

Appendix C

SUMMARY OF REASONABLY FORESEEABLE EFFECTS

Table C-1. Reasonably Foreseeable Transportation Effects for the No-Build Alternative and Amended Selected Alternative

| Transportation Area | No-Build Alternative | Amended Selected Alternative |
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| Hours of congestion/day at Interstate Bridge | SB: 16 hours NB: 14 hours | SB: 4.75 hours (70% reduction) NB: 9 hours (36% reduction) |
| Southbound weekday peak 2-hour average travel times from I-205 to I-405 in North Portland | AM: 58 minutes PM: 29 minutes | AM: 54 minutes (7% reduction) PM: 14 minutes (52% reduction) |
| Northbound weekday peak 2-hour average travel times from I-405 in North Portland to I-205 | AM: 18 minutes PM: 42 minutes | AM: 13 minutes (28% reduction) PM: 26 minutes (38% reduction) |
| Persons crossing over the Interstate Bridge per day | 241,900 total: <ul style="list-style-type: none"> • 196,600 via general-purpose vehicles • 30,100 via truck • 14,800 via transit • 400 via active transportation | 251,100 total: <ul style="list-style-type: none"> • 191,200 via general purpose vehicles • 29,200 via truck • 29,100 via transit • 740 to 1,600 via active transportation |
| Vehicle trips over the I-5 bridge/day | 180,000 (+26% compared to existing conditions) | 175,000 (-3% compared to No-Build Alternative). |
| Bridge trips by active transportation (walk, bicycle, roll) | 410 trips per day (similar to existing conditions) No improvement to facilities or connections | Between 740 and 1,600 trips per day. Improved capacity, access, safety, and user experience for trips across the bridge as well as along connecting facilities. |
| Total travel time by transit between downtown Vancouver and Hayden Island ^a | AM SB: 36 minutes ^b PM NB: 21 minutes | AM SB: 17 minutes PM NB: 17 minutes |

| Transportation Area | No-Build Alternative | Amended Selected Alternative |
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| Total travel time by transit between downtown Vancouver and Lombard Transit Center^a | AM SB: 43 minutes ^c PM NB: 41 minutes ^c | AM SB: 25 minutes ^d PM NB: 25 minutes ^d |
| Total travel time by transit between downtown Vancouver and Rose Quarter^{a, e} | Express Bus, AM SB: 43 minutes Express Bus, PM NB: 62 minutes LRT: Service not available | Express Bus, AM SB: 52 minutes Express Bus, PM NB: 38 minutes LRT: 37 minutes (both AM SB and PM NB) |
| Total travel time by transit between downtown Vancouver and Pioneer Square^{a, e, f} | Express Bus AM SB: 48 minutes Express Bus PM NB: 67 minutes LRT: Service not available | Express Bus, AM SB: 59 minutes Express Bus, PM NB: 45 minutes LRT: 47 minutes (both AM SB and PM NB) |
| Freight mobility and access | No improvement | Improved access, mobility, and safety on the bridge and improved design at critical port access points at Mill Plain and Marine Drive |
| Traffic safety | Crashes forecast to increase 28% for I-5 mainline, ramps, and ramp terminal intersections compared to existing conditions. | Crashes forecast to decrease 13% for I-5 mainline, ramps, and ramp terminal intersections compared to No-Build Alternative. |
| Arterial and local street intersections operating below standards (AM/PM peaks) | 10 intersections | 6 intersections |
| Transit safety and security | No improvement. | Light-rail stations provide a higher level of visibility and lighting than on-street bus stops. Stations will have additional safety measures incorporated into design. |

| Transportation Area | No-Build Alternative | Amended Selected Alternative |
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| <p>Effect on river navigation</p> | <ul style="list-style-type: none"> • Primary Navigation Channel: <ul style="list-style-type: none"> – Location: North – Width: 263 feet – Height: 39 feet (closed) to 178 feet (open) • North Barge Channel <ul style="list-style-type: none"> – Location: Center – Width: 511 feet – Height: 46–70 feet • South Barge Channel <ul style="list-style-type: none"> – Location: South – Width: 260 feet – Height: 72 feet • HNC for all navigation channels remain unchanged. • VNC remains unchanged. • Primary navigation channel (north location) would provide straightest route to/from the BNSF Railway Bridge compared to existing barge (center) and alternate barge (south) channels. • Unchanged navigation visibility associated with HNC (263–511 feet) and VNC (39–72 feet in the closed position; 178 feet in the open position). • 9 pier sets in the water. • Bridge Opening Timing Restrictions: No lifts allowed on weekdays: <ul style="list-style-type: none"> – 6:30 a.m. to 9:00 a.m. and 2:30 p.m. to 6:00 p.m. • Upper Vancouver Turning Basin: Approximately 2,000 feet long. • Continued risks to navigation from potential earthquake events, including the potential for the bridge failing and blocking or obstructing the navigation channels. • No demolition of the existing bridge. | <ul style="list-style-type: none"> • Primary Navigation Channel: <ul style="list-style-type: none"> – Location: Center – Width: 400 feet – Height: 116 feet • North Barge Channel <ul style="list-style-type: none"> – Location: North – Width: 400 feet – Height: 100 feet • South Barge Channel <ul style="list-style-type: none"> – Location: South – Width: 400 feet – Height: 110 feet • Increased HNC (400 feet) for primary (center) and alternate barge (south) channels. • Reduced VNC for new primary navigation channel (center) Increased VNC for the north barge channel and south barge channel. • Improved alignment with the BNSF Railway Bridge. • Increased navigation visibility. • 6 pier sets in the water. • No bridge opening timing restrictions. • Upper Vancouver Turning Basin: Maintained length with an approximately 300–325-foot shift west. • Increased seismic resiliency in event of potential seismic activity reducing risk of bridge failure or collapse and blocking or obstructing the navigation channels. • Existing bridge foundation elements will be removed to a depth determined by the USACE to not pose a hazard to current or future dredging operations. |

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| <p>Aviation</p> | <ul style="list-style-type: none"> • Portland International Airport: <ul style="list-style-type: none"> – No long-term effects on aviation activities. • Pearson Field: <ul style="list-style-type: none"> – Horizontal Surface: 98 vertical feet penetration by south lift tower, illuminated to increase visibility. – Approach Surface: No penetration. – Transitional Surfaces: Penetration by existing Interstate Bridge north lift tower; illuminated. – Westbound Departure OCS: Obstacle departure procedures required to avoid existing Interstate Bridge lift towers; climb gradient is 650 feet/NM. – Wildlife strike risk: Existing open-truss framing continues to provide bird roosting and nesting areas, existing ODOT deterrence measures continue; aircraft wildlife strike risk continues at existing level. | <ul style="list-style-type: none"> • Portland International Airport: <ul style="list-style-type: none"> – No long-term effects on aviation activities. • Pearson Field: <ul style="list-style-type: none"> – Horizontal Surface: No penetration. – Approach Surface: No penetration. – Transitional Surfaces: No penetration. – Westbound Departure OCS: Obstacle departure procedures required to avoid new bridges; climb gradient reduced to 474 feet/NM. – Wildlife strike risk: Design bridge features to reduce potential for bird nesting and roosting combined with continued deterrence measures will reduce potential for aircraft wildlife strikes from existing level. |

- a Total transit travel times include 10 minutes of walk access (1/4 mile walk on either end of the trip at 3 miles per hour average walk speed) in addition to initial and transfer (if applicable) wait time. Wait times are based on half the headway. “Headway” refers to the time or distance between consecutive vehicles (like buses, trains, or cars) traveling on the same route.
- b Route 60 does not stop at Hayden Island southbound, so a trip from Vancouver to Hayden Island travels south to Delta Park and then back north to stop on Hayden Island.
- c Route includes 60 Vancouver – Delta Park with transfer to Yellow Line LRT.
- d Travel time is on Yellow Line LRT.
- e Express Bus includes Route 101 from downtown Vancouver – Rose Quarter or Pioneer Square.
- f Express Bus includes two stops between downtown Vancouver and Pioneer Square. LRT includes 16 stops between downtown Vancouver and Pioneer Square.

feet/NM = feet per nautical mile; HNC = horizontal navigation clearance; I- = Interstate; LRT = light-rail transit; NB = northbound; OCS = obstacle clearance surface; ODOT = Oregon Department of Transportation; SB = southbound; SR = State Route; USACE = U.S. Army Corps of Engineers; VNC = vertical navigation clearance

Table C-2. Summary of Reasonably Foreseeable Community and Environmental Effects for the No-Build Alternative and Amended Selected Alternative

| Community and Environmental Effect | No-Build Alternative | Amended Selected Alternative |
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| <p>Property Acquisitions and Displacements ^{a, b}</p> | <p>None</p> | <ul style="list-style-type: none"> • For all improvements excluding the park and rides: <ul style="list-style-type: none"> – Approximately 120.9 acres of permanent acquisition. – Displacement of: <ul style="list-style-type: none"> • 59 residences. • 58 businesses. • For all Waterfront Park and Rides: <ul style="list-style-type: none"> – Approximately 2.0 acres of permanent acquisition. – Displacement of 8 businesses. – No residential displacements. • For all Evergreen Park and Rides: <ul style="list-style-type: none"> – Approximately 4.2 acres of permanent acquisition. – No residential or business displacements. |
| <p>Land Use and Economic Activity</p> | <ul style="list-style-type: none"> • Existing land uses would remain vulnerable to high levels of congestion and potential earthquake-induced failure. • No high-capacity transit, which is inconsistent with the stated policies and goals of regional transportation plans. • Congestion would impair freight movement and reduce area productivity, which could indirectly impact the implementation of land use plans and goals for economic development. • Loss in job growth could lead to decreased housing prices, increased commercial vacancies, and reduced demand for downtown revitalization. | <ul style="list-style-type: none"> • Converts approximately 128.4 acres of land to transportation use compared to the No-Build Alternative; currently primarily zoned industrial or commercial with some land zoned residential. • High-capacity transit is consistent with state, regional, and local plans and policies. • Higher toll rates during peak periods will support regional and local policies for congestion and are not expected to change land use patterns. • Property tax revenues will be reduced compared to the No-Build Alternative. • Business displacements have the potential to impact 66 businesses and 521 employees; affected businesses will be provided relocation assistance. • Bridge height will exclude up to four existing users/vessels that require more than 116 feet of vertical clearance from passage underneath the new Columbia River bridges as |

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| | | <p>compared to the No-Build Alternative. Changes to business operations for these four river users may occur, and some job loss could result.</p> |
| <p>Neighborhoods and Communities</p> | <ul style="list-style-type: none"> No change to existing neighborhoods, community facilities, or social resources. Future development might not be fully consistent with goals that assume improved mobility and expanded transit access. Neighborhoods would not benefit from reduced congestion, improved mobility, and access to employment. | <ul style="list-style-type: none"> Will not adversely affect community cohesion in neighborhoods, except for Hayden Island. Could increase cohesion in neighborhoods near the Community Connector. Will affect the Hayden Island neighborhood’s community cohesion both positively and negatively. Negative impacts include displacement of 39 floating homes and 28 businesses and changes to views. Positive impacts will include a more continuous street system, improved pedestrian and bicycle facilities, and transit that will increase connections for residents. Will result in construction-related impacts such as traffic diversion, noise, temporary reductions in air quality, and sidewalk disruptions. |
| <p>Public Services and Utilities</p> | <ul style="list-style-type: none"> Increased congestion on I-5 would increase delays in emergency response. No change to utilities. | <ul style="list-style-type: none"> Emergency service response times will be improved compared to the No-Build Alternative on I-5 and at some intersections along critical access routes due to reduced congestion. Utilities will be relocated or protected in place during construction and restored to full service following construction. |
| <p>Parks and Recreation</p> | <ul style="list-style-type: none"> 0 acres of park and recreation resources to be acquired. 0 linear feet of trails to be reconstructed and/or permanently realigned. No change in transit access to park and recreation resources in the primary study area. | <ul style="list-style-type: none"> Approximately 0.9 acres of park and recreation resources to be acquired. Approximately 6,000 linear feet of trails to be reconstructed and/or permanently realigned. Will improve access to some large regional parks. |

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| Cultural Resources | <ul style="list-style-type: none"> • 0 known NRHP-eligible historic built environment resources adversely affected. • 0 known NRHP-eligible archaeological sites potentially affected | <ul style="list-style-type: none"> • 12 known NRHP-eligible historic built environment resources adversely affected. • 11 known NRHP-eligible archaeological sites potentially affected. |
| Visual Quality | <ul style="list-style-type: none"> • Constructed elements within the AVE would not change. Project environment coherence would be negatively affected by increased traffic and congestion; however, natural and cultural elements are expected to be compatible with the existing visual environment. | <ul style="list-style-type: none"> • Changes to visual elements could alter the visual character and quality in the AVE (e.g., new bridges across the Columbia River). • LUs where the effects to visual quality are beneficial or neutral will have a natural, cultural, and project environment that is compatible with existing visual conditions. • Adverse effects to visual quality will result from blocking views of the natural environment and changes in visual experience from elevated bridge structures, such as to viewers in the floating homes at the Jantzen Beach Moorage. • The five proposed park and rides will add to the urban elements and structures in downtown Vancouver, which will change some existing views but will be compatible with the existing visual character. |

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| Air Quality | <ul style="list-style-type: none"> • 3,537,900 VMT in 2045 (66% increase compared to existing conditions). • Future regional air pollutant emissions would be substantially lower than existing emissions for all MSATs, CO, NO_x, and PM_{2.5}. Future regional emissions of VOC would be up to 25% higher than existing conditions due to increased VMT. • Changes in MSAT emissions (2045) from existing conditions (2015): <ul style="list-style-type: none"> – 1,3-Butadiene: 100% reduction – Acetaldehyde: 82% reduction – Acrolein: 89% reduction – Benzene: 69% reduction – Diesel Particulate Matter: 86% reduction – Ethylbenzene: 29% reduction – Formaldehyde: 86% reduction – Naphthalene: 83% reduction – Polycyclic Organic Matter: 93% reduction • Changes in regional criteria pollutant emissions: <ul style="list-style-type: none"> – CO: 61% reduction – NO₂: 75% reduction – VOCs: 26% increase – Total PM₁₀: 46% increase – Total PM_{2.5}: 39% reduction | <ul style="list-style-type: none"> • 3,455,400 VMT in 2045 (62% increase compared to existing conditions). • Future regional air pollutant emissions will be similar to No-Build Alternative (slightly lower emissions than No-Build Alternative due to reduced VMT). • Changes in MSAT emissions (2045) from existing conditions (2015): <ul style="list-style-type: none"> – 1,3-Butadiene: 100% reduction – Acetaldehyde: 85% reduction – Acrolein: 90% reduction – Benzene: 70% reduction – Diesel Particulate Matter: 88% reduction – Ethylbenzene: 29% reduction – Formaldehyde: 88% reduction – Naphthalene: 83% reduction – Polycyclic Organic Matter: 94% reduction • Changes in regional criteria pollutant emissions: <ul style="list-style-type: none"> – CO: 63% reduction – NO₂: 79% reduction – VOCs: 25% increase – Total PM₁₀:^c 21% increase – Total PM_{2.5}:^d 48% reduction |

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| Noise and Vibration | <ul style="list-style-type: none"> • 216 receptors would exceed highway noise thresholds. • No receptors would have moderate or severe transit noise impact levels. • No vibration impacts without the extension of light-rail. | <ul style="list-style-type: none"> • Without mitigation, 195 receptors will exceed highway noise thresholds due to the acquisition of floating homes located near the Columbia River light-rail transit bridge alignment of the Modified LPA. • With mitigation, eight existing noise walls in Vancouver will be replaced as necessary for project construction along with two new noise walls in Vancouver and one new noise wall in Portland, which collectively will reduce the number of traffic noise impacts to 113. • Transit noise impacts will occur at 12 receptors in downtown Vancouver at a 12-unit apartment complex located at E 7th Street and E C Street. • Transit vibration impacts will occur at 13 receptors in downtown Vancouver, including the same 12-unit apartment complex located at E 7th Street and E C Street and a movie theater located at E 8th Street and E C Street. |
| Energy | <p>Total regional transportation energy consumption in 2045:</p> <ul style="list-style-type: none"> • 271,933 mmBtu/day. | <p>Total regional transportation energy consumption in 2045:</p> <ul style="list-style-type: none"> • 271,187 mmBtu/day in 2045 (-0.27% compared to No-Build Alternative). |
| Electric and Magnetic Fields | <p>No change in EMF emissions.</p> | <p>EMF emissions will increase slightly at certain locations along the light-rail extension but will remain well below exposure guidelines.</p> |

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| <p>Water Quality and Hydrology</p> | <p>Water Quality and Stormwater Management:</p> <ul style="list-style-type: none"> • No change (area would remain untreated until stormwater treatment could be addressed according to state prioritization and available funding). • Contributing Impervious Area: • 178 acres total: <ul style="list-style-type: none"> - 0 acres treated. - 21 acres infiltrated. - 157 acres untreated. • Total Suspended Solids: 120,272 lbs/year • Hydrology: No change (continued release of stormwater with degraded quality into receiving waters). | <p>Water Quality and Stormwater Management:</p> <ul style="list-style-type: none"> • Beneficial effect on receiving water quality (due to BMPs to remove pollutants). • Could cause changes in peak flows and stormwater runoff volumes. • Contributing Impervious Area: 215 acres total: <ul style="list-style-type: none"> - 197 acres treated. - 18 acres infiltrated. - 0 acres untreated. • Total Suspended Solids: 16,720 lbs/year • Hydrology: Potential to cause long-term hydrologic effects due to an increase of 33 acres of contributing impervious area. |
| <p>Wetlands and Other Waters</p> | <p>No change to wetlands and other waters.</p> | <ul style="list-style-type: none"> • Wetlands: 0.25 acres • Wetland Buffers: 5.69 acres • Other Waters: <ul style="list-style-type: none"> - 0.88 acres fill - -1.04 acres (removal of structures) - Net Change: -0.16 acres (restoration) |

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| Ecosystems | <ul style="list-style-type: none"> • Aquatic resources (total net change compared to the existing condition): <ul style="list-style-type: none"> – Continued benthic habitat impacts from existing bridges: 1.04 acres. – Continued benthic habitat impacts of overwater shading (Elevated Deck) from existing bridges: 11.65 acres – Continued impacts from untreated stormwater from approximately 156.4 acres of existing contributing impervious area. – Potential for habitat impacts due to maintenance and operation. • Permanent impacts to terrestrial resources in Oregon: <ul style="list-style-type: none"> – Potential for water quality and vegetation impacts due to maintenance and operation. • Permanent impacts to terrestrial resources in Washington: <ul style="list-style-type: none"> – Potential for water quality and vegetation impacts due to maintenance and operation. | <ul style="list-style-type: none"> • Aquatic resources (total net change compared to the existing condition): <ul style="list-style-type: none"> – Benthic habitat effect: -0.16 acres (net restoration). – Overwater Shading (Water Surface): +1.24 acres. – Overwater Shading (Elevated Deck): +9.09 acres. – Beneficial effect of stormwater treatment for all post-project contributing impervious area, including approximately 156.4 acres of existing impervious area that is currently untreated. • Permanent impacts to terrestrial resources in Oregon (acres): <ul style="list-style-type: none"> – “High” wildlife/riparian value habitats: 3.25 acres. – “Medium” wildlife/riparian value habitats: 7.67 acres. – Wetlands: 0.25 acres. – Wetland Buffers: 5.69 acres. • Permanent impacts to terrestrial resources in Washington (acres): <ul style="list-style-type: none"> – Riparian buffers: 0.28 acres. – Biodiversity Areas: 0.06 acres. – Oak Woodlands: <0.01 acres – Wetlands: 0 – Wetland Buffers: 0 |
| Geology and Groundwater | <p>No change to existing seismic deficiencies; geologic resources; or groundwater quality.</p> | <ul style="list-style-type: none"> • Improved public safety, minimizing damage to infrastructure, and limiting potential economic disruption due to seismic improvements. • Slight potential for increased use of materials that could spur expansion and/or opening of surface mines. • Benefits to groundwater quality as a result of modernized stormwater management and treatment. |

| Community and Environmental Effect | No-Build Alternative | Amended Selected Alternative |
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| <p>Hazardous Materials</p> | <ul style="list-style-type: none"> • No potential for adverse effects from acquisition of contaminated sites. • No beneficial effects from the cleanup of contaminated sites. • Stormwater that is untreated for the removal of pollutants would continue to enter surface waterbodies and groundwater. • No improvement in existing spill risks from traffic congestion and collisions. • Future remediation activities at several sites have the potential to affect operation and maintenance of I-5. | <ul style="list-style-type: none"> • Moderate potential for increased liability for property owners (ODOT and WSDOT) from the acquisition of contaminated sites. • Beneficial effects on human health and safety, and surface and groundwater quality from cleanup and remediation of contaminated areas on acquired sites and limiting the possible off-site migration of contamination. • If residual contamination remains on acquired hazardous materials sites after cleanup, moderate potential for adverse effects on human health and safety if encountered during construction or with the possible off-site migration of contamination. • Beneficial effects from improvements in stormwater conveyance and treatment, which will reduce pollutants in stormwater runoff and improve surface water and groundwater quality. • Reduction in spill risk due to reduced traffic congestion and collisions. • Future remediation activities at several sites have the potential to affect operation and maintenance of the Modified LPA. |

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| <p>Section 6(f) and Federal Lands to Park (FLP)</p> | <p>No effect.</p> | <ul style="list-style-type: none"> • East Delta Park: No acquisition of Section 6(f) or FLP-protected land. • Old Apple Tree Park: Will construct a new shared-use path on approximately 0.08 acres. Permanent easement (less than 0.1 acres) along the northern edge for maintenance. The easement will not change the recreational use of the park, affect landscaping, or convert the land to a non-park use. • Marshall Community Center, Luepke Senior Center, and Marshall Park: Acquisition of approximately 5,100 square feet (0.12 acres) of the 0.5 acres of FLP program-protected land will displace some horseshoe pits and trees. • Burnt Bridge Creek Trail: No acquisition of Section 6(f) or FLP-protected land. |
| <p>Section 4(f)</p> | <p>No use of any Section 4(f) resources.</p> | <ul style="list-style-type: none"> • <i>De minimis</i> impact to Old Apple Tree Park and Marshall Park. Use with greater than <i>de minimis</i> impact of 7 historic sites^e and the Fort Vancouver NHS. • Total use of 7.7 acres. • The total area of permanent incorporation of the VHNR Historic District will fall near the middle of the range in comparing all design options (0.7 acres). Adverse effects to 14 contributing resources in the VNHR Historic District; acquisitions primarily from noncontributing resources. Severe remaining harm to the northbound Interstate Bridge and Oregon-side resources, which will be demolished. |

- a Parcel impacts, displacements, or total acreage are only counted once when more than one mode (highway, transit, or bicycle and pedestrian) results in the same or overlapping acquisitions.
- b Does not include WSDOT or ODOT-owned property or right of way, City-owned right of way, or in-water leases.
- c Total PM₁₀ emissions are the sum of PM₁₀ exhaust, PM₁₀ brake wear, and PM₁₀ tire wear.
- d Total PM_{2.5} emissions are the sum of PM_{2.5} exhaust, PM_{2.5} brake wear, and PM_{2.5} tire wear.
- e Historic sites with greater than de minimis impact include Harbor Shops (OR 107), Jantzen Beach Water Tank (OR 109) Jantzen Beach Moorage (OR 111), Northbound Interstate Bridge (OR 50), Normandy Apartments (WA 149), Bridge Substation (WA 1192), and the Vancouver National Historic Reserve historic properties (WA 1357, 369, 369, 918, 1358, 1359).

AVE = Area of Visual Effect; BMP = best management practice; CO = carbon monoxide; EMF = electric and magnetic fields; FLP = Federal Lands to Parks; I- = Interstate; lbs = pounds; LPA = Locally Preferred Alternative; LU = Landscape Unit; mmBtu = one million British thermal units; MSAT = mobile source air toxics; NO₂ = nitrogen dioxide; NO_x = oxides of nitrogen; NHS = National Historic Site; NRHP = National Register of Historic Places; ODOT = Oregon Department of Transportation; PM_{2.5} = particulate matter less than or equal to 2.5 microns in diameter; PM₁₀ = particulate matter less than or equal to 10 microns in diameter; VMT = vehicle miles traveled; VNHR = Vancouver National Historic Reserve; VOC = volatile organic compound; WSDOT = Washington Department of Transportation