	56,890

Source: Traffic data are from the *EQRB Transportation Technical Report* (Multnomah County 2021z) unless otherwise specified below.

AADT = annual average daily traffic; b/w = between; EB = eastbound; NB = northbound; SB = southbound; WB = westbound

The build alternatives are not anticipated to increase CO emissions or increase any criteria pollutants and air toxics compared to the No-Build Alternative because traffic volumes would remain the same. In addition, the Project is not expected to affect air quality because monitored CO background values in the area are well below NAAQS, and CO modeling results for other projects in the Portland metropolitan region show that CO concentrations for the build alternatives are significantly lower than NAAQS.

Indirect – Indirect impacts would be caused by the Project but could be later in time or farther removed in distance from the Project. The travel demand model used for the air quality analysis reflects future land use, employment, and growth and therefore includes forecast indirect impacts. On a regional basis, the EPA vehicle and fuel regulations, coupled with fleet turnover, would over time cause substantial reductions that, in almost all cases, would cause region-wide MSAT levels to be lower than today.

Temporary – Emissions from construction equipment also are anticipated and would include CO, NOx, VOC, directly emitted particulate matter (PM10 and PM2.5), and MSATs such as diesel particulate matter. These emissions would be the result of fossil fuel combustion by heavy construction equipment and vehicle travel to and from the site, as well as from fugitive sources such as leaks from pressurized equipment or storage tanks containing pressurized flammable liquids and gases. The duration of construction affects the length of time that the Project would produce construction-related air pollution. The Retrofit Alternative has the shortest construction duration of 3.5 years, followed by 4.5 years for any of the Build Alternatives. If a temporary bridge were used as part of the construction approach, that would add 1.5 to 2 years of construction time, extending the period of construction-related air pollution emissions. Construction would also cause some traffic delay and rerouting which could bring some traffic emissions to other locations.

Enhanced Seismic Retrofit or Replacement with Long-Span or Short-Span Approach Impacts

This section discusses impacts in addition to the common impacts described above that would result from the Retrofit, Short-Span, or Long-Span Alternatives. Under FHWA guidance, this Project is anticipated to be

categorized as a project for which no meaningful MSAT effects would be expected. As such, the project alternatives that would retrofit/replace the bridge on the same alignment are exempt from MSAT analysis.

The Retrofit and Short- and Long-span Alternatives would generate minimal air quality impacts for criteria pollutants. These alternatives would not result in changes in traffic volumes, mix of vehicle types, location, or any other factor that would cause a meaningful increase in MSAT impacts compared with the No-Build Alternative.

Replacement Alternative with Couch Extension Impacts

The Couch Extension Alternative is not exempt from MSAT evaluation because a portion of the roadway would be on a new alignment. However, it is characterized as a project with "low potential MSAT effects" under MSAT guidance because projected future traffic is expected to be well below the 140,000 to 150,000 AADT criteria. Table 3.19-1 summarizes the AADT throughout the project corridor.

Relocating westbound travel lanes under the Couch Extension Alternative would move some traffic closer to nearby homes, schools, and businesses on this section of Couch Street, and away from those on the parallel section of Burnside Street. Under the Couch Extension there could be higher ambient concentrations of MSAT than under the No-Build Alternative along the expanded new Couch Extension roadway sections. However, forecasting project-specific MSAT health impacts cannot be accomplished at this time due to incomplete or unavailable information. Conversely, MSAT concentrations for sensitive locations that are closer to traffic would likely result.

The Couch Extension is the only alternative that is not exempt from MSAT analysis; however, as stated previously, this alternative has a low MSAT potential due to its AADT. This alternative would not result in changes in traffic volumes, mix of vehicle types, location, or any other factor that would cause a meaningful increase in MSAT impacts different from that of the No-Build Alternative.

Impacts from Potential Off-Site Staging Areas

Based on the four potential sites identified, the types of impacts that could occur from off-site staging include emissions associated with moving materials and equipment to and from the sites. If the contractor chooses to use an off-site staging area, the local, county, state, and federal regulations associated with construction emissions could apply.

3.19.3 Impacts from Construction Traffic Management Options

Regionally, with the temporary bridge, air quality would remain relatively unchanged. The reason for this is that regionally, traffic would use other routes to avoid slower commutes using the temporary bridge since it would have less capacity than the Burnside Bridge. Additionally, although traffic using the temporary bridge would be less than what typically uses the crossing, the reductions in emissions at the crossing itself would be shifted to another crossing. The regional net change in emissions would be negligible.

3.19.4 Mitigation

Mitigation measures for potential temporary construction impacts normally include implementing best management practices for dust suppression. Construction contractors are required to comply with Division 208 of Oregon Administrative Rules (OAR) 340 which addresses visible emissions and nuisance requirements. A subsection of OAR 340-208 places limits on dust generated from open sources (such as construction activities) that causes a nuisance or violates other regulations. Violations of the regulations can result in enforcement action and fines. The regulation provides that the following reasonable precautions be taken to avoid dust emissions (OAR 340-208, Subsection 210):

- Use of water or chemicals, where possible, for the control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land
- Application of asphalt, water, or other suitable chemicals on unpaved roads, material stockpiles, and other surfaces that could create airborne dusts
- Full or partial enclosure of materials stockpiles in cases where application of water or other suitable chemicals are not sufficient to prevent particulate matter from becoming airborne
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials
- Application of water or other suitable chemicals on unpaved roads, material stockpiles, and other surfaces that could create airborne dusts
- Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne
- The prompt removal from paved streets of earth or other material that does or may become airborne

Based on ODOT Standard Specification, Section 290, construction contractors must follow certain control measures that include vehicle and equipment idling limitations and measures that minimize vehicle track-out and release of fugitive dust. These measures would be documented in the construction specifications the contractor is required to submit prior to the preconstruction conference. To reduce the impact of construction delays on traffic flow and resultant emissions, road or lane closures would be restricted to non-peak traffic periods when possible.

The Project would also adhere to the Multnomah County Clean Air Construction Guidance.

Particular consideration would be given to reducing potential impacts from construction dust and emissions to the residents and occupants of older buildings (such as the Portland Rescue Mission and Central City Concern) located immediately adjacent and very close to the construction zone. Compared to newer buildings, residents of older buildings that do not currently have air conditioning and rely on opening windows to cool interior temperatures, could be exposed to more construction-related dust and emissions, and could benefit from measures to reduce those impacts, especially when bridge demolition activities are occurring in that location. The potential for impacts as well as mitigation options would be evaluated and coordinated with those facilities as the Project progresses.

3.20 Hazardous Materials

This section identifies and evaluates potential hazardous materials impacts within the project area. More detail can be found in the *EQRB Hazardous Materials Technical Report* (Multnomah County 2021m).

3.20.1 Affected Environment

The API established for the hazardous materials analysis includes an approximately 0.25-mile buffer around the project area (see Figure 3.20-1). Potential hazardous materials sites were identified through a search of federal and state regulatory database records, historical land use information from available and relevant fire insurance maps (Sanborn maps), aerial photographs, available chain-of-title reports, records of historical land use decisions, and a site reconnaissance.

The API is located within the area designated as the Downtown Reach of the Willamette River at approximately river mile 12.2. This area has been heavily developed and modified during the past 150 years. Various industrial activities have occurred on the banks of the river, including shipbuilding and ship-breaking, heavy manufacturing, pesticide formulating, manufactured gas production, power generation and distribution, and lumber processing. As a result of these activities, contaminants may have reached the river and settled into the riverbed sediment. Pathways for contamination to reach the river include riverbank erosion, surface runoff, stormwater discharges, wastewater discharges, on-water activities, spills, and groundwater discharges.

The Downtown Reach is located immediately upriver (south) of the area designated as the Portland Harbor Superfund Site (ECSI Site ID 2068) (see Figure 3.20-1), which is listed as a Superfund site primarily for sediments contaminated with petroleum products, polychlorinated biphenyls (PCBs), and pesticides, along with a number of other chemicals and compounds. Extensive investigation and cleanup actions have been conducted and are ongoing for the Portland Harbor Superfund Site.

While the project area is located outside and upgradient of the Portland Harbor Superfund Site, information obtained from the Oregon Department of Environmental Quality (DEQ) indicates that sediment contamination within the Downtown Reach is likely present (and has been confirmed in many areas). Although specific sediment data within the API are limited, DEQ and the US Environmental Protection Agency (EPA) have concluded that concentrations of contaminants in the Downtown Reach are substantially lower than those found in sediments within the Portland Harbor Superfund Site. DEQ expects that concentrations of contaminants in surface sediments in the Downtown Reach will decline over time as the in-water sources are addressed, upland sources are controlled, and natural recovery mechanisms take effect. Additional information and analysis associated with scouring and modifying river sediment dynamics through project construction can be found in Section 3.15, Floodplain and River Hydraulics.

Multiple potential hazardous sites were identified adjacent to and within the API. These sites were evaluated for the highest potential to be encountered by the Project and ranked based on the proximity to the project area, the type and number of databases in which the site was found, known releases of hazardous materials or petroleum products, and the status of cleanup at sites with known releases. Nine priority sites were identified within the API and are shown in Figure 3.20-1 and further described in Table 3.20-1.

Figure 3.20-1. Hazardous Materials API and Priority Hazardous Material Sites

Table 3.20-1. Priority Hazardous Materials Sites within the API

Site Name	Address	Parcel Number	Potential Contaminants
Portland Gas Works (East Portland Gas Works, East Side Gas Works)	110 SE 2nd Ave, 5 SE Martin Luther King, Jr. Blvd	1N1E34DD-01400 and 1N1E34DD-00400	Petroleum hydrocarbons, PAHs, BTEX, trimethylbenzenes, metals, cyanide, PCBs
Gas Holder Tank Site (Former)	5 SE Martin Luther King, Jr. Blvd	1N1E34DD-00400	Petroleum hydrocarbons, PAHs, BTEX, trimethylbenzenes, metals, cyanide, PCBs
Towne Storage Property LLC (Pacific Iron Works)	17 SE 3rd Ave	1N1E34DD-00800	Petroleum hydrocarbons
North Waterfront Park	100–500 NW Front Ave	Not Applicable	Petroleum hydrocarbons, PAHs, BTEX,
PDC Block 8L Downtown Waterfront	60 NW Davis St	1N1E34DB-00200	Petroleum hydrocarbons, PAHs, metals,
Old Town Parking/Helistop Structure	33 NW Davis St	1N1E34DB-00100	Petroleum hydrocarbons, PAHs, metals
Block 15 – Former Portland Gas Manufacturing Site	121 NW Everett St	1N1E34CA-04400	PAHs
Portland Gas Manufacturing Site	Bounded by NW Everett, Glisan, 2nd Ave, and the Willamette River	Multiple	PAHs, VOC, petroleum hydrocarbons, metals
Portland Harbor Superfund Site	Willamette River	Not Applicable	TPH, PAHs, PCBs, pesticides, metals

Notes: BTEX = benzene, toluene, ethylbenzene, and xylene; PAHs = polycyclic aromatic hydrocarbons; PCBs = polychlorinated biphenyls; VOC = volatile organic compound.

3.20.2 Impacts from Bridge Alternatives

No-Build Alternative Impacts

Hazardous materials contamination in the soil, sediment, and/or groundwater throughout the project area would not be disturbed for construction of a bridge under the No-Build Alternative. The existing contamination would remain in place except where active cleanup operations are underway. Future bridge maintenance could be negatively affected by the No-Build Alternative given that existing contamination would likely remain, including the potential need to clean up any contaminated materials encountered.

Operation of the existing roadway under the No-Build Alternative could result in the release of hazardous substances or petroleum products into the environment from accidental spills. These releases could migrate to surface water, soil, or groundwater and could affect properties outside of the right-of-way.

Post CSZ earthquake, direct impacts associated with the failed structure could occur. This could include adverse impacts associated with materials containing lead-based paint, asbestos, or other hazardous substances from the existing bridge, roadway, and associated structures entering the river and shoreline areas. In addition, there is potential that spills associated with vehicles on the roadway during the CSZ event could adversely impact surface water, soil, or groundwater. Materials released from structures and/or

vehicles would need to be cleaned up accordingly, and they could have significant impact on cost, timing, and available resources.

Impacts Common to All Build Alternatives

Direct – All the build alternatives except for the Couch Extension Alternative would have six full and two partial acquisitions (see Section 3.3, Acquisitions and Relocations); the Couch Extension would have eight full and four partial acquisitions. None of the build alternatives would acquire any of the priority hazardous materials sites shown in Table 3.20-1. However, three hazardous materials sites (Towne Storage, Portland Gas Works, and Gas Holder Tank Site) are located near temporary construction easements and could be impacted by ground improvements. Subsequent cleanup and remediation, if necessary, would be an environmental benefit of the proposed action.

Operation of the build alternatives above ground and associated roadway elements are not anticipated to affect existing hazardous materials in the soil and/or groundwater, but the presence of new facilities installed underground, such as utilities, could have impacts on future cleanup efforts by physically impeding the cleanup of soil or groundwater.

Potential adverse impacts due to existing sediment contamination could occur with in-water and near-shore work related to construction for piers and bridge footings (note that under all replacement alternatives, the bascule lift variation would have a larger temporary and permanent footprint in sediments compared to the vertical lift variation). This could negatively impact surface water conditions through the release of contaminated sediment in the work area, and downriver sediment quality could also be impacted through re-deposition (although both of these are considered short-term or construction impacts). Long-term impacts from sediments could occur through releases of contaminants due to scouring and changes in river dynamics associated with the reconstructed piers (see Section 3.15, Floodplain and River Hydraulics, and Section 3.14, Water Quality).

Indirect – The operation of any of the build alternatives could result in the release of hazardous substances or petroleum products into the environment from accidental spills, similar to the No-Build Alternative. The build alternatives are not expected to substantially change traffic operations compared to the No-Build Alternative, thus the impacts from accidents and spills are not expected to be substantively different.

Temporary – All the build alternatives could have hazardous materials impacts due to construction activities including excavation, utility line trenching on the approaches, reconstruction or installation of new stormwater infrastructure, reconstruction of piers for bridge and foundations, and demolition. It is anticipated that undocumented contamination from historical land uses exists within the project area. Encountering contaminated soils, groundwater, and sediments during construction could potentially lead to migration of contaminants, as well as lead to potential exposure of construction workers and the traveling public to contaminated soils, water, and vapors. The use of detour routes during construction could lead to an increase in spills from vehicle traffic and accidents along those routes.

Post CSZ Earthquake – Comparing the build alternatives to the No-Build Alternative, a retrofitted or new structure would minimize the release of hazardous materials that would be associated with a failed bridge structure as well as reduce potential vehicle accidents, leaks, and spills during an earthquake event.

Enhanced Seismic Retrofit Alternative Impacts

The Retrofit Alternative would have the smallest amount of new permanent structures within near-shore and in-water sediment of any of the build alternatives (see Section 3.17, Wetlands and Waters) and would likely have the least potential for impacts associated with encountering hazardous materials in the subsurface during construction. Additionally, it would retain a significant amount of the existing bridge structure and

would therefore produce less potentially hazardous and non-hazardous waste compared to the other build alternatives.

Replacement Alternative with Short-Span Approach Impacts

The Short-span Alternative has a footprint similar to that of the Retrofit Alternative and has similar long-term effects. However, ground improvements and work (demolition and construction) within near-shore and river sediments would be required over a larger area for the Short-span Alternative. Therefore, impacts associated with encountering hazardous materials in the subsurface during construction are anticipated to be higher for this alternative than for the Retrofit Alternative.

Replacement Alternative with Long-Span Approach Impacts

The Long-span Alternative is anticipated to have less need for ground improvements than any of the build alternatives and would, therefore, have less potential for encountering hazardous materials during ground improvements than any of the build alternatives. With its use of clear-spans, it would have fewer construction-related impacts to near-shore and in-water sediments of any of the replacement alternatives. Compared to the Short-span Alternative lift variations, the Long-span Alternative lift variations would have smaller temporary construction footprints in the water, resulting in less potential for hazardous materials impacts. The Long-span Alternative lift variations would have similar permanent in-water footprints and are, therefore, anticipated to have similar long-term effects.

Replacement Alternative with Couch Extension Impacts

The Couch Extension Alternative would require more ground improvements than any of the other build alternatives and, therefore, has a higher potential for encountering hazardous materials during ground improvements. It would require more additional property acquisition, which could result in a higher level of property acquisition liability. It would have temporary and permanent in-water impacts that are similar to those of the Short-span Alternative.

Impacts from Potential Off-Site Staging Areas

Based on the four potential sites identified, the types of hazardous materials impacts that could occur from off-site staging could be similar to the short-term construction-related impacts. This is primarily related to the use, storage, handling, and transportation of hazardous materials. Hazardous substances or petroleum products have the potential to be released into the environment during both staging and construction activities. This includes potential releases along roadways via vehicle accidents or into the river from barge accidents while equipment and materials are transported from the staging area to the construction site. Construction equipment would be in use at the staging areas and could release petroleum products via improper transfer of fuel or from spills. Other pollutants such as paints, solvents, raw concrete, paving, and concrete-curing compounds could be present at staging areas and could enter the environment if not managed correctly.

3.20.3 Impacts from Construction Traffic Management Options

Without a Temporary Bridge

Without a temporary bridge, no additional hazardous materials impacts beyond those described above are anticipated.

With a Temporary Bridge

Use of a temporary detour bridge during construction would lead to additional potential impacts associated with hazardous materials. The primary difference in potential construction impacts is associated with in-water work activities and sediment contamination. A higher amount of in-water work activities would be required for the placement and construction of the temporary bridge and associated cofferdams. In-water and near-shoreline work activities could negatively impact surface water conditions and downriver sediment through re-deposition. Additionally, a temporary bridge that includes vehicular or transit traffic would add the potential for vehicular accidents, spills, and leaks within the API. The nature of the impacts would not differ between the build alternatives, but the extent of impacts among the build alternatives would depend upon how long a temporary bridge is needed (which depends on how long construction would last), with longer construction durations being associated with more potential for hazardous materials impacts.

3.20.4 Mitigation

Project construction would require completion of activities associated with the Sediment Evaluation Framework process led by the US Army Corps of Engineers and the EPA. The process includes developing a sampling and analysis plan, conducting pre-construction sediment sampling, obtaining permits, and a number of other activities.

Property Acquisition Mitigation Measures

Environmental due diligence, which is recommended for all properties to be acquired and/or for properties that have significant associated construction activities, can take many forms, typically including the completion of Phase I and/or Phase II Environmental Site Assessments. The focus of environmental due diligence is to determine the potential for environmental liability (existing contamination, current operational practices, construction worker health and safety, etc.) associated with a particular property and then planning and designing measures to mitigate the properties prior to construction.

Mitigation Measures for Hazardous Materials During Construction

Plans, programs, and procedures would be prepared and implemented for construction activities occurring in areas with potential for hazardous materials–related conditions, with the goals of preventing contamination from entering the environment and complying with city, state, and federal requirements. The types of plans and procedures include a hazardous building materials survey and abatement program, a health and safety plan, a contaminated media management plan, a spill plan, a construction stormwater and erosion control plan, and the use of best management practices to prevent pollution, control stormwater flows, and protect the Willamette River during construction.

3.21 Cumulative Effects

This section summarizes the key findings of the cumulative impacts analyses that are documented in the environmental technical reports. The description of past, present and future actions that are relevant to the EQRB cumulative impacts analysis can be found in the *EQRB Climate Change Technical Report* (Multnomah County 2021f).

For the built environment, the past timeline that is most relevant to cumulative effects runs from the early 1900s (prior to the opening of the current Burnside Bridge) to the present day. For the natural environment, analysis looks at broad changes beginning in the 1800s to capture a longer history of the effects of development on natural resources in the area. Although Native Americans occupied or traveled through the project area for thousands of years, those activities had relatively little effect on current environmental conditions. In the 1800s European-American settlement began, and the Portland area population began to increase dramatically.

The summary below differentiates long-term cumulative impacts from short-term cumulative impacts that result from overlapping construction projects. Where relevant to the cumulative impacts discussed below, post-CSZ earthquake impacts are also noted, as they are a form of cumulative impact (the impacts of the future CSZ earthquake combined with the impacts of the EQRB Project alternatives); otherwise the post-CSZ earthquake impacts are described in the previous sections of Chapter 3.

3.21.1 Transportation

For an evaluation of long-term cumulative traffic impacts, please see the analysis in Section 3.1, Transportation. The analysis is based on the regional travel demand model which evaluates the project impacts together with the impacts from all planned and programmed future transportation improvements as well as population and employment growth.

Regarding active transportation, the Project (especially the replacement alternatives), with upgraded bicycle and pedestrian paths on the bridge and conversion of some parking lanes into wider bicycle lanes, would connect to the City's growing bicycle-pedestrian infrastructure. This expansion of Portland's network of modern bicycle and pedestrian infrastructure is likely to contribute to further growth in use and increased mode shares for bicycles and pedestrians.

Section 3.1 also addresses short-term cumulative transportation impacts that could occur due to overlapping timing of construction of the EQRB Project and the I-5 Rose Quarter Project. Construction activities of the two projects could have temporary impacts on some of the same transportation facilities. The analysis of construction phase impacts identified that these cumulative impacts could increase some auto travel times, and would temporarily increase pedestrian and bicycle exposure to higher vehicle volumes on streets and at crossings. The analysis also suggests potential mitigation measures for these impacts.

3.21.2 Navigation

None of the build alternatives would have long-term impacts on river navigation. Bridge construction activities, however, would require temporary restrictions as discussed in the EQRB Navigation Study and the EQRB Constructability Report. The EQRB Navigation Study surveyed past and current river users, and investigated future river use and actions including boat use, dredging, and City of Portland plans and policies that could influence navigation. Projects listed in the City's adopted *River Plan* (City of Portland n.d.) address a broad range of topics including industry, neighborhoods, recreation, and natural resources. The projects planned to address the five central themes of the City's *River Renaissance Vision* (City of Portland 2001). Some of those proposed projects would specifically affect Willamette River traffic, flow, or footprint. While the projects are not guaranteed to occur, they should be monitored during their development, potential

construction, and execution because they may affect the vessels that call on the Burnside Bridge and could affect horizontal clearance requirements on some parts of the river.

All of the EQRB build alternatives would meet the most recent horizontal and vertical clearance requirements that the US Coast Guard (USCG) provided to the Project in 2020. It is assumed that other future actions would also be subject to USCG Guide Clearances for the navigable portion of the Willamette River. The EQRB build alternatives are not expected to contribute to any short-term or long-term significant adverse cumulative navigation impacts.

3.21.3 Land Use and Right of Way

The general land use trend around the east end of the bridge has seen a gradual replacement of older, often light to medium industrial uses by new residential and commercial uses. The build alternatives, which would displace three existing transportation-oriented business uses near the east approach, could contribute to this trend. After bridge construction is complete, any redevelopment of remnant parcels would be subject to City of Portland land use and development requirements.

The west end of the bridge is surrounded by two historic districts and Governor Tom McCall Waterfront Park. Historic property protections, park protections, and other factors have restricted most of the land use changes in this area to reuse of existing historic buildings rather than redevelopment. Permanent displacements from the build alternatives would be very minor on the west end. The potential for cumulative adverse land use or displacement impacts would be very small.

While EQRB construction impacts could overlap in time and geography with I-5 Rose Quarter construction, the combination of the actions would not be expected to result in any additional displacements nor in any significant, short-term cumulative land use impacts. The combined transportation impacts would be of very short duration and the temporary physical impacts of each project would be geographically separated.

3.21.4 Economics

The EQRB project is not expected to have a long-term adverse effect on economic conditions. However, post-earthquake, the build alternatives, by providing a seismically resilient crossing, would have substantial beneficial economic impacts by supporting more efficient and faster recovery. Post-earthquake, the No-Build Alternative would have adverse economic impacts that would combine with the adverse impacts of other seismically susceptible infrastructure, as described in Section 3.5.

The potential for short-term cumulative impacts, due to simultaneous impacts from the EQRB Project together with road closures associated with the I-5 Rose Quarter Project, are described in Section 3.5. Coordination among the overlapping construction projects would help to minimize the potential for cumulative, adverse short-term impacts to businesses, freight, and commuters.

3.21.5 Public Services

The build alternatives would have no long-term adverse impact on public services. However, in a major seismic event, the No-Build Alternative, when combined with the effects on all other downtown Portland crossings of the Willamette River, would contribute to a significant cumulative effect on public safety and emergency services, as discussed in Section 3.6. The build alternatives would serve to at least partially mitigate the post-earthquake impacts on public services.

Section 3.6 also addresses short-term cumulative impacts that could occur due to overlapping timing of construction of the EQRB Project and the I-5 Rose Quarter Project. Construction activities of the two projects could have cumulative temporary impacts on transportation facilities used by emergency service providers and other public services. While the analysis of this cumulative effect indicates that it is not likely

to have a significant impact on public service providers, any overlapping road closures or detours between the projects should be coordinated.

3.21.6 Utilities

Neither the EQRB Project nor any other anticipated future actions are expected to have long-term significant adverse impacts on utilities in the API. Regarding short-term cumulative impacts, none of the other major construction projects, such as the I-5 Rose Quarter Project, are expected to have impacts on the same utility infrastructure that would be temporarily impacted by the EQRB Project. No short-term cumulative adverse impacts to utilities are anticipated.

3.21.7 Social, Neighborhoods and Environmental Justice

The build alternatives are expected to have beneficial long-term impacts to social and neighborhood resources, and not contribute to any long-term, cumulative adverse impacts.

Short-term cumulative effects of overlapping construction projects in the area could reduce the number of person-to-person interactions and increase the temporary impact on community cohesion and quality of life in the affected area. Clients of Portland Rescue Mission and other social service providers would experience challenges from noise and air emissions generated by construction of all of the build alternatives, as well as from closed client access (only with the Retrofit Alternative). Any impacts to Portland Rescue Mission or the other social service providers around the west approach would need to be closely coordinated with the providers so as to minimize the risk that the project impacts on their clientele could contribute to cumulatively significant impacts on their health and wellbeing.

3.21.8 Parks and Recreation

The replacement alternatives would have no long-term adverse effects on park and recreation resources and would not contribute to any significant, long-term cumulative adverse effects. The Retrofit Alternative would displace the existing Burnside Skatepark which would be a significant loss for those who use this facility. At the cumulative scale, however, this appears to be an exception to what has otherwise been a trending growth in the number of skateparks and an expectation that more will be built in the future, according to Portland's *Skatepark System Plan* (City of Portland 2008).

Construction-phase closure of portions of Governor Tom McCall Waterfront Park and the Vera Katz Eastbank Esplanade are longer in duration compared to other recent and foreseeable future projects that could affect these facilities; the Better Naito Project will also cause construction disruption to portions of Waterfront Park, though to a lesser extent than the EQRB alternatives. The Better Naito Project, which would affect access points into Waterfront Park during construction, is expected to begin in 2020 and to be complete before the EQRB Project begins construction. These two projects would extend the cumulative duration of construction activity and noise adjacent to or within the park. To an extent, the changes that will be created by the Better Naito Project would reduce the temporary impacts of the EQRB Project in that the bicycle and pedestrian facilities that would be established by the Better Naito Project could serve as a very effective temporary facility to replace the function of a section of the Waterfront Trail that would be temporarily closed during construction of the EQRB Project.

3.21.9 Cultural Resources

The following summarizes findings from the *EQRB Cultural Resources Technical Report* (Multnomah County 2021h) which provides an in-depth review of past actions on archaeological and historic resources as well as a description of future actions on the resources affected by the Project.

Archaeological Resources

Buried archaeological resources have been affected by past development and could be affected by EQRB project excavation as well as future, unrelated redevelopment projects. Properties with the highest potential for redevelopment include parking lots and “underutilized” parcels. To reduce potential impacts, the EQRB Project is conducting pre-construction archaeological investigations and will develop a rapid assessment technique to address resources encountered during construction.

Historic Resources

The Burnside Bridge is one of 10 Willamette River bridges in the multiple property listing of the Willamette River Highway Bridges of Portland, Oregon. All of the build alternatives would make the bridge ineligible for listing in the National Register of Historic Places, which could diminish the multiple property listing. It is likely that other bridges in the multiple property listing could be either replaced or subject to major alterations/improvements for a number of reasons such as functional obsolescence or seismic retrofit/replacement. As such, there is likely to be a steady diminution in the number of eligible bridges in the multiple property listing, as well as the number of bridges individually eligible for listing in the NRHP.

While the EQRB Project would not remove or alter any of the contributing resources in the historic districts, unrelated future actions could include redevelopment of historic buildings on parcels that are considered economically “underutilized”. New development in the historic districts must address the design guidelines. The City’s historic resource ordinances provide substantial protections for these resources, but there is a process for demolition of historic buildings. New development in the Central Eastside District must meet the design guidelines for that area.

3.21.10 Visual and Aesthetics

The replacement alternatives could install a vertical lift span, and the Long-span could install approach spans with above deck superstructure, that would have a substantially different appearance from the existing bridge. These visual changes would combine with the recent and likely future construction of new, modern design buildings around the east approach which have already transitioned the general look and feel of this part of Portland. This is in contrast with the architecture and character of the area around the west approach which is defined largely by two historic districts and Governor Tom McCall Waterfront Park. The changing visual character of the east end and the less dynamic visual character of the west end would be important considerations in selecting a bridge type and during final design.

Any cumulative visual effects of overlapping construction projects in the area would be very short duration and not significant.

3.21.11 Soils and Geology

Past and present urbanization has affected surface soils and topography within the API. The added adverse effects of the EQRB build alternatives would be small, localized and largely temporary and mitigated. The extent of this work in the API represents a relatively minor change in current soils and geology conditions and would have little or no meaningful impact to existing, long-term geologic, hydrogeologic, or soil conditions. A review of reasonably foreseeable future actions did not identify any significant future changes to soils and geology in the API, with the exception of potential climate change flooding impacts on soil liquefaction (see the Climate Change discussion in Section 3.21.16).

The primary soils and geology concern for the EQRB Project relates to the significant seismic risks posed by the Cascadia Subduction Zone. The next CSZ earthquake is a reasonably foreseeable future action. While the build alternatives would create a seismically resilient crossing intended to withstand and be operable after the next CSZ earthquake, the No-Build Alternative would not. This failure, when added to the expected

failure of all other downtown bridges to be able to serve post-earthquake river crossings, would contribute to a future, significant cumulative impact. Other agencies, such as ODOT, the Port of Portland, the City of Portland, and others, are also planning to seismically upgrade selected elements of their infrastructure over time. While no other near-term seismic upgrades for major transportation infrastructure have been identified within the API, broader coordination among agencies would help realize an integrated approach to creating seismic resiliency in the region and state.

3.21.12 Wetlands, Waters, Hydraulics, Vegetation and Aquatic Resources

As discussed in the *EQRB Wetlands and Waters Technical Report* (Multnomah County 2021dd), *EQRB Hydraulic Impact Analysis Technical Report* (Multnomah County 2021o) and the *EQRB Vegetation, Wildlife, and Aquatic Species Technical Report* (Multnomah County 2021bb), past actions have substantially impacted the natural functions of the Willamette River and adjacent habitats within the project area and broader watershed. These impacts have altered hydrology, filled wetlands, displaced plant and wildlife species, impacted water quality, and reduced the extent and quality of upland and aquatic habitat. During construction, the EQRB Project is expected to marginally increase some of those cumulative adverse impacts through temporary tree and vegetation removal, temporary impacts to water quality, and temporary fill in the river. The Project is also expected to provide net beneficial impacts in the long-term through a net increase in the treatment of stormwater runoff and through compensatory mitigation for habitat impacts.

Unrelated future actions would likely contribute both adverse and beneficial impacts to these resources. For example, infill development will continue in the API and surrounding areas. According to the City of Portland (2018a), "…the area from the Ross Island Bridge to just north of the Burnside Bridge and from the east bank of the river to approximately one-half mile of the riverbank will continue to support light industry while developing into a center for new urban industries that create jobs and provide products and services to the region." Although such development likely would cause a negligible effect on river flow dynamics and water quality, it may lead to increased human activity on, in, and along the river that could diminish habitat quality of the river and riparian area. As noted below in Section 3.21.15,Hazardous Materials, the Portland Harbor Superfund Site located downstream from the bridge is expected to result in remediation of some existing contaminated river sediments which will benefit water and habitat quality. Further, DEQ expects that pollutant concentrations in this part of the river will decline over time as the existing in-water sources of contamination are addressed, upland sources are controlled, and natural recovery mechanisms take effect (DEQ 2019).

After a CSZ earthquake, the No-Build Alternative would result in the bridge collapsing into the river which would contribute to substantial cumulative effects from the earthquake on river hydraulics, geomorphic character, water quality, vegetation, and aquatic species. The build alternatives would avoid such impacts from the bridge but this benefit would be very small in relation to the total impacts from the next CSZ earthquake. With extensive post-earthquake debris removal and habitat restoration, the cumulative earthquake-related impacts to these resources could be temporary.

3.21.13 Noise and Vibration

The EQRB Project would have no long-term vibration impacts. The analysis of potential long-term traffic noise impacts (summarized in Section 3.18) is based on actual noise measurements that incorporate all existing noise sources, and on future traffic noise levels that incorporate projected changes in traffic volumes, the transportation system, and in population and employment. As such, it is an assessment of cumulative impacts. The primary noise source in the area is traffic on I-5, which would have no long-term effects from the EQRB Project. Given that current transportation plans do not include any major capacity improvements for this section of I-5, it is reasonable to assume that I-5 peak traffic noise levels would not increase significantly in the foreseeable future.

Short-term noise and vibration cumulative effects could result from the overlapping construction periods of the EQRB Project and other projects in the area, such as the I-5 Rose Quarter Project. To put the short-term construction cumulative effect in context, if similar phases of construction on both projects, such as paving, were happening at the same time and location, it could result in up to a 6 dB increase in adjacent construction noise. This is highly unlikely to occur because of the logistics associated with roadway closures and other restrictions to movement in the project areas. Nevertheless, potential mitigation strategies are provided in the *EQRB Noise and Vibration Technical Report* (Multnomah County 2021q) to reduce the potential for cumulative short-term effects.

3.21.14 Air Quality

The air quality analysis in Section 3.19 incorporates cumulative impacts. EPA's air quality monitoring data for the region reflect, in part, the accumulated mobile source emissions from past and present actions. The air quality modelling is based on the output of a travel model that incorporates reasonably foreseeable future transportation network changes, land use, population and employment forecasts, and best available assumptions of the future vehicle fleet emission rates. While those forecasts and models do not include assumptions regarding future, non-mobile emission sources, reduction in total regulated air emissions has been the trend in the Portland region and is likely to continue. Since EPA recently designated the region to be in attainment for all of the NAAQS, the potential for significant cumulative adverse impacts is likely low.

The analysis of construction activities identified potential concerns for sensitive populations around the west end of the bridge. No overlapping, temporary emissions sources, such as other construction projects, were identified in that location. The *EQRB Air Quality Technical Report* (Multnomah County 2021c) identifies potential measures to reduce temporary impacts.

3.21.15 Hazardous Materials

The hazardous materials analysis summarized in Section 3.20 includes consideration of how past actions have resulted in present levels of contamination in soils, sediment, and groundwater. While future development and redevelopment activities in the area carry the risk of accidental spills during construction, they also have the potential to result in remediation of existing soil contamination encountered during construction. The analysis also recognizes that the Portland Harbor Superfund Site Remediation located downstream of the project site will result in further cleanup of existing contaminated sediments in the river. It is reasonable to expect that the EQRB and other future projects are likely to result in incremental remediation of existing, contaminated soils and groundwater. No net adverse cumulative impacts from hazardous materials are expected from the operation of EQRB and the other reasonably foreseeable future projects.

3.21.16 Climate Change

Greenhouse gas emissions and climate change are meaningful only in the context of cumulative impacts and therefore are discussed only in the Cumulative Impacts section of the Draft EIS. This climate change discussion notes where there would be substantial differences in greenhouse gas (GHG) emissions from different alternatives because those differences are not discussed elsewhere in the Draft EIS; and because that variation is relevant to the Project's contribution to global GHG emissions, and in turn its potential contribution to climate change. More information is included in the *EQRB Climate Change Technical Report (*Multnomah County 2021f).

The impacts of global climate change on the Portland metropolitan region and the state of Oregon will be seen in sea-level rise, changes in average and peak river levels, changes in precipitation and extreme weather events, and additional runoff and associated flooding, and increases in wildfire risks. While climate is not defined by the presence of these phenomena in a given year, there is evidence suggesting that the

impacts of climate change are already occurring (IPCC 2014). For the EQRB Project, the two most relevant climate change issues are:

- How would the forecasted changes in the Willamette River affect the bridge (impacts of changing flood patterns on navigation clearance and bridge stability)?
- How would the bridge alternatives and options affect GHG emissions that contribute to global climate change?

Resiliency

In a recent assessment of Columbia and Willamette River flood stages, simulated future peak stage and projected sea-level change for the Willamette River at the Morrison Bridge is projected to increase from historical measurements by 5.5 to 6.2 feet from the year 2030 to 2059 (Wherry et al. 2019). With its immediate proximity, these estimations for the Morrison Bridge are assumed to be the same for the Burnside Bridge. The USCG requires that all current water vehicle traffic be safely accommodated with a bridge replacement, which for the Burnside Bridge results in a water crossing span with at least a 147-foot vertical clearance (when raised) and 205 foot-wide horizontal clearance. The simulated increase in future flood stages as a result of climate change impacts would not increase river levels so much that the current bridge or any build alternative bridge would be affected with the exception of the bridge approaches.

Based on a preliminary assessment of how the build alternatives could impact flood elevations (*EQRB Hydraulic Impact Analysis Technical Report* [Multnomah County 2021o]), all of them would increase base flood elevations over existing. To make the future bridge seismically resilient, the foundations and piers need to be larger than the existing ones. The replacement alternatives would have fewer impacts than the Retrofit Alternative because they would have less total in-water structure and less lateral surface area. Combined with climate changing increases in peak flows and a potential future extreme weather event, increases from any of the build alternatives could further increase peak flood levels on the river.

In all build alternatives, the increase of the base flood elevation in conjunction with the future effects of climate change are being considered in design. Detailed hydraulic modelling will be performed as part of the Bridge Type Study so that more precise estimates of impacts on flood levels can inform decisions on the bridge type and design, and in order to assess potential measures to mitigate the flooding impact.

Climate change impacts are also expected to increase the risk that higher flood levels could damage bridge piers, approaches, and other in-river structures. This risk is being accounted for in project design. Bridge approach stability would be improved in the build alternatives as liquefaction of soils and sediments are considered in design and construction of the bridge, making the bridge able to withstand more saturated soils and a higher base flood elevation which can cause soil liquefaction in areas not normally inundated with water.

GHG Emissions and Climate Change

The EQRB build alternatives, especially the replacement alternatives, have the potential to help reduce long-term GHG emissions from motor vehicles by providing wider, more comfortable and safer bicycle and pedestrian facilities on the Burnside river crossing. This will contribute to the City of Portland’s policy and plan goals to encourage bicycle and pedestrian use and decrease automobile use for trips into and out of downtown Portland, and will improve the connectivity of the Burnside Bridge to the city’s growing bicycle and pedestrian transportation network, all of which will help to reduce future transportation-related GHG emissions. None of the build alternatives would increase motor vehicle capacity on the bridge.

Construction of any of the build alternatives would generate GHG emissions through the embedded emissions in construction materials, the emissions from construction equipment and from traffic emissions due to increased congestion resulting from construction-related street closures and detours. While the

No Temporary Bridge Option would detour all traffic, resulting in the highest traffic-related GHG emissions of the build alternative options, the total GHG emissions with this option would actually be lower than with the Temporary Bridge Options. This is because constructing and then deconstructing the temporary bridge would generate additional emissions and because the mining, manufacturing, and transport of materials to build the temporary bridge would generate substantial embedded GHG emissions.

Another consideration is the cumulative effect of the next CSZ earthquake on GHG emissions. While post-earthquake traffic scenarios and GHG emission levels are very difficult to predict because of the uncertainty regarding impacts to the rest of the transportation network and the extent to which vehicles will be trapped by damage and debris, it is likely that a seismically resilient Burnside Bridge would reduce post-earthquake GHG emissions. Immediately after the earthquake, travel is likely to be chaotic due to widespread damage and uncertainty about the roadway network and other transportation infrastructure. After the initial effects, the build alternatives might facilitate more trips being taken because of the availability of a usable river crossing, although the average vehicle trip length might be shorter given that the usable crossing would require less out-of-direction travel. A seismically resilient Burnside Bridge crossing would also allow many people to walk or cycle across the river rather than rely on motor vehicles that would need to travel long distances to access a usable river crossing miles upriver. Having a viable river crossing would also make rescue and recovery much more efficient and potentially reduce the need for evacuation outside of the region, which could reduce emissions (TRB 2016; Chang 2000; Madhusudan & Ganapathy 2011). As debris is cleared and the number of passable roads gradually increases, having a viable river crossing would continue to result in less out-of-direction travel and, thus, lower GHG emissions with the build alternatives.

3.22 The Relationship of Local Short-Term Impacts and Use of Resources and the Maintenance of Long-Term Productivity

The EQRB Project would have a clear trade-off between short-term impacts versus long-term productivity. As described in previous sections of Chapter 3, nearly all of the adverse impacts from the build alternatives would occur only during construction. Building a seismically resilient Burnside Bridge would consume natural resources for building materials and cause temporary traffic congestion, partial park and recreation facility closures, public service impacts, and temporary impacts to air, water, and other natural resources. Once constructed, there would be few long-term adverse impacts that would not be mitigated, and there would be significant long-term benefits to productivity by providing a seismically resilient river crossing.

As discussed in Chapter 1, Purpose and Need, the City of Portland and the broader region are divided by the Willamette River. The existing bridges crossing the river currently carry 45 lanes of traffic for autos, freight, and buses, as well as all five of the region's light rail transit lines and numerous bicycle and pedestrian lanes and sidewalks. The bridges are essential to moving people and goods in the Portland region. However, those bridges and/or their approaches are seismically vulnerable. Geologists warn that given the average rate of occurrence of CSZ earthquakes over the last 10,000 years, we are overdue for the next big event. After the next CSZ earthquake, none of the existing downtown bridges is expected to be usable, and many will be damaged beyond repair. This defines the EQRB Project's primary need and its purpose to create a seismically resilient river crossing in downtown Portland that would be usable immediately after the next major seismic event to serve as a critical lifeline and to aid regional recovery in the weeks, months and possibly years after the event. This would be a significant benefit to the Portland region's long-term productivity.

3.23 Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action

Implementation of the proposed action would involve a commitment of natural, physical, human, and fiscal resources. Most of the land that would be permanently occupied by the proposed bridge has been used for a bridge for over 100 years, and is considered an irreversible commitment for the lifespan of the new bridge. If a greater need arises for use of the land, or if the bridge is no longer needed, the land could be converted to another use. At present, there is no reason to believe such a conversion will be necessary or desirable in the foreseeable future.

Considerable amounts of fossil fuels, other energy sources, labor, and construction materials such as cement, aggregate and steel, would be expended to construct any of the build alternatives. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. They are also not currently in short supply, and their use would not have an adverse effect upon continued availability of these resources. Any construction would also require a substantial one-time expenditure of public funds which are not retrievable.

The commitment of these resources is based on the concept that residents in the immediate area and broader region would benefit from the proposed project. These benefits would consist of providing the only downtown bridge that would survive the next major earthquake, which would mean having a lifeline for evacuation and emergency response, as well as a critical transportation link to support long-term regional recovery. Other benefits include improved safety and capacity for bicyclists and pedestrians; improved safety for motor vehicles, trucks, and buses; ability to accommodate future streetcar service; and replacement of a structure that is in need of increasingly more frequent and intensive maintenance. These benefits are anticipated to outweigh the commitment of these resources.