

3.23 Cumulative Effects

Cumulative effects result from the incremental effect of a proposed action when added to those of other past, present, and reasonably foreseeable future actions, regardless of the agency (federal or nonfederal) or person that undertakes such other actions. Cumulative effects can result from individually minor but collectively substantial actions that take place over a period of time (definition paraphrased from 40 CFR 1508.7).

The cumulative effects timeframes considered in this analysis are as follows:

- “Past” actions vary by component of the environment.
 - Natural environment analysis considers broad changes beginning in the 1800s.
 - Cultural environment analysis begins 15,000 years before present.
 - Built environment analysis starts in the early 1950s, with the construction of I-5. Additional historical context prior to the 1950s is described given the lifespan of the Interstate Bridge.
- “Present” actions are those ongoing in nature, such as maintenance of the existing transportation system.
- “Future” actions are those that will occur between the present (2024) and 2045, the design year of the IBR Program.

This analysis considers past major actions; planned transportation projects; population, employment, and land use forecasts; comprehensive land use plans; and other major public and private projects that are under development or reasonably expected to occur. Because the geographic scale of analysis varies by discipline, the cumulative effects analysis uses the study area identified in each technical report when evaluating cumulative effects on a particular resource.

The information presented in this section is based on the Cumulative Effects Technical Report, which contains greater detail and additional analysis.

3.23.1 Changes or New Information Since 2013

The Columbia River Crossing (CRC) Selected Alternative identified in the 2011 Record of Decision (ROD), as revised by the 2012 and 2013 re-evaluations, is referred to as the CRC Locally Preferred Alternative (CRC LPA). Over the past 10+ years since the CRC LPA was identified, the physical environment in the study area, community priorities, and regulations have changed, which necessitated design revisions and resulted in the IBR Modified LPA (see Section 2.5.2). Evaluation of potential impacts associated with cumulative effects has been updated in this Draft SEIS to include:

- Updates to past, present, and reasonably foreseeable future actions, or projects, in the study areas that have affected or could affect environmental and community resources.
- Changes in land uses such as development at the Vancouver waterfront, planned uses on Hayden Island, and recently constructed, altered, or removed buildings.
- Changes in the project footprint necessitated by changed conditions resulting in shifting the light-rail transit alignment, modifying interchange designs, and adding bridge configuration options.
- Change in transportation modeling and analysis.
- Changes in the direct and indirect effects on specific resources (as documented in each resource section).

Based on the analysis described in sections of Chapter 3, the effects of the Modified LPA would be similar to the CRC LPA. As such, the Modified LPA would have a similar contribution to effects caused by past, present, and reasonably foreseeable future actions and would have cumulative effects similar to those of the CRC LPA.

3.23.2 Past, Present, and Reasonably Foreseeable Future Actions

Past Actions

Past transportation projects, urbanization, housing, and other developments have influenced the social, economic, and natural environment reflected in the existing conditions of the region and study area. Past projects were not always planned and implemented with meaningful public input and communication.

Native Americans have occupied and traveled through the study area for thousands of years. Traces of their past activities are no longer easily identifiable in the study area's current natural and built environment; however, there are numerous cultural resources in the study area associated with these activities. In the 1800s, Euro-American settlement began and expanded with the Hudson Bay Company's post in Vancouver, and the Portland and Vancouver area population began to dramatically increase.

In the 1890s early urbanization in Portland and Vancouver was greatly influenced by the trolley line system, followed by the introduction of the automobile in the early 1900s. Construction of the Interstate Bridge occurred in two stages: the original bridge was built in 1917, followed in 1958 by construction of a parallel bridge and conversion of the 1917 bridge to northbound traffic only. Prior to 1917, unlimited vertical navigation (VNC) clearance at the Interstate Bridge location was available; however, the bridge limited this clearance to 178 feet when the bridge lift was fully opened. At that time, it was not expected that any navigation would have been reduced as larger vessels and cargo shipments began to transit the Columbia River in the 1930s to support building hydroelectric dams and the 1940s to support World War II shipbuilding activities.

Other past actions that influenced the built, social, and natural environment in the study area, include the removal of Indigenous peoples to reservations; authorization and maintenance of the federal navigation system on the lower Columbia River; airplane manufacturing at Pearson Field during World War I and shipyard manufacturing during World War II; urban renewal and large-scale transportation projects such as the construction of I-5; and greater concentration of development in urban centers under growth-management policies in Oregon and Washington.

Recently Completed Transportation Projects

Recent projects in or near the study area that give a sense of current development trends include:

- Port of Vancouver's West Vancouver Freight Access Project (Vancouver, west of I-5).
- Waterfront Renaissance Trail (Vancouver, east of I-5).
- Interstate Bridge northbound trunnion replacement (Vancouver/Portland).
- Interstate Bridge northbound active traffic management (Vancouver).
- Clark County Public Transit Benefit Area Authority (C-TRAN) bus-on-shoulder service (Vancouver, I-5, and Interstate 205 [I-205]).
- New metering on southbound I-5 at the 39th Street/SR 500 off-ramp (Vancouver).
- The C-TRAN The Vine on Mill Plain and Fourth Plain (bus rapid transit) (Vancouver).

Recently Constructed Development

- Multifamily residential buildings along N Marine Drive and N Anchor Way (Portland, east of I-5).
- Vanport wetlands restoration (Portland, west of I-5).
- Jantzen Beach Center redevelopment (outdoor mall) (Portland, Hayden Island, west of I-5).

- Floor and Décor (commercial store) (Portland, Hayden Island, east of I-5).
- Vancouver Waterfront (mixed-use development) (Vancouver, west of I-5).
- Hurley Building condominiums (Vancouver, west of I-5).
- New Seasons (grocery store) (Vancouver, west of I-5).
- West Barracks renovation (commercial properties) (Vancouver, east of I-5).
- Vancouver Community Library (Vancouver, west of I-5).
- Aegis/Providence Academy redevelopment (mixed-use development) (Vancouver, west of I-5).
- Block 10 (mixed-use development) (Vancouver, west of I-5).
- Office buildings at 210 W 4th Street and 1010 E 6th Street (Vancouver, west of I-5).
- Vancouver Center Condos (Vancouver, west of I-5).
- Vancouver Innovation, Technology and Arts Elementary School (Vancouver, east of I-5).

Present Actions

Present actions are those that are ongoing in nature, such as regional population growth and maintenance of the existing transportation system and ongoing transportation safety improvements. These include maintenance of the Interstate Bridge, the City of Vancouver’s Pavement Management program, and the City of Portland’s Fixing Our Streets program.

Reasonably Foreseeable Future Actions

For many resources, anticipated changes in conditions over time are linked to future changes in population, employment, traveler behavior, and transportation system performance, and land use patterns. Regional transportation forecast modeling is built upon the best available projections of 2045 population, employment, and land use changes and includes the transportation improvements that are reasonably expected to occur by 2045. Therefore, the analyses based on regional traffic forecast modeling are already cumulative. This includes the analysis of air quality, climate, energy (fuel and greenhouse gas [GHG] emissions), noise and vibration, and transportation.

The list of reasonably foreseeable future actions included in the cumulative effects analysis has been organized into three categories:

1. Future transportation projects.
2. Other future projects (non-transportation).
3. Future growth and regional changes identified in adopted state, regional, and local plans.

Future Transportation Projects

The list of reasonably foreseeable future transportation projects is based primarily on the transportation modeling conducted for the IBR Program, which is detailed in Appendix A of the Transportation Technical Report.¹ The list includes a variety of projects that are assumed to be built and in operation before 2045.

¹ ODOT’s Regional Mobility Pricing Project was not included in the modeling or cumulative effects analysis as that project was not included in the 2018 RTP. Additionally, all work on the Regional Mobility Pricing Project was halted in March 2024 at the direction of the Oregon governor, and the project is not anticipated to be reinitiated at this time.

Sources for this future transportation project list include the financially constrained project list in the 2018 Regional Transportation Plan (RTP).²

The list of future transportation projects considered for the No-Build Alternative cumulative effects analysis includes the projects noted above but does not include the improvements proposed under the Modified LPA and assumes that the Interstate Bridge would not be tolled. The Modified LPA assumes the same future transportation projects as the No-Build Alternative, with the addition of the Program components, including additional auxiliary lanes on I-5, light-rail transit extension from the Expo Center Station in Portland to Evergreen Boulevard in Vancouver, active transportation improvements, and variable-rate tolling on the Columbia River bridges.

The RTP transit projects and the service levels they include reflect regional growth priorities and policies emphasizing lower reliance on driving and more transit and active transportation to meet future regional mobility needs. The Transportation Technical Report provides further detail on the other transportation projects included in the 2018 RTP, but the primary transit projects in the 2018 RTP to improve regional transit and meet the demands of future growth are listed below.

- Five high-capacity transit projects: Division Transit, Southwest Corridor, Red Line extension, the Central City Capacity Analysis, and Steel Bridge Improvements.
- Nineteen enhanced transit projects and two streetcar extensions, involving capacity, speed and reliability improvements throughout the region.
- Investments in the vehicle fleet, maintenance facility expansions, and technology to improve operations.

Other Reasonably Foreseeable Future Projects

Other reasonably foreseeable future projects considered in the cumulative effects analysis were identified based on proximity to the area where most physical changes associated with the Program would occur (see Figure 2-1 in the Cumulative Effects Technical Report). This list of projects, described below, was confirmed with local and regional partner agencies.

- **Vancouver Waterfront.** This ongoing project is a large-scale mixed-use development led by a public/private collaborative partnership between the City of Vancouver and private development interests. A master plan was approved for the 20-block, 32-acre site, which included new office and residential space in addition to a public park and multiuse trail. While the improvements are largely complete, private properties at the waterfront continue to be developed. No timeline is currently available for when the remaining blocks would be developed, but construction could overlap with construction of the Modified LPA.
- **Terminal 1.** The Port of Vancouver USA is developing a 10-acre property known as Terminal 1, which is located between the Vancouver waterfront (described above) and the existing Interstate Bridge. Terminal 1 would be a mixed-use development with a hotel, office and retail space, outdoor gathering areas, and a public marketplace. Terminal 1 would also complete a missing segment of the Vancouver Waterfront Renaissance Trail, connecting the existing trail at the Vancouver waterfront to the existing Columbia River Renaissance Trail east of Terminal 1. Some elements have been constructed, including an outdoor amphitheater. Construction of other features is underway, with an anticipated completion date of 2027.

² Federal regulations require that an RTP be financially constrained. This means that total transportation expenditure levels identified within the RTP must not exceed the total revenue level reasonably expected to be available for the metropolitan region over the life of the plan; this includes existing revenues and new revenues that may be reasonably anticipated. Transportation modeling typically includes only projects in the fiscally constrained RTP. However, one transportation project, the Fourth Plain Safety and Mobility project, is not listed on the financially constrained list in the RTC's regional transportation plan (RTP) but was incorporated into the modeling at the request of partner agencies.

- **Renaissance Boardwalk.** The Renaissance Boardwalk project is a public-private partnership between Kirkland Development and the City of Vancouver to develop a 2.3-acre plot of land directly to the east of the Interstate Bridge. The development plans include two new buildings and underground parking, with 230 apartments and retail space for 30 tenants. A public walkway along the water's edge would be included in the development and would connect to existing trails. Construction is planned to begin in spring 2024; an anticipated end date has not been published.
- **Waterfront Gateway.** This project, run by the Vancouver City Center Redevelopment Authority, would redevelop a 6.4-acre site in downtown Vancouver near City Hall. The City Center Redevelopment Authority has selected a development team to move forward with efforts to turn the site into a mixed-use destination space that includes office, retail, and residential uses. The City has identified this project as a major opportunity for housing and economic growth, given the site's position between the waterfront and downtown Vancouver. While some project details are available (including a high-level site plan and potential residential units), environmental studies are not currently available for the project. The project is currently in the design phase, with construction projected to begin in early 2025 and end in 2027.
- **Levee System Improvements.** There are two concurrent efforts underway to improve the existing levee system along the Columbia River near the Interstate Bridge: the U.S. Army Corps of Engineers (USACE) and Urban Flood Safety & Water Quality District (UFSWQD) Portland Metro Levee System project and Flood Safe Columbia River. Proposed improvements include raising the elevation of the levees. Anticipated environmental impacts for this project are documented in the Final Integrated Feasibility Report and Environmental Assessment (USACE and CCDD 2021), with a Finding of No Significant Impact signed in April 2022. The IBR Program is coordinating with the agencies involved to ensure the design efforts consider the timing and scope of the proposed modifications to the levees.
- **Restoration and Habitat Projects.** There are several planned restoration projects within and near the Program footprint and along habitat corridors or waterways that pass through the footprint. Restoration activities are planned along Burnt Bridge Creek in Vancouver and the Columbia Slough in Portland (Ecology n.d.; Lee and Stamberger 2018, respectively). These projects are led by various agencies and organizations including the Cities of Vancouver and Portland and the Columbia Slough Watershed Council. Restoration actions are likely to occur as funding becomes available, and no specific timeline is available.
- **Portland Expo Center Redevelopment (Expo Future).** Metro owns the Portland Expo Center, which is a 53-acre employment and exhibition site located west of I-5. Following a development opportunity study, Metro recommended redevelopment of the Expo Center into a sports and cultural complex. While a general future use has been recommended, project details are still to be determined, and therefore many potential effects (and contribution to cumulative effects) cannot be described quantitatively at this time. No schedule or timeline is currently available for this project. The IBR Program will continue to coordinate with Metro as the Expo Center project progresses.
- **Cascade Renewable Transmission Project.** Installation of a new high-voltage transmission cable buried in the bed of the Columbia River through the study area will transfer energy from utility-scale wind, solar, and other renewables to help meet renewable energy demand in Oregon and Washington. The transmission cable will extend from The Dalles to Portland, traveling approximately 100 miles beneath the Columbia River. Some general environmental information is available about the project and the proposed technology; however, no detailed studies are available and it is anticipated this project will require an EIS. No schedule or timeline is currently available for this project. The IBR Program will coordinate with the utilities involved to consider the timing and location of the proposed facility.

Future Growth and Regional Changes Identified in Adopted State, Regional, and Local Plans

Adopted state, regional, and local plans include visions of growth or change in the region over the next 20 years. These visions are reflected in this analysis, as the plans' assumptions regarding growth were inputs into the regional modeling conducted for air quality (including GHG emissions), energy, noise and vibration, and transportation. Details on how projected changes in population, land use, employment, and other factors are reflected in the regional modeling are provided in Appendix A of the Transportation Technical Report.

3.23.3 Cumulative Effects

Please see the resource technical reports for additional information on anticipated Modified LPA effects on a particular resource (e.g., air quality, wetlands). Although there are some differences in direct and indirect impacts and benefits associated with the various design options, these differences generally do not change the conclusions regarding the Program's contribution to cumulative effects for each resource.

Transportation

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Past and present actions affecting transportation in the study area (and region) include population growth and accompanying development, which subsequently led to an increase in single-occupancy and freight vehicles on roads, and the expansion of public transit and active transportation networks. Past actions that have supported the growth and reliance on single-occupancy vehicles include the construction of I-5 and the Interstate Bridge. Past public transportation improvements in the area include expansion and increase in service of the Tri-County Metropolitan Transportation District of Oregon (TriMet) bus and light-rail system (including the extension of light-rail to the Expo Center in 2004), as well as the C-TRAN bus service (including the recent introduction of bus rapid transit along Fourth Plain Boulevard and Mill Plain Boulevard in 2017 and 2023).

Many of the reasonably foreseeable future actions, primarily those identified in the 2018 RTP, are transportation projects that address the anticipated needs of the community for travel by vehicles, freight, public transit, and active transportation. The non-transportation future actions reflect the ongoing growth and development in the region that will rely on the existing and planned transportation networks, including new commercial and residential units at Waterfront Gateway, Renaissance Boardwalk, and Terminal 1.

Primary transportation trends in the study area include the growing number of vehicles on the roads (with increasing congestion and crash rates) and a growing demand for more public transit and active transportation options.

No-Build Alternative

Under the No-Build Alternative, congestion would continue to increase and the active transportation and transit improvements proposed under the Modified LPA would not be constructed. Congestion at the bridge would continue to be caused by overall high traffic volumes, the structure's limited capacity, limited sight distance, substandard shoulders, short merge and diverge locations north and south of the bridge, high-volume on- and off-ramp flows north of the river, and high truck volumes.

Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on transportation (identified above) would continue under the No-Build Alternative. Future growth and development would continue to increase transportation demand. Although other transit projects may be implemented in the region, their benefits would be reduced if the Modified LPA is not included as anticipated in adopted regional plans. Active transportation systems would be expanded but not between Portland and Vancouver. Tolling of I-205 (Abernethy Bridge), which is currently on hold, but if advanced in Oregon would

likely contribute to the beneficial cumulative effects of several future projects that would reduce regional congestion and increase the use of public transit and active transportation.

Modified LPA

The Modified LPA would reduce freight and vehicle congestion, improve safety, and improve the connectivity, capacity and reliability of active transportation and transit networks. Future travel demand would be more efficiently served by the multimodal transportation improvements included in the Modified LPA as well as other improvements in the region, consistent with adopted regional transportation plans. The region's goals for higher levels of transit and active transportation use would be better supported by the completed transit and trail connections between Portland and Vancouver, in combination with other regional projects. The key drivers of transportation demand—other future population growth and accompanying developments—will continue to affect conditions for all transportation modes and facilities in the study area and region.

Cumulative Effects Conclusion – Transportation

Past actions affecting transportation in the study area include the construction of I-5 and the Interstate Bridge, construction of state and local transportation networks, implementation of public transit service, and the establishment of local transit agencies (TriMet, C-TRAN) and regional metropolitan planning organizations (Metro, RTC). These actions, taken in response to rapid regional growth, have had a cumulative effect of providing additional transportation capacity, safety improvements, transportation demand management and transportation systems management enhancements on highways, public transit systems, and active transportation networks. Some areas continue to experience congestion where the demand for transportation exceeds capacity, and safety challenges are still present. Recent projects, such as development in downtown Vancouver, along with population growth have continued the trend of more vehicles on the road and exacerbated congestion, while other projects, such as The Vine, have improved access to alternative transportation options. Planned reasonably foreseeable future actions included in the 2018 RTP will contribute to managing congestion, improving safety, and expanding the transit and active transportation networks; however, under the No-Build Alternative (including the effects of past, present, and future actions), congestion would continue to grow and safety would continue to worsen. As compared to the No-Build Alternative with past, present, and reasonably foreseeable future actions, the cumulative effect of the Modified LPA (including the effects of past, present, and reasonably foreseeable future actions) would be an improvement to congestion and safety (see Table 3.1-10 and 3.1-12).

When combined with past, present, and reasonably foreseeable future actions, the No-Build Alternative would have adverse cumulative effects because of growing congestion and crashes. The cumulative effects on transportation from the Modified LPA combined with past, present, and reasonably foreseeable future actions, when compared to the No-Build Alternative, would be beneficial with fewer vehicle hours of delay and lower crash frequency on I-5.

Navigation

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Past actions affecting river navigation include authorization and construction of the Columbia River federal navigation channel, construction of upstream dams and navigation locks, construction of the existing Interstate Bridge and North Portland Harbor bridge, and other bridges constructed downriver and upriver of the study area, such as the BNSF Railway Bridge (which has 79 feet of vertical clearance when in the closed position and unlimited vertical clearance when in the open position) and the I-205 Glenn L. Jackson Memorial Bridge (which has a fixed vertical clearance of 136 feet). The location of the existing navigation channels in the river requires vessels to make an S-curve maneuver between the Interstate Bridge and the BNSF Railway Bridge opening when transiting the barge or alternate barge channels.

The federal navigation channel at and upstream of the Interstate Bridge was established as a deep-draft (27 feet) channel to accommodate ocean-going ships upstream to The Dalles. This shipping traffic never materialized, and the USACE currently maintains the channel to a depth of 17 feet, reflecting current river traffic. If the USACE were to deepen the channel from Vancouver to The Dalles to 27 feet as authorized, it would allow deeper-draft vessels to traverse the study area, which could contribute to a change in waterway use. Few properties exist within this reach of the river (BNSF Railway Bridge in Vancouver to Celilo Falls BNSF bridge) that have current commercial/industrial facilities using waterborne shipping or the potential for future such facilities. The primary factors affecting commercial/industrial development along the Columbia River are political and geographic constraints, including the Columbia River Gorge National Scenic Area, transportation routes paralleling the river, steep topography, and existing recreational and open space uses. Industrial uses generating marine vessel traffic are typically located within industrial parks in urban areas.

Several ongoing and planned navigation maintenance projects downriver and upriver of the Interstate Bridge could contribute to long-term beneficial cumulative effects on navigation in the study area. The USACE maintains the federal navigation channels to the authorized and/or maintained depths by conducting maintenance dredging on a yearly basis for the federal navigation channel along the Columbia River. The USACE is developing an updated Channel Maintenance Plan with lower Columbia River ports to ensure that the federal navigation channel downstream is maintained and operational for another 20 years. Dredging is also conducted by ports and private entities in the area to maintain adequate waterway depth at marinas and marine terminals.

No reasonably foreseeable future actions were identified that would contribute to a long-term adverse cumulative effect by restricting reasonable navigation. Upriver navigation and marine commerce development would continue to be restricted by existing political and geographic constraints, such as the National Scenic Area and the navigation clearance under the I-205 bridge and other upriver governing structures (e.g., bridges, utility lines).

Temporary cumulative effects on navigation would occur during construction of other reasonably foreseeable future actions, as addressed in Section 3.23.4.

No-Build Alternative

Columbia River navigation conditions would not be changed by the No-Build Alternative; navigation would continue to be affected by the existing piers and bridge opening restrictions. Under the No-Build Alternative, the primary navigation channel under the Interstate Bridge would remain in its current position, which generally lines up with the opening in the BNSF Railway Bridge. The alternate channels under the Interstate Bridge are located toward the center and south bank of the river, thus requiring vessels to make an S-curve maneuver between the Interstate Bridge and the BNSF Railway Bridge opening.

Routine maintenance dredging performed by the USACE's dredge *Yaquina* would continue to maintain the federal navigation channel to an adequate depth to support current navigation needs. Without seismic upgrades to the Interstate Bridge, a major earthquake could collapse or seriously damage one or both bridges, temporarily restricting or preventing navigation.

Modified LPA

Under the Modified LPA (including all bridge configurations), river navigation safety in the main channel of the Columbia River would be improved by (1) reducing the need for an "S" curve maneuver (to align with the BNSF Railway Bridge opening) for many vessels that currently use the barge and alternate barge channels and could use the northern channel under the Modified LPA, which would provide a straighter route between the two bridges, (2) increasing horizontal navigation clearance by reducing the number of piers, and (3) improving

seismic resiliency.³ In addition to the main channel, the Modified LPA would improve navigation safety on North Portland Harbor through improved seismic resiliency and wider pier spacing, which would allow more room for smaller vessels to pass under the new bridges.

There would be some differences in impacts to navigation from a fixed-span configuration (either double-deck or single-level) compared to a single-level movable-span configuration, specifically associated with the VNC. The movable-span configuration would provide a VNC of 178 feet in the open position for a vertical lift span bridge and be consistent with the U.S. Coast Guard's Preliminary Navigation Clearance Determination (issued in May 2022). The two fixed-span configurations would provide 116 feet VNC, which would prohibit some existing vessels from transiting unless modifications or other accommodations were made to those vessels or cargo. A fixed-span configuration would permanently prevent vessels with VNC requirements of greater than 116 feet (and unable to modify the vessel) to transit under the bridge for its 100+ year service life.

Under a movable-span configuration, vessels requiring a bridge opening would be restricted to specified time periods to transit the new Columbia River bridges; timing restrictions would be updated and formalized during a federal rulemaking process. Under the single-level or double-deck fixed-span configuration, all vessels would pass under the bridges without timing restrictions.

Dredging activities performed by the USACE's dredge *Yaquina* would not be affected by the Modified LPA; however, during construction of the Modified LPA, there would be occasions when the dredge *Yaquina* would not be able to transit the bridge unless the dredge was modified, or alternate measures of dredging would be implemented.

Cumulative Effects Conclusion – Navigation

Past actions have both improved and limited navigation conditions in the study area. The establishment of federal navigation channels and associated dredging improved navigation and allowed for deeper draft vessels to transit the Columbia River from the Pacific Ocean to the BNSF Railway bridge in Vancouver, while the construction of bridges, dams, and overhead utilities across the river, as well as land use restrictions, have limited navigation along the full length of the Columbia River. Past, present, and reasonably foreseeable future actions along with the No-Build Alternative would retain the existing Interstate Bridge with nine in-water pier sets and narrow horizontal navigation clearances. Vessels that do not require a bridge opening, including most tugboats with barges, would continue to use the barge and alternate barge channels requiring S-curve maneuvers, which can be hazardous to navigation in inclement weather and high-water conditions, to align with the nearby BNSF Railway bridge. Ongoing and planned maintenance of the navigation channels by USACE and others would continue under the No-Build Alternative.

Along with maintenance of the navigation channels, the Modified LPA would improve navigation by providing a straighter route for many vessels to transit through the new Columbia River bridges and the BNSF Railway Bridge via the relocated barge channel (north) and a reduction in the number of in-water piers, as well as improved seismic resiliency. Vessels using the primary navigation channel (center) and alternate barge channel (south) would need to make an S-curve maneuver; however, the wider horizontal navigation clearance would enable vessels to begin this maneuver earlier in downbound transits and providing greater distance before needing to transit the BNSF Railway Bridge resulting in improved navigation safety. Under the Modified LPA with a fixed-span configuration, navigation for some vessels would be prohibited.

It is difficult to predict Maritime Transportation System demands and associated need for bridge openings for the 100+ year service life of the bridge since vessel traffic and river-level conditions vary from year to year and

³ All vessels that can transit with 100-feet of vertical clearance (for fixed-span configurations) or 89-feet of vertical clearance (for movable-span configuration) could use the relocated north barge channel, which would provide the straightest route between the new Columbia River Bridges and the BNSF Railway Bridge. Only those vessels or cargo requiring a higher vertical clearance would need to use the relocated primary navigation channel and make an "S" curve maneuver.

economic trends for maritime commerce may change over time. If a fixed-span configuration is selected, the Modified LPA would contribute to a cumulative adverse effect on navigation by further limiting navigation upstream on the Columbia River, which has been limited by past and present actions, such as construction of roads and rail lines, creation of the National Scenic Area, and construction of bridges with less than 178 feet of vertical clearance.

Under the No-Build Alternative, the cumulative effects on navigation from past, present, and reasonably foreseeable future actions would remain unchanged. Compared to the No-Build Alternative, the cumulative effects on navigation from the Modified LPA with a double-deck or single-level fixed-span configuration would be adverse for some vessels or fabricators shipping large cargo due to the reduction in VNC. Cumulative effects on navigation from the Modified LPA with a single-level movable span would retain the existing VNC so all vessels and cargo that currently transit the bridge would continue. Beneficial cumulative effects on navigation from the Modified LPA, under all bridge configurations, would occur as a result of increased horizontal navigation clearance and increased use of the northern channel for many vessels, thereby, improving navigation safety as vessels transit through both the new Columbia River Bridges and the BNSF Railway Bridge.

Property Acquisitions and Displacements

Effects from Past, Present, and Reasonably Foreseeable Future Actions

The original construction of I-5 during the late 1950s and early 1960s required substantial property acquisitions and displacements in the study area. According to historic aerial photos, the floating home moorages were developed following the original construction of I-5, and therefore no floating homes were displaced by I-5. Most of the area (approximately 84%) that would be directly affected by the Modified LPA is already public right of way from previous transportation projects or other infrastructure projects.

No known reasonably foreseeable future projects would require displacements on the Hayden Island floating home community along North Portland Harbor. Existing state and federal regulations have made it difficult to permit new moorages for floating homes, making it unlikely that new slips would be available in the future. In addition to the existing floating home sites along North Portland Harbor, there are slips along the Multnomah Channel in northwest Portland, St. Helens, and Scappoose and in Washington near Caterpillar Island on the Columbia River. In June 2023, 76 floating homes were available for purchase in the Portland metro area, with 30 located on owned slips (versus rented from the moorage) (Portland Floating Homes 2023). A review of publicly available information did not identify any information suggesting that moorages have been declining.

Most of the reasonably foreseeable future projects would not result in the displacement of existing residential or commercial properties, although one (Renaissance Boardwalk) may require one business displacement. Based on recent and proposed developments in Vancouver, ongoing infill development may displace additional businesses (see the Land Use Technical Report for additional details).

While redevelopment of the Expo Center would change the underlying use of the site to a sports and cultural complex, the property would remain under the control of Oregon Metro and does not constitute a displacement.

No-Build Alternative

Under the No-Build Alternative, no Program-related acquisitions would occur. Other reasonably foreseeable future actions in the study area would continue under the No-Build Alternative; however, most reasonably foreseeable future actions are not currently anticipated to result in acquisitions or displacements.

Modified LPA

In Oregon, most of the acquisitions and displacements resulting from the Modified LPA would be commercial properties and floating homes on Hayden Island. As noted above, current regulations and a lack of other moorage spaces limits opportunities for relocating displaced floating homes.

In Washington, most acquisitions and displacements would be commercial properties and multifamily dwellings in downtown Vancouver. Some single-family residences would be acquired and displaced along I Street in Vancouver's Shumway neighborhood. The Modified LPA would displace up to 13 businesses in downtown Vancouver.

Cumulative Effects Conclusion – Property Acquisitions and Displacements

Past actions, including the construction of I-5 and other major roadways, have required substantial acquisitions and displacements in the study area. Most of the present and reasonably foreseeable future actions are not anticipated to acquire or displace businesses or residences (with the exception of one potential business displacement). Reasonably foreseeable future transportation actions would follow federal and state guidelines, such as the Uniform Relocation and Real Property Acquisitions Policies Act of 1970, as amended, to provide replacement housing and relocation benefit packages.

The No-Build Alternative, combined with past, present, and reasonably foreseeable future actions, would not contribute to cumulative acquisitions and displacements. The acquisition of property for the Modified LPA would be substantially smaller than the acquisitions associated with the original construction of I-5 in the corridor but would make a small cumulative contribution to the conversion of residential and commercial land to transportation use, and to the total number of acquisitions and displacements that have occurred within the study area.

Under the No-Build Alternative, the cumulative effects on acquisition from past, present, and reasonably foreseeable future actions, would continue to be adverse through conversion of private property to public infrastructure. The cumulative effects on acquisition from the Modified LPA would have an incremental adverse effect with additional property acquired for public right-of-way.

Land Use and Economic Activity

Land Use

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Past development in the Portland-Vancouver region transformed land use over time from wilderness to urbanization. Since the 1950s, actions affecting land use have included the construction of I-5 and other transportation projects, increased urbanization, and new growth-management regulations. Land use on Hayden Island has changed from recreational to residential and commercial development, including the Jantzen Beach Center (a regional large-format retail shopping center) and surrounding retailers. Residential uses in the area include manufactured homes and floating homes associated with small marinas, as well as other low- to medium-density developments.

Vancouver's downtown has changed greatly over the past decade, broadening from mainly professional offices to tourism and recreation, retail shopping, meeting and convention activities, housing, and entertainment. Revitalization of the retail core and central waterfront has included new office, mixed-use, and residential development including projects such as the Vancouver Waterfront. New and growing land uses include retail, office/commercial, and multifamily residential.

Identified reasonably foreseeable future actions in the study area that could contribute to cumulative effects on land use include:

Interstate Bridge Replacement Program

- Improvements to public transit, state highways, local road networks, and active transportation facilities, as identified in the 2018 RTP. Land use cumulative effects from reasonably foreseeable future transportation-related improvements have been evaluated by using results of the transportation analysis.
- Metro’s future redevelopment of the Expo Center could replace or expand the exhibition hall use that currently occurs at this location. Future plans may include a sports and cultural complex.
- The redevelopment of Hayden Island’s commercial core from the current large-scale retail land use pattern to a more urban form with more mixed uses, pedestrian-scale design, and transit orientation. The City of Portland’s 2009 plan also identifies a replacement bridge over the Columbia River and the addition of high-capacity transit—both of which the IBR Program would provide—as important elements of future development on the island.
- Several developments for the Vancouver Waterfront. These redevelopments include (1) the Port of Vancouver’s Terminal 1 mixed use (i.e., hotel, office and retail space, outdoor gathering areas, and a public marketplace) project, which also includes trail connection to the Vancouver Waterfront Renaissance Trail; (2) Renaissance Boardwalk, which is public-private partnership for a mix of apartments, retail and underground parking; and, (3) the Waterfront Gateway Project, run by the Vancouver City Center Redevelopment Authority, to redevelop an area between the waterfront and downtown Vancouver with mixed-use office, retail, and residential uses. These future Vancouver Waterfront developments would continue to expand the present and recent past developments to create more commercial-residential uses compared to past industrial uses along the waterfront.
- Adopted state, regional, and local agency and port plans that identify future visions for growth and land use planning to accommodate that growth. Population is projected to increase and result in needs to expand employment opportunities, which also necessitate adequate levels of housing, utilities, recreation facilities, schools, and other services.

No-Build Alternative

The No-Build Alternative would not address current deficiencies in the Interstate Bridge structure, design, or capacity. Other reasonably foreseeable future actions would be expected to proceed and would address some elements of state, regional, and local agency visions; however, without improvements associated with the Modified LPA, the existing and future land uses that rely on I-5 to travel within the region could be affected by high levels of congestion, unsafe conditions, and potential earthquake-induced failure. There would also be no high-capacity transit service to connect the regional centers of downtown Vancouver and downtown Portland, which would be inconsistent with the stated policies and goals of applicable regional transportation and land use plans. In addition, the No-Build Alternative would not meet certain goals in the Hayden Island Neighborhood Plan or the Vancouver City Center Vision & Subarea Plan, such as providing light-rail transit service or improving connectivity within the neighborhoods.

Other reasonably foreseeable future actions would contribute to cumulative impacts to land use as new development and redevelopment would continue to change the landscape of existing and future land use.

Modified LPA

The Modified LPA is consistent with and would support land use policies, transportation system plans, and development trends in Oregon and Washington, which encourage investment in urban infrastructure, multimodal transportation, freight mobility, economic development, and compact urban development. It would also support statewide policies and goals directing high-density growth to urbanized locations and integrating planned transportation facilities. These anticipated land use changes could accelerate development (e.g., residential, commercial, office) focused near new light-rail facilities, but land use would remain consistent with adopted plans. Land use and development in Oregon and Washington is governed by

state and growth-management laws, local land use plans, zoning regulations, and other controls. These land use controls require all development to be consistent with existing zoning and comprehensive planning in order to be permitted.

The Modified LPA would convert approximately 47 acres of land, currently zoned as commercial, industrial, residential, mixed-use, and open space, into transportation use (see Section 3.3, Acquisitions). The Community Connector near Evergreen Boulevard in downtown Vancouver would address existing gaps in active transportation connectivity between residential and commercial land uses created by the past construction and presence of I-5.

Variable-rate tolling as part of the Modified LPA would support regional and local policies for managing traffic congestion. Tolling is not expected to change land use patterns because land use and development in the study area are governed by state land use and growth-management laws, local land use plans, zoning regulations, and other controls. However, the combination of improved transit service and the introduction of tolling would shift some trips from vehicle to transit and reduce overall vehicle travel miles traveled across the Columbia River on an average weekday by approximately 1% compared to the No-Build Alternative.

Cumulative Effects Conclusion – Land Use

Past actions have changed land use throughout the study area, typically increasing the density of development and converting undeveloped or residential areas to commercial or transportation uses. None of the present actions are anticipated to convert land uses or alter land use patterns. Reasonably foreseeable future actions include planned transportation projects, which would include the conversion of land currently in non-transportation uses to transportation use, and development and redevelopment that would create additional residential, commercial, industrial and recreational land uses in the study area. All present and reasonably foreseeable future actions would be required to comply with the applicable adopted land use plans.

The No-Build Alternative, combined with past, present, and reasonably foreseeable future actions, would not convert existing land uses to a transportation use; however, it would be inconsistent with adopted land use plans, such as the Hayden Island Neighborhood Plan and the Vancouver City Center Vision & Subarea Plan that included goals of providing light-rail transit service. Although the Modified LPA would include right of way acquisitions that would convert existing land uses to a transportation use, it would be consistent with the goals of local land use plans to provide light-rail transit service and providing transit stations near planned land use development.

Under the No-Build Alternative, the cumulative effects on land use from past, present, and reasonably foreseeable future actions would be negligible because land use from reasonably foreseeable future actions would continue to comply with local land use plans. Compared to the No-Build Alternative, the cumulative effects on land use from the Modified LPA would be beneficial as it would provide light-rail transit service to Hayden Island and downtown Vancouver and may facilitate planned growth and development in station areas consistent with local land use plans.

Economic Activity

Effects from Past, Present, and Reasonably Foreseeable Future Actions

I-5 runs continuously from Mexico, through the United States, and into Canada and is used for freight, business, and personal travel. In the Portland-Vancouver region I-5 is the central component of the transportation infrastructure. Freight needs are a major driver for future improvements along the I-5 corridor.

The Columbia River is the regional backbone of marine commerce. Commercial vessels on the Columbia River include cruise vessels, tugs, tows, barges, and marine contractors' vessels. Commercial tugs and barges have

the highest share of river usage and transit year-round and accounted for approximately 54% of the bridge opening events across a 35-year study period.

The Ports of Portland and Vancouver are critical to the region's economic growth and prosperity. The total annual tonnage moving through the two ports is expected to double from approximately 300 million tons in 2007 to almost 600 million tons in 2040 (Cambridge Systematics 2015). Both ports connect to the surface transportation network within the study area, as well as the Columbia River, to move products to, from, and within the region. To remain competitive with other West Coast ports, efficient and cost-effective multimodal transportation systems must be available. Increases in regional traffic congestion could severely hinder the ports' ability to move goods and impact their competitiveness. Similarly, economic growth in the region would increase demands along the I-5 corridor, as Metro forecasts that the number of jobs in the Portland-Vancouver Standard Metropolitan Statistical Area would increase by approximately 1.6% per year. This is slightly higher than the Oregon-area growth rate of 1.1% per year and the Washington-area growth rate of 1.0% per year.

Identified reasonably foreseeable future actions in the study area that could contribute to cumulative effects on economic activity include:

- Continued development of Terminal 1 by the Port of Vancouver, which will expand the mixed-use Vancouver Waterfront area nearer to the I-5 corridor and is anticipated to enhance the waterfront as a regional attraction for commercial and retail jobs.
- A stated goal of the Waterfront Gateway development is to strengthen the economy by creating a "bustling center with high-quality jobs." While no job estimate is available at this time, the development will include new office and retail uses, which will support job creation in the study area.
- Portland Expo Center is a 53-acre redevelopment site that has been recommended by Metro to be redeveloped into a sports and cultural complex. The redevelopment could be a local and regional attraction drawing visitors to the I-5 corridor and surrounding businesses and lodging. This project is still in the early stages but would likely contribute commercial and retail jobs to the study area.
- The 2018 RTP includes short- and long-term strategies and transportation projects. These strategies and projects are integral to the local and regional economy, addressing economic growth, environmental health, and equitable mobility.
- The Cascade Renewable Transmission Project is estimated to support 300 to 400 jobs and apprenticeship programs during construction and generate revenues that will strengthen local tax bases. The cables will also add east-to-west energy transfer capability in the region and assist in the distribution of increased power flows, especially during extreme heat events, which would help maintain power supply for commercial activities.

No-Build Alternative

Under the No-Build Alternative, increasing congestion and unreliable travel times on I-5 could result in negative economic effects, as planned economic development may occur more slowly with business owners reluctant to locate in an area with poor access and mobility for employees and customers. Freight reliability would decrease as congestion continues to spread throughout the day and customers could elect to shop in areas with better access and mobility. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects with an increase in jobs and commerce (identified above) would continue under the No-Build Alternative.

Modified LPA

The Modified LPA would have both adverse and beneficial impacts on economic activity, with the overall long-term economic effects after construction expected to be positive (short-term cumulative effects during

construction are addressed in Section 3.23.4). The Modified LPA's highway, transit, and active transportation components would move people and commerce more effectively and efficiently through the I-5 corridor. The Modified LPA, along with other projects aimed at reducing congestion and enhancing freight mobility, would support an improvement in economic activity. Congestion relief in the study area would benefit freight traffic generated by Swan Island, the Rivergate area, the Port of Portland, and the Port of Vancouver. Incremental benefits would include decreased travel times, increased mobility, and increased reliability for freight vehicles. The Modified LPA would provide a slight improvement to marine commerce for many vessels as most vessels would be able to pass under the bridges without timing restrictions, providing more flexibility in operating schedules and reducing wait times. With the fixed-span configurations, some larger vessels and future freight shipments would not be able to pass under the bridges; the IBR Program is coordinating with these river users to develop measures to avoid economic impacts through vessel or cargo modifications and other accommodations.

The Modified LPA would acquire additional rights of way from taxable property with the potential for decreasing property tax revenues. However, the reduction in sales tax is not anticipated to have a substantial economic impact, given that most of the affected businesses would be commercial offices.

Cumulative Effects Conclusion – Economic Activity

The Portland-Vancouver region and economy is largely dependent on its role as a gateway and distribution center for domestic and international markets. The development of corridors along the Columbia and Willamette rivers, the BNSF Railway and Union Pacific Railroad transcontinental rail lines, Portland International Airport, and marine terminals of Portland and Vancouver are all integral components to the region's ability to transport goods, with the I-5 corridor serving as the backbone of the region's transportation network. Many past projects have worked to solidify I-5 as the central component of regional infrastructure (including construction of the Interstate Bridge and development of the ports). Freight needs are an important driver for future improvements along the I-5 corridor, and economic growth in the region would increase demands along the I-5 corridor.

Several reasonably foreseeable future projects will support job creation and improve freight mobility and connectivity in the area, thereby benefiting economic activity. The 2018 RTP includes several capacity and safety projects west of I-5 that are designed to improve safety and flow for commercial trucks traveling between I-5 and industrial areas to the west. Additionally, plans for the area would generally improve travel conditions for commercial trucks, but those improvements could be offset by congestion resulting from projected growth in population and employment.

Increased congestion, decreased freight reliability, and unreliable travel times on I-5 associated with the No-Build Alternative, as well as past, present, and reasonably foreseeable future actions, would contribute to adverse cumulative effects on economic activity by slowing planned economic development. Economic activity requires reliable transportation; therefore, the improvements in capacity, safety, and reliability provided by the Modified LPA, in combination with past, present, and reasonably foreseeable future actions, would cumulatively benefit economic activity by allowing commercial and industrial activity that is constrained by existing transportation conditions to improve.

With the No-Build Alternative, reasonably foreseeable future economic activity could be limited by increased congestion and decreased freight reliability that would occur as future travel demand would not be met by the available transportation infrastructure provided by past, present, and reasonably foreseeable future actions. The Modified LPA, in combination with these other actions, would cumulatively benefit employers, businesses, marine commerce, and economic activity through job creation, reduced congestion, enhanced marine operating schedules, freight mobility, transit access, and vehicular circulation when compared to the No Build Alternative.

Neighborhoods and Equity

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Past projects adversely affected neighborhoods in the I-5 corridor, while more recent transportation projects have generally provided net benefits through improved access, pedestrian-oriented development, mitigation, and other amenities. Past highway development had significant effects on neighborhoods and communities along the I-5 corridor, including equity priority communities.⁴ The development of I-5 required the acquisition of right of way and the relocation of many businesses and homes and contributed to a loss of community cohesion. Local planning efforts serve to strategically place and design current and future transportation to maximize benefits and minimize negative impacts. Neighborhoods within Portland and Vancouver formally adopt neighborhood plans as part of their respective comprehensive plans and typically include goals, objectives, proposed comprehensive plan and zoning changes, and an implementation strategy. Neighborhood plans and comprehensive plans for each respective city will contribute to the current trend of improving neighborhood access and mobility.

Reasonably foreseeable future actions in the study area that could contribute to cumulative effects on neighborhoods and equity include transportation and development projects with the potential for displacement or relocation of businesses and homes or actions that affect connectivity and cohesion. Many of the reasonably foreseeable future projects have yet to complete environmental assessments, but at this time none have been identified that would require the displacement or relocation of homes. Renaissance Boardwalk may result in one business displacement, although it would also improve connectivity along the waterfront. There are no known encampments of houseless populations at the sites of the reasonably foreseeable future actions; however, encampments are typically transient and the potential for displacement would need to be evaluated for each project prior to construction.

The Main Street Promise project will improve safety and connectivity in downtown Vancouver through improvements to vehicle and active transportation infrastructure. Other transportation improvements in the adopted RTPs would contribute to the cumulative effect of improving connectivity in neighborhoods in the study area.

No-Build Alternative

The No-Build Alternative would not displace residences or businesses and would not directly change community cohesion. Neighborhoods in the study area would continue to develop according to local and regional plans, though their development might not be fully consistent with goals that assume improved mobility in the I-5 corridor and expanded transit access. Neighborhoods and equity priority communities would experience increased traffic congestion, decreased safety, and no benefits from increased mobility and accessibility from construction highway improvements, light-rail, and active transportation facilities. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on neighborhoods and equity would continue under the No-Build Alternative.

Modified LPA

The Modified LPA would have both beneficial and adverse effects on neighborhoods and equity. The Modified LPA is not anticipated to adversely affect community cohesion in most neighborhoods, except for Hayden Island. Benefits from the Modified LPA to equity priority communities include increased access to high-

⁴ The IBR Program has made a commitment to the community to place equity at the center of the Program, beyond legal and statutory requirements. A foundational component of this commitment was the formation of an Equity Advisory Group, which developed a Program-specific definition of equity and identified “equity priority communities” as those who experience and/or have experienced discrimination and exclusion based on identity or status. The communities include Black, Indigenous, and People of Color (BIPOC); people with disabilities; communities with limited English proficiency; persons with lower incomes; houseless individuals and families; immigrants and refugees; young people; and older adults.

capacity transit, increased availability of active transportation, and highway and driving travel time reductions. Burdens to equity priority communities include potential displacement of encampments of houseless populations, residential displacements, and the additional transportation cost from tolling. See Section 3.05, Neighborhoods and Equity, for additional details on direct and indirect impacts to neighborhoods and equity priority communities.

The Modified LPA is expected to continue the positive trend in the corridor of improving neighborhood access and mobility. The provision of a light-rail station, the connection of N Tomahawk Island Drive under I-5, and the improved access and capacity of the Hayden Island interchange may contribute to the viability and success of redevelopment plans for the island (see Section 3.4, Land Use and Economic Activity). However, the Modified LPA would displace sufficient commercial and residential activities to constitute an adverse impact. One major difference between the Modified LPA and past actions is that past actions were not always planned and implemented with meaningful input from and communication with the public, including equity priority communities. Involving communities and understanding impacts is an essential part of the IBR Program.

Cumulative Effects Conclusion – Neighborhoods and Equity

Past transportation projects, such as the original construction of I-5, had significant effects on neighborhoods and communities in the I-5 corridor, including equity priority communities, leading to a loss of community cohesion and displacement of businesses and homes. Recent, present, and reasonably foreseeable future actions typically seek to avoid, minimize and mitigate impacts to communities through closer analysis of how a project could affect neighborhoods and specific populations. Most of the reasonably foreseeable future actions are anticipated to improve connectivity and cohesion, either as their intended purpose (e.g., Waterfront Gateway) or through required mitigation (e.g., the I-5 Rose Quarter Improvement Project). Local land use plans, including neighborhood plans in Portland and Vancouver, will continue the trend of improving neighborhood access and mobility.

The No-Build Alternative would not contribute to adverse or beneficial cumulative effects on neighborhoods and equity created by past, present, and reasonably foreseeable future actions. The Modified LPA would contribute to adverse cumulative effects from past and reasonably foreseeable future actions that have displaced commercial and residential uses. Reasonably foreseeable future actions that would affect neighborhoods and equity would be required to follow federal and state guidelines for potential displacement and other adverse impacts. The Modified LPA and other reasonably foreseeable future actions would also contribute to the positive trends of improving neighborhood access and mobility, and providing public engagement opportunities for neighborhoods and equity priority communities

Under the No-Build Alternative, the cumulative effects on neighborhoods and equity from past, present, and reasonably foreseeable future actions, would continue to be adverse due to displaced commercial and residential uses. Compared to the No-Build Alternative, the cumulative effects on neighborhoods and equity from the Modified LPA would be beneficial due to improved access, pedestrian-oriented development, and other amenities and slightly more adverse due to potential displacement.

Public Services and Utilities

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Past population growth has incrementally increased demand on public services and utilities. Effects from most of the reasonably foreseeable future projects would include changes to traffic patterns and increased demand on public services and utilities. Adopted land use plans and projected population growth are expected to create an increased demand for public services and utilities. However, since those increases are planned, it is reasonable to assume that the public service sector and utility providers would have adequate time to plan and adjust for future conditions.

Forecast population and development patterns reflected in the long-range comprehensive plans of the jurisdictions served by each public service and utility provider will affect public services and utilities. Service providers evaluate future population growth and calculate provider needs such as increased numbers of police officers, expanded treatment plants, new equipment, or new station locations. Anticipated density increases in downtown Vancouver and on Hayden Island are consistent with current long-range plans and growth assumptions, and increased services for new development would occur in urbanized areas that already have public services and utilities. This anticipated development would not require the extension of service to a new geographic area.

Current emergency response time trends are increasing. Annual performance reports by the City of Portland Fire and Rescue show that from 2017 to 2022, fire and medical emergency response times at the 90th percentile increased. The City of Vancouver Fire Department reports an increase in standard response times from 2022 to-2023. Similarly for law enforcement, the Portland Police Bureau's Dispatched Calls Dashboard indicates that the average emergency response times within the study area increased between 2017 and 2022. Forecasted changes in response times are not available, although service providers are anticipated to plan for future needs based on forecast population and development patterns found in long-range comprehensive plans.

No-Build Alternative

The No-Build Alternative would not change existing utility connections and would, therefore, not have a cumulative effect on utilities. While the No-Build Alternative would not change the types of public services provided, increased congestion could slow response times for emergency vehicles, and ongoing bridge openings would continue to disrupt traffic and cause potential delays for emergency vehicles, which would have an adverse effect on public services. I-5 is an important north-south access route through the study area, and it is the only emergency access route to and from Hayden Island. Increased congestion under the No-Build Alternative would decrease the ability of the public, particularly Hayden Island residents, to reliably reach or receive public services due to increased travel times and lower travel speeds.

Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on public services and utilities (identified above) would continue under the No-Build Alternative. Impacts from those actions would be included in long-range plans and growth assumptions.

Modified LPA

The Modified LPA would enhance transit service that provides access to public service facilities such as medical facilities, police and fire facilities, or schools. The Modified LPA would provide transportation reliability improvements through changes in roadway and traffic operations to critical access routes that would generally improve emergency response times to serve the planned growth. The direct physical impacts to public services from the Modified LPA would be minor. The IBR Program would work with affected communities to ensure that Program-related changes do not impair existing overall levels of public service. Utilities would be protected in place or relocated during construction; following completion of construction, utilities are expected to operate as well as or better than they do currently.

Cumulative Effects Conclusion – Public Services and Utilities

Past actions, including population growth, have incrementally increased the demand on public services and utilities. Current trends in emergency response times show an increase in response times, and, consistent with current practices, public service providers will continue to evaluate reasonably foreseeable future population growth to meet demand. Reasonably foreseeable future actions in the study area that could affect public services and utilities include increased service and associated new or improved facilities as well as an increase in utility services based on forecast population and development patterns found in comprehensive

long-range plans. The Cascade Renewable Transmission Project would provide renewable energy and additional energy capacity to the Oregon and Washington electrical grid.

The No-Build Alternative, combined with past, present, and reasonably foreseeable future actions, would not contribute to cumulative effects on utilities but would contribute to cumulative effects on public services (Table 3.6-5). Under the No-Build Alternative, increased congestion in the study area would continue to slow response times for emergency vehicles, ongoing bridge openings would continue to disrupt traffic and cause potential delays for emergency vehicles, and the public would have a decreased ability to reliably receive or reach public services. The Modified LPA and other reasonably foreseeable future actions would support planned growth in the study area by providing new light-rail service, improving the reliability of bus transit, and facilitating the types and densities of development envisioned in local and regional land use plans, especially in Hayden Island and downtown Vancouver.

The No-Build Alternative, including past, present, and reasonably foreseeable future actions, would have cumulative adverse effects on public service as a result of increases in emergency response times. The Modified LPA would provide beneficial improvements in transportation reliability serving emergency access routes and expanded access to high-capacity transit. There would be little to no cumulative effects on utilities from either alternative.

Parks and Recreation

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Park and trail development efforts in the region have been ongoing and will continue consistent with current plans and programs. Some of the parks and recreation facilities are regulated and protected by Section 4(f) of the U.S. Department of Transportation Act, Section 6(f) of the Land and Water Conservation Fund Act, and/or the Federal Lands to Parks (FLP) program. These protections, along with state and local goals to increase access to recreation facilities, have led to an increase in acreages of parks and recreation facilities in both Vancouver and Portland over the past decade (City of Vancouver 2021; City of Portland 2022).

Recent projects that have added or expanded facilities include public open space at the Vancouver waterfront and a new amphitheater at Terminal 1, both of which are connected by new segments of the Renaissance Trail. Planned expansions of park and recreation facilities in adopted plans include park and trail development at the North Portland Harbor waterfront, Hayden Island, the Vancouver National Historic Reserve, and Kiggins Bowl. None of the identified reasonably foreseeable future projects are anticipated to reduce the number or size of park or recreation facilities in the study area (including those protected under Section 4(f), Section 6(f), or the FLP program). Several of the reasonably foreseeable future projects would create new parks and recreation facilities, including a new sports and cultural complex at Expo Center, 2 acres of public space at Waterfront Gateway, and public spaces and trails proposed as part of Terminal 1 and Renaissance Boardwalk. Planned extensions or improvements to the trail systems in Portland and Vancouver will connect many of the new recreation facilities.

No-Build Alternative

The No-Build Alternative would not require the conversion of parks and recreation resources to transportation use. Access to parks and recreation resources would remain as is, with limited public transit service and active transportation facilities. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on parks and recreation (identified above) would continue under the No-Build Alternative.

Modified LPA

The Modified LPA would require the acquisition of approximately 1.3 acres of parkland for a transportation use. Permanent acquisitions would be required from East Delta Park, the Fort Vancouver National Historic Site, Old Apple Tree Park, Marshall Community Center and Park, and Kiggins Bowl. Some acquisitions would affect lands protected by Section 4(f) and/or Section 6(f) (see Chapter 4 for the draft Section 4(f) evaluation and Section 3.21, Section 6(f) and Federal Lands to Parks). These acquisitions would be used for transportation uses, including improved connections across the active transportation network in the study area.

The Modified LPA would improve access to regional recreational resources including the Portland International Raceway, East Delta Park, and the Vancouver National Historic Reserve. Notably, it would improve access and connections to the Portland Expo Center, which would support Metro’s plans to redevelop the site into a sports and cultural complex. The Modified LPA would also improve access to the Vancouver waterfront and connect parks on both the east and west sides of the bridges, which would essentially restore the once-connected waterfront that was bifurcated by the existing bridge.

Cumulative Effects Conclusion – Parks and Recreation

While some past actions reduced recreational areas due to conversion to other uses, recent projects have typically increased the number of recreation and park resources. Present actions include routine maintenance of parks and recreational facilities. Current trends suggest that parks and recreation sites in the study area will continue to be expanded and improved by reasonably foreseeable future actions.

The No-Build Alternative would not contribute to cumulative effects as access to parks and recreation resources would remain as is and there would be no change to existing resources. However, other actions would continue to result in net expansions, and improve access to, parks and recreation facilities. The Modified LPA would contribute to current trends by improving connectivity between existing and planned facilities through new and improved active transportation facilities.

Under the No-Build Alternative, the cumulative effects on parks and recreation from past, present, and reasonably foreseeable future actions, would continue to be beneficial through increased number and size of parks and recreation facilities. The cumulative effects on parks and recreation from the Modified LPA would have a net incremental beneficial effect through additional access and connections.

Cultural Resources

Archaeological Sites

Effects from Past, Present, and Reasonably Foreseeable Future Actions

The Archaeology Technical Report identifies and assesses effects on archaeological sites protected under Section 106 of the National Historic Preservation Act. While there is archaeological evidence that Native Americans inhabited the Pacific Northwest more than 10,000 years ago, the archaeological record for Native American land use in the lower Columbia River begins around 3,500 years ago. The Native American groups inhabiting the cultural resource area of potential effects (APE)⁵ were part of an extensive network of villages, trade, and harvesting, fishing, and resource sites. Villages consisted of multifamily houses and other structures such as fish-drying sheds or scaffolds, sweat and menstrual lodges, and temporary dwelling houses. Starting in the late 18th century, maritime expeditions by Europeans and European Americans began

⁵ The APE is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties, if any such properties exist.” (936 CFR 800.16(d)) APE is analogous to “study area,” which is the term commonly used for other resources.

to interact with Native Americans along the Oregon coast and the mouth of the Columbia River. European American settlement along the Columbia River's southern bank remained sparse in the mid-1800s and the area remained sparsely developed throughout the 19th century. More extensive development began in the 20th century, including rapid development associated with World War II and construction of I-5 in the 1950s.

Past construction activities have involved earthmoving on a massive scale, which impacted the presence and preservation of archaeological sites in the APE. Many archaeological sites have been lost or altered by construction projects, though some have been preserved underground and, recently, some have been recovered, studied, and archived. Additional studies are in progress to verify known archaeological resource presence and dimensions, and to identify unrecorded terrestrial and marine archaeological sites. Further studies will be performed through phased identification as allowed under Section 106 of the National Historic Preservation Act (36 CFR 800.4 (b)(2)) and would be stipulated in the Section 106 Programmatic Agreement (PA).

While none of the identified reasonably foreseeable future actions are known to affect a documented archaeological site, it is likely that reasonably foreseeable future actions in the APE could encounter additional sites, which could be preserved, recovered, disturbed, or destroyed. The environmental assessment for the USACE levee system improvements acknowledges that these improvements could disturb or destroy known or presently unknown archaeological resources (USACE and CCDD 2021). Ground disturbance associated with any of the reasonably foreseeable future actions, as well as ongoing development in the area consistent with adopted land use plans, may affect archaeological sites. Current local, state, and federal cultural resources laws and regulations that protect archaeological sites reduce the likelihood of destruction, but cannot completely prevent it.

No-Build Alternative

The No-Build Alternative would not affect archaeological sites in the APE and would therefore not contribute to a cumulative effect. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on archaeological sites would continue under the No-Build Alternative, though any impacts from those actions would be subject to regulatory requirements for the protection of archaeological sites.

Modified LPA

Construction-related physical ground disturbance is anticipated to be the primary source of potential permanent and temporary direct effects on archaeological sites. As discussed in Section 3.8, 15 archaeological sites are located within the Washington portion of the APE; of these 15 sites, 12 are within the Modified LPA footprint and have the potential to be impacted by construction-related physical ground disturbance based on the anticipated nature and extent of ground disturbance associated with the Modified LPA. The remaining three resources are located within the APE but are outside of the Modified LPA footprint. FHWA and FTA are consulting to complete the Section 106 process and resolve adverse effects on historic properties through the development of a PA, pursuant to 36 CFR 800.14(b).

Cumulative Effects Conclusion – Archaeological Sites

The archaeological record for Native American land use in the lower Columbia River begins around 3,500 years ago. European and European American settlement in the area began in the late 18th century and remained sparsely developed throughout the 18th and 19th centuries. More extensive development began in the 20th century, including rapid development associated with World War II and construction of I-5 in the 1950s. Past construction activities have impacted the presence and preservation of archaeological sites in the APE and ground disturbance from ongoing development could disturb or destroy known or unknown archaeological resources in the area. Recent studies have recovered, studied, and archived archaeological sites and

additional studies are in progress to verify known archaeological resource presence and dimensions, and to identify unrecorded terrestrial and marine archaeological sites.

The No-Build Alternative would not contribute to cumulative effects on archaeological sites, as no known archaeological sites in the APE would be affected; however, it would not change the overall trends in disturbance to archaeological sites from other past, present, and future actions. Although local, state, and federal regulations are in place to protect archaeological sites, ground disturbance during construction of the Modified LPA and other reasonably foreseeable future projects may result in adverse effects on known or unknown sites.

Under both the No-Build Alternative and the Modified LPA, cumulative effects on archaeological sites from past, present, and reasonably foreseeable future actions would be adverse due to a pattern of large-scale ground disturbance in the study area.

Historic Built Environment

Effects from Past, Present, and Reasonably Foreseeable Future Actions

The historic built environment (HBE) includes built resources protected under Section 106 of the National Historic Preservation Act. Some of the historic sites are also regulated and protected by Section 4(f) of the U.S. Department of Transportation Act. There is a wide variety of HBE resources in the APE in Oregon and Washington, reflective of the area's historic development. The land now known as Vancouver became an important post in the Hudson's Bay Company's inland trade routes, succeeded thereafter by a U.S. military installation, and was the center of life and commerce in the region. The region became an important area for trading in the 18th and 19th centuries, with ample resources provided by the rivers and adjacent valleys. Further growth and development in the region in the 20th century was driven by the introduction of wartime industries, such as the Kaiser shipyards, and the completion of major infrastructure projects, including railroad bridges and the Interstate Bridge. The 1917 Interstate Bridge span is listed on the National Register of Historic Places in both Oregon and Washington, and the 1958 span has been determined eligible for listing.

Past activities of settlement and development both created the existing HBE and have dramatically affected the preservation of HBE resources in the APE. Many resources were demolished or their historic contexts largely altered. The original construction of I-5 divided Vancouver's downtown from the Vancouver National Historic Reserve and separated the major commercial and civic center from the historic resources and context of the fort and barracks. Recent development, including the Vancouver Community Library and the Aegis/Providence Academy redevelopment, has affected the HBE through changes in the historic setting of downtown Vancouver.

Several of the identified reasonably foreseeable future actions are anticipated to affect known historic resources, namely redevelopment of the Expo Center, which is recommended as eligible for listing on the National Register of Historic Places, and the USACE levee system improvements, which would affect contributing resources in the Columbia Slough Drainage Districts Historic District (note that the Modified LPA would have no adverse effect on this district). It is also likely that reasonably foreseeable future actions could alter the context and setting of historic resources, and ongoing development in the area consistent with adopted land use plans may affect historic resources, ranging from demolition, preservation and restoration, to changes in the historic setting.

No-Build Alternative

The No-Build Alternative would retain the existing infrastructure, including the existing historic Interstate Bridge, which would continue to operate. There would be no direct impacts on the character-defining features or integrity of the HBE properties and, therefore, no contribution to cumulative effects. A seismic event could adversely affect the two historic bridge spans. Other reasonably foreseeable future actions in the

study area that could contribute to cumulative effects on the HBE (identified above) would continue under the No-Build Alternative, though any impacts from those actions would be subject to regulatory requirements for the protection of historic sites and features.

Modified LPA

The Modified LPA is being designed to avoid direct effects on HBE resources and minimize impacts that cannot be avoided. However, activities proposed for the Modified LPA would result in adverse effects, as defined under 36 CFR 800.5, on 12 HBE properties, including demolition of the northbound and southbound Interstate Bridge (and the Normandy Apartments under the I-5 shifted west design option). Other changes include affecting the historic features or settings of various resources. There are some differences in effects on historic properties across the design options, but no design option would completely avoid adverse impacts, and therefore all would contribute to adverse cumulative effects.

Cumulative Effects Conclusion – Historic Built Environment

HBE resources in the APE in Oregon and Washington are reflective of the growth and development in the region, particularly trading in the 18th and 19th centuries and the introduction of wartime industries during the 20th century. Despite substantial development over the past decade, many historic resources and districts remain in the study area. Ongoing development has led to an incremental loss of the area's historic fabric, and this will continue into the future as more development and redevelopment occur. The No-Build Alternative would not directly contribute to cumulative effects on the HBE; however, it would not change the overall past, present, and reasonably foreseeable future trends of HBE properties being affected by other transportation and land redevelopment actions. While reasonably foreseeable future actions, including the Modified LPA, will be required to meet regulatory requirements, the Modified LPA will contribute to changes in the context and setting of the study area over time.

Under both the No-Build Alternative and the Modified LPA, the cumulative effects on the HBE from past, present, and reasonably foreseeable future actions would be adverse due to specific impacts to HBE resources and changes in the surrounding historic setting.

Visual Quality

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Visual quality impacts occur when the visual character of a place changes (for example, from an agricultural landscape to a residential development) as perceived by viewers. In the Portland and Vancouver areas, visual character has steadily evolved from a primarily natural environment to rural and agricultural, and then to suburban and urban. The I-5 corridor has steadily grown in development intensity and in use as a major transportation route. Reasonably foreseeable future development projects will continue the study area's visual transformation. Identified reasonably foreseeable future actions that would alter the existing and cumulative visual character in the study area include development and redevelopment projects in downtown Vancouver and north Portland. Reasonably foreseeable future projects such as Terminal 1, Waterfront Gateway, Renaissance Boardwalk, and Portland Expo Center Redevelopment would add new buildings or redevelop existing buildings adding to the development intensity along the I-5 corridor and existing visual character of the project environment in downtown Vancouver, along the Vancouver waterfront, and in north Portland. Reasonably foreseeable future transportation projects within the study area would contribute to changes in the visual character of the physical and project environment through visual changes from traffic congestion and constructed elements within the road, public transit, and active transportation network.

All of the identified reasonably foreseeable future projects would alter the existing and cumulative visual character in the study area to some degree; however, projects would be required to be consistent with

existing zoning and design standards, which would maintain visual consistency with existing development and minimize additional adverse effects to visual quality.

No-Build Alternative

While the existing bridges, ramps, interchanges, roadways, and other structures would remain in place, the visual environment would not be static or unchanging with the No-Build Alternative. Ongoing and upcoming development within the Area of Visual Effect (AVE) would continue to impact the visual character.

Furthermore, the No-Build Alternative would lead to heightened traffic congestion within the AVE, potentially diminishing the overall visual cohesiveness of the project environment. However, the No-Build Alternative would not significantly influence the existing visual character and would not contribute to cumulative adverse effects on visual quality.

Other reasonably foreseeable future actions in the study area could contribute to cumulative effects on visual quality as identified above, although impacts from those actions would be subject to applicable regulatory requirements within existing zoning and design standards.

Modified LPA

The primary elements of the Modified LPA that would affect visual character and quality are new highway bridges across North Portland Harbor and the Columbia River; revised I-5 interchanges; and light-rail transit guideway, stations, and park-and-ride facilities. The visual quality of the entire length of the study area and all landscape units would be affected.

In general, the Modified LPA is expected to have a range of visual quality impacts from neutral to beneficial for most viewers in the Columbia Slough, Columbia River, Vancouver Downtown, Burnt Bridge Creek, and Ruby Junction landscape units. With the Modified LPA, the higher Columbia River bridges' decks and the more visually complex SR 14 interchange represent an increase in the scale of visual elements of the project environment. These new elements are likely to be notably more visible to adjacent recreational viewers in the Greater Central Park landscape unit. As a result, impacts to visual quality are expected to be adverse for these sensitive viewers.

Cumulative Effects Conclusion – Visual Quality

Past actions transitioned the visual character of the study area from a natural environment to an urban environment as Portland and Vancouver developed and as rail routes and the I-5 corridor were constructed. The current trend of urban development will continue, and present and reasonably foreseeable future projects would continue to change visual character as the area continues to develop and transition to a denser urban environment.

The No-Build Alternative would not change the overall trends in visual quality with reasonably foreseeable future actions continuing the trend of urban development in the study area. The Modified LPA and reasonably foreseeable future actions would add to beneficial and adverse cumulative effects on visual character through ongoing and upcoming urban development creating new visual elements. To the extent that projects would be consistent with existing zoning and design standards to maintain visual consistency with existing development, their visual character would be consistent with the long-standing trend of an increasingly urban landscape.

Under both the No-Build Alternative and the Modified LPA, the cumulative effects on visual quality from past, present, and reasonably foreseeable future actions, would be either beneficial or adverse, depending on the viewers' location, activity, and visual sensitivity.

Air Quality

Effects from Past, Present, and Reasonably Foreseeable Future Actions

In the 1800s, there were limited air pollutant emissions as the study area and region was characterized by natural wilderness landscapes and human settlements were significantly smaller than they are in the present day. Since the 1950s, actions including the construction of I-5 and increased urbanization have resulted in the incremental introduction of air pollutants from vehicles and development. Starting in the early 1970s, regulatory controls on air pollutant emissions have substantially reduced emissions, including industrial and vehicle emissions. Long-term monitoring has shown that air quality has improved over the years. The Oregon Department of Environmental Quality (DEQ) measures air pollutant levels with a network of air monitoring and sampling equipment at more than 40 sites throughout the state, including the study area. The Washington State Department of Ecology (Ecology) does not operate many monitors in the Vancouver area because the monitors operated by DEQ fulfill the federal monitoring requirements for the metropolitan area. Over the last 10 years, pollutant concentrations have been trending mostly downward for most locations, with most exceptions corresponding to wildfire smoke events.

The implementation of current regulations will continue to reduce pollutant emissions from mobile sources and other sources into the future and, along with vehicle electrification, are expected to yield additional vehicle emission reductions over the next 25 to 30 years (DEQ 2021; FHWA 2016).

The air quality analysis is based on projected land use and employment information, expected overall growth in the region and the study area, and the effect of the transportation projects identified as reasonably foreseeable future actions. Non-transportation projects may increase emissions, such as general commercial and residential development in the area. Tolling of I-205 (Abernethy Bridge), if advanced in Oregon, may reduce overall emissions through a mode shift away from single-occupancy vehicles to carpooling, public transit, and active transportation, as well as a reduction in emissions associated with congestion.

No-Build Alternative and Modified LPA

Under both the No-Build Alternative and the Modified LPA, air pollutant emissions are expected to be substantially lower in the future than under existing conditions for most mobile source air toxics and criteria pollutants. For all pollutants analyzed, future (2045) emissions are projected to be lower than existing conditions under both the Modified LPA and No-Build Alternative.

The Modified LPA would result in lower pollutant emissions than the No-Build Alternative. Reductions in vehicle miles traveled (VMT) and improved traffic flow under the Modified LPA would result in lower emissions of mobile source air toxics and criteria pollutants in the region, with decreases ranging from 1% to 16%, varying by pollutant. The Modified LPA may also contribute to beneficial cumulative effects through the expansion of public transit and active transportation networks or other projects, resulting in changes to emissions and beneficial effects on air quality. However, traffic volumes on some roadway links would increase with the Modified LPA, which could increase localized air pollutant concentrations.

Regional improvements, such as increased transit capacity and extension of active transportation networks, would further reduce additional future emissions and have a positive effect on air quality. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on air quality (identified in the air quality analysis) would continue under the No-Build Alternative, though any impacts from those actions would be subject to applicable regulatory requirements for air pollutant emissions from mobile sources or other sources.

Cumulative Effects Conclusion – Air Quality

Past actions affecting air quality in the study area and region include population growth and accompanying development leading to an increase in the number of emission sources, including single-occupancy and

freight vehicles, industrial sites, and the expansion of and demand for utilities. Recent actions have started to reverse course and reduce air pollutants, primarily due to the implementation of programs and regulations to control pollutant emissions. In addition, recent and reasonably foreseeable future regional improvements to transportation supply through increased roadway and transit capacity, active transportation networks, and measures such as regulations on other source types would reduce additional future emissions and have a positive effect on air quality. Long-term monitoring of air quality over the last 10 years is showing a downward trend in pollutant concentrations. Reasonably foreseeable future actions in the study area that affect air quality would be required to meet applicable regulations that control air pollutant emissions.

Due to long-term air quality trends and other actions, future air pollutant emissions under the No-Build Alternative are expected to be reduced for most mobile source air toxics and criteria pollutants. The Modified LPA would further reduce emissions compared to the No-Build Alternative, through reductions in VMT, improved traffic flow, and expansion of public transit and active transportation networks.

Under the No-Build Alternative, the cumulative effects on air quality from past, present, and reasonably foreseeable future actions would be beneficial due to an anticipated reduction in pollutant emissions. Compared to the No-Build Alternative, the cumulative effects on air quality from the Modified LPA would be incrementally more beneficial due to reduced VMT, improved traffic flow, and a mode shift to public transportation and active transportation.

Noise and Vibration

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Past actions include urban development in the region that led to the introduction of urban noise sources in the study area. In addition to existing urban noise sources, residential and commercial construction activities in the study area could be a substantial, intermittent source of noise and vibration into the future.

Noise in the study area is typical of urban noise sources and noise levels. Sources include traffic on I-5, SR 14, SR 500, Martin Luther King Jr. Boulevard, N Marine Drive, and various arterials and other roadways. Air traffic associated with Portland International Airport (PDX) and Pearson Field is also a substantial source of noise that has increased over time. Marine vessels on the river, trains on two rail lines, industrial uses, and the Portland International Raceway further add to the cumulative noise environment. Many residences and other uses in the study area, including those adjacent to I-5 and the proposed light-rail transit line, have experienced increasing noise levels over time, resulting from steady growth in vehicle traffic, air traffic, and other urban noise sources. If the land use plans for the City of Vancouver and Hayden Island are realized, then residential and commercial construction activities could be a substantial, intermittent source of noise and vibration into the future.

Present and reasonably foreseeable future transportation and transit projects are required to evaluate noise and vibration impacts resulting from permanent facility improvements and from construction activities. If cumulative transportation noise levels exceed thresholds established by ODOT, WSDOT, FHWA, and FTA, then mitigation analysis must be conducted. Past projects were not always subject to these requirements; thus, present and reasonably foreseeable future projects, through required mitigation analysis and implementation, are often able to reduce overall transportation noise, as the applied mitigation would also reduce noise produced by existing transportation sources.

Identified reasonably foreseeable future actions in the study area that could contribute to cumulative effects on noise and vibration include the following:

- Transportation improvements to public transit, state highways, local road networks, and active transportation facilities as identified in the 2018 RTP. These projects are included into the transportation analysis of the Modified LPA and No-Build Alternative.

- Metro’s future redevelopment of the Expo Center, which may include a sports and cultural complex, could replace or expand the exhibition hall use that currently occurs at this location.
- Two concurrent efforts are underway to improve the existing levee system along the Columbia River near the Interstate Bridge: the USACE and UFSWQD Portland Metro Levee System project and Flood Safe Columbia River. Proposed improvements include raising the elevation of the levees.
- The City of Portland’s 2009 planning for Hayden Island calls for redevelopment of the commercial core from the current large-scale retail land use pattern to a more urban form with more mixed uses, pedestrian-scale design, and transit orientation. The plan identifies a replacement bridge over the Columbia River and the addition of high-capacity transit, both of which the IBR Program would provide, as important elements of future development on the island.
- Several developments are planned for the Vancouver waterfront, including (1) the Port of Vancouver’s Terminal 1 mixed-use (i.e., hotel, office and retail space, outdoor gathering areas, and a public marketplace) project, which also includes a trail connection to the Vancouver Waterfront Renaissance Trail; (2) the Renaissance Boardwalk, which is public-private partnership for a mix of apartments, retail, and underground parking; and (3) the Waterfront Gateway Project run by the Vancouver City Center Redevelopment Authority to redevelop an area between the waterfront and downtown Vancouver with mixed-use office, retail, and residential uses. These future Vancouver waterfront developments would continue to expand the present and recent past developments to create more commercial-residential uses compared to past industrial uses along the waterfront.

No-Build Alternative

Under the No-Build Alternative, increased noise and vibration levels in the future would be expected to increase as population, employment, highway traffic, public transit service, air traffic, and freight rail traffic continue to grow and planned development and redevelopment are implemented. The No-Build Alternative would result in highway noise impacts to 215 sensitive receptors (e.g., residences, parks, schools, and hotels) where noise levels approach or exceed noise abatement criteria thresholds established by ODOT, WSDOT, and FHWA. No new transit-related noise and vibration impacts would occur under the No-Build Alternative. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects related to noise and vibration would continue under the No-Build Alternative. There would be permanent noise and vibration effects associated with highway traffic, and temporary effects associated with construction of transportation facilities.

Modified LPA

The noise analysis described in Section 3.11 incorporated regional growth and foreseeable transportation projects; therefore, the noise modeling results include transportation-related cumulative effects associated with noise and vibration from the Modified LPA in combination with other transportation projects in the study area. Noise and vibration impacts under the Modified LPA would include permanent impacts such as increased noise to sensitive receptors along I-5, existing and new transit facilities, and along local streets that would be modified in the study area. Approximately 198 sensitive receptors would experience highway-related noise levels that approach or exceed noise criteria thresholds established by ODOT, WSDOT, and FHWA. Transit-related noise would have moderate-level impacts to approximately 12 sensitive receptors (this would be reduced to 0 with mitigation) and vibration impacts to 13 sensitive receptors along the extended light-rail transit facilities. Construction activities would result in increased noise and vibration due to construction equipment, drilling or pile driving, and other related construction activities. Construction-related noise impacts are regulated by local jurisdictions through permits or variance requests.

Noise abatement proposed for the Modified LPA, such as noise walls, would reduce traffic noise to below the noise abatement criteria levels at 77 of the 198 noise-impacted sensitive receptors. Mitigation measures

would be developed in accordance with the FHWA highway noise mitigation regulations and the FTA transit noise and vibration impact assessment manual (see Section 3.11.7).

Cumulative Effects Conclusion – Noise and Vibration

Past actions include urban development in the region that led to the introduction of urban noise sources in the study area. Many residences and other uses in the study area have experienced increased noise levels over time, driven by the growth in urban noise sources. Under the No-Build Alternative, no new transit-related noise and vibration impacts would occur, although continued population, employment, highway traffic, public transit service, air traffic, and freight rail traffic growth and planned development and redevelopment would contribute to increased noise and vibration levels in the future. The No-Build Alternative would result in highway noise impacts to 215 sensitive receptors in the study area.

While the Modified LPA would increase transportation noise in and introduce transit vibration to the study area, it would also provide mitigation that would reduce noise levels at sensitive receptors affected by cumulative transportation noise from past, present, and reasonably foreseeable future actions. Including mitigation benefits, the Modified LPA would result in cumulative highway noise impacts to 121 sensitive receptors as compared to 160 existing impacts and 215 with the No-Build Alternative (Table 3.11-8).

Past, present, and reasonably foreseeable future actions have introduced transportation noise creating adverse effects in the study area, which would continue with the No-Build Alternative. The Modified LPA would have both adverse and beneficial cumulative effects. It would increase existing noise and vibration generated by highway and transit sources, but it also would provide noise abatement measures that would reduce the number of sensitive receptors affected by cumulative highway noise levels.

Energy

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Regional energy demand and use in the study area have grown as a result of general development patterns, including suburban residential growth, increases in the VMT of single-occupancy vehicles, and increase in renewable energy sources used. However, even though cumulative energy demand and use in the study area has increased, the expansion of C-TRAN's bus service in Vancouver (including the introduction of bus rapid transit and electric express buses) and improvements in TriMet's bus and light-rail system (including the extension of light-rail to the Expo Center and the use of wind-generated electricity for the Metropolitan Area Express [MAX]), contribute to a small incremental benefit for cumulative energy demand and use due to the use of alternative energy sources, and supporting a mode shift from personal vehicles to public transit. These strategies are consistent with and reflective of action items in the City of Vancouver's 2022 Climate Action Plan and climate emergency priorities in the City of Portland's Climate Emergency Workplan 2022–2025.

Tolling of I-205 (Abernethy Bridge), if advanced in Oregon, may reduce energy use through a reduction in the number of single-occupancy vehicles on the road caused by a mode shift to carpooling, public transit, and active transportation.

The Cascade Renewable Transmission Project will help achieve Oregon and Washington's clean energy goals by adding 1,100 megawatts (MW) of east-to-west energy transfer capability in the region and assisting in the distribution of increased power flows on the networked transmission system, especially during extreme heat events.

The future demand for energy will depend on trends in population, economic activity, energy prices, and adoption and implementation of technology. The U.S. Energy Information Administration projects that energy consumption in the transportation sector will remain lower than 2019 levels through 2050 due to

improvements in fuel economy. As a result, energy consumption by light-duty and heavy-duty vehicles is projected to remain lower than 2019 levels through 2045.

No-Build Alternative and Modified LPA

The energy analysis in Section 3.12 incorporates projected increases in traffic, regional growth, and reasonably foreseeable future transportation projects. The analysis showed that under both the No-Build Alternative and the Modified LPA, energy consumption and GHG emissions in 2045 are expected to be substantially lower than existing values for the region, which is consistent with national trends. Although the annual VMT in the study area would increase, GHG emissions would decrease substantially compared to baseline conditions (2015) due to the implementation of fuel and engine efficiency regulations. On a regional basis, future emissions would be similar under the No-Build Alternative and Modified LPA.

Operation of the Modified LPA would lower the transportation demand for petroleum relative to the No-Build Alternative because of the mode shift to public transportation and active transportation options. Energy required to power light-rail transit operations is more than offset by the reduction in petroleum demand from roadway users. Daily regional VMT would decrease by approximately 0.16%, and total regional transportation energy consumption would decrease by approximately 0.28% in 2045 under the Modified LPA compared to the No-Build Alternative.

Construction of the Modified LPA would require up to 2.6 million British thermal units to power construction equipment and transport materials to and from project locations. This increased demand for petroleum during construction would be offset by the benefits achieved from roadway user energy demand after 15 years of operations.

Cumulative Effects Conclusion – Energy

Past actions have increased regional energy demand and use in the study area, largely as a result of general development patterns, which have been increasingly dense and urban. Current trends from present and reasonably foreseeable future actions include the adoption of renewable energy sources and public transit improvements, which are increasing the use of alternative energy sources and supporting a mode shift from personal vehicles to public transit. Reasonably foreseeable future actions will continue to incrementally decrease energy demand and GHG emissions.

Energy consumption and GHG emissions under the No-Build Alternative would continue to decline due to other past, present, and reasonably foreseeable future actions. The Modified LPA would further reduce energy consumption and GHG emissions compared to the No-Build Alternative, through reductions in VMT and a mode shift to public transit and active transportation.

The Modified LPA and other actions would contribute to adverse cumulative effects on energy through the energy demand required to construct the projects, as well as beneficial cumulative effects on energy by contributing to other projects that lower the transportation demand for petroleum due to mode shift.

Under the No-Build Alternative, the cumulative effects on energy from past, present, and reasonably foreseeable future actions would be beneficial due to reduced energy consumption and GHG emissions from the implementation of fuel and efficiency regulations. Compared to the No-Build Alternative, the cumulative effects on energy from the Modified LPA would be incrementally more beneficial due to reduced VMT and a lower transportation demand for petroleum due to mode shift to public transportation and active transportation options.

Electric and Magnetic Fields

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Federal regulations addressing electromagnetic fields (EMF) were introduced in response to incremental increases in the presence of EMF sources such as AM and FM radio, television, and wireless sources. Sensitive receptors to EMF include hospitals and research facilities. The existing EMF environment in the study area varies depending on location, as EMF levels are site- and time-specific. Sensitive receptors to EMF, such as hospitals and research facilities, are not known to be located within the study area. The main transportation sources of EMF within the study area are the traction power system and traction power substations associated with the TriMet MAX light-rail transit system.

Present and reasonably foreseeable future actions that could contribute to cumulative effects on EMF would be new sources of high-voltage power or high-frequency transmission, or the introduction of new EMF-sensitive receptors. None of the reasonably foreseeable future actions are anticipated to create new sensitive receptors, and only the Cascade Renewable Transmission Project would create potential new sources of EMF, as the project would install an underwater and underground cable bundle through the study area. However, the cables will be shielded so that they produce no external electric fields (Cascade Renewable Transmission n.d.).

No-Build Alternative

The No-Build Alternative would not change EMF sources as a result of Program activities. Other reasonably foreseeable future actions in the study area that could contribute to a cumulative effect on EMF would continue under the No-Build Alternative, but no proposed significant sources or sensitive facilities have been identified.

Modified LPA

The extension of the light-rail line under the Modified LPA would result in the generation of additional EMF within the study area. EMF levels from Portland's light-rail system are well below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and American Conference of Governmental Industrial Hygienists exposure standards. There is no evidence to indicate that light-rail-generated EMF would change the human health risk associated with cumulative EMF exposure. Therefore, as with the existing light-rail system, the Modified LPA would not have adverse effects associated with EMF emissions.

Cumulative Effects Conclusion – Electric and Magnetic Fields

Past actions, primarily electrification in the twentieth century and the introduction of light-rail transit, led to an increase in EMF exposure in the environment. None of the present or reasonably foreseeable future actions in the study area are anticipated to contribute to EMF levels in the study area. Sensitive receptors to EMF, such as hospitals and research facilities, do not exist in the study area and none are currently proposed.

The No-Build Alternative would not contribute to cumulative effects on EMF exposure, and it would not change the overall trends in EMF exposure from other actions. The Modified LPA would introduce a new source of EMF variation.

The cumulative effects from EMF exposure created by past, present, and reasonably foreseeable future actions, including the Modified LPA, are negligible because of the lack of evidence indicating a change in human health risk associated with cumulative EMF exposure and the absence of existing or proposed EMF-sensitive facilities in the study area.

Water Quality and Hydrology

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Historic land use changes and increasing urbanization have decreased the number of natural areas and the natural flow of water bodies in the study area. Over the past 150 years, historic off-channel areas have been filled, rechanneled, diverted, and otherwise developed for agricultural and urban use. Flood-control measures have been implemented that affect the entire lower Columbia River area. Levees and river embankments were constructed in the early 1900s on both sides of the Columbia River, which isolated most of the floodplain from all but the highest flows. Development of the hydropower system on the Columbia River has also significantly influenced peak seasonal flows in the river, as well as their velocity and timing. The channelization of the watershed, combined with the development of the hydropower system, dramatically altered the historic hydrologic regime.

The enactment of environmental laws beginning in the 1960s (such as the Clean Water Act), combined with decreases in upstream heavy industrial activities, has reduced contamination sources and improved water quality in study area water bodies. However, most of the water bodies within the study area are “303(d)-listed,” meaning they fail to meet the water quality standards for one or more pollutants under the Clean Water Act. There are approximately 180 acres of existing contributing impervious area (CIA) in the study area; stormwater runoff from over 80% of the CIA (approximately 150 acres) is untreated.

Most present and reasonably foreseeable future projects would improve water quality and hydrology in the study area as new development is held to stricter standards for stormwater management and treatment than past actions. The redevelopment of the Expo Center and Waterfront Gateway properties, for example, would likely improve runoff from these sites, which are mostly impervious surfaces at present. While individual actions are required to mitigate and treat their stormwater runoff, increased development could still lead to an increase in pollutant discharges to local water bodies as a result of increased congestion and traffic on existing roads that lack sufficient treatment.

Anticipated projects that would improve water quality in the study area include restoration activities along Burnt Bridge Creek in Vancouver and the Columbia Slough in Portland (Ecology 2021; Lee and Stamberger 2018). For Burnt Bridge Creek, Ecology recommends sampling and monitoring of water quality, implementing best management practices for stormwater management in the watershed, completing watershed evaluations, conducting windshield surveys and desktop analysis, achieving system potential riparian vegetation of 85% tree canopy, and completing additional studies to identify priority areas for streamflow restoration activities.

Future projects from the Columbia Slough Watershed Council may include slough cleanup and stormwater management projects such as the Expand for a Bigger Great Slough Clean Up program, Portland Water Bureau’s Main Pump Station riparian restoration, and a volunteer trash monitoring program. In addition, cleanup of the Portland Harbor Superfund Site will improve water quality in the Willamette River, which flows into the Columbia River downstream of the Interstate Bridge.

Future hydrologic projects in the study area include maintenance of the existing drainage system as well as the levee system improvements proposed by the USACE and UFSWQD. These projects would maintain and improve the flood-control systems in the study area.

No-Build Alternative

The No-Build Alternative would continue to degrade water quality through untreated stormwater runoff from existing impervious roadway surfaces within the study area. However, it is assumed that the No-Build Alternative would maintain existing water quality conditions and would not result in long-term changes (either increased or decreased impacts) as there is not a reliable method to quantify future emissions or other pollutants, such as 6PPD-quinone. Other reasonably foreseeable future actions in the study area that could

contribute to cumulative effects on water quality and hydrology (identified above) would continue under the No-Build Alternative, though impacts from those actions would be subject to applicable regulatory requirements.

Modified LPA

The Modified LPA would increase impervious roadway surfaces within the study area to approximately 200 acres, which could result in increased stormwater runoff rates and volumes. However, the Modified LPA includes stormwater treatment facilities for new and resurfaced existing roadways, including the new Columbia River bridges, which would remove pollutants from stormwater runoff and improve water quality in the Columbia Slough, Columbia River, North Portland Harbor, Burnt Bridge Creek, and Fairview Creek. With the Modified LPA, all stormwater runoff from the CIA would be treated to remove pollutants before being discharged into water bodies, reducing the area of untreated CIA by 150 acres. With new stormwater treatment and infiltration, the Modified LPA would improve surface water quality, increase groundwater recharge, and help restore natural flow to water bodies, thus reducing impacts of past actions.

Based on a preliminary hydraulic assessment, there may be a small net rise to the base flood elevation of the Columbia River and North Portland Harbor, which would be confirmed with a Location Hydraulic Study prior to the Final SEIS. If the hydraulic analysis showed a resulting rise in the base flood elevation, mitigation would be explored, such as improving hydraulic efficiency and compensate for flood storage capacity.

Cumulative Effects Conclusion – Water Quality and Hydrology

Hydrological function in the study area has been heavily influenced by past development, hydropower projects, and flood-control projects. Past development has also increased impervious surfaces and the number of pollutant sources in the study area, including industrial sites and vehicles, leading to many of the water bodies failing to meet water quality standards under the Clean Water Act. Because recent, present, and reasonably foreseeable future projects are subject to stricter regulatory standards for pollutants and hydrological effects, it is anticipated that water quality will continue to improve in the study area and hydrological effects will continue to be managed by existing and planned hydropower and flood-control projects. Due to the lack of a reliable method to quantify future emissions or other pollutants, it is assumed that existing water quality conditions would be maintained under the No-Build Alternative (see Section 3.14).

The No-Build Alternative would contribute to adverse cumulative effects on water quality and hydrology through the continued release of pollutants and untreated runoff from past development, and would not contribute beneficial cumulative effects created by present and reasonably foreseeable future actions, which are held to stricter regulations.

Under the No-Build Alternative, the cumulative effects on water quality and hydrology from past, present, and reasonably foreseeable future actions would be beneficial due to reasonably foreseeable future actions that would provide more stringent treatment of stormwater runoff. Compared to the No-Build Alternative, the cumulative effects on water quality and hydrology from the Modified LPA would be incrementally more beneficial due to improved stormwater treatment within the CIA.

Wetlands and Other Waters

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Urbanization and land use changes have reduced the acreage of wetlands in the study area since the 1800s (Morlan et al. 2010). Between the 1780s and 1980s, Oregon and Washington lost an estimated 38% and 31% of their wetlands, respectively (Dahl 1990). In the 1970s through the 1990s, stricter federal and state protections reduced the annual wetland loss in the Willamette Valley but did not stop the loss of wetlands (Morlan et al. 2010). Since 1958 (the base year of I-5 construction), some wetland restoration has occurred near the

southern portion of the study area. The Port of Portland completed a wetland restoration project at the 90-acre Vanport wetlands parcel, located immediately west of the existing highway and light-rail line. Other historic wetlands east of the highway, in the Delta Park area and on Hayden Island, have experienced increased development, draining, or filling since 1964.

Identified reasonably foreseeable future actions in the study area that could contribute to cumulative effects on wetlands and other waters include:

- Planned restoration activities near the Columbia Slough and the Smith and Bybee Wetlands Natural Area, which would improve wetland functions.
- The Portland Metro Levee System project is estimated to result in the loss of approximately 0.5 acres of wetlands that would be mitigated through compensatory mitigation (e.g., the purchase of credits from a wetland mitigation bank) (USACE and CCDD 2021). Mitigation would be required to completely offset any loss of functions or value, and USACE issued a Finding of No Significant Impact in 2022.
- The Renaissance Boardwalk mixed-use development has been proposed near the Columbia River in Vancouver; it is close to wetlands. While more detailed information is not yet available for this project, impacts to wetlands or waters would have to meet Washington state requirements for no net loss of functions or value.
- Future dredging projects, such as the potential deepening of the navigation channel by USACE, that would disturb sediment in the Columbia River waterway. USACE and affected ports are conducting environmental reviews for a Dredged Material Management Plan for the Lower Columbia River, which would document effects to wetlands and waters as well as proposed mitigation. However, these environmental reviews are not yet complete, so specific information regarding the potential impacts from the dredging project are not known at this time.
- The Cascade Renewable Transmission Project would install an underwater cable at the bottom of the Columbia River. This project has not gone through environmental review yet, and more specific impacts are not known at this time; however, this proposed project would likely involve disturbing the river bottom sediment to create an approximately 18-inch trench for the cable (Cascade Renewable Transmission n.d.).

The Oregon Department of State Lands recorded a net loss of wetlands over the past decade in Oregon (approximately 45 acres), although there has been a net gain in the last 5 years (approximately 47 acres). Based on the data, statewide wetland gains and losses are highly variable year to year (ranging from a net loss of 42 acres to a net gain of 60 acres). While all recorded wetland losses are compensated, this is often achieved through the purchase of credits from mitigation banks or in-lieu fee programs, and wetland enhancement and preservation are not counted as wetland gains as they do not result in gains in wetland acres (Pelton 2024). Similar data for Washington State were not located; however, the state's regulatory agencies are charged with ensuring no net loss of wetland value or function. USACE, Ecology, and some Washington jurisdictions (including the City of Vancouver) encourage the use of mitigation banks and in-lieu fee programs over on-site mitigation because they can offer greater assurance for mitigation (Hruby et al. 2009; USACE and EPA 2008). Therefore, a loss of wetlands can be reliably offset in another location within the watershed without a loss of overall value and function.

No-Build Alternative

The No-Build Alternative would not result in further filling of wetlands or the fill or reduction of wetland buffers within the study area due to Program activities. Untreated stormwater from over 150 acres of CIA within the study area would continue to be discharged into wetlands and other waters. Increased development, traffic volumes, and congestion could increase pollutant discharge to wetlands and waters, including 6PPD-quinone (a byproduct of tire dust that is toxic to salmonids). Other reasonably foreseeable

future actions in the study area that could contribute to cumulative effects on wetlands and other waters (identified above) would continue under the No-Build Alternative, although impacts from those actions would be required to meet applicable regulatory requirements for no net loss of functions or value.

Modified LPA

The Modified LPA would require the fill of relatively small areas of wetlands and wetland buffers (approximately 0.58 acres and 7.39 acres, respectively), which would adversely affect wetland functions. In addition, the Modified LPA would increase the impervious surface area in the vicinity of wetlands and decrease the distance between wetlands and roadway traffic, which could increase stormwater flow and pollutants. However, the Modified LPA would also provide stormwater facilities that would treat stormwater runoff for both new and existing impervious surfaces created by the original construction of I-5 in the study area, which would improve water quality flowing into wetlands. In addition, the double-deck fixed-span configuration would result in a net restoration of approximately 0.13 acres of waterway in the Columbia River and North Portland Harbor due to the smaller footprint of the replacement structures compared to the existing Interstate Bridge. The single-level fixed-span and single-level movable-span configurations would both result in a small net loss (less than 0.1 acres).

Mitigation for wetland fill is regulated by federal, state, and local jurisdictions and would typically require purchasing credits from an agency-approved mitigation site or completing on-site or off-site mitigation to compensate for lost or degraded functions. Fill of the Vanport wetland would require increased mitigation ratios because it is an existing wetland mitigation site. Unavoidable impacts to wetlands and other waters would be offset through one or more compensatory mitigation projects, which are currently being developed in coordination with federal, state, and local regulatory agencies, tribes, and community members. With mitigation, it is anticipated that the Modified LPA would result in a net beneficial effect on quality and ecological function of wetlands and waters.

The net reduction of fill in the Columbia River and improved stormwater treatment would improve the current functions of wetlands and waters, helping to mitigate some past actions.

Cumulative Effects Conclusion – Wetlands and Other Waters

Past actions, including construction of I-5 and the existing Interstate Bridge, led to a decline in the amount and function of wetlands and other waters. Present actions are required to adhere to more stringent regulations, with the current requirements being no net loss in wetland function and value and treating stormwater runoff from roadways. Reasonably foreseeable future actions in the study area that affect wetlands and other waters would also be required to comply with regulations to achieve no net loss of wetland function or value and treat stormwater.

While the No-Build Alternative would not result in filling of wetlands or other waters, it would not improve wetland functions, and untreated stormwater would continue to be discharged into wetlands and other waters. The Modified LPA would result in the fill of some wetlands, and would provide mitigation to improve the current value and functions of wetlands, and would improve stormwater treatment.

Under the No-Build Alternative, the cumulative effects on wetlands and other waters from past, present, and reasonably foreseeable future actions would be beneficial due to reasonably foreseeable future actions that would provide more stringent stormwater treatment for water that flows into wetlands and other waters. Compared to the No-Build Alternative, the cumulative effects on wetlands and other waters from the Modified LPA would be incrementally more beneficial due to improved stormwater treatment within the CIA and mitigation to replace lost functions and values of fill placed in wetlands and waters.

Ecosystems

Fish, Wildlife, and Vegetation

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Ecosystem resources include fish, wildlife, plants, and their habitats. Ecosystem resources within the study area include habitat for a variety of plants, terrestrial wildlife, birds, fish, marine mammals, rare plants, and noxious weeds. This discussion of ecosystem resources includes aquatic and terrestrial species.

Native Americans lived in the study area for more than 10,000 years before the arrival of Euro-American settlers. Since the Euro-American settlement in the mid-1800s, human population growth and land development have gradually displaced and reduced the quality and quantity of wildlife habitat. Historically, many activities, including deforestation, urbanization, dams for hydroelectricity, irrigation and flood control, hatchery operations, and overfishing have contributed to the loss of habitat and reduction in fish and wildlife species. These past actions have made significant changes to the region's ecosystems. Compared to their historic conditions, natural habitats in the area are generally small and fragmented.

General growth and development in the region will continue to affect species and habitats in the study area. Current and reasonably foreseeable future projects, such as the Portland Metro Levee System project, Flood Safe Columbia River, Port of Vancouver Terminal 1, Cascade Renewable Transmission Project, dredging, and maintenance of existing waterfront structures could include activities that would affect aquatic or terrestrial species and their habitats. For example, additional impervious surface area could increase the quantity of stormwater runoff, affecting aquatic habitat function. Of the reasonably foreseeable future actions, only the Portland Metro Levee System project is identified as increasing impervious surfaces (by less than 1 acre); the remaining projects (including the Renaissance Boardwalk, Waterfront Gateway, and Expo Center) are located in areas that currently consist primarily of impervious surfaces and redevelopment may ultimately improve runoff if it includes stormwater detention and treatment.

Substantive legislation to protect natural resources began in the 1960s and has since expanded. Projects that are subject to federal, state, and/or local permits require a mitigation sequencing process consisting of avoidance, minimization, and mitigation to reduce effects on species and their habitats. Reasonably foreseeable future projects would be required to provide stormwater quality treatment consistent with applicable stormwater regulations, which would reduce pollutants being discharged into water bodies and improve water quality and aquatic habitat for aquatic species. Because requirements typically include treatment for existing untreated impervious surfaces, reasonably foreseeable future projects may lead to a net beneficial effect on water quality and aquatic habitat for aquatic species. Reasonably foreseeable future projects constructed over time would also be legally required to avoid, minimize, and mitigate impacts to fish and wildlife to achieve no net loss in habitat function. Planned restoration in the study area includes cleanup at the Portland Harbor Superfund Site and smaller projects along Burnt Bridge Creek in Vancouver and the Columbia River Slough in Portland (EPA n.d.; Ecology 2021; Lee and Stamberger 2018).

No-Build Alternative

The No-Build would continue to contribute to an adverse cumulative effect on ecosystem resources, particularly aquatic habitat and aquatic species, from untreated stormwater runoff from I-5 and disturbance of fish and wildlife during intermittent bridge and highway maintenance activities. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on fish, wildlife, and vegetation (identified above) would continue under the No-Build Alternative, though any impacts from those actions would be subject to applicable regulatory requirements. Untreated stormwater from over 150 acres of CIA within the study area would continue to be discharged into wetlands and waters, negatively affecting these natural habitats and species within them. Increased development, traffic volumes, and congestion

could increase pollutant discharge to wetlands and waters, including 6PPD-quinone (a byproduct of tire dust that is toxic to salmonids).

Modified LPA

Construction of the Modified LPA would result in temporary impacts (e.g., increased noise, turbidity, overwater shading) to aquatic and terrestrial species and their habitats. The Modified LPA would result in both permanent and short-term disturbance to sensitive terrestrial habitats, including riparian buffers, trees, wetlands, and wetland buffers. To minimize the impacts to fish and wildlife species and their habitats during construction, as described in the Ecosystems Technical Report and required in the permits that would be issued, best management practices would be followed.

Long-term effects on aquatic ecosystem resources would include displacement of benthic habitat from the new bridge piers and new overwater shading from the bridges' shaft caps and bridge decks. The Modified LPA would create new impervious surfaces, which would generate stormwater runoff but would also provide water quality treatment for new and existing impervious surfaces, including those created by the original construction of I-5 that did not include stormwater treatment. The Modified LPA would reduce pollutants (including dissolved copper) associated with highway runoff, improving aquatic habitat. Impacts to fish and wildlife species and their habitats would be avoided, minimized, and offset through compensatory mitigation, as required by compliance with federal, state, and local regulatory requirements. These mitigation measures would result in no net loss of habitat function. A compensatory mitigation approach is currently in development with federal, state, and local regulatory agencies; tribes; and community members.

Mitigation measures required for the Modified LPA would reduce harmful effects and even improve parts of the local ecosystem relative to existing conditions. The Modified LPA would have a net beneficial effect on fish and wildlife species and habitat, considering the proposed improvements treating stormwater entering the Columbia River and North Portland Harbor.

Cumulative Effects Conclusion – Fish, Wildlife, and Vegetation

Past actions, such as deforestation, urbanization, and construction of dams for hydroelectricity, have resulted in loss of habitat and reduction in fish and wildlife species. Although regulations have been implemented to protect species and their habitat, present actions include development that would continue to affect species and their habitat. Reasonably foreseeable future actions, such as the Portland Metro Levee System Project and the Cascade Renewable Transmission Project, which both involve extensive over-, near-, and in-water work, would also affect species and their habitat.

The No-Build Alternative would contribute to adverse cumulative effects on ecosystem resources, particularly aquatic habitat and aquatic species, from continued untreated stormwater runoff from I-5 and disturbance of fish and wildlife during intermittent bridge and highway maintenance activities. The Modified LPA would not impact sensitive terrestrial habitats and species. The Modified LPA would displace some benthic habitat for aquatic species, and result in new overwater shading from shaft caps, in the Columbia River; however, the Modified LPA would also provide water quality treatment that would improve aquatic habitat.

Under the No-Build Alternative, the cumulative effects on fish, wildlife, and vegetation from past, present, and reasonably foreseeable future actions would be adverse, due to actions that remove or disrupt habitat, but also beneficial, due to new development being held to stricter stormwater management and treatment standards. Compared to the No-Build Alternative, the cumulative effects on fish, wildlife, and vegetation from the Modified LPA would be incrementally more beneficial due to the additional treatment of stormwater from roadways within the CIA.

Aquatic and Terrestrial Species of Interest

Species of Interest (SOI) is not a specific category of governmental or nongovernmental organization-designated species, but refers to native species identified through tribal, local, state, and federal coordination as having particular importance because of their regulatory status, rarity, and/or special habitat considerations. Examples of aquatic and terrestrial SOI species include those species listed under the federal Endangered Species Act, species with other federal regulatory protections (such as marine mammals, bald eagles, and migratory birds), species with special state regulatory status in Oregon or Washington, and other species that consulting tribes have identified as warranting particular focus.

Effects from Past, Present, and Reasonably Foreseeable Future Actions

The effects from past, present, and reasonably foreseeable future actions on fish, wildlife, and vegetation (described above) are anticipated to have similar effects on SOI. Many SOI are subject to additional legal protections (e.g., the Endangered Species Act) and require additional evaluation and mitigation for impacts caused by present and reasonably foreseeable future actions. Compliance with the relevant laws, regulations, policies, and codes in force would help minimize or mitigate the effects of other actions on SOI and their habitats. However, even if a project has a net beneficial impact on these species, many of them would continue to face threats to their continued long-term survival.

No-Build Alternative

The No-Build Alternative would continue to contribute to an adverse cumulative effect on aquatic and terrestrial SOI from untreated stormwater runoff from I-5 and direct disturbance of aquatic and terrestrial SOI during intermittent bridge and highway maintenance activities. As noted above for non-SOI species, reasonably foreseeable future actions in the study area that are identified above and could contribute to cumulative effects on ecosystems would continue under the No-Build Alternative, though any impacts from those actions would be subject to applicable regulatory requirements. Within the study area, untreated stormwater with various pollutants would continue to be discharged into aquatic habitats, including 6PPD-quinone.

Modified LPA

Construction of the Modified LPA would result in temporary impacts (e.g., increased noise, turbidity, and overwater shading) to aquatic and terrestrial SOI. Long-term effects on aquatic and terrestrial SOI species and their habitats would include displacement of benthic habitat from the bridge piers and new overwater shading. The Modified LPA would reduce pollutants associated with highway runoff (including dissolved copper), improving water quality and habitat function for aquatic SOI.

Mitigation measures under the Modified LPA would reduce harmful effects and even improve parts of the local ecosystem relative to existing conditions. The Modified LPA would have a net beneficial effect on habitat function for aquatic SOI, considering improved treatment of stormwater entering the Columbia River and North Portland Harbor.

Cumulative Effects Conclusion - Aquatic and Terrestrial Species of Interest

Past actions on aquatic and terrestrial SOI have resulted in the same effects as non-SOI fish, wildlife, and vegetation, including deforestation, urbanization, and construction of dams for hydroelectricity, that have resulted in loss of habitat and reduction in the populations of SOI. Although regulations have been implemented to protect SOI, present actions include development that would continue to affect SOI and their habitat. Reasonably foreseeable future actions would affect SOI ecosystem resources, particularly the Portland Metro Levee System Project and the Cascade Renewable Transmission Project, which both involve extensive in-water work in the Columbia River.

The No-Build Alternative would contribute to adverse cumulative effects on aquatic and terrestrial SOI from continued untreated stormwater runoff from I-5 and direct disturbance of fish and wildlife during intermittent bridge and highway maintenance activities. The Modified LPA would not impact sensitive terrestrial habitats and terrestrial SOI. The Modified LPA would displace some benthic habitat, and result in new overwater shading from shaft caps, in the Columbia River that would affect aquatic SOI; however, the Modified LPA would also provide water quality treatment that would improve aquatic habitat.

Under the No-Build Alternative, the cumulative effects on aquatic and terrestrial SOI from past, present, and reasonably foreseeable future actions would be adverse, due to actions that remove or disrupt habitat, but also beneficial, due to new development being held to stricter stormwater management and treatment standards. Compared to the No-Build Alternative, the cumulative effects on aquatic and terrestrial SOI from the Modified LPA would be incrementally more adverse due to in-water habitat loss and incrementally more beneficial from additional stormwater treatment.

Geology and Groundwater

Effects from Past, Present, and Foreseeable Future Actions

Past activities in the study area that have affected geological conditions and groundwater include settlement and development of the region, filling of lowland areas, grading of slopes, and construction in earthquake-prone areas. The study area consists of soils with high relative earthquake hazard rating that are susceptible to severe ground shaking and liquefaction during a major seismic event. The steep slopes and soils susceptible to erosion in the Burnt Bridge Creek area have been disturbed in the past from the construction of I-5 and SR 500. Current infrastructure, including roads, bridges, and buildings, was constructed under seismic codes applicable at the time of construction. The existing bridges and other I-5 structures, such as overpasses and retaining walls, were built before design standards addressed the impacts associated with subduction zone earthquakes, including severe liquefaction. More recent development, such as the mixed-use buildings along the Vancouver waterfront, was constructed to current design standards and should withstand a major seismic event.

Past actions such as the Vanport Flood, the siting of the Hayden Island Landfill, and industrial activities along the Columbia River resulted in contamination of groundwater through the spillage or leakage of gasoline and other petroleum products stored at commercial sites or industrial facilities. Contaminants from historical commercial and industrial activities in both Vancouver and Portland have diminished groundwater quality. Reasonably foreseeable future actions, such as the Waterfront Gateway, levee system improvements, and the Renaissance Boardwalk, may include development and regrading that could lead to soil erosion, even with erosion control best practices in place. These actions may also continue to sustain existing impacts to degradation of the groundwater quality from stormwater runoff in the study area. These and other reasonably foreseeable future actions would also be constructed to current seismic standards and would contribute to the beneficial cumulative effect of improved resiliency throughout the study area.

No-Build Alternative

The No-Build Alternative would not include the construction of new Columbia River bridges and other structures built to current seismic safety standards. Therefore, the No-Build Alternative would leave I-5 vulnerable to earthquakes and other geologic hazards that would have an adverse cumulative effect. In addition, the No-Build Alternative would continue to leave stormwater runoff untreated, which would continue contributing to an adverse cumulative effect on groundwater. The identified reasonably foreseeable future actions in the study area that could contribute to cumulative effects on geological and hydrogeologic conditions would continue under the No-Build Alternative, subject to applicable regulatory requirements for water quality and current seismic design standards.

Modified LPA

The Modified LPA would construct new Columbia River bridges and other I-5 structures to current seismic design standards that would substantially improve the region's seismic resiliency to withstand a major seismic event. The design of the Modified LPA would address potential non-seismic settlement to avoid impacts to levees. The Modified LPA would expose approximately 415 acres of near-surface soils to potential erosion from excavation, fill, clearing, and grading during construction. Impacts to geology and geologic hazards (such as steep slopes, soil erosion, and landslides) would be mitigated and avoided to the extent feasible by the Modified LPA. Construction on steep slopes would be minimized and the roadway design would include retaining walls or other stabilization techniques to reduce the potential for soil erosion and slope failure hazards. Landslides are not known to occur within the study area and the Modified LPA would address the risks of increased scour that could result from potential landslides upstream caused by a major Cascadia Subduction Zone event. No long-term effects on geologic hazards are anticipated in the Ruby Junction Maintenance Facility expansion area.

The Modified LPA would have beneficial effects on groundwater quality, including for the Troutdale Sole Source Aquifer, through stormwater facilities that would manage stormwater volume and flow rates and treat stormwater runoff to reduce pollutants. The Modified LPA could also improve groundwater quality by remediating some existing contamination.

Cumulative Effects Conclusion – Geology and Groundwater

Past actions that have affected geological and groundwater conditions include regional development that has graded slopes and occurred in earthquake-prone areas and commercial and industrial activities that have resulted in groundwater contamination. Present actions in the study area are required to meet current, stricter standards for water quality, erosion control, and seismic safety. Reasonably foreseeable future actions, including new construction and redevelopment of existing sites, would continue to bring buildings and infrastructure throughout the study area up to current seismic design standards and comply with regulatory requirements related to discharges into groundwater.

The No-Build Alternative would not include the construction of new Columbia River bridges or other structures, leaving I-5 vulnerable to earthquakes and other geologic hazards and stormwater runoff that enters into groundwater would remain untreated. The Modified LPA would improve the seismic resiliency of the Columbia River bridges and other I-5 structures and would treat stormwater runoff within the CIA that enters into groundwater.

Under the No-Build Alternative, the cumulative effects on geology and groundwater from past, present, and reasonably foreseeable future actions would be adverse because I-5 infrastructure would continue to age and be increasingly vulnerable to damage in an earthquake and untreated stormwater would enter into groundwater. Compared to the No-Build Alternative, the cumulative effects on geology and groundwater from the Modified LPA would be beneficial due to improved seismic resiliency of structures in the I-5 corridor and the treatment of stormwater that enters into groundwater.

Hazardous Materials

Effects from Past, Present, Reasonably Foreseeable Future Actions

Past actions in the study area, including spills and releases of hazardous materials from commercial and industrial land uses, have caused soil and groundwater contamination and pose a risk to human health. There are 579 sites that could contain hazardous materials within the study area, and the Ruby Junction Maintenance Facility is a small-quantity generator for hazardous wastes, including solvents, batteries, and paints. High-priority hazardous materials sites include the U.S. Army Vancouver Barracks, Hayden Island landfill, and Jantzen Beach car wash, among others. Many of these contaminated areas have been

documented, and in some cases cleanup actions have been initiated or completed. There may also be unknown contamination caused by past land uses and actions in the study area that poses additional risks. Reports of spills and releases of hazardous materials within the study area vary by location and year, averaging approximately zero to three incidents annually. Reported incidents of hazardous substances are managed by the Oregon State Fire Marshal's Hazardous Substance Incident database and reported spill incidents are managed by Ecology's Reported Spills to Water database.

Identified reasonably foreseeable future actions in the study area that could contribute to cumulative effects on hazardous materials include development and redevelopment of existing buildings and paved areas, particularly on sites with a history of industrial use. Properties in older urban areas, such as downtown Vancouver or Hayden Island, would be more likely to contain existing contamination. However, new development and redevelopment would be required to remediate known or discovered hazardous materials, including lead or asbestos-containing materials, to comply with local land use plans.

Development in the study area may involve the management of legacy sites, which are hazardous materials sites where the owner is or should be undertaking long-term cleanup actions. Sites for which the responsible party has not yet complied may require additional investigation and cleanup. These sites may also be considered "orphan" sites, which are being managed by regulatory agencies. Reasonably foreseeable future development in the study area could add exposure risks but also provide cleanup and remediation benefits. The discovery of new legacy sites would be the responsibility of the property owners, including ODOT and WSDOT, who would need to comply with all applicable federal, state, and local requirements for managing and mitigating contamination. In addition, population and employment growth could cause increased traffic that may result in slightly more incidents of hazardous material spills from vehicle collisions as congestion remains at current levels or worsens over time.

No-Build Alternative

Under the No-Build Alternative, there would be no acquisitions or displacements, no potential for hazardous materials liability resulting from property acquisition, and no cleanup of previously contaminated locations. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on hazardous materials would continue under the No-Build Alternative, though any activities on contaminated sites would be subject to applicable regulatory requirements for managing and mitigating contamination.

Modified LPA

The Modified LPA would require ODOT and WSDOT to acquire properties or portions of properties that have been identified as contaminated sites. Contamination may also exist within portions of WSDOT's existing right of way. Properties to be disturbed or acquired that have contamination above levels defined in regulatory standards would be subject to remediation and cleanup prior to construction. The discovery of contamination within new or existing right of way would be the responsibility of the property owners, including ODOT and WSDOT, who would be subject to applicable remediation and cleanup requirements. The Modified LPA would have beneficial effects due to the cleanup and remediation of previously contaminated areas on disturbed or acquired sites (consistent with state requirements). This cleanup would reduce the risk of future contamination and risks to human health.

Construction of the Modified LPA, or other reasonably foreseeable future construction actions, creates a potential for the release of hazardous substances or petroleum products into the environment from the improper transfer of fuel or spills from construction equipment. Other pollutants, such as paints, acids for cleaning masonry, solvents, raw concrete, paving, striping products, and concrete-curing compounds, are often present at construction sites and may enter the environment if not managed correctly.

The Modified LPA would improve safety and operations on I-5, which could reduce hazardous material spills as a result of highway crashes.

Cumulative Effects Conclusion – Hazardous Materials

Past actions include spills and releases of hazardous materials from commercial and industrial land uses, which have resulted in contaminated sites in the study area. Present actions include continued spills and releases of hazardous materials (reported incidents of hazardous substances and spills vary by location and year) and also efforts to clean up contaminated sites in the study area. Reasonably foreseeable future actions in the study area that would affect hazardous materials would include the continued potential for spills and cleanup efforts to meet applicable regulatory requirements for managing and mitigating contamination.

The No-Build Alternative would not result in the potential disruption of contaminants on properties within the study area and would not cleanup previously contaminated property. The Modified LPA would cleanup and remediate previously contaminated areas on disturbed or acquired sites and would improve safety and operations on I-5, which would potentially reduce spills as a result of highway crashes.

Under the No-Build Alternative, the cumulative effects on hazardous materials from past, present, and reasonably foreseeable future actions would be beneficial for the environment and human health through the reduction and cleanup of hazardous materials as a result of redevelopment. Compared to the No-Build Alternative, the cumulative effects on hazardous materials from the Modified LPA would be incrementally more beneficial because acquired sites that are contaminated within the study area would be cleaned up.

Climate Change

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Substantially rising GHG concentrations from human activities have been a primary driver of global warming. Both Ecology and the Oregon Global Warming Commission publish reports every 2 years measuring their states' GHG emissions and progress toward state and federal goals to reduce these emissions. Transportation (including highway, rail, and air transport) is the greatest contributor to GHG emissions nationally and in Oregon and Washington; other major contributors include electric power generation, industrial uses, residential and commercial energy consumption, and agriculture. Multiple federal, state, regional, and local regulations and policies have been enacted to guide the development and evaluation of transportation projects and local communities' management of GHG emissions. NEPA and many state environmental policy regulations now require project sponsors to quantify the GHG emissions of their projects. Policy efforts aimed at reducing transportation GHG emissions include incentives for purchasing electric vehicles, funding of electric vehicle charging infrastructure, and funding to increase less-polluting travel modes like transit, walking, and biking.

Reasonably foreseeable future actions related to the policies and plans of state, regional, and local jurisdictions have the potential to influence the decrease in GHG emissions in the transportation and land use sectors. Policies that directly regulate the emissions of vehicles, such as a clean fuels standard, have the greatest potential to reduce GHG emissions. Additional ancillary benefits may also come from transitions to renewable energy sources in the energy sector. For example, the Cascade Renewable Transmission Project will transfer approximately 1,100 MW of large-scale wind, solar, and other renewable energy sources to help meet renewable energy goals in Washington and Oregon. Renewable energy sources emit fewer upstream GHGs than energy generated from fossil fuels. Other actions currently being legislated or encouraged to reduce GHG emissions include limits on industrial emissions, strategies to reduce home and commercial energy use or switch to green sources, and efforts to curb methane production by the agricultural industry. Collectively, these efforts have reduced emissions in the U.S. by approximately 3% since 1990 (EPA 2024). This trend is expected to continue as a result of stronger regulation of emissions.

Compared to existing conditions, GHG emissions associated with the transportation sector are expected to decline in future years due to improvements in vehicle fuel technologies and the transition away from using

gasoline and diesel fuels to power vehicles. As more of the vehicle fleet is composed of electric cars, the decarbonization of the electric grid in Washington and Oregon will further decrease GHG emissions associated with vehicle travel.

Because the effects of regional growth and reasonably foreseeable future actions are incorporated into the transportation modeling, the results of the GHG emissions modeling for both the No-Build Alternative and the Modified LPA reflect cumulative effects on annual GHG emissions in the study area that include projected vehicle volumes in 2045.

No-Build Alternative

Although VMT would increase in the study area by 2045 under the No-Build Alternative, GHG emissions are expected to decline substantially over this period due to the implementation of fuel and engine regulations. However, the No-Build Alternative would not contribute to this cumulative reduction in GHG emissions. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on climate change (identified above) would continue under the No-Build Alternative, though any impacts from those actions would be subject to regulatory requirements to reduce emissions and improve resiliency.

Modified LPA

The Modified LPA would result in fewer user GHG emissions than the No-Build Alternative because of a mode shift to public transit and active transportation, as well as decreases in VMT, congestion, and vehicle idling. While the sources of GHG emissions during construction would be temporary, the GHG emissions would remain in the atmosphere. GHG emissions from construction would include exhaust from construction equipment and vehicles used to transport materials to and from the study area. There would also be GHG emissions associated with the embodied carbon of construction materials, which refers to emissions due to material production. GHG exhaust during construction would be mitigated and reduced by following current standard specifications and regulatory guidance from ODOT and WSDOT to conserve the use of construction materials and fuels and by implementing best management practices.

The Modified LPA includes features that would improve local and regional resiliency to the anticipated effects of climate change. These features would help to avoid fragmentation and degradation of floodplain hydrology by sensitively locating new and modified transportation and utility project components; maximizing management of stormwater by restoring existing unused impervious paved areas to natural, permeable, and vegetated conditions during the design phase; and ensuring that the bridge design would accommodate potential effects of climate change, such as larger water volumes from winter storms and more frequent snow and ice storms.

Cumulative Effects Conclusion – Climate Change

Past actions, primarily transportation projects and population growth and development, have led to an increase in GHG emissions and climate hazards. Present actions include additional transportation projects which could increase GHG along with efforts, such as the Cascade Renewable Transmission Project, that seek to lower GHG emissions and/or improve climate resiliency. Reasonably foreseeable future actions are expected to generate GHG emissions as well as seek to reduce VMT and GHG emissions as roadway users shift to transit and active transportation modes and a reduction in roadway congestion

The No Build Alternative would not contribute to a reduction in GHG emissions; it would continue past trends of car-centric transportation networks. While construction of the Modified LPA would generate GHG emissions from construction equipment and materials, in the long-term the Modified LPA would provide transit and active transportation options to lower VMT and GHG emissions and improve climate resiliency.

Under the No-Build Alternative, the cumulative effects on climate change from past, present, and reasonably foreseeable future actions would be beneficial as a result of other actions that would reduce

GHG emissions. Compared to the No-Build Alternative, the cumulative effects on climate change from the Modified LPA would be incrementally more beneficial due to reduced VMT and GHG emissions in the I-5 corridor and improvements in climate resiliency.

Environmental Justice

Effects from Past, Present, and Reasonably Foreseeable Future Actions

The original construction of I-5 and I-205 through Portland had significant effects on the populations in and adjacent to the highway's path, including environmental justice (EJ) populations.⁶ ODOT cleared entire blocks for development of the roadway, dividing neighborhoods, displacing residences, and affecting businesses in the historic center of Portland's Black community. The construction of I-5 through Vancouver changed the city by closing 5th Street (the route heading east) and encouraging development of housing to the north of downtown. Fewer displacements occurred in Vancouver than Portland because the area was less densely developed than Portland at that time.

One socioeconomic impact attributed to the cumulative effect of population growth and development is an increase in the cost of living. Between 2000 and 2021, median gross rent increased 52% in Portland, 48% in Multnomah County, 40% in Vancouver, and 41% in Clark County (adjusted for inflation) (U.S. Census Bureau 2000, 2021). In the same period, median household income increased by only 15% in Portland and 11% in Multnomah County, while median household income decreased by 4% in Vancouver and 7% in Clark County (U.S. Census Bureau 2021). As the cost of living increases, low-income households often move farther from jobs and services to find affordable housing. This can result in longer commute times and higher transportation costs for low-income households.

Tolling of I-205 (Abernethy Bridge), if advanced in Oregon, could increase transportation costs for EJ populations. The tolling project may implement low-income or equitable tolling policies to subsidize or offset the economic burden of tolling on low-income and minority populations. There are no other known reasonably foreseeable future projects within the study area that would contribute to a cumulative effect on EJ populations, such as displacement or increasing the cost of living. Reasonably foreseeable future transportation actions would follow federal and state guidelines, such as the Uniform Relocation Act, to provide replacement housing and relocation benefit packages.

Reasonably foreseeable future development and redevelopment projects include projects in downtown Vancouver and north Portland. Future projects such as Terminal 1, Waterfront Gateway, Renaissance Boardwalk, and Portland Expo Center Redevelopment would add new buildings or redevelop existing buildings. There is not enough information at this time to determine the exact impacts; however, reasonably foreseeable future development projects may lead to the displacement of encampments of houseless populations and the Renaissance Boardwalk could displace an existing commercial property.

No-Build Alternative

The No-Build Alternative would not change the existing conditions that affect EJ populations. It would not acquire or displace residences or businesses or provide an extension of light-rail, improvements to active transportation facilities, and improved bus service in the corridor. Therefore, the No-Build Alternative would not contribute to beneficial or adverse cumulative effects on EJ populations. Other reasonably foreseeable future actions in the study area that could contribute to cumulative effects on EJ populations would continue under the No-Build Alternative, although impacts from actions subject to review would follow federal and state guidelines to provide mitigation for displacement or other adverse impacts.

⁶ Environmental justice populations include low-income and minority groups.

Modified LPA

The Modified LPA would have both beneficial and adverse effects on EJ populations. Some populations, including minority and low-income individuals, would be adversely affected by displacement of businesses and residents and by noise, dust, and traffic during construction. However, in general, the Modified LPA would likely improve conditions (such as air pollution, poor access to affordable housing and transportation, and poor transit service) for populations and neighborhoods that have historically been adversely affected by other past actions.

For low-income populations, among which Black, Indigenous, and people of color (BIPOC) communities are overrepresented, the impacts of tolling associated with the Modified LPA, such as the share of total household income spent on transportation costs, may be a disproportionate and adverse impact. The IBR Program is considering a low-income toll program to address these impacts.

EJ populations would benefit from the Modified LPA through the construction of light-rail transit; increased transit frequencies; improved travel times on I-5; improved bicycle and pedestrian facilities; and safer vehicle, bicycle, and pedestrian travel.

Cumulative Effects Conclusion – Environmental Justice

Past actions, such as the original construction of I-5 and I-205 led to the displacement of residences, affected businesses, and influenced development patterns and growth in Portland and Vancouver. Present actions include population growth and continued development that include residential and/or business displacements and increases in the cost of living. Reasonably foreseeable actions include continued development and population growth that could impact low-income households and their access to affordable housing, and result in longer commute times and higher transportation costs. Present and reasonably foreseeable future actions in the study area that affect EJ populations would be required to follow state and federal guidelines to provide mitigation for displacement and other adverse impacts.

The No-Build Alternative would not result in displacements that would affect EJ populations or improvements to the transportation system, including active transportation facilities and transit, that would improve mobility for EJ populations. The Modified LPA would affect EJ populations, including minority and low-income individuals, through the displacement of businesses and residents by noise, dust, and traffic during construction. For low-income populations, tolling of the Columbia River bridges would affect transportation costs. The IBR Program is considering a low-income toll program to address these impacts. The Modified LPA would improve conditions (such as air pollution, poor access, and poor transit service) for EJ populations and neighborhoods. The Modified LPA would provide beneficial cumulative effects to EJ populations through a variety of transportation improvements to public transportation, traffic congestion, active transportation, and traffic safety.

Under the No-Build Alternative, the cumulative effects on EJ populations from past, present, and reasonably foreseeable future actions would be adverse due to the potential for displacements that could affect EJ individuals and businesses and rising transportation costs. Compared to the No-Build Alternative, the cumulative effects on EJ populations from the Modified LPA would be adverse due to the potential displacement of EJ individuals and businesses and beneficial through improvements in access, traffic safety, transit service, air quality, and noise.

Aviation

Effects from Past, Present, and Reasonably Foreseeable Future Actions

Two airports are located near the study area: Pearson Field and Portland International Airport (PDX). Both airports were in operation prior to construction of I-5 in the early 1950s (though improvements at both airports have occurred since then), and both the airports and the existing Interstate Bridge pre-date federal

aviation regulations. Past actions affecting aviation in the study area include development that penetrates the airspace of aircraft landing or departing at Pearson Field. The towers of the existing Interstate Bridge and several buildings in downtown Vancouver currently penetrate Pearson Field Part 77 airspace. There are no known planned reasonably foreseeable future projects in the area that would contribute to cumulative effects on airspace.

No-Build Alternative

The No-Build Alternative would not alter existing aviation conditions. The towers of the Interstate Bridge would continue to penetrate into Pearson Field Part 77 airspace, which requires special departure procedures to help aircraft avoid the towers. The Interstate Bridge creates no intrusion or hazard for aircraft navigation at PDX. There are no other known reasonably foreseeable future actions in the study area that could contribute to cumulative effects on airspace; however, any impacts from reasonably foreseeable future actions would be subject to federal aviation regulations, in addition to local airport overlay zoning regulations and Pearson Field departure procedures.

Modified LPA

The Modified LPA would have no effect on aviation at PDX. The Modified LPA with a single-level or double-deck fixed-span configuration would contribute to beneficial cumulative effects on operations at Pearson Field by removing the lift towers that were introduced when the existing Interstate Bridge was constructed. The Modified LPA with the movable-span configuration would also remove the existing lift towers but would introduce new penetrations into the Pearson Field airspace and would contribute to existing cumulative effects on aviation. The lift towers for the vertical lift span, based on the preliminary design, would be similar in elevation to the existing lift towers and permanently penetrate the Pearson Field airspace. The Modified LPA would reduce wildlife strike risk at Pearson Field by including bridge design features to reduce the potential for bird nesting and roosting combined with continued deterrence measures.

Cumulative Effects Conclusion – Aviation

Past actions, including development in downtown Vancouver and construction of I-5, led to airspace penetrations for aircraft landing or departing at Pearson Field. Present actions would comply with Federal Aviation Administration requirements to ensure compliance with airspace regulations. There are no reasonably foreseeable future actions in the study area that would affect aviation airspace.

The No-Build Alternative would not change existing airspace conditions; several buildings in downtown Vancouver and the existing Interstate Bridge would continue to penetrate the Pearson Field Part 77 airspace and require specific departure procedures to help aircraft avoid the bridge towers. The Modified LPA could reduce bird nesting and bird strike risk at Pearson Field. The Modified LPA would have no effect on aviation at PDX but, depending on the bridge configuration, could result in new airspace penetrations for Pearson Field airspace.

Under the No-Build Alternative, the cumulative effects on aviation from past, present, and reasonably foreseeable future actions would be negligible as other actions would continue to comply with Federal Aviation Administration requirements. Compared to the No-Build Alternative, the cumulative effects on aviation from the Modified LPA would be minor and beneficial due to reduced potential for bird nesting and, if a movable-span configuration is selected, adverse through continued penetration into protected airspace.

3.23.4 Temporary Cumulative Effects

Cumulative effects during construction may result when simultaneous or sequential construction projects have an additive effect on the temporary effects of constructing the Modified LPA. Construction of the

Modified LPA, which includes construction of the new bridges and removal of the existing bridges, is anticipated to overlap with the construction of several of the reasonably foreseeable future projects listed in Section 3.23.2. These include Vancouver Waterfront, Terminal 1, Renaissance Boardwalk, Waterfront Gateway, the various levee system improvements, Portland Expo Center, and the Cascade Renewable Transmission Project. In addition, numerous transportation projects in the 2018 RTP are scheduled for construction in the same timeframe.

Simultaneous or sequential construction projects can increase congestion, cause temporary delays and disruptions to local residents and businesses, create more temporary employment opportunities, impact community and natural resources, and require additional public and private spending. Temporary cumulative effects on the community may result from local traffic congestion and rerouting, as well as noise and air quality impacts, when construction of the Modified LPA overlaps with the construction of other projects in the area. Other projects would have their own traffic control plans, but some may influence the travel routes of commuters and freight and could place more traffic in the study area. Likewise, some projects are on planned haul routes and could influence the delivery of supplies and materials to the job sites for the Modified LPA.

As more detailed plans are developed, traffic control plans would need to be coordinated with these projects and their timelines. Mitigation plans, including coordinated traffic control plans and business assistance, would reduce the temporary negative consequences of construction, while the employment demands would result in positive economic outcomes for the region.

Construction of the Modified LPA could also result in increased employment and spending in the study area during construction. The extent of these effects depends on the funding sources and the makeup of work crews used during construction. This could affect the ability of other projects to obtain skilled workers.

Construction of the Modified LPA is likely to affect marine commerce, including disruptions and delays for vessels during the in-water work (projected to be periodic over 4 years). Several other projects will require in-water work that may occur at the same time, including the Renaissance Boardwalk, the levee system improvements, and the Cascade Renewable Transmission Project.

In addition to marine commerce, overlapping in-water work can also create temporary cumulative effects on fish and wildlife. For each project, most construction-related natural environment impacts would be localized in extent and magnitude such that cumulative effects from other projects would be minimal. Other projects in the area, such as the two levee improvement projects and the Cascade Renewable Transmission Project, could directly impact the same waters or wetlands or regulated habitats that the Modified LPA would affect. Cumulative effects related to construction activities would only occur if such activities were being conducted simultaneously and near construction being conducted for the Modified LPA. Temporary cumulative effects to aquatic habitats may include underwater noise from pile driving, physical benthic impacts, and shading from temporary in-water and overwater structures.

Any project that requires substantial in-water construction work would require federal approvals for work within the river and would therefore undergo Endangered Species Act consultation. To minimize impacts to aquatic species and their habitats, certain work below the ordinary high water mark of the Columbia River and North Portland Harbor would be restricted to defined timing restrictions, referred to here as the in-water work window. The USACE, NOAA Fisheries, USFWS, ODFW, and WDFW all can recommend and/or require restrictions on the timing of in-water work during their regulatory review processes.

Upland ground-disturbing activities (including clearing, grubbing, and excavation) have the potential to cause erosion, which in turn may introduce sediment into adjacent water bodies. However, reasonably foreseeable future projects would require project-specific erosion and sediment control plans, which would reduce the potential for upland construction to cause turbidity in the Columbia River.

If construction of reasonably foreseeable future projects does occur simultaneously with IBR Program-related construction, adverse cumulative effects would be temporary and minimized through construction coordination between ODOT, WSDOT, and other agencies.

3.23.5 Irreversible and Irretrievable Commitments of Resources

NEPA regulations from the Council on Environmental Quality require the environmental analysis to identify "...any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented" (CFR 1502.16). Irreversible and irretrievable resource commitments include the use of nonrenewable resources throughout a project that may be irreversible if removal of the resources occurs and cannot be replaced within a reasonable timeframe (for example, extinction of a threatened or endangered species) or if obstruction of the use of resources occurs after construction. Implementing the Modified LPA would involve committing natural, physical, human, and fiscal resources.

The proposed improvements would involve a long-term conversion of approximately 47 acres of land to provide right of way for the Modified LPA. Although these transportation facilities could revert to urban land and open space, that is unlikely and would require resources to make happen. Fossil fuels used to power construction, operate vehicles, and manufacture materials are the major nonrenewable resources that would be consumed by construction of the Modified LPA and the resulting daily vehicle operations.

Considerable amounts of labor and material, including cement, aggregate, asphalt, sand, fill materials, lime, and steel, would be used for construction. For demolition of the existing infrastructure, reuse options are relatively limited, but many materials can be recycled. As construction packages and plans are developed, construction bid document specifications or performance requirements could include measures such as maximizing the inclusion of recycled material to reduce new material production, such as recycling existing concrete and asphalt pavements to be used as aggregate base, subbase, backfill materials, etc. The use of these construction materials would not have an adverse impact upon continued availability of these resources. Construction would also require a substantial one-time expenditure of both state and federal funds that may not be retrievable. Retrievability is possible if the improved transportation facilities spur economic growth and toll revenues are bonded to provide capital funding for bridge construction.