

Chapter 4

Cumulative Impacts

4.1 Cumulative Impacts

Cumulative impacts are those that result from past, present, and reasonably foreseeable future actions, combined with the potential impacts of the proposed action. A cumulative impact assessment looks at the collective impacts posed by individual land use plans and projects. Cumulative impacts can result from individually minor, but collectively substantial impacts taking place over a period of time.

Cumulative impacts to resources in the project area may result from residential, commercial, industrial, and highway development, as well as from agricultural development and the conversion to more intensive types of agricultural cultivation. These land use activities can degrade habitat and species diversity through consequences such as displacement and fragmentation of habitats and populations, alteration of hydrology, contamination, erosion, sedimentation, disruption of migration corridors, introduction of invasive species, changes in water quality, and introduction or promotion of predators. They can also contribute to potential community impacts, such as changes in community character, traffic patterns, housing availability, and employment.

4.1.1 Regulatory Setting

Cumulative impact is defined in 40 CFR, Section 1508.7 of the Council on Environmental Quality Regulations as:

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 (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

4.1.2 Resources Analyzed for Cumulative Impacts

The information gathered and analysis conducted in the technical reports for each resource was used as a starting point for making a determination as to which resources are expected to be substantially affected by direct and indirect impacts of the proposed action and, therefore, may have more than minimal cumulative impacts and should be analyzed in-depth for cumulative impacts. These resources include:

- Land use
- Environmental Justice and Socioeconomics
- Visual resources.

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More Information

Resources with minimal contributions to cumulative impacts are described in Section 4.1.6 Cumulative Impacts.

Brief descriptions of resources with minimal contributions to cumulative impacts are provided in Section 4.1.6 Resources with Minimal Contributions to Cumulative Impacts.

Analysis for cumulative impacts follows an 8-step process:

1. Identify the resources to consider
2. Define the study area for each resource
3. Describe the current health and historical context for each resource
4. Identify the direct and indirect impacts that might contribute to a cumulative impact
5. Identify other current and reasonably foreseeable actions
6. Identify and assess potential cumulative impacts
7. Document the results
8. Assess the need for mitigation.

The geographic boundary of the study area for potential cumulative impacts to these resources considers the geographic extent of direct and indirect project impacts as well as the natural boundaries of these resources. The cumulative impacts study area encompasses a larger area than the API to account for projects within a more regional context that could contribute to cumulative impacts to land use, environmental justice and socioeconomics, and visual resources. The cumulative impacts study area comprises approximately 11,000 acres (Exhibit 4-1).

The cumulative impact study area extends north of Tumalo Road to capture the commercial development around the Deschutes Market Road/Tumalo Junction interchange; east to 18th Street and to Deschutes Market Road to capture the planned Juniper Ridge development; south to Revere Avenue to capture new development south of the API; and west to follow O.B. Riley Road and the Old Bend–Redmond Highway and to include the Urban Area Reserve lands west of the API.

4.1.3 Cumulative Impacts: Land Use

Current Status/Viability and Historical Context

The Bend area was occupied by Native Americans for thousands of years before it was first visited by white explorers in 1834, and the “Farewell Bend” Ranch was established in 1877. Later, in 1904, Bend became incorporated with a population of just 300 people. Bend has historically seen rapid spurts of population growth and corresponding development as illustrated in Exhibit 4-2.

Bend’s UGB was first established in 1981 when the population was 17,425. Since then, the UGB has expanded by approximately 600 acres. In 2004, the City of Bend began an effort to further expand the UGB to accommodate the growing need for development as the population has more than quadrupled in size since the UGB was first established.

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Exhibit 4-1: Cumulative Impacts Study Area

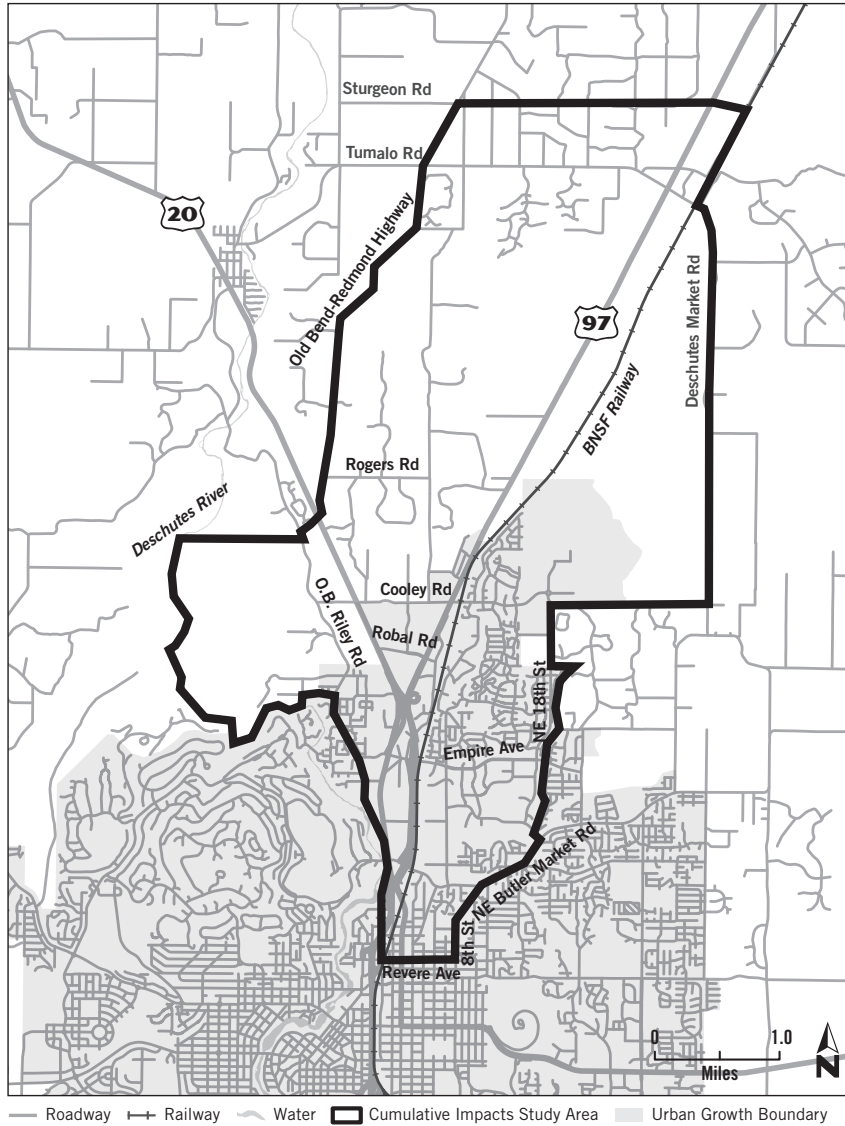
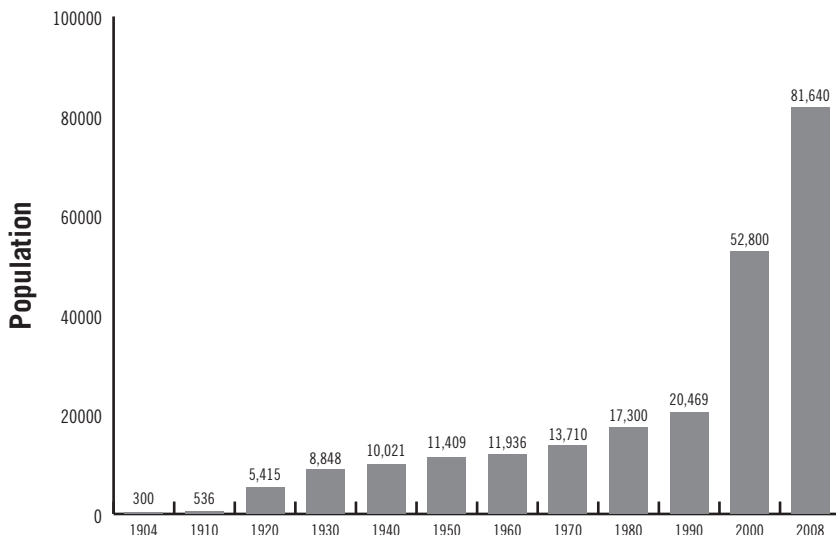


Exhibit 4-2: Population in Bend 1904–2008



Source: City of Bend 2010.

More Information

Please refer to Section 3.2 Land Use for a more detailed discussion on direct and indirect impacts to land use.

In 2009, the Bend City Council and the Deschutes County Board of County Commissioners adopted a new UGB; however in 2010, the Oregon Department of Land Conservation and Development remanded the UGB expansion to the City and County for further work to comply with state law.

Direct and Indirect Impacts

The primary direct impact of the proposed action that could contribute to cumulative impacts to land use is the acquisition of additional right of way, which would convert existing land uses to a transportation use. Under the East DS1 Alternative, 180 acres would be acquired and converted to a transportation use; under the East DS2 Alternative, 131 acres would be acquired and converted to a transportation use.

The primary indirect impact from the proposed action that could contribute to cumulative impacts to land use is a reduction in the acreage available for rural use, including rural residential uses and small-scale non-commercial farming. Under both build alternatives most of the acquisitions would be partial acquisitions of land adjacent to roadway, which would allow the remaining land to continue its current use.

Current and Reasonably Foreseeable Actions

While development in Bend and Deschutes County soared in the early and mid-2000s, it slowed tremendously toward the end of the decade with the onset of the economic recession. Nonetheless, there are still a number of other current and reasonably foreseeable actions in the consideration of cumulative impacts, including:

- Commercial development
- Communication facilities
- Park and trail improvements
- Residential development
- Roadway improvements
- Transit improvements
- Utility improvements.

Exhibit 4-4 shows the other current and reasonably foreseeable actions within the cumulative impacts study area.

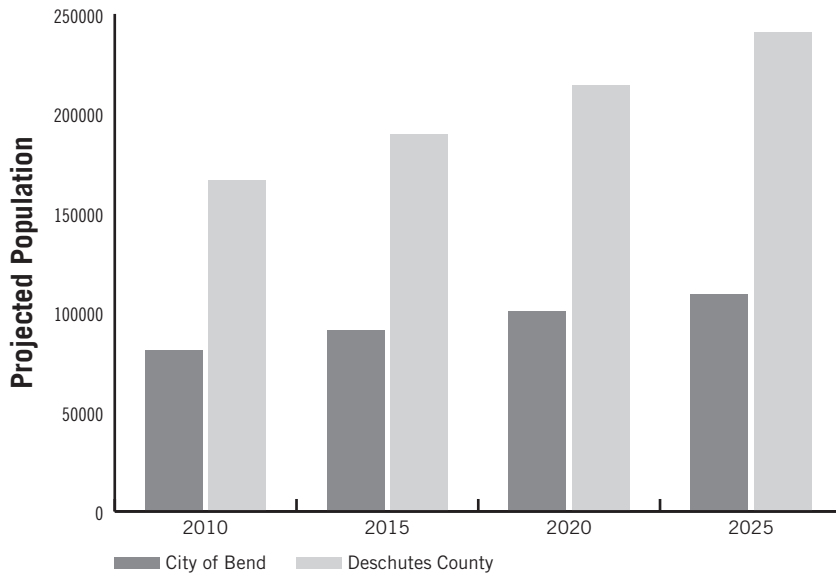
Land uses are most likely to be impacted by other current and reasonably foreseeable actions that would convert existing land uses to a new land use. Of particular note among the foreseeable actions is the 1,500 acre planned Juniper Ridge project east of the API, which would include employment, educational, and research opportunities, a town center, and residential neighborhoods. Potential major commercial development in the proximity of the proposed action includes Phase II of the Cascade Village Shopping Center and a Walmart store north of Cooley Road. There is no evidence that these developments will happen and no applications are currently on file with the City of Bend

or Deschutes County, but the respective businesses own property in the area, and the shopping center has a conceptual plan for the second phase of its development. Also of note is the large area of Urban Area Reserve land west of US 97. A portion of Juniper Ridge (approximately 500 acres) is also located within the Urban Area Reserve zone.

Cumulative Impacts

The City of Bend and Deschutes County are both projected to experience population growth over the next 15 years. The 2005-2025 Deschutes County coordinated population projection, shown in Exhibit 4-3, is the latest estimate available for projected population growth.

Exhibit 4-3: Projected Population Growth in Bend and Deschutes County 2010–2025



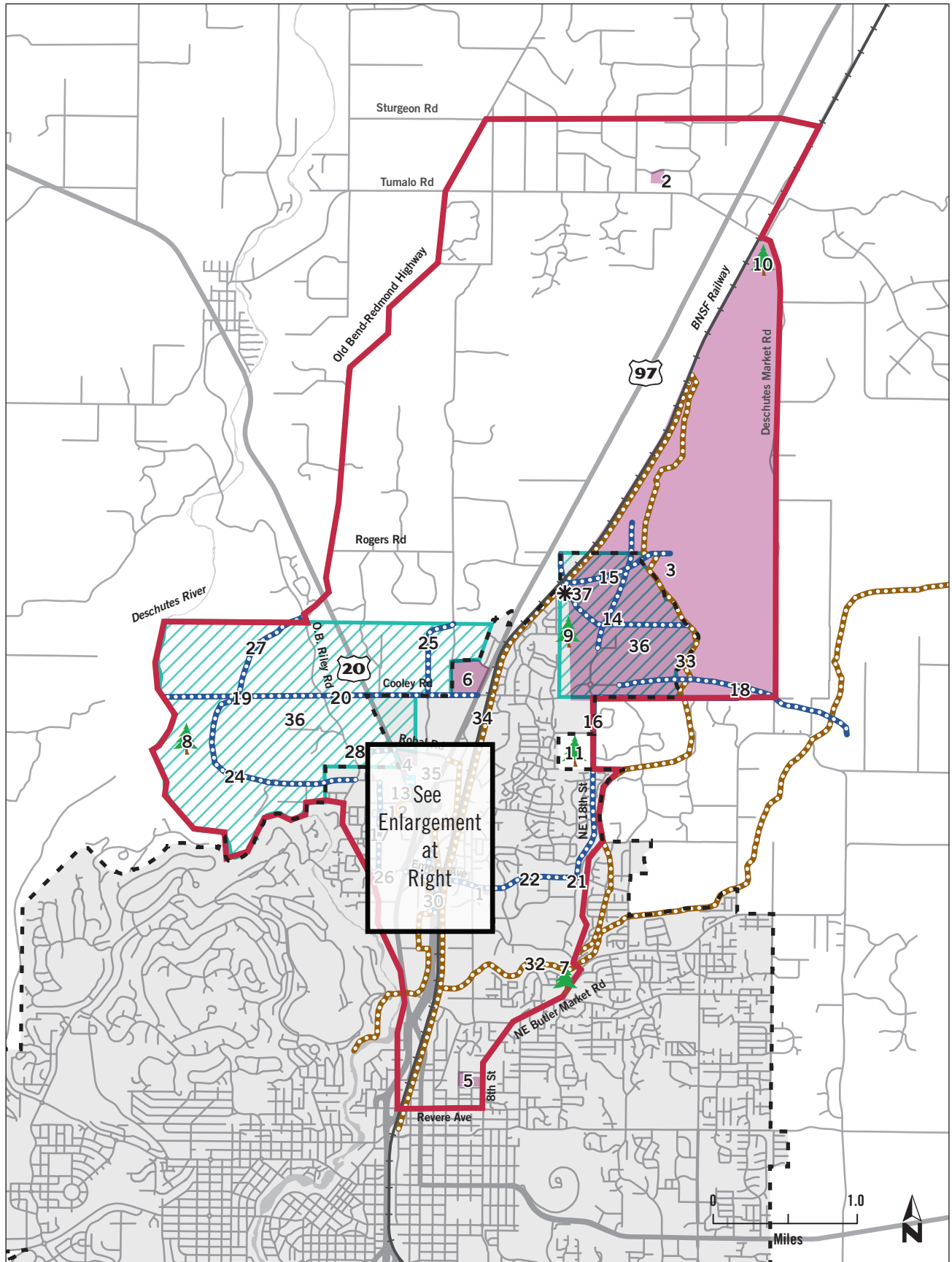
Source: Bend Metropolitan Planning Organization 2007, City of Bend 2009b, Deschutes County 2010a.

Note: The Bend Metropolitan Planning Organization’s 2007-2030 Metropolitan Transportation Plan, City of Bend’s Bend Area General Plan, and Deschutes County’s 2030 Draft Deschutes County Comprehensive Plan utilize the 2005-2025 Deschutes County coordinated population projection, completed in 2004. The traffic analysis for the proposed action also incorporates these projections as the analysis is based on the Bend Metropolitan Planning Organization’s travel demand model.

These estimates are an indication of the growth that the City and County expect to experience in the next 15 years. The City, County, and Bend Metropolitan Planning Organization’s land use and transportation plans account for this projected growth. Based on these projections it is likely that there will be a need for additional development of many of the current and reasonably foreseeable projects identified in Exhibit 4-4. Specifically, it is reasonable to anticipate that the Urban Area Reserve lands, including a portion of Juniper Ridge, would be converted from a rural land use to commercial, industrial, residential, and park uses to serve the growing population. It is unknown at this time how the UGB expansion will evolve. If expanded, the UGB could be expected to add Urban Area Reserve lands for development further into the future.

Definition
Urban Area Reserve Lands
 Lands zoned Urban Area Reserve are identified for future urban growth.

Exhibit 4-4: Other Current and Reasonably Foreseeable Actions in the Cumulative Impacts Study Area



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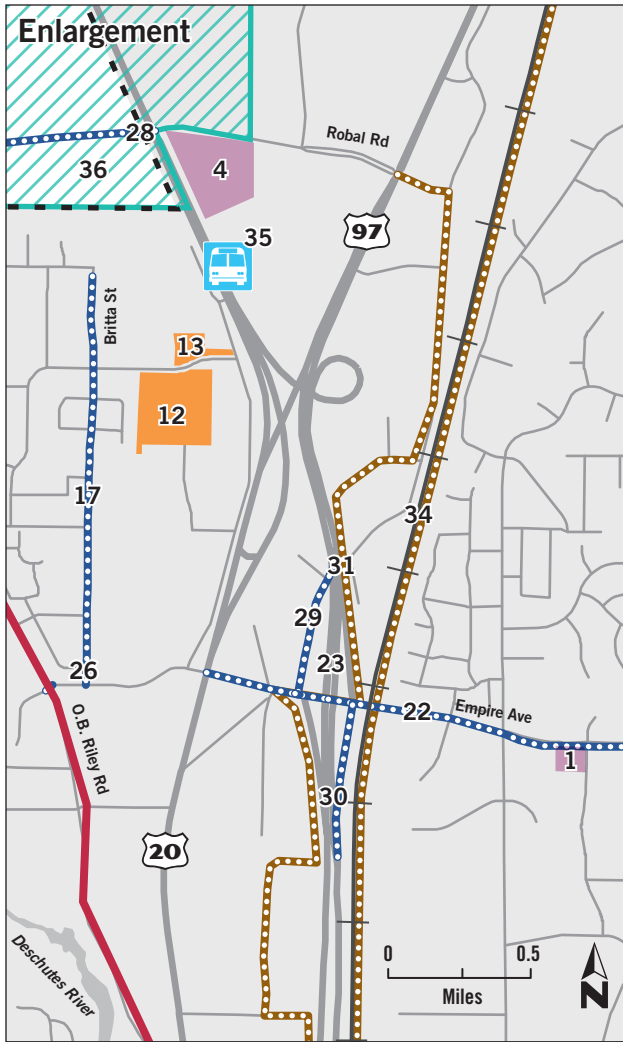
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Legend

- Roadway
- +— Railway
- Water
- ▭ Cumulative Impacts Study Area
- ▭ Urban Growth Boundary
- ▭ Commercial/Residential Development
- 🌲 Park Development
- ▭ Public Development
- ⋯ Roadway Improvements
- ⋯ Trail Improvements
- 🚌 Transit Facilities
- 🏠 Urban Area Reserve Land
- ⚡ Utility Improvement
- # Project

Map Number	Project Name
Commercial, Industrial, and Residential Development	
1	Airgas
2	First Addition to Whispering Pines Estates
3	Juniper Ridge
4	Phase II Cascade Village
5	Vail Meadows Planned Unit Development
6	Walmart Store

Map Number	Project Name
Park Development	
7	Butler Market Park
8	Community/Regional Park
9	Juniper Ridge Park
10	Oregon Rush Soccer Fields
11	Rock Ridge Park
Public Development	
12	Deschutes County Oregon State Police/911 Building
13	Deschutes County Mental Health Facility
Roadway Improvements	
14	18th Street Extension
15	18th Street to Juniper Ridge Connections
16	18th Street Widening
17	Britta Street Extension
18	Cooley Road Extension East
19	Cooley Road Extension West
20	Cooley Road Widening
21	Empire Avenue/18th Street Roundabout
22	Empire Avenue Widening
23	Empire Avenue/US 97 Signal
24	Glen Vista Road Extension
25	Hunnell Road to Cooley Road Connection
26	O.B. Riley Road/Empire Avenue Signal
27	Old Bend Redmond Highway Extension
28	Robal Road Extension
29	US 97 Ramp Addition
30	US 97 Ramp Widening
Trail Improvements	
31	North Parkway Trail
32	North Unit Canal Trail
33	Pilot Butte Canal Trail
34	Rails with Trails Corridor
Transit Facilities	
35	Park and Ride Facility
Urban Area Reserve Lands	
36	Urban Area Reserve Lands
Utility Improvements	
37	Pacificorp Power Station and Power Lines

Key Point

Land Use Mitigation Measures

Key mitigation measures for direct and indirect impacts to land use include:

- Relocation assistance for all displaced residents and businesses in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970
- Compensation for all property rights acquired at fair market value
- Minimization of conversion of prime farmland.

No Build Alternative – The No Build Alternative would not require right of way acquisition and would not convert existing land uses to transportation uses. Therefore, the No Build Alternative is not expected to contribute to overall changes in land uses within the cumulative impacts study area.

East DS1 and East DS2 Alternatives – The incremental impact of the build alternatives in combination with other past, present and reasonably foreseeable projects to land uses would include:

- Acquisition and conversion of 131–180 acres of land zoned as Industrial Light, Multiple Use Agriculture, or Urban Area Reserve.

In the context of the 1,460 acres zoned Urban Area Reserve in the north end of Bend, west of US 97, and the 1,500 acre Juniper Ridge development that are planned to be converted from rural to urban land uses, the land that would be converted by either build alternative is relatively small. The conversion of Multiple Use Agriculture land would contribute to the overall loss of rural residential land uses.

Need for Mitigation

As described in Section 3.2.4 Land Use, the design of the proposed action, including access management, and the mitigation measures that would be undertaken would minimize the direct and indirect impacts on land use, and therefore also the cumulative impacts. Subject to the approval of amending the *Transportation System Plan* to include the project in the financially constrained list, the proposed action would be consistent with the *Bend Area General Plan*, the current and draft 2030 *Deschutes County Comprehensive Plan*, and 2007-2030 *Metropolitan Transportation Plan*. Therefore, with the exception of the improvements proposed at the north end of the API where exceptions to the statewide goals are needed, the proposed action would not cause induced growth because this planned growth is already accounted for in the local land use and transportation plans.

The proposed action as well as other current and reasonably foreseeable actions would be required to follow environmental regulations and comply with City and County comprehensive plans, zoning codes, transportation plans, public infrastructure plans, development ordinances, Oregon’s statewide planning goals, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. In addition, under the proposed action interchange area management plans for the US 97/Empire Avenue interchange and new US 97 interchange in the north end of the API would be adopted by the Oregon Transportation Commission. The interchange area management plans would consist of an interchange function

statement, land use assumptions, and a circulation and access management plan. The interchange area management plans could be implemented through comprehensive plan language, an interchange area management plan overlay district, and transportation system plan amendments that would limit and manage access on state and local roadways around the interchanges. These measures, in combination with existing zoning and comprehensive plan designations, would deter induced growth around the interchanges. All of these land use actions would minimize the proposed action's contribution to cumulative impacts to land use such as additional development of rural lands. Land use actions supporting the interchange area management plans would be submitted and require approval by the City of Bend or Deschutes County, as appropriate, prior to the publication of the Final EIS.

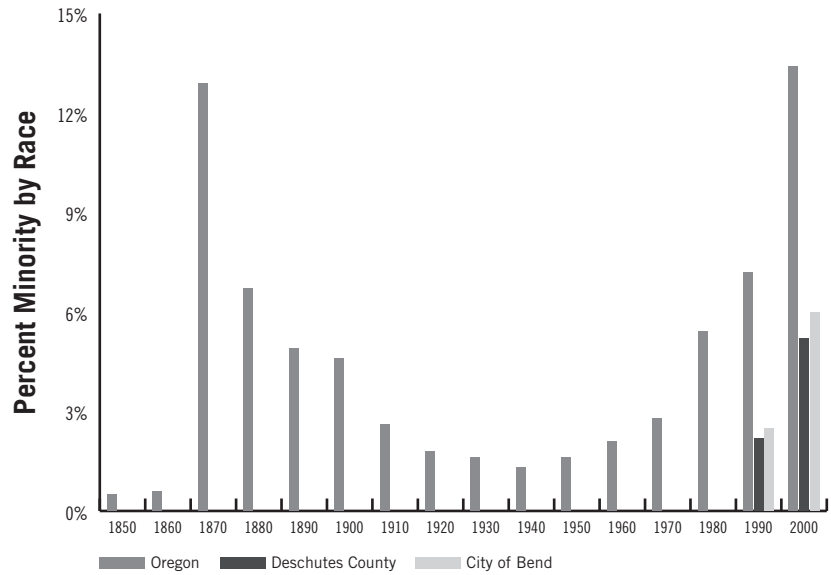
4.1.4 Cumulative Impacts: Environmental Justice and Socioeconomics

Current Status/Viability and Historical Context

Bend was inhabited only by Native Americans until 1834 when the first European explorers visited the area. Extensive timber resources and railroads helped draw more Euroamericans to the area throughout the second half of the nineteenth century. With the development of canals for irrigation, the City saw growth in agriculture and continued in-migration, leading to increased development and urbanization. As described in the prior section, the City of Bend's population has grown tremendously since the City's incorporation in 1904, with dramatic increase beginning at the end of the twentieth century (Exhibit 4-2).

As the population in Bend, Deschutes County, and Oregon has grown, it has also become more diverse. The proportion of minorities in the state increased greatly in the 1800s and has steadily grown since 1940, as shown in Exhibit 4-5; likewise, the proportion of minorities in Bend and Deschutes County grew from 1990 to 2000. The percent of minorities in the City more than doubled between 1990 (2.5 percent) and 2000 (6.1 percent).

Exhibit 4-5: Percentage of Minorities by Race in Oregon, Deschutes County, and City of Bend 1850–2000

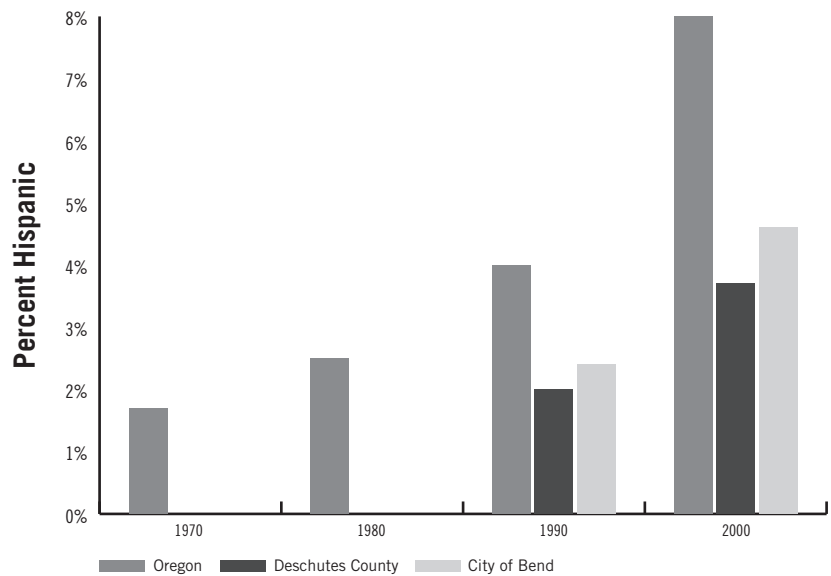


Source: US Census 1990, 2000 and 2002.

Note: City-level and County-level US Census data on minorities not available prior to 1990.

Similarly, the percentage of state, county, and city residents that are Hispanic has increased in recent decades as the population has grown. In 1990 Hispanics represented 2.4 percent of the City of Bend’s population and 2.0 percent of the Deschutes County population; by 2000 these percentages nearly doubled to 4.6 percent and 3.7 percent, respectively, as shown in Exhibit 4-6.

Exhibit 4-6: Hispanic Percentage of Population in Oregon, Deschutes County, and City of Bend 1970–2000



Source: US Census 1990, 2000 and 2002.

Note: City-level and County-level US Census data on minorities not available prior to 1990.

Direct and Indirect Impacts

When the City was incorporated in 1905, Bend's economy depended on sawmills and it continued to operate as a mill town through much of the twentieth century until this industry was hit hard by the timber bust in the 1980's. In the 1970's Bend's economy began to diversify with manufacturing, trade, medical services, and tourism accounting for more and more jobs. Bend's tourism and resort industry took a leap forward with the establishment of the Mount Bachelor ski area (City of Bend 2009b, Deschutes County 2010b).

Because there would be no improvements under the No Build Alternative, there would be no direct impacts that would contribute to cumulative impacts to socioeconomic conditions. However, the following indirect impacts from the No Build Alternative could contribute to cumulative impacts: worsened congestion, travel time delays, increased response times for emergency services, potential for increased cut-through traffic in neighborhoods, and reduced safety and mobility for drivers, pedestrians, and bicyclists.

The primary direct impacts from the proposed action that could contribute to cumulative impacts to socioeconomic conditions include business and residential displacements/relocations. The primary indirect impacts from the proposed action that could contribute to cumulative impacts to socioeconomic conditions include: improved vehicle and transit travel time; increased emergency service responses times; reduced accident rates; improved bicycle and pedestrian mobility; and reduced traffic in neighborhoods.

No disproportional impacts to environmental justice populations would occur under the proposed action, as demonstrated in Section 3.4 Environmental Justice.

Current and Reasonably Foreseeable Actions

Other current and reasonably foreseeable actions (Exhibit 4-4) that would most likely impact socioeconomic conditions and environmental justice populations include those projects which would add or remove community facilities (parks, trails, sidewalks, transit service); roadway projects that would change emergency service response times; residential development that would provide additional housing; commercial development that provides employment opportunities and contributes to the local economy; projects that would result in residential or business displacements; improvements that would alter community cohesion; and actions that would impact economic development opportunities.

More Information

Please refer to Sections 3.4 Environmental Justice and 3.5 Socioeconomic Analysis for a more detailed discussion on direct and indirect impacts to environmental justice and socioeconomic conditions.

More Information

Other current and reasonably foreseeable actions in the cumulative impacts study area are shown in Exhibit 4-4.

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As the City of Bend and Deschutes County grow, additional housing, employment opportunities, community facilities, and services would be needed to accommodate new residents. All social groups, including environmental justice populations, would be anticipated to experience the same cumulative adverse and beneficial impacts resulting from the proposed action in combination with other current and reasonably foreseeable actions.

No Build Alternative – The incremental impact of the No Build Alternative in combination with other past, present and reasonably foreseeable projects to environmental justice populations and socioeconomic conditions would include:

- Higher traffic volumes and increased traffic demand on local roads, resulting in increasing cut-through traffic over time in neighborhoods and disrupting community cohesion.
- Reduced safety and mobility from additional traffic, resulting in an adverse impact to residents' quality of life.
- Enhanced community facilities from other actions, such as additional sidewalk, bicycle, and trail improvements; new park facilities; and improvements to the Public Safety Complex. Pedestrian and bicycle mobility would be enhanced by these improvements. However, worsened traffic congestion from additional development would generate vehicle trips on US 97, making it more difficult and more time consuming for citizens to travel to these community facilities by automobile.
- Roadway improvements proposed under other current and reasonably foreseeable actions could improve emergency service providers' ability to reach their destinations to some degree. However, US 97 is a major facility which must be navigated to reach many locations and the absence of improvements to this facility would lead to worsened traffic congestion and would adversely impact emergency service providers' ability to quickly reach their destinations.
- Additional employment opportunities would be generated both temporarily during construction of other projects and permanently where new commercial facilities are built. However, the additional commercial development could worsen traffic congestion on US 97, which in combination with the indirect impacts of the No Build Alternative could lead to increased travel time for employees and customers to reach businesses by automobile, potentially affecting customers' willingness to travel to a particular business.
- Worsened congestion could delay freight movement through the study area, negatively impacting the regional and state economy.

East DS1 and East DS2 Alternatives – The incremental impact of the build alternatives in combination with other past, present and reasonably foreseeable projects to environmental justice populations and socioeconomic conditions would include:

- Displacement of approximately nine residences would lead to localized changes in the Boyd Acres Neighborhood under both build alternatives. In addition, displacement of four residences in the Hunnell Neighborhood under the East DS1 Alternative would contribute to a minor localized change in that neighborhood. These displacements could impact residents with long tenure in these neighborhoods and could slightly alter community activity and communication within the neighborhoods.
- Community cohesion and quality of life could be altered by increased traffic within neighborhoods from the extension of 3rd Street through the Hunnell Neighborhood under the East DS1 Alternative, resulting in vehicular and road noise, light, glare, and exhaust. Reduced cut-through traffic in the Boyd Acres Neighborhood would benefit community cohesion.
- Improved safety and mobility would improve residents' quality of life through a reduction in commute time and costs, and more transportation options.
- Pedestrian, bicycle, and roadway improvements would improve travel time and reduce congestion, leading to an overall improvement in connectivity between community facilities and residents' ease of travel to the community facilities.
- Emergency service providers' travel routes would change as a result of the proposed action. Reduction in congestion would improve response times, but for some locations the longer travel routes would result in longer response times.
- Displaced businesses that would choose to close their business and would not relocate could lead to a loss of tax revenue, although this could be partially offset by new commercial development resulting from other projects and future commercial development opportunities in the Urban Area Reserve lands. Business displacements would primarily be concentrated in the Nels Anderson Road business area under both alternatives.
- Roadway improvements could benefit businesses and the economy by enhancing customers' ease of travel to businesses, although customers may need to learn new travel routes to reach some businesses may change. Improved traffic flow and travel times resulting from roadway improvements could also benefit the regional and state economy by improving travel conditions and predictability for freight traffic.

Key Point

Environmental Justice and Socioeconomic Mitigation Measures

Key mitigation measures for direct and indirect impacts to environmental justice and socioeconomic resources include:

- Relocation assistance for all displaced residents and businesses in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970
- Compensation for all property rights acquired at fair market value
- Provide housing of last resort if needed.

Overall, the build alternatives would lead to more beneficial cumulative impacts related to safety, mobility, and travel time than the No Build Alternative. Neither build alternative would contribute to adverse cumulative impacts to environmental justice populations. The displacements resulting from the build alternatives, however, would lead to greater adverse cumulative impacts to community character and cohesion than under the No Build Alternative.

Need for Mitigation

The design of the proposed action and the mitigation measures that would be undertaken, as described in Sections 3.4.4 Environmental Justice and 3.5.4 Socioeconomic Analysis, minimize the direct and indirect impacts on environmental justice and socioeconomic resources, and therefore also the cumulative impacts of the proposed action.

The other current and reasonably foreseeable actions (as listed in Exhibit 4-4) would also be required to follow environmental regulations and associated mitigation measures. For example, other actions that require displacements would also have to comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

4.1.5 Cumulative Impacts: Visual Resources

Current Status/Viability and Historical Context

Lands within the cumulative impacts study area are arid and were considered unsuitable for cultivation by Native Americans and early settlers, creating a harsh landscape that experienced stunted development activities through the early twentieth century. A 1947 atlas of Deschutes County soils classified the majority of land as “sloping, very stony lands suited for range, having minor conservation needs” (Soil Conservation Service 1947:40).

Due to the limitations of the landscape, growth and settlement activities did not begin to flourish until the mid to late twentieth century. The expansive growth of Bend over the last three to four decades has resulted in the construction of modern industrial and commercial buildings along US 97 and US 20, as well as in between the two highways near Robal Road and Cooley Road. Central and northern portions of the API contain a higher percentage of residential buildings, but the number of commercial buildings is beginning to increase in these areas as the Bend urban growth boundary and city limits continue to expand in tandem with its growing population.

Long before these modern housing and commercial developments were established, the open, arid lands were used for various stock raising activities made possible by Oregon’s adoption of the Carey Act in 1901. In accepting the Carey Act of 1894, the state allowed settlers

to acquire 160 acres of what was formerly publicly-owned arid land if they agreed to irrigate 20 acres. Private developers were then given a lien against the lands benefited by the canals and reservoir systems, allowing private irrigation companies to raise needed capital while taking on the risk of investment (Tumalo Irrigation District 1999–2007). The adoption of the Carey Act in Oregon was felt immediately, as three canals were constructed within its boundaries during this significant period of irrigation expansion in the early twentieth century.

In the later part of the twentieth century and the beginning of this century, Bend experienced rapid population growth, as shown earlier in Exhibit 4-2. In 2005, Bend was the sixth-fastest growing metropolitan area in the US. The recent economic downturn, however, has affected Central Oregon more severely than other areas of the state, and development in Bend has slowed tremendously.

With this growth and development has come a continual expansion of built facilities and structures outward toward undeveloped lands across the landscape. New road corridors have been built and parcels of land subdivided. Neighborhoods and shopping centers drawing regional retailers have been constructed. As a result, the visual character has transitioned from rural to urban, particularly within the City of Bend's UGB. However, outside the UGB, there are still portions of the API that are visually transitional and that retain a rural character.

Direct and Indirect Impacts

The primary direct and indirect impacts of the No Build Alternative that could contribute to cumulative impacts to visual resources are increasing light and glare encroachment and visually distracting traffic congestion.

The primary direct impacts of the proposed action that could contribute to cumulative impacts to visual resources are: vegetation removal, grading, construction of new roadway facilities, and construction of new elevated structures. The primary indirect impact from the proposed action that could contribute to cumulative impacts to visual resources is land conversion from a non-transportation use to a transportation use.

Current and Reasonably Foreseeable Actions

Other current and reasonably foreseeable actions (Exhibit 4-4) that would likely impact visual resources include those projects that would require grading; construct elevated structures (such as bridges, overcrossings, elevated roadways, and walls); add or remove vegetation; remove or fill water features; change the setting of historic features; reduce or increase open space; or construct new buildings, roadways, or above ground utilities.

More Information

Other current and reasonably foreseeable actions in the cumulative impacts study area are shown in Exhibit 4-4.

Cumulative Impacts

No Build Alternative – The incremental impact of the No Build Alternative in combination with other past, present and reasonably foreseeable projects to visual resources and visual quality would include:

- Increasing light and glare coming from the highway, and an increase of light and glare on local roads as motorists use local streets to avoid congestion on US 97.
- Increased visual distraction from traffic congestion on US 97 and local roads.

East DS1 and East DS2 Alternatives – The incremental impact of the build alternatives in combination with other past, present and reasonably foreseeable projects to visual resources and visual quality would include:

- Landform changes, particularly grading, cuts and fills to accommodate new roads, structures or buildings which could remove or modify topographic features.
- Vegetation removal leading to less overall textural, color, shape and form variation across the landscape, and/or the elimination of intact stands of mature shrubs and trees which provide a natural, visual buffer.
- Reduction or elimination of water features either through filling or piping, decreasing the color, movement and textural variation that water provides.
- Removal of historic resources which may have period aesthetic features, or conversion of the historic landscape surrounding such resources to more urban uses.
- Open space reduction as lands are subdivided and/or converted for other uses such as residential, commercial or industrial, thereby decreasing the intactness and unity of visual resources and/or views.
- Light and glare intrusion into natural spaces and increasing night-time brightness across the landscape.
- Visual bisecting of otherwise intact and harmonious landscape units, particularly when new roads are created.
- Intrusion upon natural edges (e.g. tree lines, rivers, rock outcroppings) by lines and angular shapes (e.g. roads, bridges, docks, buildings, signs, utilities).
- Increasing vertical development as more multi-level buildings, aerial signs and aboveground utilities rise from the landscape.
- Additional visually-distracting congestion as traffic increases.

Overall, the build alternatives would have a minor contribution to the cumulative impacts on visual quality in this relatively urbanized corridor. Furthermore, the use of consistent aesthetic treatments would

create visual unity within the build alternatives and promote visual blending with the surrounding landscape. This would further minimize the build alternatives' adverse cumulative impact to visual quality. Existing development standards and requirements within the City of Bend and Deschutes County would also minimize the adverse visual impacts of the build alternatives combined with other current and reasonably foreseeable projects.

Need for Mitigation

The design of the proposed action and the mitigation measures that would be undertaken, as described in Section 3.8.4 Visual Resources, minimize the direct and indirect effects to visual resources, and therefore also the cumulative effects of the proposed action.

The other current and reasonably foreseeable actions would also be required to follow environmental regulations and associated mitigation measures. Other actions potentially affecting visual resources would also have to comply with City of Bend development standards relating to visual changes in Special Planned Areas and with the requirements of Deschutes County's Landscape Management Combining Zone, which maintains scenic and natural resources.

4.1.6 Resources with Minimal Contributions to Cumulative Impacts

Some resources would have few direct and/or indirect impacts under the three alternatives studied in the Draft EIS and under other current and reasonably foreseeable actions. The proposed action would not be expected to contribute to substantive cumulative impacts for these resources, nor would other current and reasonably foreseeable actions. A brief explanation is provided as to why each of the following resources is not included in this cumulative impact analysis.

Transportation Facilities

The forecast traffic volumes used to analyze the transportation impacts of the proposed action in Section 3.1 Transportation includes traffic from all sources, including other current and reasonably foreseeable actions; thus the transportation analysis in that section addresses cumulative adverse and beneficial impacts as well as direct and indirect impacts, so those impacts are not analyzed in this chapter.

Right of Way and Utilities

Other than the utility relocations described in Section 3.3 Right of Way and Utilities, the build alternatives would not be expected to have substantial direct or indirect adverse impacts on utilities. Similarly, other current and reasonably foreseeable actions are not expected to result in substantial impacts to utilities, so the proposed action would not be expected to cumulatively contribute to any past, current

Key Point

Visual Avoidance Measures

Key avoidance measures for direct and indirect impacts to visual resources would include:

- Avoid bisecting visually intact rural residential lands west of Hunnell Road
- Avoid vegetation removal and terrain grading west of Hunnell Road
- Design Cooley Road to be an undercrossing of US 97 to avoid elevated structures and minimize the visibility of US 97.

or future adverse impacts to utilities. Please refer to Sections 4.1.4 Cumulative Impacts: Land Use and 4.1.5 Cumulative Impacts: Environmental Justice and Socioeconomics for potential cumulative impacts to residents and businesses that may result from right of way acquisition.

Parks and Recreational Facilities

The build alternatives are not anticipated to relocate, remove, temporarily disturb, or otherwise impact existing park and recreational facilities or prohibit construction of planned trails in the API. Other current and reasonably foreseeable actions, specifically planned parks and trails, would generally contribute to an enhanced network of such facilities in the Bend area, but would not substantially impact the overall park and recreational facilities network. The proposed action is not expected to contribute to a substantial cumulative change in the park and recreational facilities within the cumulative impact study area.

Historic Resources

The proposed action could contribute to a minor long-term change in the historic resources within the API, including removal of the Nels and Lillian Andersen House, piping segments of the Swalley Canal, and a construction a new undercrossing of the Oregon Trunk Railway. However, the house is already a highly modified structure and there are no other contributing structures on the property, so its removal would have a minor impact in the more regional context of historic resources. Similarly, the changes to the Swalley Canal and Oregon Trunk Railway are very minor and the historic alignments of both would be retained. Impacts of other current and reasonably foreseeable actions on historic resources are unknown.

Water Quality, Hydrology, and Stormwater Runoff

Although there would be new impervious surface added with the proposed action, there would be few direct adverse impacts to surface water bodies and water quality. Stormwater treatment would be implemented for both build alternatives which would treat some of the stormwater runoff, and the existing system of drywells and drainwells would be decommissioned according to Oregon Department of Water Resources regulations for well decommissioning. For the remaining stormwater runoff that would not be diverted to engineered treatment facilities, vegetation and soils in roadside ditches would incidentally treat the stormwater. The existing roadside ditches function well and can handle the additional volume, there is no adjacent receiving surface water body, and groundwater resources are typically found at depths of 500 to 700 feet below ground surface. In addition, other development within the watershed would be required to comply with water quality regulations as discussed below.

The City of Bend has implemented an integrated stormwater management plan to comply with federal and state water quality regulations. As part of the plan, the City must reduce the amount of pollutants moving from homes and businesses to the storm drain system, monitor stormwater, and lessen the impacts of development on water quality. The plan also addresses drinking water protection areas. Although the City does not have jurisdiction over the water quality aspects of stormwater management on private property, private well owners must meet state requirements for stormwater quality in addition to meeting the City's requirements for managing stormwater quantity. Given the regulatory framework for managing stormwater quality and quantity within the City of Bend, other development projects would have to include stormwater controls and treatment in order to be constructed, which would contribute cumulatively to the improvement of water resources within the watershed. Thus, the proposed action would not be expected to cumulatively contribute to any past, current, or future adverse impacts to water resources.

Natural Systems and Communities

Impacts to natural systems and communities from the proposed action and other current and reasonably foreseeable actions would be the removal of numerous slivers of strategy habitats that already abut public road facilities, offer minimal habitat value, and are distributed across a relatively large area. At a regional level, removal of these small areas of habitat would not be expected to substantially contribute to cumulative impacts to natural systems and communities.

The proposed action would result in piping 950 to 2,300 feet of the Swalley Canal, a wildlife linkage feature for the western grey squirrel and other small mammals. The Swalley Irrigation District has just completed a project that included piping approximately 5 miles of the Swalley Canal to reduce water loss from evaporation. In the context of the entire wildlife linkage, which includes 30 miles of habitat adjacent to US 20 and 40 miles of habitat adjacent to US 97, the cumulative impacts to wildlife linkages resulting from the proposed action or other current and reasonably foreseeable actions would be expected to be minor. No new barriers to other wildlife movement would occur under the proposed action.

Wetlands and Other Waters

While the proposed action would not result in additional impacts to wetland and water resources in the Deschutes Watershed, it would continue to contribute to the current impacts associated with irrigation withdrawal from the Deschutes River.

Piping portions of the Swalley Canal would benefit the Deschutes Watershed by slowing the loss of surface water to evaporation. Neither

of the proposed action or other current and reasonably foreseeable actions would likely contribute to a substantial cumulative loss of wetlands or waters in the Deschutes Watershed, so cumulative impacts to wetlands and other waters would not be expected to be substantial.

Threatened and Endangered Species

Because no direct impacts to threatened or endangered fish or wildlife species would be anticipated, the proposed action would not be expected to cumulatively contribute to any past, current or future adverse impacts to listed fish and wildlife species. Deschutes County is one of three main population centers for Peck’s milkvetch, covering approximately 640,000 acres. Therefore, the potential removal of 1 acre of marginal habitat for Peck’s milkvetch by either the proposed action, when combined with other past, current or foreseeable future projects in the area, would have a negligible cumulative impact.

Non-Threatened or Endangered Species

Non-threatened or endangered species would experience minor direct and indirect impacts associated with removal of numerous slivers of strategy western juniper and sagebrush habitats under the proposed action and other current and reasonably foreseeable actions. Because the removal of habitat would be distributed across the approximately 11,000 acre cumulative impact study area, at a regional level the project and other current and reasonably foreseeable actions would not be expected to substantially contribute to cumulative impacts to non-threatened or endangered species.

Invasive Species

Direct impacts to invasive species from the proposed action and other current and reasonably foreseeable actions would result from disturbing existing invasive species populations that are distributed across the 10,779 acre cumulative impact study area. The proposed action and other current and reasonably foreseeable actions would be required to mitigate for invasive species. At a regional level these disturbances would have a minor cumulative contribution to the spread of invasive species after mitigation is applied.

Air Quality

The forecast traffic volumes used to analyze the air quality impacts of the proposed action in Section 3.15 Air Quality includes traffic from all sources; thus, the air quality analysis in that section addresses cumulative adverse and beneficial impacts as well as direct and indirect impacts. The proposed action would result in only minor impacts to air quality which would be offset by the beneficial impacts of US Environmental Protection Agency regulations. Other current and reasonably foreseeable actions would also not be expected to result in

substantial impacts to air quality, so no substantial cumulative impacts to air quality would be expected.

Noise

FHWA and ODOT criteria for noise impacts are based on the peak noise hour, which is the maximum hourly noise level generated by the roadway. The traffic conditions used to calculate the peak hour noise levels for the direct impacts of the proposed action result in the highest theoretical hourly noise levels that could occur along the road when the greatest number of vehicles operating at free flow conditions. If there are fewer cars at free flow, the noise levels generated by the road would be lower. If there are more cars and congestion occurs, resulting in slower speeds, lower noise levels would also result. Therefore, the noise cumulative impacts analysis is independent of how much traffic is actually projected for the road.

Additional road improvement projects would either result in the actual noise levels approaching the conditions modeled for the proposed action as part of the direct impacts analysis if the road is not congested (that is, the number of cars at free flow conditions in the build alternatives), or change the amount and/or time of congestion, which does not affect quantification of the peak noise hour levels. The direct impact analysis presented in Section 3.16 Noise includes planned projects and associated projected traffic. Thus, the direct impacts analysis encompassed cumulative impacts, so those impacts are not discussed further in this chapter.

Energy

The forecast traffic volumes used to analyze energy impacts of the proposed action in Section 3.17 Energy includes past and future transportation improvements and related energy consumption; thus, the analysis in that section addresses cumulative adverse and beneficial impacts as well as direct and indirect impacts. The proposed action would result in only minor impacts to energy consumption. Other current and reasonably foreseeable actions would also not be expected to result in substantial impacts to energy consumption, so no substantial cumulative impacts would be expected.

Geology

The proposed action and other current and reasonably foreseeable actions would not be expected to have direct or indirect adverse impacts on the soils or geologic conditions, nor would they be anticipated to create any new geologic hazards. Thus, the proposed action would not be expected to cumulatively contribute to any past, current or future adverse impacts to geologic resources. Please refer to Section 4.1.5 Cumulative Impacts: Land Use for potential cumulative

impacts to soils identified as prime farmland if irrigated or farmland of statewide importance.

Hazardous Materials

If hazardous materials are identified in the API and were to be encountered during construction, measures would be taken to avoid or remediate any contaminants present. Thus, any potential direct adverse impacts would be avoided through remediation. This in turn produces a direct beneficial impact to human health and the environment.

As described in Section 3.9 Water Quality, Hydrology and Stormwater Runoff, the proposed action would also provide formal and incidental treatment of stormwater that would minimize the hazardous materials that would potentially enter the groundwater. Other development in the API would also be required to provide stormwater treatment of runoff from impervious surfaces to reduce hazardous materials that would potentially enter the groundwater. Since there would be no adverse direct or indirect impacts for hazardous materials under the proposed action and no substantial impacts resulting from other current and reasonably foreseeable actions, no substantial cumulative impacts would be expected.

4.2 Climate Change

4.2.1 Greenhouse Gas Impacts and Global Climate Change

The issue of greenhouse gas emissions and global climate change is an important national and global concern that is being addressed by various state and federal agencies, including ODOT and FHWA.

Since the context for greenhouse gas emissions is a global scale, it is virtually impossible to perform a meaningful analysis of most local transportation projects. Greenhouse gas emissions analyses are more informative at regional, state, or national levels and should be accomplished during local and regional land use planning processes when more capable modeling tools are developed. While it still may be possible to quantify greenhouse gas emissions associated with a proposed transportation project, tools have not been developed for how to translate those emissions into impacts on climate change on any scale. ODOT’s recent land use and transportation modeling efforts have shown that land use patterns have a much greater impact on all emissions than do highway expansions. Further, the needs for most highway projects are typically a result of land use changes, development, growth, and other local and regional changing trends. Therefore, to best inform decision making, greenhouse gas emissions

estimation needs to be done during the transportation system and land use planning processes.

As of the date of publication of this document, no federal laws specifically require greenhouse gas emissions analyses in project-level National Environmental Policy Act documents. The National Environmental Policy Act requires federal agencies to scope and address the significant issues of any proposal and to concentrate on the analyses of issues that can be truly meaningful to the consideration of and comparison between project alternatives. In the absence of federal regulations and a regional or national framework for considering the implications of project-level greenhouse gas analyses, FHWA concludes that greenhouse gas emissions calculated for project alternatives cannot be usefully evaluated in the same way that vehicle emissions are evaluated within a local project-level context and that such an attempted analysis would not inform project decision-making in any meaningful way.

4.2.2 Oregon Strategies

Greenhouse gas emissions are currently not regulated in the State of Oregon. However, there are numerous goals for states and the nation to meet, and strategies to reduce greenhouse gas emissions are currently being addressed by ODOT and other state agencies throughout Oregon. On August 7, 2007 the Climate Change Integration Act came into effect with the passage of Oregon house bill 3543. Oregon House Bill 3543 creates greenhouse gas emissions reduction goals for the State of Oregon, which aim to reduce emissions 10 percent below 1990 levels by 2020 and achieve a 75 percent reduction below the 1990 levels by 2050. Oregon House Bill 3543 also created the Oregon Global Warming Commission that is responsible for recommending policies to state and local governments to reduce greenhouse gas emissions. The Oregon Global Warming Commission is expected to promulgate rules to direct agencies on how to regulate and enforce the legislation.

Intelligent transportation systems and land use planning policies will be among several strategies necessary to meet the state's goal of reducing greenhouse gas emissions. To accomplish this, the Oregon Global Warming Commission has formed a Land Use and Transportation Committee. The scope and function of the Land Use and Transportation Committee is to work with state agencies including ODOT and the Oregon Department of Land Conservation and Development to integrate greenhouse gas reduction goals into state transportation planning and land use policies currently under development. Transportation and land use policies will be designated

to stop the growth of greenhouse gas emissions, and then reduce over time, according to the specific goals set out the Oregon Legislature.

Research is also underway to develop more capable models for measuring, analyzing, evaluating, and reporting greenhouse gas emissions. ODOT is coordinating with other state and federal agencies (including the Oregon Department of Energy, Oregon Department of Environmental Quality, FHWA, and the US Environmental Protection Agency) to determine appropriate contexts for measuring impacts from transportation and land use changes.

ODOT and FHWA specific strategies regarding climate change efforts are summarized in Appendix E.