

4.18 INDIRECT AND CUMULATIVE EFFECTS

4.18.1 How Were Indirect Effects Analyzed?

Indirect effects are effects that are caused by a proposed project, but are separated from direct effects because they occur later in time or at some distance from the project. The analysis of indirect effects ensures that all project-related impacts are properly discussed during environmental review.

Indirect effects often relate to changes in land use. The analysis of indirect effects looks for growth inducing effects and other effects related to changes in the pattern of land use, population density or growth rate, and related effects on air and water, as well as other natural systems including ecosystems (40 Code of Federal Regulations 1508.8).

Indirect effects result from one project but, unlike direct effects, typically involve a chain of cause-and-effect relationships that can take time to develop and can occur at a distance from the project site.

NOTE TO READER: *This EA provides a tiered environmental review. Chapter 4 evaluates the project specific environmental impacts associated with construction of the North Study Area Build Alternative (See Section 3.4 for description). Chapter 5 provides a corridor level discussion of the South Study Area (See Section 3.5). Specific project footprint improvements are not currently defined for the South Study Area.*

Under the Washington State Growth Management Act, land use changes are the direct result of local planning decisions. FHWA and WSDOT do not control this process. However, indirect impacts may be associated with a transportation project if the project affects the rate and pattern of land use development by adding a new access or a bypass route.

To determine whether something might be an indirect effect, WSDOT asks: would the change occur but for the transportation project? If the transportation project is necessary for the impact to occur, then it is either a direct impact or an indirect effect.

WSDOT included the consideration of potential indirect effects along with direct effects throughout all of the discipline studies. The study area for each resource was used to assess the potential for indirect effects on each resource. Analysts also sought regional data and studies prepared by Pierce County, Joint Base Lewis-McChord (JBLM) and the Puget Sound Regional Council (PSRC). The method for assessing the potential for indirect effect on each resource was similar to the methods for assessing direct affects described in the corresponding reports/tech memos.

Indirect Effects: *As described in the NEPA implementing regulations, indirect effects occur as a result of a proposed project, but take place later in time or are further removed in distance from the proposed project. (40 CFR 1508.8)*

4.18.2 What Indirect Effects Are Expected from the Build Alternative?

Indirect effects are tied to the direct effects described in early sections of this EA. WSDOT looked at interactions between the Build Alternative's effects to identify ways in which it would contribute to effects further removed in time or place.

WSDOT examined the possibly of indirect effects related to all the Build Alternative direct impacts. The Build Alternative would improve an existing section of highway. It would replace intersections, but would not add new access to I-5. The Build Alternative would accommodate about 10% more traffic in the heart of the corridor than the No Build Alternative. Drivers on the improved facility would

experience nine minutes shorter PM peak northbound travel time than No Build. The Build Alternative would improve local connectivity with the Gravelly-Thorne connector, along with bicycle/pedestrian connectivity with the proposed new shared use path adjacent to I-5.

No indirect effects were identified for the following resource areas: Air quality, noise, geology and soils, water resources, fish/wildlife/vegetation, hazardous materials, visual quality, section 4(f) and 6(f), or land use. In these resource areas, WSDOT found very little difference in development or land use patterns between the no build and the build alternatives. The Build Alternative does not encourage changes in land use beyond those disclosed as direct property impacts (areas where WSDOT is converting land to transportation use). Indirect effects were reported in the wetlands study as direct impacts to wetland buffers. These effects are fully accounted for in the analysis of direct effects. The use of the phrase “indirect effects to wetlands” should not be confused with the NEPA indirect effects. The Build Alternative would indirectly affect the Fort Lewis Garrison Historic District and the Salvation Army Red Shield Inn, by causing a minor erosion of setting to these properties. Impacts in the vicinity of the Salvation Army Red Shield Inn that would cause an erosion of setting include widening of Constitution Drive and construction of a pedestrian path immediately south of Constitution Drive. Impacts to the Fort Lewis Garrison Historic District that would cause erosion of setting include widening of I-5 and limited vegetation removal.

The Build Alternative will not directly or indirectly change the commercial or residential character of the Build Alternative vicinity area. No adverse indirect effects are anticipated.

The Build Alternative is consistent with local plans, and may contribute minor positive indirect effects. These would be derived from four project elements: improved highway interchange design,

local street connections, non-motorized path and grade-separation. These changes may facilitate locally authorized improvements, such as commercial and residential redevelopment. Section 4.17 describes the anticipated benefits of the Build Alternative, especially in the Woodbrook and Tillicum neighborhoods. Improved traffic circulation and grade-separation is expected to make the area more attractive to developers, customers, and residents. Grade-separation from the rail lines may also provide minor beneficial indirect effects to the city of Lakewood, consistent with its plans.

Temporary, beneficial indirect economic effects may accrue from the hiring of vendors and purchasing of materials and supplies required for project construction, leading to increased employment throughout the relevant parts of the supply chain in the short-term.

4.18.3 How Were Cumulative Effects Analyzed?

Under NEPA, cumulative effects result from the incremental effects of the project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person

Cumulative Effects: The impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. (40 CFR 1508.7)

undertakes the action. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative effects include past, present, and reasonably foreseeable future actions within the study area that, together with the proposed project, may have a cumulative effect on the environment. Past and present actions affecting

environmental resources are reflected in the existing conditions of the Build Alternative. Reasonably foreseeable future actions include those that are being implemented or have been implemented recently, including planned and funded transportation improvements, and other local and regional infrastructure proposals.

The analysis of cumulative effects helps decision makers and the public know whether or not there are incremental changes to a given resource which could, if left unmitigated, reach significant proportions.

In identifying and analyzing potential cumulative impacts WSDOT used joint guidance issued by WSDOT, FHWA Washington Division, and the U.S. Environmental Protection Agency Region 10, entitled: *Guidance on Preparing Cumulative Impact Analyses* (2008). The guidance outlines eight steps for identifying and assessing cumulative impacts:

1. Identify the resources that may have cumulative impacts to consider in the analysis.
2. Define the study area and timeframe for each affected resource.
3. Describe the current status and historical context for each.
4. Identify direct and the indirect impacts that may contribute to a cumulative impact.
5. Identify other historic, current and reasonably foreseeable actions that may affect resources.
6. Assess potential cumulative impacts to each resource; determine magnitude and significance.
7. Report the results.
8. Assess and discuss potential mitigation issues for all adverse impacts.

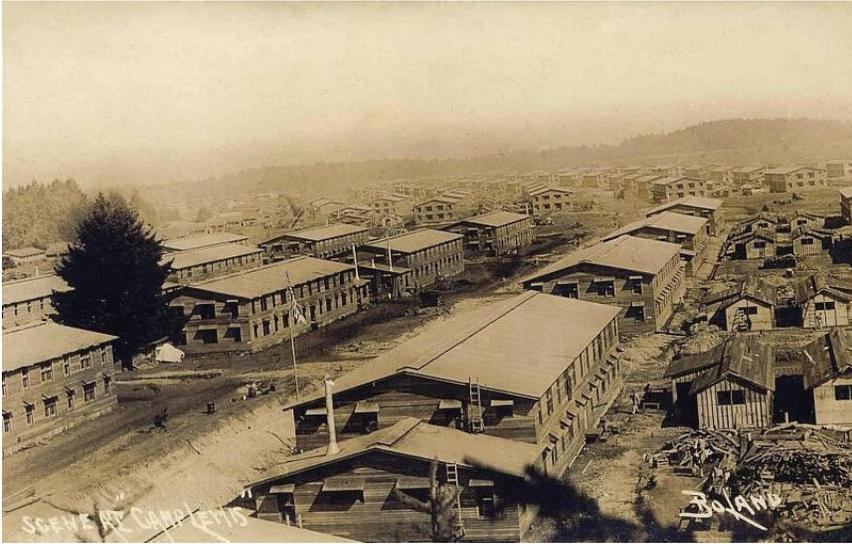
For the cumulative effects analysis, WSDOT considered both temporal (timeframe) and geographic (resource-specific study areas). In framing the historic and future context, analysts looked at the land use and transportation development patterns.

Study areas are defined for each resource. The cumulative effects evaluation uses the same study areas used in assessing direct effects. In addition, WSDOT considered the information provided in the Phase One study and sought regional data and studies prepared by Pierce County, JBLM and the PSRC. With regard to traffic congestion on I-5, WSDOT also considered Thurston County and through-traffic. See the Transportation (4.3) and Land Use (4.15) sections of this Environmental Assessment (EA) for more information.

WSDOT relied on the information in the discipline-specific studies and the regional and local studies referenced in the Land Use section. Information provided in the affected environment and direct effects analysis helped to characterize the trend and current conditions.

WSDOT considered the potential for cumulative impacts to all resource areas analyzed in this EA. In addition, the measures to minimize direct effects of the Build Alternative were evaluated in making the cumulative effect determination. For example, temporary construction effects that are fully mitigated during construction are not likely to contribute to a cumulative effect. In general, the study focused on construction and operational effects of the proposed Build Alternative.

Consistent with the joint guidance, WSDOT's study of cumulative effects only focused on the resource areas where potential direct and indirect effect was identified. If there are no project impacts on a particular resource, then WSDOT did not include that resource in the cumulative effects report since the project cannot contribute toward a cumulative effect.



Fort Lewis began as Camp Lewis in 1917.

4.18.4 Historical and Present Context (Including Reasonably Foreseeable Projects)

WSDOT considered how the Build Alternative, in combination with past, present and future actions is likely to affect the natural and built environment. The Nisqually people have lived in the watershed for thousands of years. In 1833, the Hudson’s Bay Company established a fur trading post at Fort Nisqually.

The Project corridor and the entire Puget Sound region have been heavily urbanized over the past 100 years. Natural areas have been dramatically altered. Waterways have been channelized and wetlands filled or drained. The area has only fractions of the populations of native animals, birds and fish it had at statehood. Development has also deforested much of the area, decreased water and air quality, increased noise levels, and contaminated soils.

The history of trails and roads throughout the area provides insights into how people historically moved between where they lived,

worked and neighboring communities. In 1910 surveyors were “establishing the most feasible location” for a “north and south trunk road” from Blaine to Vancouver.¹ Their survey may not have gone through the Project corridor, however, maps of the time show a projected “Pacific Highway” route west of American Lake. (The Pacific Highway and I-5 are east of the Lake.) Kroll’s 1915 map shows a road running approximately along the future highway path through the Build Alternative.² A segment of what was called Permanent Highway No. 12 was paved in concrete from the south Tacoma City Limits to the north edge of Camp (later Fort) Lewis in 1918,³ and by 1920 “the only remaining unpaved portion of the highway between Tacoma and Olympia [was] across the Nisqually flat.”^{4,5}

The Pacific Highway was expanded to four lanes (two lanes in each direction) through the Project corridor ca. 1940-41. From ca. 1957 to 1959 the highway was upgraded to a freeway and widened to six lanes (three in each direction) in places. In the early 1970s the freeway between Exit 116 and 120 was widened to six lanes (three in each direction). In the mid-1970s the freeway from Exit 123 to Exit 127 was widened to eight lanes (four in each direction). Collector-distributor lanes were added to the Exit 120 interchange in the early 1970s. The Exit 118 interchange was built ca. 1997.

The region’s natural features, the lakes, creeks, Nisqually River and delta, influence human development patterns. The past 100 years has defined much of the present land use and development trends. Today, growth

¹ Third Biennial Report of the Highway Commissioner, 1910, p. 40.

² Kroll’s Map of Pierce Co., Washington, Kroll Map Company, Seattle, 1915.

³ Seventh Biennial Report of the State Highway Commissioner, 1918, p. 92.

⁴ Eighth Biennial Report of the State Highway Commissioner, 1921, p. 83.

⁵ Craig Holstine email, 1/27/2016

throughout Pierce County is directed by the comprehensive plans and other land use policies developed by the County and local jurisdictions.

WSDOT collected information about current and reasonably foreseeable future projects in the area as part of this analysis. Projects underway in the area include the WSDOT Point Defiance Bypass Rail Project. Passenger Rail improvements are underway on the Sound Transit owned rail line adjacent to I-5. Amtrak trains will run on that corridor in fall 2017. Interchange improvements to enable safe train operations are being made to existing at-grade crossings. Other passenger rail improvements include the extension of Sounder Commuter Rail Service to DuPont.

The city of Lakewood is making several local roadway improvements, including the 150th Street SW and the Madigan Access project at the Berkeley Street Interchange.

The Pierce County Readiness Center at Camp Murray is underway and will be completed in 2016. In addition, there are some large projects anticipated for Camp Murray and JBLM. Air National Guard is planning to build a \$24 million facility in fiscal year 2019 (They will have a funding determination by June 2016). The Washington State Military

Department is intending to build a new Joint Force Headquarters in fiscal year 2022. This will be a \$43 million project. Funding will be announced in 2018.⁶

The Clover Park School District reported that they do not have any approved construction projects in the project area. However they are in the process of updating their facilities master plan and it could include replacing at least one school in this area. A final determination is expected in late 2017 or early 2018.⁷

Joint Base Lewis-McChord reported several projects including a new elementary school, as well as a major medical facility, the National Intrepid Spirit Center. The 25,000 square-foot Intrepid Spirit Center will cost approximately \$11 million and will open its doors equipped with the latest in brain technology and treatment. These and other JBLM projects are listed in Table 4.18-1.⁸

The SR 704 Cross Base Highway Project is not considered among the reasonably foreseeable future projects because [the August 2004 Record of Decision is no longer valid and actionable given the potential for changed conditions and the amount of time passed since its signature. Actions to proceed with finalization of design, right of way acquisition, or construction would require further environmental review under NEPA. Additionally, it is not a priority transportation project for this WSDOT region and is not](#) included in a financially constrained plan. In 2004, FHWA completed NEPA and recorded a decision on the Cross Base Highway project to construct a six-mile-long limited access highway from I-5 to SR 7. In 2009, one project element was completed, the Spanaway Loop Road to SR 7.

Reasonably Foreseeable Future Actions

The cumulative impact analysis should only include those proposed actions or projects with a reasonable expectation of happening. When identifying reasonably foreseeable actions begin with asking questions like the following:

- ◆ *Is the proposed project included in a financially constrained plan?*
- ◆ *How reasonable is it to assume that the proposed project will be constructed?*

– WSDOT, EPA, FHWA Joint Guidance 2008

⁶ Ron Cross WA-MIL email, November 24, 2015

⁷ Rick Ring email, November 23, 2014

⁸ Chris Runner/JBLM email, February 24, 2016

Table 4.18-1 Recent and Proposed Development Proposals in the Build Alternative

Project Description	Jurisdiction
Demolish two 2-story apartment buildings and construct a Jack in the Box drive through restaurant with parking and landscaping at 15310 Union Ave	Lakewood
Construct a 3,900 sq. ft. McDonald's drive through restaurant with 39 parking stalls and landscaping on a 0.91 acre site at 15004 Union Ave. S. W., Tillicum	Lakewood
Construct Starbucks coffee shop, parking and landscaping at 15305 Union Ave.	Lakewood
Retail redevelopment in Tillicum at the corner of Berkeley and Union	Lakewood
Construct a 90-room Fairfield Inn hotel with parking, utilities, and landscaping on a 2.41 acre site at 1515 Wilmington Ave	DuPont
Construct a 5-story 140 room Hilton Home Suites Hotel with parking, utilities, and landscaping at Station Drive and southbound I-5 Exit 119 off-ramp	DuPont
Construct a 5,000 sq. ft. drive through bank branch of the Navy Federal Credit Union with 4 drive-through lanes, 63 parking stalls and related improvements on a 2.4 acre site next to southbound I-5 Exit 119 off-ramp	DuPont
Construct a 31-room addition to the Liberty Inn Hotel at 1400 Wilmington Street	DuPont
Install public safety communication facility with 125 ft. lattice tower and antennas and microwave dish; construct 12x20 shelter with generator, with site access off Foreman Road	DuPont
International Place soil cleanup; excavate 100-200 cubic yard of arsenic contaminated soil from 32 acre site on Steilacoom-DuPont Road	DuPont
Construct a one story, 9,275 sq. ft. building for the DuPont Learning Center with 42 parking stalls and related site improvements on 1.16 acres on McNeil Street	DuPont
Air National Guard is planning to build a \$24,000,000 facility in fiscal year 2019	National Guard
Upgrade Lakewood's 55 kv transmission line to 115 kv, city wide	Lakewood
Extend sewer on 146th St. S. W. and 150th St. S. W. to Woodbrook Drive in American Lake South	Lakewood
Construct a new 761 student elementary school near Madigan Army Medical Center along Blaine Ave	JBLM
Construct a National Intrepid Center of Excellence Facility near Madigan Army Medical Center	JBLM
Construct a replacement Waste Water Treatment Plant along Solo Point Road	JBLM
Expand the Lewis Main Exchange Retail Store	JBLM
Construct a new dual foods fast food drive through facility along Nevada Ave on Lewis Main	JBLM
Construct a new Entertainment Center (movie theater and casual dining restaurants) on Lewis Main near Liggett Ave and 14th Street	JBLM

Source: SEPA Register Searches conducted September 2015 and July 2016, personal communication with City of Lakewood and JBLM

1 Introduction / Need and Purpose

2 Setting, Planning and Outreach

3 Description of Alternatives

4 North Study Area Analysis

5 South Study Area Analysis

In 2014, SR 704 Cross Base Highway, I-5 to Spanaway Loop Road, was listed as “Unprogrammed” with a completion date of 2035 by the Puget Sound Regional Council (Vision 2040).

4.18.5 What Were the Results of the Cumulative Effects Analysis?

The Build Alternative is designed to meet WSDOT and FHWA environmental stewardship guidance as well as to comply with all environmental laws. It improves an existing segment of I-5 which was built in 1960. All reasonable measures to minimize adverse effects have been incorporated into the Project design. The measures combine avoidance, minimization, mitigation, and enhancement. An example of enhancement is the Build Alternative will improve access for those in the Tillicum and Woodbrook neighborhoods, helping address existing isolation caused by previous transportation and land use decisions, and contributing a beneficial cumulative effect on community connectivity.

WSDOT finds that the Build Alternative, together with past, present and foreseeable future projects, will have only minor contributions to cumulative effects on the natural and community resources in the study areas. The results of the analysis for each resource or discipline area are on the following pages.

Transportation

The Project directly benefits the interstate and local transportation. With the Build Alternative there are beneficial cumulative effects on transportation. Future planned transportation projects that could also affect traffic conditions in the Build Alternative were considered for the cumulative effects analysis. The Build Alternative

would contribute a positive cumulative effect on regional and local transportation.

Air Quality

The central Puget Sound region has designated maintenance areas for carbon monoxide and particulate matter. The region is in attainment for all other criteria pollutants. In general, the air quality in the central Puget Sound region has either maintained or seen improvements over the last five years. Cleaner cars, industries, and consumer products have contributed to cleaner air throughout much of the United States, including in the central Puget Sound region, and this trend is likely to continue. Without the Build Alternative, regional air quality is still likely to improve between the present and 2030 because of trends towards cleaner vehicles and industries.

The Build Alternative will reduce congestion on I-5 and at the improved intersections localized carbon monoxide emissions will be essentially unchanged when compared to the No Build condition. MSAT emissions for both the Build and No Build Alternative are projected to be well below existing conditions due to technological advancements. Greenhouse gas emissions for the Build Alternative are likely to be slightly reduced compared to the No Build Alternative due to improved traffic flow. Construction may cause minor temporary air quality disturbances from dust and construction-related emissions; measures have been incorporated in the Build Alternative to control temporary air quality issues during construction. The construction and operation of the Project is not likely to contribute to cumulative effect on air quality.

Noise

In 1930 the Tacoma Airfield was built and in 1940 renamed McChord. In the late 1950s, I-5 was built, and traffic noise from the highway, arterial roads and air traffic has substantially increased ambient noise levels in comparison to pre-war years. The number of residences negatively affected by road noise has increased as traffic levels have increased and infilling closer to the roadway occurred in the established neighborhoods.

Project-related noise from construction and operation has been assessed, see Section 4.5. The Build Alternative will incorporate noise barriers where reasonable and feasible to reduce the impact. Compared to the No Build, the Build Alternative will reduce noise adjacent to the roadway by constructing noise barriers at up to six locations. The Project in combination with current and future projects is likely to result in a slight reduction in the cumulative road noise in the area.

Geology and Soils

The Puget Sound region has undergone multiple glaciations that have deposited a variety of soil types. Within the Build Alternative low slope gradients, climatic conditions, and soil textures have produced an environment that is naturally resistant to erosion. Human activities since the late 19th century have substantially changed the topography near the corridor. The original construction of I-5 excavated areas to create bridge footings and facilitate connections with local streets.

The Build Alternative would result in minor changes to topography through excavation and filling. Cumulative effects on soil erosion are not expected to increase substantially beyond current levels.

Water Resources

Over the last several decades, urban development and the discharge of untreated stormwater have reduced water quality in the resource study area. Stormwater regulations since the 1990s have been aimed at treating and reducing pollutants in runoff before discharge to streams and lakes. Compensatory mitigation is associated with any new development that impacts streams.

State and local governments are actively working to maintain and improve water resources. In Lakewood, the Lake Steilacoom Improvement Club is a group of lakeside homeowners that protect water quality and reduce the spread of aquatic weeds. The city of DuPont has active volunteer groups helping to restore damaged streams.

The construction of the Build Alternative may have minor, temporary effects on adjacent water bodies and streams, incorporating measures to protect groundwater. It will provide long-term stormwater treatment where none currently exists, a minor benefit to water quality. The Build Alternative has a minimal contribution of impervious surface in combination with other past, present, and future projects. Overall the Build Alternative is not likely to contribute to a cumulative effect on water resources.

Wetlands

Wetlands in the study area have been substantially affected by past and present land use actions. Taken together, these effects have resulted in significant wetland loss in the resource study area. In recent decades, local, state, and federal agencies have set rules and implemented regulations to protect wetlands. Compensatory mitigation is associated with any new development that impacts

wetlands. The city of DuPont has several planned neighborhoods that were platted around wetlands. The 2015 update to the city's comprehensive plan conditions certain activities when adjacent to the wetlands in order to preserve the natural character and to protect habitat function. The area has active volunteer groups and private landowner efforts that have helped restore damaged wetlands.

The Build Alternative will have temporary impacts on wetlands and streams, incorporating measures to protect groundwater and surface water. It also incorporates rigorous stormwater treatment and control and is not likely to contribute to a cumulative effect on water quality.

Fish, Wildlife and Vegetation

Human development and land use patterns impact fish and wildlife habitat and vegetation. Past development actions, including military base operations, road construction and housing, have adversely affected wildlife habitat within the study area. WSDOT considered the Build Alternative's minimization measures for effects to vegetation in combination with other current and future projects that seek to improve habitat and the environmental protection provided through local agencies' critical area ordinances. The area has benefited from collaborative efforts like the Nisqually National Wildlife Refuge, environmental projects on JBLM, and various restoration actions by Nisqually Tribe, Pierce County and nongovernmental agencies like The Nature Conservancy (*Fort Lewis Grow The Army Final EIS*).

The Build Alternative has a minor, short-term construction effects on the vegetation along the right of way, and will convert some land cover to impervious surface. WSDOT will perform roadside restoration throughout the Build Alternative limits. WSDOT found that the Build Alternative's vegetation measures are adequate to ensure no contribution to an adverse cumulative effect.

Hazardous Materials

Hazardous materials are not themselves a resource that would be evaluated for cumulative effects. Hazardous materials can, however, enter the air and water and eventually affect human health and ecosystems. Hazardous materials can be associated with contaminated soils and groundwater, building materials encountered through demolition, accidental spills at construction sites, and leaking underground storage tanks. Depending on the type of contamination, there can be risks to worker safety and public health as well as environmental damage. The risk of encountering hazardous materials during the construction of the Build Alternative is low, however, and safeguards would be in place to minimize temporary impacts, including the WSDOT Spill Prevention Control and Countermeasures Plan for construction projects.

In general, new development projects remediate past contamination and result in improved conditions. The Build Alternative is not likely to contribute to a cumulative environmental effect from hazardous materials releases. The Build Alternative is not expected to result in a discharge of hazardous materials, although there are known areas of contamination from past land uses. If any inadvertent discharges occur, these will be contained and adverse effects avoided.

Visual Quality

The transformation of the visual landscape began with the arrival of nonindigenous settlers in the mid-19th century. Over a century-and-a-half, people harvested forests, created farms and built transportation routes for trade and access to resources, steadily developing the Puget Sound region. Urban centers including Tacoma and communities to the south were built and connected through rail

and roadways. The military camps and railroad along with roadways became significant features of the visual landscape.

The direct impacts on visual quality result from the modified interchanges and the proposed noise walls. In the context of the existing urban environment and future highway, rail, and military operations, the visual elements of the Build Alternative would not contribute to a cumulative visual impact.

Archaeological and Historic

Past and present development has removed or altered the character of many cultural resources in the central Puget Sound region during the last 150 years. The development and subsequent loss of character or integrity of historic properties follows a national trend, which led to the passage of federal and state regulations to protect these resources. Although many resources have already been lost, the rate of attrition is slowing because of federal, state, and local protections and an increasing public interest in preserving the nation's cultural heritage for future generations.

Based on the cultural resources analysis and coordination with the tribes and Washington's Department of Archaeology and Historic Preservation (DAHP), the Build Alternative is not expected to significantly impact cultural resources. Cultural resources coordination requirements include measures to address inadvertent discoveries.

Socioeconomic and Environmental Justice

WSDOT considered the Build Alternative's anticipated direct and indirect effects on social elements including environmental justice populations to evaluate whether it contributes to any adverse cumulative effects. The Build Alternative is anticipated to have both

beneficial and adverse impacts on elements of socioeconomics and environmental justice.

On the beneficial side, the Build Alternative will improve access, particularly in the Tillicum and Woodbrook neighborhoods. This will help address the existing isolation caused by prior transportation and land use decisions. It will also help address the lack of walkways and bike paths. As a result, the Build Alternative would have a slight beneficial contribution to the cumulative effect on community connectivity.

The Build Alternative will have some direct negative effects from property acquisition and relocation. The property impacts are consistent with current trends, and do not contribute to a cumulative effect.

The Build Alternative design has been refined in a way that minimizes the number of households and businesses displaced or otherwise adversely affected. Mitigation will be provided to residents who are displaced through the relocation process. Benefits to the Tillicum community offset the adverse impacts, including: 1) the Gravelly-Thorne connector 2) improved circulation, and 3) additional non-motorized transportation connections. Highway traffic noise and visual quality mitigation would be provided to the extent possible in Tillicum as well as along other impacted portions of the Build Alternative area. The Build Alternative provides a benefit to the low income and minority residents in that it reduces the isolation associated with the cumulative effects of past and present land use and transportation patterns in these areas.

Land Use

Land use trends were established within a short period after the Puget Sound region was settled by non-indigenous people in the mid-19th century. Over a century-and-a-half, the area was steadily developed. Urban centers including Tacoma and communities to the south were built and connected through rail and roadways. The federal government had a big role in setting the land use pattern of the military reservation. The Build Alternative includes unincorporated Pierce County and the relatively new cities of Lakewood and DuPont.

The Build Alternative would not affect land use or induce growth and development in the region. As noted under potential indirect effects, any future development or redevelopment will be consistent with land use plans and policies for that area. The Build Alternative is not likely to contribute to a cumulative effect on land use.

Economics

WSDOT examined the potential economic impacts in the Tillicum Area in addition to the broader scope of the socioeconomic analysis. Compared to No Action, the Build Alternative would not significantly affect local businesses. Some short-term, construction-related effects are anticipated; however, in context with current and future actions, these are not likely to adversely impact customers, workers or business owners. No contribution to cumulative effect is likely to result from the Build Alternative.

4.18.6 What Mitigation Measures Were Considered?

The Build Alternative would result in long-term improvements to transportation and would further the goals of regional and local land use and transportation plans. Overall, operations of the Build Alternative would not contribute to adverse cumulative impacts and no mitigation would be necessary.

4.18.7 How Were Potential Climate Change and Extreme Weather Risks Considered and Addressed?

All of WSDOT's major capital projects undergoing environmental review consider climate change and extreme weather events as part of the agency's strategic plan commitment. The project team examined available information about climate trends and the results of WSDOT's assessment of vulnerable infrastructure. WSDOT is aware that past trends for a specific resource (water, habitat, air) may not be accurate predictions for the future. Instead, we need to look at scientifically-based projections of the changing climate as part of our analysis of cumulative effects.

The results of WSDOT's recent vulnerability assessment (WSDOT, 2011) show the section of Interstate-5 along the Build Alternative to be of low vulnerability to climate-related threats. The Project corridor appears resilient to future climate-related effects. The Build Alternative may experience extreme wind, rain and snow storms and more days of extreme heat, but this segment of I-5 is not prone to severe flooding and is out of the zone for potential impacts from sea-level rise. The Build Alternative will include elements that address stormwater flow to reduce the likelihood of localized flooding.

The construction and operation of the Build Alternative would consume energy and emit Greenhouse Gas (GHGs) into the

atmosphere. Operation of the Build Alternative would not be measurably different from the No Build Alternative and thus would not contribute to a cumulative effect. Construction of the Build Alternative would have temporary release of emissions. WSDOT has taken steps to minimize fuel use during construction to reduce GHG emissions by construction equipment by setting up construction areas, staging areas, and material transfer sites in ways that reduce equipment and vehicle idling. Considered with the effects of past, present, and reasonably foreseeable future actions, the Build Alternative would have a negligible contribution to cumulative effects on energy and GHG emissions. WSDOT is active in state-wide and regional efforts to reduce vehicle miles traveled (VMT) and GHG emissions.