B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

Big Eddy-Knight Transmission Project

Final Environmental Impact Statement

Volume 1: Environmental Analyses

July 2011

DOE/EIS-0421

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Bonneville Power Administration

Cooperating Agencies:

State of Washington, Energy Facility Site Evaluation Council

State of Oregon, Oregon Department of Energy

July 2011

Big Eddy-Knight Transmission Project

Responsible Agency: U.S. Department of Energy, Bonneville Power Administration (BPA)

Cooperating Agencies: Washington Energy Facility Site Evaluation Council, Oregon Department of Energy

Title of Proposed Project: Big Eddy-Knight Transmission Project, DOE/EIS - 0421

States Involved: Oregon and Washington

Abstract: BPA is proposing to build a new 500-kilovolt (kV) transmission line in Wasco County, Oregon and Klickitat County, Washington and a new substation in Klickitat County. The new BPA transmission line would extend generally northeast from BPA's existing Big Eddy Substation in The Dalles, Oregon, to a new substation (Knight Substation) proposed to be connected to an existing BPA line about 4 miles northwest of Goldendale, Washington. The proposed Big Eddy-Knight Transmission Project is needed to increase transmission capacity to respond to requests for transmission service in this area.

BPA is considering three routing alternatives and a no action alternative for the proposed transmission line. The transmission line routing alternatives all would use a combination of existing BPA and new 150-foot wide right-of-way. The routing alternatives range from about 27 to 28 miles long. BPA is considering different tower combination options (single-circuit and double-circuit) including paralleling existing transmission lines. Two substation sites are being considered for the proposed Knight Substation; the sites are on adjacent properties along an existing BPA transmission line. Two fiber optic cable options are also being considered and the project includes work at BPA's existing Big Eddy and Wautoma substations. BPA's preferred alternative is the East Alternative using some double-circuit towers (Option3), Substation Site 1 and the Wautoma Option for the fiber optic cable.

The proposed project could create impacts to land use and recreation, visual resources, vegetation, geology and soils, water resources and wetlands, wildlife, fish, cultural resources, social and economic resources, public health and safety, transportation, air quality, and greenhouse gases. Chapter 3 of the EIS describes the affected environment and potential impacts in detail.

BPA released a draft EIS in December 2010 for public review and comment. BPA considered all comments received to update the final EIS and develop the Comments and Responses volume. BPA expects to issue a Record of Decision for the proposed project in late Fall 2011.

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For additional copies of this document, please call 1-800-622-4520 and ask for the document by name. The EIS is also on the Internet at: http://www.bpa.gov/go/BEK. You may also request copies by writing to:
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For additional information on DOE NEPA activities, please contact Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance, GC-54, U.S. Department of Energy, 1000 Independence Avenue S.W., Washington D.C. 20585-0103, phone: 1-800-472-2756 or visit the DOE NEPA Web site at www.eh.doe.gov/nepa.

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Summary

This chapter summarizes the ~~draft~~ environmental impact statement (EIS) prepared for the Big Eddy-Knight Transmission Project:

- Purpose of and need for action
- Project overview, including the Proposed Action Alternatives and No Action Alternative
- Affected environment and environmental impacts

S.1 Purpose of and Need for Action

S.1.1 Background

Bonneville Power Administration (BPA) is a federal agency within the U.S. Department of Energy that owns and operates more than 15,000 circuit miles of high-voltage transmission lines in the Pacific Northwest. These lines move most of the Northwest's high-voltage power from facilities that generate the power to power users throughout the region and to nearby regions such as Canada and California.

BPA has a statutory obligation to ensure it has sufficient capability to serve its customers through a safe and reliable transmission system. The Federal Columbia River Transmission Act directs BPA to construct improvements, additions, and replacements to its transmission system that the BPA Administrator determines are necessary to provide service to BPA's customers and maintain electrical stability and reliability (16 United States Code [USC] Section [§] 838b[b-d]). If there is not enough available ~~transmission capacity~~ transfer capability on the transmission system to accommodate new transmission requests, new transmission facilities may be proposed. These proposed projects are subject to appropriate environmental review under the National Environmental Policy Act (NEPA).

Consistent with its Open Access Transmission Tariff, BPA accepts requests for transmission service in a transmission service request queue. ~~Based on~~ In 2008, BPA conducted its first Network Open Season (NOS) marketing process~~es conducted in 2008,~~ to help manage the requests in this queue and assist in determining where new infrastructure might be needed to accommodate these requests. BPA has ~~determined there is~~ identified a need to increase the capacity of the 500-kilovolt (kV) transmission system in the proposed project area to respond to resubmitted requests that BPA ~~has~~ received during the 2008 NOS to move power across its system. The need is partly due to wind generation facilities in the region, which have greatly increased the amount of power being produced east of the Cascade Mountains. This power needs to move to load centers west of the Cascades, but there is not sufficient capacity available on existing transmission lines, specifically along the West of John Day transmission path. Without new transmission facilities, BPA's system would likely become overloaded at certain times of the year, which could cause outages on BPA's and local utilities' transmission service grids.

As a result, BPA is proposing to build a 500-kV lattice-steel-tower transmission line that would run from its Big Eddy Substation near The Dalles, Oregon, to a new Knight Substation about 4 miles northwest of Goldendale, Washington. This proposed project would eliminate an electrical bottleneck in this area, provide an additional electrical pathway, and increase the system capacity to accommodate the requested transmission service and allow additional power to flow through the region. Three action alternatives are being considered for the transmission line, along with two (adjacent) site options for the proposed substation, and a No Action Alternative. The project also includes two options for stringing fiber optic cable to enhance transmission system communications (see Map S-1).

In addition to accommodating requests for firm transmission service, the proposed project would ~~address reliability issues on~~ benefit the operation of BPA's transmission system in other ways. The proposed new line and substation would help redistribute the flow of power, which would increase the capacity of the overall system. This capacity increase ~~in overall system capacity would include being able to increase the capacity to serve the~~ would provide a stronger year-round power source for the Portland, Oregon, load service area ~~metropolitan area during winter~~. In addition, the project is consistent with long-range system plans and would defer the need for future reinforcement projects that would be needed in its absence.

S.1.2 Public Involvement

~~Early in the development~~ During the scoping period of this EIS (summer 2009), BPA solicited comments from the public; Tribes; federal, state, regional, and local agencies; interest groups and others to help determine what issues should be studied. Comments were requested by publishing notices in the *Federal Register,* mailing a letter to about 400 potentially interested and affected persons, holding two public open-house style meetings, placing ads in and sending press releases to local media about the comment period and public meetings, and meeting with Tribes, state agencies, congressional, county and city staffs, and interest groups. Comments received were posted on the project's Web site, which provided additional information and other means for providing comments.

Based on initial public comments from more than 400 people and additional studies of the transmission system, BPA refined the proposed transmission line routing alternatives. In December 2009, BPA mailed the public a factsheet that described the refinements and requested more comments. ~~In all, more than 400 people provided comments by mail, fax, telephone, via the project Web site, or at public meetings.~~

In December 2010, BPA distributed the draft EIS to the public (landowners, Tribes, federal, state, regional, and local agencies, interest groups and others) for review and comment. BPA accepted comments through January 28, 2011.

Comments were requested by publishing a notice in the *Federal Register,* mailing a letter to about 950 potentially interested and affected persons, holding two public open-house style meetings, and placing ads in and sending press releases to local media about the comment period and public meetings. Comments received were posted on the project's Web site, which provided additional information and other means for providing comments.

In all, about 400 people commented on the draft EIS. Volume III of this EIS provides all comments received and BPA's responses.

S.2 Project Overview

The proposed 500-kV transmission line would run from BPA's Big Eddy Substation near The Dalles to a proposed Knight Substation about 4 miles northwest of Goldendale. The project also includes work at BPA's existing Big Eddy and Wautoma substations and installation of new fiber optic cable for system communications. BPA is considering three routing alternatives for the transmission line: a West Alternative, a Middle Alternative, and an East Alternative (see Map S-1). All routing alternatives are located in Wasco County, Oregon, and Klickitat County, Washington and would cross the Columbia River and portions of the eastern end of the Columbia River Gorge National Scenic Area. The three routing alternatives are about 27 or 28 miles long, and cross varying amounts of private, state, federal and Tribal lands.

If a decision is made to build the project, construction would likely begin in summer 2011 and take about 20 months. The transmission line and substation would be built by one or more construction crews of about 50–60 workers each (70–100 at the peak of construction). Work would begin at the substations, followed by construction of the line.

A total of 125–135 towers would be installed. About 16-~~21~~ 20 miles of new access roads would be constructed; in addition, ~~11-16~~ 10-13 miles of existing access roads and ~~5 miles of~~ several existing county roads would need improvements; and some ~~3-5~~ 3–9 miles of temporary roads would be built. Where 20-26 intermittent stream and drainage crossings are unavoidable, some ~~25-30~~ 50-64 culverts would be installed. If a decision is made to construct the line, it would be energized and operating by February 2013.

The total estimated project cost ranges between $90–115 million depending on the routing alternative and tower option.

BPA is also considering a No Action Alternative.

S.2.1 Proposed Action Alternatives

Big Eddy Substation. Each of the three action alternatives would start at Big Eddy Substation. Big Eddy Substation would require a new 500-kV bay to connect the proposed line into the electrical system. All work would occur and all equipment would be installed within the existing electrical yard and control house.

Transmission Line Alternatives. The transmission line alternatives use a combination of existing and new rights-of-way. In general, BPA would need a 150-foot-wide right-of-way for the new transmission line and a 50-foot-wide easement for access roads. For each routing alternative, BPA is considering different tower combinations, including paralleling or replacing existing transmission lines.

- **West Alternative.** The West Alternative route extends north from Big Eddy Substation, within mostly vacant BPA right-of-way to the Columbia River. The route then crosses the river and heads west and then north, paralleling BPA's existing Spearfish Tap 115-kV wood-pole transmission line for about 1 mile. The route then angles northeast next to BPA's existing Chenoweth-Goldendale 115-kV wood-pole line for about 12 miles, to a point just south of the Little Klickitat River. At this point, the West Alternative turns east and continues to follow the Chenoweth-Goldendale line for about 1 mile before separating from that line and veering north to connect with either proposed Knight Substation site. This alternative is about 27 miles long.
- **Middle Alternative.** From Big Eddy Substation, the Middle Alternative route runs east and slightly north in existing right-of-way next to BPA's existing Harvalum-Big Eddy 230-kV lattice-steel transmission line for about 7 miles before crossing the Columbia River. The route crosses the river just west of the Harvalum-Big Eddy line near Wishram, Washington, and continues to parallel this existing line for about 1.5 miles before heading north in new right-of-way. The Middle Alternative then heads generally north for about 15 miles to the Knight Substation sites, with two jogs east along the way – one for about 1.5 miles along BPA's existing Big Eddy-Spring Creek 230-kV lattice steel transmission line, and the other for about 2 miles partially along BPA's existing Chenoweth-Goldendale line. This alternative is about 27 miles long.

- **East Alternative (Preferred).** The East Alternative route follows the same path as the Middle Alternative for about the first 9 miles to a point just north of Wishram, at which point the routes separate. The East Alternative continues east next to two existing BPA lines that parallel each other – BPA's Harvalum-Big Eddy 230-kV lattice-steel line and BPA's McNary-Ross 345-kV lattice-steel line – for an additional 5 miles before turning north in new right-of-way. The East Alternative then generally runs north for about 14 miles to the proposed Knight Substation sites. This alternative is about 28 miles long. The East Alternative is BPA's Preferred Alternative.

Knight Substation Options. The project would include a new Knight Substation in Klickitat County. BPA is considering two adjacent sites for Knight Substation, both under the transmission line corridor that contains BPA's Wautoma-Ostrander 500-kV line and the North Bonneville-Midway 230-kV line. The substation would be a fenced 22-acre facility. ~~require about 30 acres, of which 10 acres would be fenced to contain the yard and control house.~~

- **Knight Substation Site 1 (Preferred).** Site 1 is the most western site, located about 0.5 miles west of Knight Road. The property is currently privately owned and being farmed, but is for sale. Because siting the substation on the property would likely sever it from the remaining ownership and agricultural use, 80 acres would likely be purchased (the parcel is 80 acres, but BPA presently owns 8 acres of it for the right-of-way of the existing lines crossing through it). Construction at Substation Site 1 ~~would~~ could require a 1-mile temporary access road from Hill Road; about 1 mile of Hill Road would require upgrading. ~~access, likely off Hill Road from the west, Butts Road from the south, or from Pine Forest Road from the north. These county roads may require upgrading.~~ Permanent access ~~would be~~ required for operations after construction~~, likely~~ would come from Knight Road.

- **Knight Substation Site 2.** Site 2 is adjacent to Site 1 on the east, and is currently part of a 544-acre parcel owned by the Washington Department of Natural Resources (DNR) that abuts Knight Road. The parcel is leased for agriculture and is currently fallow. BPA would purchase a 30-acre portion of the parcel. Site 2 would be accessed from the east off Knight Road.

Wautoma Substation. To support addition of the Big Eddy-Knight transmission line and Knight Substation, equipment would need to be installed at BPA's Wautoma Substation in Benton County, Washington. This would require a 175-by-150 foot expansion of the existing electrical yard, all within BPA's property. About 125 feet of transmission line access road would need to be rerouted to the edge of BPA's property boundary.

Fiber Optic Cable Options. The proposed transmission line would require a fiber optic cable for communications between substations. Two options are being considered (see Map S-1). For the **Loop Back Option**, cable would be strung on the proposed transmission line towers from Big Eddy Substation to Knight Substation and then loop back to Big Eddy Substation on the same towers. For the **Wautoma Option (Preferred)**, the fiber optic cable could follow the same route to Knight Substation but then continue an additional 72 miles on BPA's Wautoma-Ostrander transmission line through Klickitat and Yakima counties to BPA's Wautoma Substation in northwest Benton County, Washington. Existing access roads would be used for construction of the Wautoma Option, which is preferred because it would optimize the transmission communications system by creating a large communications loop used by multiple substations.

S.2.2 No Action Alternative

Under the No Action Alternative, BPA would not build the proposed Big Eddy-Knight transmission line, Knight Substation, or install fiber optic cable. Without building these facilities, BPA would be unable to provide long-term firm transmission service for the service requests that the proposed line is intended to accommodate. However, BPA may be able to provide other forms of transmission service to some of these customers, such as non-firm transmission service (non-firm is not guaranteed to be available and is only available after commitments for firm service have been met).

S.3 Affected Environment

The proposed transmission line alternatives would all begin within the National Scenic Area in Wasco County, Oregon, and cross the Columbia River, either near The Dalles or about 6 miles to the east. Each alternative would then travel through the National Scenic Area for several more miles, climbing up and over the Columbia Hills ridgeline in Klickitat County, Washington. Descending down the north side of the Columbia Hills, the alternatives would cross gently rolling agricultural plateau for several miles before crossing the Little Klickitat River and some wooded ravines. Where the alternatives would traverse the Klickitat County plateau, views can be expansive and include Mount Adams to the northwest and Mount Hood to the south. After crossing the Little Klickitat River, the alternatives would continue north to connect with Knight Substation, which would be located south of the Simcoe Mountain foothills. Elevation across the project area ranges from 160 feet above sea level at normal pool elevation of Lake Celilo behind The Dalles Dam to 2,628 feet at the crest of the Columbia Hills.

The line routes mostly cross private land, but some state, federal, and Tribal trust lands are also crossed. Populated areas include the cities of The Dalles in Oregon and Goldendale in Washington; rural unincorporated communities such as Celilo and Biggs in Oregon; and Wishram and Centerville in Washington; and several existing and future large-lot residential subdivisions, such as River Crest, near the Little Klickitat River in Washington. However, the project area is predominantly rural and dominated by privately owned farms interspersed with a few parcels of federal, state and Tribal lands. Soils are typically silty varieties of loam, much of which are considered prime farmland or support “farmlands of statewide importance.” Most of the land is used as rangeland, interspersed with some cropland, primarily nonirrigated. Some land is in conservation programs. There are also several small orchards and a vineyard located in the project area’s southern portion, near the Columbia River, where there are also an abundance of parks and recreation sites (including Columbia Hills State Park and the Columbia Hills Natural Area Preserve).

Agriculture is a major economic force in the area, although retail sales generate the most revenue in both counties. Also driving the local economy are lumber production, health care, manufacturing, professional services, recreation and tourism, food services and – a fast growing sector – electric power generation. Several wind farms have been built near the project area and several others are planned.

As is typical of a mostly rural area, local motorists are served primarily by two-lane county roads. Four scenic highways run through or by the project area on the south and east. Other local transportation facilities include those of the Burlington Northern Santa Fe, Union Pacific, and Amtrak railroads, two public airports (north of The Dalles and west of Goldendale), and two private airstrips.

Besides the Columbia River, the area’s main waterways include Fifteenmile Creek in Oregon, which drains into the Columbia, and Swale Creek and the Little Klickitat River, both tributaries of the Klickitat River in Washington. Fifteenmile Creek has a small 100-year floodplain and Swale Creek a much wider one. In addition, there are many scattered, intermittent streams and dry washes throughout the area. The four main waterways are all fish-bearing and some intermittent streams may contain fish seasonally. The Columbia and Klickitat river segments and Fifteenmile Creek segment spanned by the project provide critical habitat for certain fish species, including several federally protected salmon, steelhead and bull trout populations in the Columbia River.

Reflecting the arid climate, vegetation in the project area includes grassland, shrub-steppe (including scabland lithosols), disturbed grassland/shrub-steppe, cropland, woodlands (including riparian woodlands), and wetlands. High-quality grassland and shrub-steppe are now rare, but a few "priority ecosystems" containing them are identified in the project area – in the Columbia Hills and along the Little Klickitat River. Disturbed grassland/shrub-steppe is the predominant vegetation type (as mentioned, this is largely used as rangeland or pasture), followed by cropland. A few small woodlands can be found along some waterways and dry washes. Because the area is arid, there are few wetlands and they are widely scattered throughout the project area; only a handful are of high-quality.

Ten Washington-listed special-status vegetation species are found in the project area, two of which are also federal species of concern (clustered lady's slipper and obscure buttercup). No federally protected or candidate plant species are known to be within the project area.

The area's vegetation provides habitat for a variety of wildlife. Common mammals are coyote, deer, elk, rabbits, squirrels, and various rodents. Common birds that live in or pass through the area include game birds such as pheasant and partridge; migrating waterfowl such as geese and ducks; birds of prey; and many species of passerines (songbirds). There are no federally listed wildlife species likely to occur in the project area, but several federal "species of concern" or state-listed species are likely to occur because of habitat types found. These species include certain birds of prey and game birds; the Western gray squirrel; and some species of deer, jackrabbits, bats, reptiles, turtles and frogs.

Several historic and culturally significant sites and artifacts can be found in the area, particularly along the Columbia River where abundant fisheries attracted native people to establish villages. Upland areas and the Klickitat plateau were visited seasonally by native people in search of roots and herbs, or used for spiritual activities. Later, Euro-Americans would settle here, establishing homesteads, planting crops and building roads, fences and other infrastructure. Remnants of these activities, from petroglyphs to a fish wheel, provide a living history of the area's former inhabitants.

If the Wautoma Option is selected for the fiber optic cable, the project would cross ~~affect~~ an additional 72 miles of land in Washington within the existing Wautoma-Ostrander transmission line corridor. Fiber optic cable ~~Cable~~ would run on the existing line from Knight Substation across 18 miles of Klickitat County and 51 miles of Yakima County before crossing the northwest tip of Benton County to reach Wautoma Substation. Generally, the route is sparsely populated. About half of the line's corridor crosses the Yakama Indian Reservation; remaining land is mostly privately owned with some federal land, including Brooks Memorial State Park.

The existing Wautoma-Ostrander transmission line crosses mostly shrublands and grasslands. It spans the Yakima River, several fish-bearing streams and creeks, and runs near priority habitat for some wildlife, including mule and black-tailed deer, the Western gray squirrel and wild turkey.

S.4 Environmental Impacts

Construction and installation of ~~tall~~ lattice-steel towers, new access roads and the new substation, and related counterpoise installation, pulling/tensioning sites, and staging areas, would all create temporary and permanent impacts on area resources. Construction would require the use of heavy vehicles, helicopters, and equipment like cranes and bulldozers. Construction activities could impact local roads, delay motorists, and create dust and noise. Some land would be removed from current uses ~~or~~ and restricted from future uses: ~~although~~ landowners are ~~generally~~ compensated for new easements across their land. Some vegetation would be cleared, trees removed and wildlife habitat disrupted to accommodate road, tower and substation construction. Construction activities themselves could disturb wildlife and disrupt breeding. Soil would be disturbed and/or compacted around tower footings and access roads, potentially causing erosion and water runoff. Excavation could disturb unmapped cultural resources. Although the area's major waterways would be spanned, some intermittent streams would be crossed, requiring culvert installation to maintain seasonal flow, and some small patches of wetlands may be disturbed. Besides physical impacts, new towers and some roads would be highly visible in a few areas, affecting scenic views particularly where they would travel within the National Scenic Area, across the skyline or in viewers' foreground.

Additions made to Big Eddy Substation would have minimal, if any, impacts to resources because all work would occur within the substation's yard. The only impact would be due to noise during construction.

Environmental impacts on resources by each alternative and the proposed Knight Substation are summarized below. Estimated impact totals (measured in acres, miles, etc.) are both temporary and permanent impacts combined. Where each resource is discussed in Chapter 3, more detailed impact assessments are offered, broken down by temporary/permanent and project component (e.g., tower footings, access roads).

Environmental impacts created by the Loop Back fiber optic cable option are not summarized below because they would be the same as described for each transmission line alternative. Impacts on resources by the Wautoma (fiber optic cable) Option and Wautoma Substation additions are summarized collectively under S.4.15.

S.4.1 Land Use and Recreation

Each ~~action~~ transmission line alternative would cross primarily privately owned land, as well as a mix of state and federal lands. The Middle and East alternatives also cross some Tribal lands. Project area land uses are predominantly agriculture (primarily rangeland but some cropland), with some parks, recreation areas, a preserve, and land in conservation programs. Construction of the line would temporarily disrupt land uses in staging areas and at pulling/tensioning sites; it would permanently remove land from use for tower footings, roads, and Knight Substation, and permanently limit land uses and activities within the right-of-way. Generally, however, existing agricultural uses could continue along the line after construction.

West Alternative. Would follow existing BPA right-of-way for 16 of its 27 miles; about 21 miles cross private land and 6 miles cross state land (Columbia Hills State Park, Columbia Hills Natural Area Preserve, Washington Fish and Wildlife). (A fraction, 0.4 mile, crosses federal [BPA] land). No tribal lands would be crossed. Some 233-432 acres of new right-of-way would be required, depending on the selected tower option. The West Alternative would convert the most state land (31-106 acres) to right-of-way and would require the greatest amount of land in the National Scenic Area (72-119 acres) for new right-of-way. No homes would be within the right-of-way. Tower and road construction under this alternative would impact ~~the most parks and~~ park, conservation, and preserve land (~~32-56~~ 30–54 acres), and ~~the most~~ agricultural land (about ~~138-213~~ 134–211 acres). ~~compared to the other action alternatives.~~ Overall impacts on land use would be ***moderate-to-high.***

Middle Alternative. Would follow existing BPA right-of-way for 9 of its 27 miles; about 24 miles cross private land, 1 mile federal, 0-1 mile state and 1 mile Tribal land. Some 284-309 acres of new right-of-way would be required, depending on the selected tower option. The Middle Alternative would convert the least state land (0-14 acres) to right-of-way and would require much less land in the National Scenic Area (40-43 acres) for new right-of-way compared to the West Alternative. No homes would be within the right-of-way. Tower and road construction under this alternative would impact ~~few (less than 4)~~ only 0.3 acres of parks and conservation land and about ~~155-175~~ 159-180 acres of agricultural land. Overall impacts on land use would be ***low-to-moderate.***

East Alternative. Would follow existing BPA right-of-way for 14 of its 28 miles; about 25 miles cross private land, 1 mile federal, 0.5-1.5 mile state and 1.5 mile Tribal land. Some 258-269 acres of new right-of-way would be required, depending on the selected tower option. The East Alternative would convert a small amount of state land (9-23 acres) to right-of-way and would require the least amount of land in the National Scenic Area (1-5 acres) of all action alternatives. No homes would be within the right-of-way. Tower and road construction would impact few (~~less than 4~~ 0.5-1.5) acres of parks and conservation land and about ~~166-210~~ 172-216 acres of agricultural land. About 0.5 mile of the line would pass through the Windy Flats Energy Production Area, but would not impact wind turbines or preclude future development. Overall impacts on land use would be ***low-to-moderate.***

Knight Substation Options. Construction of the substation on Site 1 ~~would~~ could ~~convert more than~~ permanently remove up to ~~70~~ 86.3 acres of prime farmland ~~to~~ from nonagricultural use, although unused portions could be leased for agricultural use. ~~and require a 0.75-mile new access road.~~ It would temporarily impact an additional 21 acres of agricultural land. Site 2 would ~~convert~~ permanently remove up to ~~30~~ 36.7 acres of prime farmland ~~to~~ from nonagricultural use, ~~with a relatively short access road~~ and temporarily impact an additional 13 acres of agricultural land. Both sites would have ***moderate*** land use impacts.

S.4.2 Visual Resources

Each action alternative would place steel towers in the National Scenic Area along the Columbia River—appearing most visible where the towers cross the skyline or are in ~~viewers'foregrounds~~ fore or middle ground views—as well as near scenic byways and small populated areas, and through pastoral landscapes. Some new access roads would also need to be built in the National Scenic Area, occasionally on steep slopes where necessary cut-and-fill or benching would make them more visible.

West Alternative. Longest route (of the action alternatives) running through the National Scenic Area—9.6 miles. Potentially visible from the highest number of local parks (8), scenic highways (3) and trails (4) because it would traverse the Columbia River at a new crossing, climb up steep slopes and place tall steel towers where there are currently wood-pole structures. Also, due to tower heights and proximity to a local airport, ~~some~~ the two towers on either side of the Columbia River would need lighting ~~or painting,~~ and conductors spanning the river would require marker balls. Farther north, where it would run across the Klickitat plateau and link to Knight Substation, the West Alternative would cross the Little Klickitat River and run ~~near~~ in the fore and middle ground views of several rural homes and ~~several existing and~~ future large-lot subdivisions, potentially interfering with expansive views. However, it would run near (within 1,000 feet of) the fewest number of homes and businesses—17–24—of the action alternatives. Because of its impact in the National Scenic Area and on some sensitive viewers throughout the Klickitat plateau, overall visual impacts would be ***high***, the highest impact among the action alternatives.

Middle Alternative. Shortest route running through the National Scenic Area—5.5 miles. In this area, it would primarily run next to (or replace) an existing transmission line in an area that already contains industrial infrastructure (railroad tracks, highways, other development). The Middle Alternative would parallel or share on existing transmission line crossing over the Columbia River, but would require placing towers and access roads in new right-of-way where it climbs the Columbia Hills' steep terrain; ~~some~~ two towers ~~in this area~~ on either side of the Columbia River would need to be lighted ~~or painted~~ and conductors spanning the river would require marker balls. Overall, it would be potentially visible from three state parks, two scenic highways and one trail. The Middle Alternative would run near the greatest number of homes and businesses —42-46—of which 25 are in the Washington community of Wishram. ~~and would run near several large-lot "view" subdivisions.~~ These homes and business would have close, foreground views of towers. Where the alternative would cross the Klickitat plateau and link to the Knight Substation, it would cross the Little Klickitat River and run near some rural residences and future large-lot subdivisions, which could interfere with residents' expansive views. Overall visual impacts would be ***moderate-to-high***, slightly less than the West Alternative because of the industrial environment along the Middle Alternative's first 9 miles and lower relative visual impact of towers placed in the National Scenic Area.

East Alternative. About 7.3 miles of its route would run through the National Scenic Area. The East Alternative would have the same route as the Middle Alternative for the first 9 miles, but would continue to follow (or replace) an existing line through the National Scenic Area for several more miles (i.e., it would have no new right-of-way within the scenic area). ~~Some~~ Two towers ~~in this area~~ on either side of the Columbia River would need to be lighted ~~or painted~~ and conductors spanning the river would require marker balls. Where the East Alternative would turn north along new right-of-way, it would cross through acres of more visually dominant wind turbines. The East Alternative would run near 39–42 homes and businesses, including 25 in Wishram and the rest throughout the Klickitat plateau (where visual impacts would essentially be the same as the Middle Alternative, although affecting different plateau residents). It would ~~, and~~ be potentially visible from four parks, three scenic highways and one trail. ~~Because it has more right-of-way within existing transmission line corridors than the Middle Alternative, and fewer visual impacts in the National Scenic Area, overall~~ Overall visual impacts would be ***moderate-to-high***, ~~the lowest of the action alternatives~~ with lesser impact than the Middle Alternative along it's southern portion (in the National Scenic Area) and about the same impact elsewhere.

Knight Substation Options. Both Sites 1 and 2 would be in agricultural fields crossed by BPA's existing North Bonneville-Midway 230-kV and Wautoma-Ostrander 500-kV steel tower transmission lines. On either site, the substation would be mostly seen by local motorists on Knight Road. On Site 1, the substation would be partially visible to a property owner planning to build a home to the west; ~~Few~~ few other residents are nearby (none within ~~1,000~~ 800 feet). On Site 2, the substation would be visible from eight view lots ~~although a parcel~~ east of Knight Road. ~~has been subdivided into eight view lots.~~ Visual impacts by the substation would be ***moderate*** for Site 2, because it is closest to Knight Road and the future housing development, and ***low-to-moderate*** for Site 1.

S.4.3 Vegetation

Impacts to vegetation would include removal, disturbance, changes in vegetation type, and the potential spread of noxious weeds. In some right-of-way areas, trees would have to be removed. At tower sites and along new access roads, vegetation would be permanently removed and soils would be compacted; impacts would depend on the amount and quality of vegetation removed. In addition, habitat fragmentation could occur where new or expanded rights-of-way or access roads would cross through sensitive plant communities. Although most disturbed vegetation would be allowed to reestablish, these would be vulnerable to noxious weed infestations in the interim. However, mitigation measures would be taken to reduce weed spread.

West Alternative. Could impact eight of nine special-status species found or likely to be present along the proposed line. Would impact ~~133-199~~ 114–180 acres of disturbed shrub-steppe/grassland, the predominant vegetation cover; ~~31-53~~ 27–49 acres of high-quality grassland (the only alternative that crosses this vegetation type); and ~~9~~ 8–15 acres of high-quality shrub-steppe. The Idaho fescue-houndstongue hawkweed and Oregon white oak-ponderosa pine priority ecosystems would be impacted. Eight of 11 woodland areas would be impacted by tree removal; about 93–130 trees would be removed, although none near water bodies. Greatest vegetation impact of the action alternatives; impacts would be ***high.***

Middle Alternative. Could impact two special-status species found or likely to be present along the proposed line. Would impact ~~125-140~~ 105–121 acres of disturbed shrub-steppe/grassland—including some in relatively good condition where it would cross over the Columbia Hills—and about 4–11 acres of high-quality shrub-steppe, but would not disturb any high-quality grassland or priority ecosystems. Three of seven woodland areas would be impacted by tree removal; about 26 trees would be removed in upland areas. Impacts on vegetation would be ***moderate.***

East Alternative. Could impact one special-status species likely to be present along the proposed line. Would impact ~~142-153~~ 125–136 acres of disturbed shrub-steppe/grassland, but no high-quality shrub-steppe or grasslands and no priority ecosystems. Two of six woodland areas would be impacted by tree removal; about 16 trees would be removed in upland areas. Least vegetation impact of the action alternatives; impacts would be ***low.***

Knight Substation Options. There would be ***no*** impacts on special-status species, priority ecosystems, any type of shrub-steppe/grassland, or woodlands on either site. ~~The 10-acre substation yard would disturb nonirrigated cropland only.~~ Overall impact on vegetation would be ***low*** for both sites, because the type of vegetation that would be impacted is abundant and common to the area and a relatively small amount would be disturbed.

S.4.4 Geology and Soils

Construction of the transmission line would expose soil to rain and wind, causing erosion; compact soil; and remove soil from use either by taking it off-site or covering it with impervious surfaces. Impacts would be greatest during and immediately after construction, until revegetation, drainage and erosion control measures are established. While some landslide areas would be crossed, most are inactive.

West Alternative. Building the line and about ~~40~~ 36 miles of access roads would disturb about ~~169-268~~ 148–240 acres of land, depending on the selected tower option. This could cause soil to erode at a rate of about ~~28-41~~ 26–39 tons/year along the project corridor, similar to naturally occurring erosion rates for the area. This alternative has the lowest disturbance within potential landslide areas—about ~~2.5~~ 2.2 acres. Overall geology and soils impact: ***low.***

Middle Alternative. Building the line and about ~~37~~ 40 miles of access roads would disturb about ~~159-179~~ 109–132 acres, depending on the selected tower option. This could cause soil to erode at a rate of about ~~33-35~~ 34–36 tons/year along the project corridor, ~~equivalent to~~ slightly less than the natural erosion rate. Disturbance within potential landslide areas—about ~~8-9~~ 8–10 acres—would be more than the West Alternative, but much less than the East Alternative. Overall geology and soils impact: ***low-to-moderate.***

East Alternative. Highest erosion impact because of steeper terrain crossed; building the line and about ~~37~~ 38 miles of access roads would disturb about ~~169-212~~ 125–136 acres, depending on the selected tower option. Because of topography, this could cause soil to erode at a rate of about ~~42-57~~ 44–59 tons/year along the project corridor, slightly higher than the natural erosion rate. This alternative has the highest disturbance within potential landslide areas: about ~~22-30~~ 19–26 acres. Overall geology and soils impact: ***moderate-to-high.***

Knight Substation Options. About 29.65 acres ~~1 ton~~ of soil would be ~~subject to erosion~~ permanently impacted at Site 1; an additional 42.5 acres of soil would be temporarily impacted. Elevation across Site 1 varies by about 20 feet, so the substation yard would be terraced. About 147,000 cubic yards of soil would likely require excavation and would be spread across 19 acres to the north of the substation yard and revegetated. Soil impacts on Site 1 would be ***moderate***. About 28.65 acres of soil would be permanently impacted at Site 2 and an additional 15.5 acres temporarily impacted; no soil stockpiling would be required and the site is slightly flatter than Site 1. ~~compared with 0.5 ton at Site 2. Erosion rates differ because Site 1 has slightly more rolling terrain. Site 1 would also require a longer access road than Site 2. Still, soil~~ Soil impacts on ~~both site~~ Site 1 would be ***low-to-moderate***. There would be ***no*** landslide impacts on either site.

S.4.5 Water Resources and Wetlands

Transmission line construction would cause ground disturbance that could affect waterways and groundwater. To minimize this impact, no towers would be located in waterways, floodplains or within 50 feet of the Columbia River and other primary creeks and rivers, which would be spanned from bank-to-bank high above the water level. No new access roads would cross the area's primary waterways (the Columbia and Little Klickitat rivers, Fifteenmile and Swale creeks), but some access roads could cross intermittent tributaries or drainages, where culverts would be used to ensure continued water passage. No new access roads would be built in floodplains; one existing road needing improvement is within a floodplain. There would be some wetland impacts where tower footings or access roads would encroach slightly on these resources (measured in hundredths and tenths of an acre).

Although there would be some vegetation removed in new rights-of-way, ~~there would be no~~ shade reduction to waterways would only occur in one instance along an intermittent stream crossed by the West Alternative.

There would be some groundwater impacts, although BPA would work to minimize these. Erosion control measures taken wherever soils would be exposed during construction would minimize sediment transport~~ation~~ to groundwater recharge areas, including intermittent streams.

West Alternative. Least disturbance within 50 feet of streams – about 2 acres would be disturbed for nine permanent tower footings. Highest number of stream crossings by roads; ~~17~~ new and ~~15~~ improved access roads would cross 26 intermittent streams, drainages or dry washes, ~~but lowest number of new~~ requiring installation of up to 64 culverts. ~~(25) required~~. No towers or new or improved access roads would be built in floodplains. Most riparian areas would be left untouched with the exception of

Threemile Creek, where some shade tree removal could have a low impact on water temperatures when water level is low. Overall impact on water courses: ***low***.

Highest impact on wetlands—some ~~1.7-3.0~~ 1.8–3.3 acres in 18 wetlands would be permanently or temporarily disturbed by tower footings or road fill. Three potentially impacted wetlands have been identified as high-quality because of their special characteristics. Four impacted wetlands could have more than 0.1 acre disturbed. Overall impact on wetlands: ***high***.

Middle Alternative. Would disturb slightly more land within 50 feet of streams than the West Alternative—about 2.2 acres for ~~up~~ 8 to 12 permanent tower footings. Lowest number of stream crossings by roads—~~10~~ new and ~~10~~ improved access roads would cross 20 intermittent streams, drainages or dry washes, requiring ~~28~~ 50 new culverts. No towers or new access roads would be built in floodplains. One existing access road paralleling the southeast bank of Fifteenmile Creek and within a portion of its floodplain would need to be improved. Riparian areas would not be disturbed. Overall impact on water courses: ***low***.

Slightly lower impact on wetlands than the West Alternative—about 1.4–1.7 acres in 13 wetlands would be permanently or temporarily disturbed. One identified high-quality wetland could be impacted slightly by access road construction. ~~Six~~ Five impacted wetlands could have more than 0.1 acre disturbed. Overall impact on wetlands: ***moderate-to-high***.

East Alternative. Greatest disturbance within 50 feet of streams—about 2.7–2.9 acres would be disturbed for four to five permanent towers. New and improved access roads would cross ~~22~~ 24 streams/drainages requiring ~~and improved access roads eight streams/drainages; similar to the West Alternative.~~ ~~Up to 30~~ up to 62 new culverts ~~would need to be installed~~. No towers or new access roads would be built in floodplains. One existing access road paralleling Fifteenmile Creek and within a portion of its floodplain would be improved. Riparian areas would not be disturbed. Overall impact on water courses: ***low.***

Lowest impact on wetlands—about ~~0.9~~ 0.8 acre in nine wetlands would be disturbed. No high-quality wetlands have been identified along the East Alternative, although two impacted low-quality wetlands could have more than 0.1 acre disturbed. Overall impact on wetlands: ***low-to-moderate.***

Knight Substation Options. There are no creeks or drainages on either substation site and neither is in a designated floodplain; both are relatively flat. With implementation of erosion control measures, construction at either site, including access road and counterpoise installation (and redistribution of excavated soil on Site 1), would have minimal impacts on surface water. There are no wetland areas on either Site 1 or Site 2. ~~A potential wetland near Site 2 would not be impacted by substation or road construction.~~ Both sites would have ***no*** impacts on waterways and wetlands.

S.4.6 Wildlife

None of the action alternatives would impact federal threatened or endangered wildlife species. However, some federal species of concern and state-listed species could be impacted by construction disturbance, habitat loss, and potential collisions with lines. BPA would take various mitigation steps to minimize these impacts, including scheduling construction around certain breeding seasons and installing bird diverters on overhead ground wires.

West Alternative. Would impact some high-quality habitat—including grasslands, shrub-steppe, woodlands, rock and cliff, and wetlands (see S.4.3 Vegetation)—and some special-status species. Slight impacts would be likely on the Western gray squirrel; amphibians, turtles, and wetland invertebrate species; the sage lizard; and some common species of birds and wildlife. Overall impacts would be ***moderate-to-high***.

Middle Alternative. Would primarily impact common habitat that is abundant in the area. It would impact a small amount of high-quality habitats (the fringe of one shrub-steppe area, but no grasslands or rock and cliff areas) and only slightly impact woodlands and wetlands. There would be few potential impacts on special–status species (amphibians, turtles, bald eagle, white pelican, and mule and black-tailed deer). Overall impact would be ***low-to-moderate*.**

East Alternative. Would mostly impact common habitat that is abundant in the area. It would not impact high-quality habitats (grasslands, shrub-steppe, or rock and cliff), would only slightly impact woodlands and wetlands, and would have few potential impacts on special-status species (golden eagle, prairie falcon, peregrine falcon, bald eagle, white pelican, and mule and black-tailed deer). Overall impacts would be ***low-to-moderate***.

Knight Substation Options. ~~Substation~~ Construction of the substation on ~~either site~~ Site 1 would ~~remove 10~~ impact about 72 acres of ~~crop~~ agricultural land habitat; construction on Site 2 would impact about 44 acres of agricultural land. ~~from use,~~ No special-status species, nests, or burrows were found on Site 1 or 2. Because a small percentage of ~~this~~ widespread and relatively low quality habitat would be disturbed, wildlife impact ~~Impacts~~ would be ***low*** at either substation site.

S.4.7 Fish

Fish would be impacted if the water quality and habitat in which they live were changed. Impacts could be due to erosion causing sedimentation of streams, pollution from petroleum spills, stream alterations, and riparian vegetation (shade) removal. However, none of the action alternatives would directly alter fish habitat or require culverts in fish-bearing streams. All tree removal would be upland from fish-bearing stream edges and would not impact shading ~~on water surfaces~~ of these streams. Mitigation measures would be taken to prevent spills and minimize erosion.

West Alternative. Would cross four fish-bearing streams, but towers would be placed well away from the water's edge, no culverts would be required, and no riparian trees would be removed. The Columbia and Little Klickitat rivers and Fifteenmile Creek have special-status fish species present where crossed. Construction work would not occur near these waterways; there would be no impacts to these fish. Culverts ~~(25)~~ would be placed only in seasonal non-fish-bearing tributary streams or dry washes. There would be ***no-to-low*** impact on fish***.***

Middle Alternative. Would cross the same four fish-bearing streams as the West Alternative, with no towers near streams, no culverts required, and no riparian trees removed. There would be no impacts on special-status fish species where it crosses the Columbia and little Klickitat rivers and Fifteenmile Creek. An existing access road along Fifteenmile Creek would require upgrading; mitigation measures would ensure no sediment reaches the creek. Culverts ~~(28)~~ would be placed only in seasonal non-fish-bearing tributary streams or dry washes. There would be ***no-to-low*** impact on fish***.***

East Alternative. Would cross the same four fish-bearing streams as the other alternatives, with no towers near streams, no culverts required, and no riparian trees removed. There would be no impacts on special-status fish species where it crosses the Columbia and Little Klickitat rivers and Fifteenmile Creek. An existing access road along Fifteenmile Creek would require upgrading; mitigation measures would ensure no sediment reaches the creek. Culverts ~~(30)~~ would be placed only in seasonal non-fish-bearing tributary streams or dry washes. There would be ***no-to-low*** impact on fish***.***

Knight Substation Options. No fish-bearing streams are located in the vicinity of Knight Substation Sites 1 or 2 or along the proposed substation access road or where associated construction (such as counterpoise installation) would occur. ~~A dry wash tributary~~ A mapped drainage to Blockhouse Creek runs through Site 1, ~~about 4 miles and 1 mile downstream of Sites 1 and 2, respectively, is located nearby,~~ but no sign of the drainage was found during field surveys and no fish occur in Blockhouse Creek in the vicinity of the confluence with the dry wash. There would be ***no*** impact on fish on either site.

S.4.8 Cultural Resources

Because the project transects areas significant to Columbia River Tribes and the general area has a rich history, construction of the line could potentially disturb cultural sites. It would also introduce visual elements that could alter the character of sensitive cultural and spiritual resource sites. However, towers and access roads would be sited to avoid known sensitive areas whenever possible and trained cultural resource monitors would be consulted during construction to ensure unidentified sites are not inadvertently impacted. Where certain segments of older BPA transmission lines (those built before 1974 and therefore eligible for listing on the National Register of Historic Places) may be removed, the project could impact historically significant BPA facilities.

West Alternative. Would pass within 1 mile of 157 cultural resource sites, including pre-contact sites such as rock images and burial sites, and historic sites such as trails and a fishwheel location. Of these, 11 sites are within the West Alternative's right-of-way and include scattered and isolated pre-contact artifacts, a pre-contact rock alignment, a pre-contact cairn, and an historic rock alignment. The line would avoid all but one of the larger sites and all burial areas, but ~~The line~~ would ~~also~~ cross through Homesteads of the Dalles Mountain Ranch Historic District and an area of the Columbia Hills that could contain unknown cultural resources. While surveys conducted before construction would help identify these, potential impacts on cultural resources are higher than the other two alternatives. Potential impacts would be ***moderate*** on these resources West Alternative tower options that would remove 16 miles of the existing Chenoweth-Goldendale transmission line would have a ***high*** impact on the line's historic value due to the portion removed relative to its entire length.

Middle Alternative. Would pass within 1 mile of ~~133~~ 138 cultural resource sites, including pre-contact and historic sites similar to the West Alternative. Of these, ~~nine~~ 14 sites are within the Middle Alternative's right-of-way and include ~~threescatters~~ scattered and isolated pre-contact and ~~of~~ historic artifacts, ~~two pre-contact isolated artifacts,~~ an historic railroad grade, pre-contact and ~~an~~ historic rock alignments, and a large site with pre-contact artifacts, pictographs, and burial sites. The line would also cross over an Oregon Trail segment (no longer visible) at two places due to a 90-degree bend where the line crosses the Columbia River. Because the most significant cultural site would be separated by a vertical distance that precludes disturbance, and other sites would be avoided, potential impacts on cultural resources would be ***low*** on these resources. Middle Alternative tower options that would remove about 9 miles of the Harvalum-Big Eddy transmission line would have a ***moderate*** impact on the line's historic value due to the portion removed relative to its entire length.

East Alternative. Would pass within 1 mile of ~~123~~ 129 cultural resource sites, including pre-contact and historic sites similar to the West and Middle alternatives. Of these, ~~10~~ 16 sites are within the East Alternative's right-of-way or proposed access road alignment and include ~~two~~ scatters of historic and pre-contact artifacts, an historic railroad grade, ~~pre-contact lithic artifact scatters,~~ a pre-contact burial site, pre-contact and ~~an~~ historic rock alignments, and a large site with pre-contact artifacts, pictographs, and burial sites. Like the Middle Alternative, the East Alternative crosses over an Oregon Trail segment at two points. Because the most significant cultural site would be separated by a vertical distance that precludes disturbance, and other sites would be avoided, potential impacts on cultural resources would be ***low*** on these resources. East Alternative tower options that would remove about 9 miles of the Harvalum-Big Eddy transmission line and 5 miles of the McNary-Ross transmission line would have ***moderate*** impacts on the lines' historic values due to the relatively small proportions of the lines that would be removed.

Knight Substation Options. There are no known cultural resource sites near either proposed Knight Substation site or along the proposed substation access road or where counterpoise installation would occur. However, only limited cultural resource surveys have been conducted in the vicinity of either location in the past. BPA recently conducted limited archaeological testing of portions of Site 1; no cultural resources were identified. Because the substation ~~would be~~ sites are located where there is a low likelihood of cultural resources, there would be ***no-to-low*** potential impact**.**

S.4.9 Socioeconomics

The proposed project would impact private farms, ranches, and residences; some state lands; and possibly recreational lands. The action alternatives would not result in the loss of large amounts of land from any single property or fragment any local communities, although concerns about the line's impact on property values could potentially create a sense of loss of the agrarian, cultural, and natural resource aesthetic in the area.

The action alternatives would have similar impacts on certain economic elements. During construction, workers would be hired, would need housing and would buy goods and services locally; this would have temporary positive impacts on employment, housing, retail and Washington State (state sales tax revenues). In addition, the state and Klickitat County would benefit from one-time gains in tax revenues of about $1.95 million and $150,000, respectively, through "use" taxes levied on the value of out-of-state materials purchased for the project. BPA would reimburse landowners for lands required for new right-of-way or access road easements. Potential impacts on property values would be variable; some low, temporary negative impacts on values (and salability) might occur on an individual basis for some properties along or near the transmission line. There would be no impact on public services such as law enforcement, schools and hospitals, but due to a slight increase in potential fire danger from construction and maintenance activities, there would be a low impact on fire-fighting services by all action alternatives.

West Alternative. Most agricultural economic impacts would occur in rangelands and nonirrigated cropland. Maximum permanent reduction in direct agricultural output would be about $5,845 per year, of which $631 would be labor income. Indirect earnings reductions by related sectors would be about $9,580 per year for Klickitat and Wasco counties, $1,615 of which would be labor income. This is a small proportion of the two counties' overall output, which is measured in tens of millions of dollars. Impacts on the local and regional economy would be ***low***.

The West Alternative tower option that would include permanently removing most of the Chenoweth-Goldendale line could affect Klickitat County Public Utility District (PUD). Klickitat PUD uses this line as a backup to the Goldendale Substation when other lines are down for maintenance. Other means for backup would need to be found as needed. Impact on Klickitat PUD would be ***moderate***.

Middle Alternative. Similar to the West Alternative, most agricultural economic impacts would occur in rangelands and nonirrigated croplands, although relatively more cropland would be impacted. Maximum permanent reduction in direct agricultural output would be about $8,280 per year, of which $835 would be labor income. Indirect earnings reductions by related sectors would be about $12,237 per year for Klickitat and Wasco counties, of which $1,996 would be labor income. This is a small proportion of overall output; impacts on the local and regional economy would be ***low***.

East Alternative. Similar to the other alternatives, most agricultural economic impacts would occur in rangelands and nonirrigated croplands; like the Middle Alternative, relatively more cropland would be impacted. Maximum permanent reduction in direct agricultural output would be about $7,380 per year, of which $785 would be labor income. Indirect earnings reductions by related sectors would be about $11,303 per year for Klickitat and Wasco counties, of which $1,893 would be labor income. This is a small proportion of overall output; impacts on the local and regional economy would be ***low***.

Knight Substation Options. Building the substation and access road ~~on~~ for Site 1 ~~would~~ could permanently remove up to ~~80~~ 86.3 acres of mostly privately owned, nonirrigated cropland from production. Total reduction in economic output would be about $~~20,984~~ 22,491/year for Klickitat County, of which $~~2,937~~ 3,148/year would be labor income. Direct effects to the individual landowner would be slightly smaller. However, the landowner would be compensated by purchase of the property by BPA, and 50–70 acres could potentially be leased out for cultivation in the future. Placing this privately-owned land into federal ownership would also remove it from the Klickitat County tax base, for a loss of about $142 annually in property taxes. The proposed access road to Site 1 across DNR property could have about a $322/year impact on DNR State Trust Lands. These losses would be considered a permanent ***low*** impact on all parties.

Building the substation and access road for ~~on~~ Site 2 would permanently remove about ~~30~~ 36.7 acres of DNR land leased for crop production. Total reduction in economic output would be about $~~7,880~~ 8,446/year for Klickitat County, of which $~~1,103~~ 1,182/year would be labor income. Direct effects on DNR and its sharecroppers would be slightly less. Sharecroppers would not be compensated for losses. Revenues to DNR would be reduced by about $~~900–2,100~~ 2,451 per year, about a thousandth of a percent of 2009 revenues from State Trust Lands. DNR would be compensated by purchase of the land rights, and since the state does not pay property tax, this would have no impact on the county tax base. These losses would be a permanent ***low*** impact on all parties.

Installation of an overhead ground wire and counterpoise would also cause temporary impacts to cropland during construction; BPA would compensate for crop damage or loss as appropriate.

S.4.10 Transportation

During construction of the line, motorists on local roads would temporarily experience increased traffic and possible delays. In the long-term, motorists and the county would benefit from improvements to small segments of county roads. Development of BPA access roads could have positive or negative impacts on affected landowners. Installation of tall towers along the transmission line corridor could pose air traffic hazards if not properly marked. The Federal Aviation Administration (FAA) will review all towers and wires exceeding 200 feet above ground or water to determine which require marking (~~painting or~~ lighting for towers and marker balls for wires). The FAA has already determined that, for all alternatives, the towers on either side of the Columbia River would require lighting and the topmost wire crossing the river would require marker balls.

West Alternative. Would require the greatest amount of new access roads (about ~~21~~ 19 miles) among the alternatives. Also requires ~~11~~ 10 miles of existing access road upgrades, 3 miles of temporary access roads, and 5 miles of county road upgrades. It would pass relatively close to two airports and have at least 11 towers exceeding 200 feet. Overall impacts would be ***low-to-moderate.***

Middle Alternative. Would require about ~~19~~ 20 miles of new access road, ~~15~~ 13 miles of existing access road upgrades, and ~~3~~ 7 miles of temporary roads. Would have at least five towers exceeding 200 feet. Overall impacts would be ***low.***

East Alternative. Would require about 16 miles of new access road, ~~16~~ 13 miles of existing access road upgrades, and ~~5~~ 9 miles of temporary roads. Would have at least eight towers exceeding 200 feet. The FAA has already reviewed the East Alternative and determined the Columbia River towers and wire crossing is the only location requiring marking (lighting for towers; marker balls for topmost wire). The East Alternative would run perpendicular to the end of a small private airstrip in Klickitat County, impacting its use. Overall impacts would be ***low-to-moderate.***

Knight Substation Options. ~~Knight Road would provide primary access to either~~ Construction at Site 1 may require temporary road access from Hill Road, which would itself require upgrading to accommodate equipment. Construction traffic would be noticed mostly on Knight Road, but would be dispersed along Butts and Hill roads. ~~Site 1 or 2 during construction. However, for Site 1, construction vehicles would likely travel from Knight Road onto either Hill Road, Butts Road, or Pine Forest Road to connect with a temporary access road to the site. The selected county road may require upgrades to accommodate expected heavy loads. When construction is complete, the temporary access road would be removed.~~ Permanent access to ~~either site~~ Site 1 would be from Knight Road. Site 2 would be accessed directly from Knight Road during construction, with construction traffic most noticeable on Knight. The substation would be remotely controlled, with only periodic visits by BPA personnel, so traffic due to substation operations and maintenance would be minimal. Depending on the season of construction, a temporary access road may need to be built within existing BPA right-of-way to install counterpoise and ground wire. Overall substation impacts on transportation would be ***low.***

S.4.11 Noise

Sources of noise would be construction equipment used to build the line and, after completion, “corona” noise (hum and/or crackling) from the energized conductors, as well as noise generated by maintenance activities: annual ground crew inspections, twice-yearly helicopter patrols, and periodic use of power equipment to clear brush. Noise impacts during construction would be the same for all action alternatives: temporarily ***moderate-to-high.*** Construction noise would be localized (affecting a few residents or business owners at a time) and ~~temporary~~ short-lived as crews would complete line segments and move on.

West Alternative. Corona noise would be rare (it occurs most often during foul weather, which happens only 1 percent of the time in the project area). In areas where homes or businesses are already near existing lines and the new line would parallel or replace these lines, the potential for corona noise would remain the same or decrease. (Newer transmission lines are configured to reduce corona.) In areas where homes or businesses would be near new right-of-way (e.g., no transmission line currently exists), corona could be audible at the edge of the right-of-way in foul weather, but would be masked by ambient noise the rest of the time. Overall permanent noise impact from operations and maintenance of the line: ***low***.

Middle and East Alternatives. Same corona noise impacts as the West Alternative, with the exception of one home in Wishram that could be as close as 71 feet to the centerline of either alternative (if the single-circuit option were used). While this house is already close to an existing line, it would be even closer to the new line, with the potential for higher corona noise impacts. Using a double-circuit tower option in this area would place towers farther from this home. Overall permanent noise impact from operations and maintenance of the line: ***low,*** with the potential exception of one home where it could be higher.

Knight Substation Options. Construction noise impacts would be ***low-to-moderate***, because there are no residences within ~~1,000~~ 800 feet of either Site 1 or 2. The substation would create ***no-to-low***

permanent noise impacts on either site because the existing adjacent transmission line would remain the predominant source of environmental noise.

S.4.12 Public Health and Safety

General safety impacts would be the same for all action alternatives: ***low***. Contractors would be required to follow all safety standards and lines would be built to National Electric Safety Codes (NESC).

Impacts from electric and magnetic fields (EMF) generated by the new line would be similar for each action alternative. Construction standards and grounding requirements would minimize the potential for nuisance shocks from electric fields for anyone near the right-of-way. Even with the addition of the transmission line, magnetic field levels in the area would remain comparable to ambient levels, with one exception: if a single-circuit option were used, the Middle or East alternatives would run within 71 feet of one home, potentially boosting magnetic fields there slightly over ambient levels, for a potentially higher impact on that one home.

EMF levels at the perimeter of the Knight Substation yard, on either Site 1 or 2, would reflect fields generated by the new 500-kV line. The magnitudes and impacts would be similar to those for the transmission lines alone. Within a few hundred feet, these fields would dissipate to ambient levels. Since there are no residences near either substation site, there would be ***no*** EMF impacts.

S.4.13 Air Quality

There are no major industrial facilities along the action alternatives or substation sites and no significant existing air quality problems in these portions of Wasco and Klickitat counties. Local air pollutant emissions are mainly windblown dust from agricultural operations and tailpipe emissions from traffic along state highways and local roads. Construction of any action alternative would generate a temporary increase in such pollutants; specifically, heavy equipment would create dust and add to exhaust emissions, and removal of some trees and vegetation would create fugitive dust. However, the amount of pollutants emitted from construction vehicles and equipment would be relatively small and comparable to typical conditions when agricultural equipment is operated in the project vicinity. Once the line is operational, maintenance vehicles would make infrequent trips in the area, travelling primarily on rocked access roads that may temporarily kick up a small amount of dust. There would be ***no-to-low*** air quality impacts for all alternatives.

S.4.14 Greenhouse Gases

Construction of the transmission line would contribute to greenhouse gas (GHG) concentrations in several ways. Removal or disturbance of trees, vegetation and soil (which absorb gases), and exhaust from construction equipment and vehicles, would incrementally increase carbon dioxide, methane, and nitrous oxide emissions. Lesser emissions due to once-annual ground inspections (maintenance vehicles) and twice-annual helicopter inspections would occur when the line is operational. Analysis has determined GHG contributions from these activities would be very small. The impact of any action alternative would be ***low***.

S.4.15 Fiber Optic Cable and Wautoma Substation

Fiber Optic Cable

Loop Back Option

In the Loop Back Option, the cable would be strung on the proposed new transmission towers. There would be no new impacts beyond those already discussed for the action alternatives.

Wautoma Option

Stringing cable on and under the existing Wautoma-Ostrander transmission line would disturb a small patch of land around some tower footings. About 16 splice boxes would be placed on the transmission towers or in the ground next to the towers. At each site, about 0.25 acre of ground would be temporarily disturbed by a reeling truck and tensioning equipment. All equipment would stay within existing right-of-way and use existing access roads. There would be no staging areas.

~~In addition, outside the yard of the Knight and Wautoma substations, concrete vault boxes (4 feet x 4 feet x 4 feet) would be installed. Other fiber optic cable equipment needed as part of the communications network would also be installed within existing substation yards.~~

Impacts by the Wautoma Option would be ***low*** on:

- Land use ~~and recreation~~ because no new easements would be required and, while some crops could be damaged, the amount of affected acreage is small and landowners would be compensated, as appropriate;
- Recreation, because there is ~~and~~ only one state park is in the vicinity where visitors could be impacted temporarily by construction activity;
- Visual resources, because the area is sparsely populated and the addition of the fiber optic cable would likely not be noticed;
- Noise, because use of loud equipment or helicopters would only be allowed during daylight hours and would be short-term at any one location; and
- Cultural resources, because new ground disturbance would be minimal. (BPA is also surveying the area and consulting with Tribes.)

The Wautoma Option would have ***no-to-low*** impacts on vegetation, because vegetation that would be disturbed would be next to existing tower legs, the vegetation has been previously disturbed, and it is not comprised of trees or special-status species. There would also be ***no-to-low*** impacts on soils because limited digging and compaction would occur and mitigation would help alleviate these impacts.

It would have ***low-to-moderate*** impacts on wildlife because it could cause temporary displacement in some areas. While not expected to impact any federal threatened or endangered species, some state-listed and other species could be impacted by construction activities or collisions with lines. The higher impact would occur only if construction took place during breeding seasons for migratory birds or the Western gray squirrel.

The Wautoma Option would have ***no*** impacts on waterways, wetlands and fish, because all waterways and wetlands would be avoided (spanned). It would also have ***no*** impact on the area's socioeconomics, transportation facilities, public health and safety, air quality, or GHG emissions.

Wautoma Substation

The Wautoma Substation expansion would occur within BPA property on the southeast side of the existing electrical yard. The yard's perimeter fence would be extended to house a reactor bank and an existing transmission line access road would be re-routed. The 0.6-acre location of the proposed expansion is on disturbed, relatively even ground, is sparsely vegetated with grassland species, and has a transmission line access road running through it. There are no federally threatened or endangered species of plants or wildlife, or other special-status species, on the property or in the vicinity of the substation. There are no known cultural resources on the property. Construction would have temporary ***low*** visual and noise impacts for one homeowner within a mile of the substation and could have temporary ***low*** impact on transportation, although local roads are lightly traveled. It could also have temporary ***low*** impacts on air quality in the immediate vicinity due to dust kicked up during construction. The substation expansion would have ***no-to-low*** impacts on vegetation, soils and wildlife because the area is previously disturbed and compacted and does not have any high quality habitat. The substation project would have ***no*** anticipated impact on land use, streams or wetlands, fish, socioeconomic resources, public health and safety, or GHG emissions.

S.4.16 Cumulative Impacts

Cumulative impacts are environmental impacts that result from the incremental impact of an action, such as one of the proposed action alternatives, when added to other past, present and reasonably foreseeable future actions.

Past actions that have affected natural and human resources in the project area include construction and operation of The Dalles Dam, several BPA transmission lines and Big Eddy Substation; agricultural activities; railroad, highway and road construction and use; commercial and residential development; National Scenic Act designation; conservation lands and park designations; airport construction and operation; and wind energy development.

Currently and in the reasonably foreseeable future, it is expected that many of these activities will continue and some will grow. For example, more "wind farms" are under construction and planned in Klickitat County. Several large parcels of agricultural land near the Little Klickitat River have been subdivided for large-lot residential subdivisions. If a decision is made to build one of the action alternatives, the selected alternative would add to these impacts with construction and operation of additional transmission line facilities and the new Knight Substation.

The Big Eddy-Knight Transmission Project's incremental contribution to impacts on resources would vary. Generally, it would have ***no-to-low*** additional impacts on waterways, fish, public health and safety, air quality, greenhouse gas emissions and long-term noise; and ***low-to-moderate*** additional impacts on geology and soils, transportation, and cultural resources. For other resources, including vegetation and wildlife (including special-status species), wetlands, and land use and recreation, cumulative impacts could range from ***low to high***, depending on the action alternative selected and portion of transmission line corridor discussed. Overall, construction and operation of the Big Eddy-Knight Transmission Project would contribute most to incremental impacts on visual resources, particularly in the National Scenic Area, with the greatest cumulative visual impact expected from the West Alternative.

Chapter 1
Purpose of and Need for Action

The Bonneville Power Administration (BPA) is proposing to build a 500-kilovolt (kV) lattice-steel-tower transmission line that would run from BPA's Big Eddy Substation near The Dalles, Oregon, to a new substation called Knight Substation, which would be located about 4 miles northwest of Goldendale, Washington. The proposed Big Eddy-Knight Project would increase the electrical capacity and transfer capability of BPA's transmission system in the area. BPA is considering three transmission line routing alternatives, two adjacent sites for the proposed substation, two fiber optic cable options, and a No Action Alternative for the project (see Map 1-1).

This chapter describes the need for BPA to increase the electrical capacity and transfer capability of its transmission system in response to requests for use of its system. This chapter also identifies the purposes that BPA is attempting to achieve in meeting this need, transmission system benefits from BPA's proposal, and the agencies involved in development of this environmental impact statement (EIS). The end of the chapter provides a summary of the public scoping process conducted for the EIS and information about the scope and organization of the EIS.

As a federal agency, BPA is required by the National Environmental Policy Act (NEPA) to take into account the potential environmental consequences of its proposal and take action to protect, restore, and enhance the environment during and after construction. Preparation of this EIS assists in meeting those requirements.

1.1 Background

BPA is a federal agency within the U.S. Department of Energy that owns and operates more than 15,000 circuit miles of high-voltage transmission lines in the Pacific Northwest. BPA's electrical transmission ~~lines~~ system transmits most of the Pacific Northwest's power to serve customers in Idaho, Oregon, Washington, western Montana, and ~~small parts of eastern Montana, California, Nevada, Utah, and Wyoming. These lines move most of the Northwest's high voltage power from facilities that generate the power to power users throughout the region and~~ to nearby regions such as Canada and California. BPA sells transmission services in order to accommodate requiests to transmit power across BPA's transmission system. BPA's transmission customers, typically utilities, independent power producers, and power marketers, use these services to delvier ~~by transferring~~ power over BPA's transmission lines to their buyers. ~~Buyers of high-voltage~~ Users of power include public utility districts, municipalities, direct service industries (e.g. aluminum plants) and investor-owned utilities which, in turn, use their own facilities to provide electricity to homes, businesses, industries, and farms throughout the Pacific Northwest. ~~Direct service industries (e.g., aluminum plants) are also purchasers of power that is moved by BPA's transmission lines~~.

~~To move this power on BPA's transmission lines, BPA sells transmission service that allows the use of these lines.~~ BPA has a statutory obligation to ensure it has sufficient capability to serve its customers through a safe and reliable transmission system. The Federal Columbia River Transmission Act directs BPA to construct improvements, additions, and replacements to its transmission system that the BPA Administrator determines are necessary to provide service to BPA's customers and maintain electrical stability and reliability (16 United States Code [USC] Section [§] 838b[b-d]).

Most requests for transmission service are for long-term firm service. Long-term firm service is an agreed-upon use of the transmission system at specific times of day and year. To help guide its approach to receiving, managing, and responding to requests for long-term, firm transmission service over its transmission system, BPA has adopted an Open Access Transmission Tariff[1] for its transmission system (BPA 2008a). The tariff has procedures that provide access to BPA's transmission system for all eligible service requests on a first-come, first-served basis, subject to a determination that there is sufficient available transfer capability ~~transmission capacity~~ (ATC) on BPA's transmission system. ATC is a measure of the transfer capability remaining in the physical transmission network for additional commercial activity, over and above existing commitments for service. If there is not enough available transfer capability ~~transmission capacity~~ on the system to accommodate new requests for transmission service, new transmission facilities, such as an additional transmission line, that increase transfer capability may be proposed ~~to increase the capacity to grant new transmission requests~~. Any new transmission facilities proposed must meet all BPA requirements and are subject to appropriate environmental review under NEPA.

Consistent with its tariff, BPA accepts requests for transmission service in a transmission service request queue. In the past few years, the amount of requested service in this queue, measured in megawatts (MW), has far exceeded projected load growth (increase in electrical demand) in the Pacific Northwest. For example, in March 2008, BPA's transmission service request queue contained about 9,200 MW of requests for service. At the same time, BPA forecasted only 2,500 average MW of load growth for all utilities within the Pacific Northwest through 2017. Because the amount of requests in the queue far exceeded the forecasted load growth for the region, it was clear to BPA that some transmission service requests in the queue were speculative, but the speculative requests were impossible for BPA to identify. This uncertainty made it difficult for BPA to accurately plan for truly necessary system upgrades, and the sheer volume of requests was making the queue congested and unmanageable.

To help address this issue, BPA developed and initiated a Federal Energy Regulatory Commission (FERC)-approved Network Open Season (NOS) marketing process to help manage the queue and eliminate speculative requests. In 2008, BPA conducted the first NOS process and utilities, power generators (including wind generators), power marketers, and others were asked to resubmit their requests to use BPA's transmission system to transmit their power. BPA then was able to determine which of these requests could be served by existing available transmission capacity, and which of these requests would require system upgrades to provide the requested service.

For transmission service requests requiring system upgrades, BPA conducted electric powerflow studies of separate "clusters" of requests to determine where the system was congested and what upgrades were needed to accommodate the most requests. In conducting these studies, BPA took into consideration reliability criteria established by the North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) (see boxes). NERC, the national electric reliability organization, and WECC, the regional reliability organization, help coordinate the operation and planning of the bulk transmission system in the region. Utilities are required to meet the standards of both organizations when planning new facilities.

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[1] BPA's tariff is generally consistent with the Federal Energy Regulatory Commission (FERC) *pro forma* open access tariff. More information about the Federal Energy Regulatory Commission is available on its Web site: www.ferc.gov/. More information about BPA's tariff is available on BPA's Transmission Web site: http://www.transmission.bpa.gov/business/ts_tariff/.

About the North American Electric Reliability Corporation

NERC is a self-regulatory organization that has statutory responsibility to regulate bulk power system users, owners, and operators through the adoption and enforcement of standards for fair, ethical, and efficient practices.

NERC develops and enforces reliability standards; assesses adequacy annually via a 10-year forecast and winter and summer forecasts; monitors the bulk power system; and educates, trains, and certifies industry personnel. NERC is subject to oversight by FERC and governmental authorities in Canada.

As of June 18, 2007, FERC granted NERC the legal authority to enforce reliability standards with all U.S. users, owners, and operators of the bulk power system, and made compliance with those standards mandatory and enforceable. More information is available on NERC's Web site: http://www.nerc.com (NERC 2010).

About the Western Electricity Coordinating Council

WECC is the regional entity responsible for coordinating and promoting bulk electric system reliability in the West. WECC's service territory extends from Canada to Mexico. It includes the provinces of Alberta and British Columbia, the northern portion of Baja California, Mexico, and all or portions of the 14 western states.

In addition to coordinating system reliability, WECC assures open and non-discriminatory transmission access among members, provides a forum for resolving transmission access disputes, and provides an environment for coordinating the operating and planning activities of its members as set forth in its bylaws.

Membership in WECC is open to all entities with an interest in the operation of the bulk electric system in the West. All meetings are open and anyone may participate in WECC's standards development process. More information is available on WECC's Web site: http://www.wecc.biz/ (WECC 2009).

One of the service request clusters that BPA studied involved requests for long-term firm transmission service in the project area. Through the 2008 NOS process, BPA received approximately 1,150 MW of requests through this area. There currently are several existing BPA high-voltage transmission lines that pass through this area, such as the John Day-Big Eddy Nos. 1 and 2 500-kV lines, that are at times heavily loaded. There also are several network "flowgates" in the general vicinity of the project area, including the West of McNary, West of Slatt, and North of John Day flowgates.[2] The West of McNary flowgate, consisting of BPA lines generally running east-to-west, is located in eastern Oregon near McNary Dam on the Columbia River near the town of Umatilla, Oregon. The West of Slatt flowgate, also consisting of BPA lines generally running east-to-west, is located in eastern Oregon south of the town of Arlington, Oregon and is somewhat in series with the West of McNary path. The North of John Day flowgate, consisting of BPA lines generally running north-to-south, is a broad flowgate that encompasses several transmission lines in south-central Washington.

[2] BPA has designated several locations on its transmission system as network "flowgates." Flowgates are internally monitored points on a transmission system that aid in determining where there may be congestion (i.e., a limitation in the amount of power allowed to flow across the point).

The existing east-to-west transmission lines in the project vicinity are generally in series with both the West of McNary and West of Slatt flowgates. These lines are on a transmission path that feeds power directly into the Pacific Direct Current Intertie (PDCI) as well as the Portland load area. Under BPA's tariff, all existing lines that were originally used to move power from the Columbia River hydrosystem to the load centers west of the Cascades, such as the lines in the project vicinity, are now also required to provide transmission service to power marketers, wind generators, and others. As a result, these transmission paths have become increasingly congested.

BPA's ~~powerflow~~ cluster studies determined that there is not enough available transmission capability ~~capacity~~ to accommodate requests received through the 2008 NOS process to move power from the east side of the Cascade Mountains (along the Oregon/Washington border) to load centers (such as Portland, Oregon) on the west side of the Cascades and to major transmission lines serving California. In particular, the West of McNary and West of Slatt flowgates lack sufficient capacity to accommodate all of these requests. Wind generation facilities built and proposed in the region have greatly increased the amount of power being produced on the east side of the Cascade Mountains. Most requests have come from wind developers throughout the region. Some requests are for power already integrated into BPA's transmission system, but the power is unable to flow unrestricted due to bottle necks and lack of capacity, and some requests are from developers waiting for capacity to plan for ~~additional~~ wind projects that they have already proposed in ~~throughout~~ the region.

BPA's study of this cluster also found that a new 500-kV transmission line from BPA's existing Big Eddy Substation in Oregon to a point on BPA's existing Wautoma-Ostrander 500-kV transmission line in Washington would allow BPA to accommodate ~~up to~~ the 1,150 MW of NOS 2008 service requests (see Map 1-1).

In addition to accommodating these requests, BPA recognized that such a new transmission line in this location would also help address several other transmission issues in the project area. Through many years of experience in operating its transmission system, BPA transmission planners and operators have realized that a new 500-kV transmission line in this area would help improve system performance by balancing flow across the North of John Day flowgate, thus reducing reactive losses and improving voltage stability performance. A new 500-kV transmission line specifically between Big Eddy Substation and a point along the Wautoma-Ostrander 500-kV transmission line also would relieve the limiting facilities on the existing John Day-Big Eddy Nos. 1 and 2 500-kV lines in the West of John Day transmission path, and improve Portland area load service by providing an additional transmission line through the area.

As it has worked on developing a potential solution for accommodating the firm transmission service requests that it has received, BPA also had ~~has taken~~ the proposed Big Eddy-Knight project reviewed through the WECC Project Coordination process (formally known as the Regional Planning Project Review) ~~(Regional Review) process.~~ The ~~Regional Review~~ Project Coordination process is the initial development phase of a project in which regional interest is expressed for a possible new transmission line project. BPA coordinated the review through ColumbiaGrid (see box) and worked with other interested regional parties in developing the proposed project.

During the ~~Regional Review~~ Project Coordination process, BPA shared study results and proposed alternate plans of service with other Northwest utilities. This provided other utilities an opportunity to review and comment on BPA's plans with the goal of developing the best plan of service with respect to regional benefits and impacts. The ~~Regional Review~~ Project Coordination process for Big Eddy-Knight concluded in February 2008.

About ColumbiaGrid

ColumbiaGrid is a non-profit membership corporation formed in 2006 to improve the operational efficiency, reliability, and planned expansion of the Pacific Northwest transmission grid. The corporation itself does not own transmission, but its members and the parties to its agreements own and operate an extensive network of transmission facilities.

ColumbiaGrid has substantive responsibilities for transmission planning, reliability, the Open-Access Same-Time Information System (OASIS), and other development services. These tasks are defined and funded through agreements with members and other participants. Development of these agreements is carried out in a public process with broad participation. More information about ColumbiaGrid is available on its Web site: http://www.columbiagrid.org/ (ColumbiaGrid 2009).

1.2 Need for Action

BPA needs to increase the electrical capacity and transfer capability of the 500-kV transmission system in the project area in response to firm transmission requests that BPA has received to move power across this portion of its system. Through the 2008 NOS process, BPA received about 1,150 MW of requests for transmission service in the project area from multiple customers. BPA has received additional requests for service in this area though the 2009 and 2010 NOS processes. There is insufficient existing available transmission capacity and transfer capability on the existing 500-kV transmission system in this area to accommodate these requests.

A new 500-kV transmission line between BPA's Big Eddy Substation in Oregon and BPA's existing Wautoma-Ostrander 500-kV transmission line in Washington would increase the 500-kV transmission capacity from the east side of the Cascade Mountains (along the Oregon/Washington border) to the west side of the Cascades and allow BPA to provide the requested long-term, firm transmission service in the region. Connecting these two 500-kV facilities would eliminate a bottleneck in this area, provide an additional electrical pathway, and increase the system capacity allowing additional power to flow through the region (see Section 1.4 for other transmission system benefits related to a new line). Using BPA's existing transmission system in this area without a new transmission line to respond to the service requests would likely result in BPA's transmission system becoming overloaded at certain times of the year. This could lead to cascading outages affecting other BPA facilities and triggering outages on other utility transmission lines in the area, and possibly other portions of the regional transmission system.

1.3 Purposes

In meeting the need for action, BPA will attempt to achieve the following purposes:

- Optimize electrical capacity and performance of the transmission system
- Maintain reliability of BPA's transmission system to BPA and industry standards
- Meet BPA's contractual and statutory obligations
- Minimize project costs where practical
- Minimize impacts to the natural and human environment
- Minimize future impacts

1.4 Transmission System Benefits

In addition to being able to accommodate requests for firm transmission service, as discussed in Section 1.1, the proposed project would ~~address reliability issues on~~ have several other benefits for operation of BPA's transmission system. The proposed new line and substation would help redistribute the flow of power, which would increase the capacity of the overall system, including the capacity to serve the Portland area during the winter, and also would in general provide a stronger year-round source of power for the Portland load service area. More specifically, the proposed project would improve transmission system performance and address reliability issues of the transmission system by redistributing the flow across the North of John Day flowgate and reducing reactive loss, which would result in about 600 MW of additional transfer capability across the North of John Day flowgate. The proposed project also would provide more support to the Portland load service area by providing about 200 MW of additional transfer capability across the West of Cascades South flowgate for winter load conditions. In addition, the project is consistent with long-range system plans and would defer the need for future reinforcement projects that would be needed in its absence.

1.5 Agency Roles

1.5.1 Lead and Cooperating Agencies

BPA is the lead agency responsible for preparing this EIS under NEPA. BPA will use the EIS, along with comments from the public, to inform the following BPA decisions:

- Whether to build a new 500-kV transmission line to meet the need.
- If the decision is to build the transmission line, which routing alternative, substation site, and fiber optic option would be constructed and operated. (See Chapter 2 for descriptions of the alternatives.)

The Council on Environmental Quality (CEQ) regulations implementing NEPA allow for the designation of other federal, state, and local agencies and Indian tribes as cooperating agencies for an EIS where appropriate. In furtherance of existing cooperative agreements between BPA and the states of Washington and Oregon, the Washington Energy Facility Site Evaluation Council (Washington EFSEC) and the Oregon Department of Energy will participate in preparation of this EIS as cooperating agencies under NEPA. Among other things, these state agencies will assist BPA in the environmental evaluation of transmission line routes, develop possible mitigation measures, and identify state interests that should be addressed in the EIS.

1.5.2 Other Agencies That May Use This EIS

Chapter 5 of this EIS identifies other federal agencies that may have permitting, review, or other approval responsibilities related to certain aspects of the proposed project. For instance, the U.S. Forest Service (USFS) is responsible under the Columbia River Gorge National Scenic Area Act (16 USC 544-544p) for making a determination concerning the consistency of portions of the proposed project that would be located in the Columbia River Gorge National Scenic Area (National Scenic Area) with the provisions of the Scenic Act (see Section 5.23 ~~5.22~~ and Chapter 7 of this EIS). In addition, to the extent that the proposed project would cross land managed or owned by the USFS, this agency also may need to conduct appropriate environmental review before authorizing this proposed use. Federal agencies, such as the USFS, may use all or part of this EIS to fulfill their NEPA responsibilities for their actions related to the proposed project.

Certain state, regional and local agencies also may use all or part of this EIS to fulfill their applicable environmental review requirements for any actions they may need to take for the proposed project. For example, portions of the routing alternatives cross land owned by the State of Washington and managed by the Washington State Department of Natural Resources (DNR), the Washington State Parks Department, as well as the Washington Department of Fish and Wildlife. In addition, any crossing of the Columbia River by the proposed transmission line would be subject to DNR's Aquatic Permit program and an easement from Oregon's Department of State Lands. Before the Washington state agencies can take action to authorize use of state-managed lands or issue aquatic permits, the state agencies must comply with the requirements of the Washington's State Environmental Policy Act (SEPA), Chapter 43.21C RCW. BPA is coordinating with the state of Washington to attempt to ensure that environmental issues relevant to the Washington state agencies and their SEPA needs are addressed, to the fullest extent practicable, in BPA's NEPA process. Accordingly, it is expected that these agencies will use relevant information from this EIS to help fulfill their SEPA requirements for their actions related to the proposed project.

See Chapters 5, 6 and 7 for additional information on federal, state, regional and local agencies with potential involvement in the proposed project.

1.6 Public Involvement and Major Issues

Early in the development of this EIS, BPA solicited comments from the public, Tribes, federal, state, regional, and local agencies, interest groups and others to help determine what issues should be studied in this EIS. Because these issues help define the scope of the EIS, this process is called "scoping." Public comments were received by mail, via fax, by telephone, through the BPA Web site, and at scoping meetings.

1.6.1 Scoping Outreach

During the scoping period for the EIS, BPA requested comments through the following means:

- On June 3, 2009, BPA published a Notice of Intent (NOI) to prepare an EIS and conduct public meetings for the Big Eddy-Knight Transmission Project in the *Federal Register* (Vol. 74, No. 105). The NOI initiated a 30-day public scoping period.

- Also in June 2009, BPA sent a letter to about 400 potentially interested and affected persons, requesting comments and inviting the public to a scoping meeting. The letter was sent to people who live along the proposed transmission line routes; federal, state, regional, and local agencies that may have expertise or require permits for the project; Tribes with interest in the area; and other interest groups.
- BPA sent a press release to local media, and placed paid ads in the following newspapers about the public scoping meetings and the comment period:
  - The Dalles Chronicle – Tuesday, June 23 and Sunday, June 28, 2009
  - Tri-City Herald – Monday, June 22 and Sunday, June 28, 2009
  - Goldendale Sentinel – Thursday, June 25, 2009.
- Two open-house style public meetings were held – in The Dalles, Oregon on June 30, 2009 and in Goldendale, Washington on July 1, 2009. At each meeting BPA received comments on the proposed alternatives.
- Additional meetings were held with tribes; state agencies; congressional, city, and county staffs; and interest groups.
- BPA established a project Web site with information about the project and the EIS process www.bpa.gov/go/BEK/. BPA posted a link to all comments it received on the project Web site.
- In December 2009, BPA sent the public a factsheet that described refined routing alternatives based on comments received during the public scoping process and additional studies of the transmission system, and requested public comment on those refinements.

More than 100 people attended the public scoping meetings held in The Dalles and Goldendale in summer 2009. The open house-style meetings featured topic-specific stations and information. BPA staff was available to answer questions and help landowners locate their property on maps in relation to the proposed project routes. BPA staff recorded verbal public comments in notes and on flip charts and members of the public had an opportunity to provide written comments on comment forms.

In addition, the BPA project manager, environmental coordinator, and other staff held meetings with state agencies (EFSEC, DNR, Fish and Wildlife, Parks, Washington State Department of Ecology [Ecology], and Department of Archaeology and Historic Preservation in Washington and the Oregon Department of Energy); representatives of tribes with interests in the area (the Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Warm Springs Reservation, Nez Perce Tribe of Idaho, and the Confederated Tribes of the Umatilla Indian Reservation); staff for members of Congress; Klickitat County, Washington and Wasco County, Oregon officials and planning departments; the Columbia River Scenic Gorge Commission (CRGC); the USFS; and the Friends of the Gorge.

1.6.2 Scoping Comment Summary

Over 400 people commented on the project during the scoping period for the EIS. People expressed opinions about a wide range of issues for BPA to consider. Questions and concerns included the following:

- Questions about the underlying need for the project; for example, whether the project is needed for the wind farms in the area, and where the power on a new line would go.
- Questions about the design of the proposed transmission line–how big the towers would be, how much right-of-way would be needed, how close the line could be to existing lines.
- Opinions and data supporting a particular route for the line.

- Concern about the visual impact on views in the Columbia River Gorge National Scenic Area, other recreation areas and homes.
- Concern about how the line would affect farming, such as possible irrigation and aerial spraying disruptions and effects on crops during construction.
- Concern about impacts to natural preserve areas, wildlife habitat, and protected animal and plant species.
- Concern about potential human health risks associated with electromagnetic fields.
- Concern that the project would impact property values, the ability to sell land being subdivided, and the inherent value of family homesteads.

This is a partial list of issues identified from the comments received. All comments received were logged in and forwarded to resource specialists to include in their environmental impact analyses for the EIS.

Thirty-eight individuals submitted comments in response to the December 2009 factsheet that described the project refinements. Issues raised in comments were similar to the issues raised during the scoping period.

All comments submitted, the Public Scoping Comment Report (June 2009 through September 2009), and other project information are on the project Web site: www.bpa.gov/go/BEK.

1.6.3 Draft EIS Public Outreach

In December 2010, BPA distributed the draft EIS to the public (landowners, Tribes, federal, state, regional, and local agencies, interest groups and others) for review and comment. BPA accepted comments through January 28, 2011.

During the draft EIS comment period for the EIS, BPA requested comments through the following means:

- On December 10, 2010, BPA published a Notice of Availability (NOA) for the Big Eddy-Knight Transmission Project draft EIS and announced public meeting dates in the *Federal Register* (Vol. 75, No. 237). The NOA initiated a public comment period extending over more than 45-days (BPA allowed for additional days to accommodate holidays).
- Also in December 2010, BPA sent a letter to about 950 potentially interested and affected persons, requesting comments and inviting the public to open-house style public meetings. The letter was sent to people who live along the proposed transmission line routes; federal, state, regional, and local agencies that may have expertise or require permits for the project; Tribes with interest in the area; and other interest groups.
- BPA sent a press release to local media, and placed paid ads in the following newspapers about the draft EIS public meetings and the comment period:
    - The Dalles Chronicle – Wednesday, December 29, 2010; and Wednesday, January 5, and Sunday, January 9, 2011
    - Tri-City Herald – Wednesday, December 29, 2010; and Wednesday, January 5, and Sunday, January 9, 2011
    - Goldendale Sentinel – Wednesday, December 29, 2010; and Wednesday, January 5, and Wednesday, January 12, 2011.

- Two open-house style public meetings were held – one in The Dalles, Oregon on January 11, 2011 and one in Goldendale, Washington on January 12, 2011. At each meeting BPA received comments on the draft EIS.
- The draft EIS was posted on BPA's project website: www.bpa.gov/go/BEK/. Comments were accepted online. BPA also posted a link to all comments it received.

About 400 people commented on the draft EIS during the comment period. Opinions and concerns expressed during this comment period echoed those received during the scoping period. In addition, people submitted questions and concerns about the following:

- Requests for additional information about potential landslide impacts.
- Requests for information about BPA emergency response procedures.
- Suggestions for additional noxious weed control.
- Requests for consideration of alternatives that would avoid the National Scenic Area or would place the proposed transmission line underground.

This is a partial list of issues identified from the comments received. Volume III of this EIS provides all comments received on the draft EIS and BPA's responses to the comments.

1.7 Issues Outside the Scope of the Proposed Action or this EIS

Most issues raised during the scoping process are considered to be within the scope of the Proposed Action and are addressed in this EIS. However, some issues are considered to be either beyond the scope of this EIS (and thus are not addressed in this EIS) or are outside the scope of the Proposed Action. The following describes these issues.

1.7.1 Regional Generation Development

BPA received a suggestion that BPA undertake a programmatic review of all energy generation projects, including new and proposed wind development, that may occur throughout the region related to any increased capacity on BPA's transmission system. BPA does not have a region-wide program or plan related to wind or other generation projects, and does not dictate or direct where these projects are proposed. In addition, none of these generation projects are proposed, constructed, or operated by BPA; instead, they are proposed and undertaken by private entities, and their siting is controlled by state or local jurisdictions. BPA's role is typically limited to simply deciding ~~considering~~ whether to interconnect these proposed projects, in compliance with its Open Access Transmission Tariff and after an evaluation of the environmental effects of the proposed interconnection under NEPA.

Furthermore, decisions by BPA on whether to interconnect a particular proposed generation project to its transmission system would be made independently of a decision on whether to construct the proposed Big Eddy-Knight Transmission Project. More specifically, a decision to interconnect any generation project is not dependent on construction of this proposed transmission line. In addition, this transmission line is being proposed to respond to requests for transmission service from a variety of existing and proposed generation sources, as well as from entities simply looking to move their electrical power from one point to another. These requests are already in BPA's queue for transmission service. A decision to proceed with the Big Eddy-Knight Transmission Project thus would not be fully dependent on decisions related to interconnection of any new or proposed generation development projects in the region.

Therefore, new and proposed generation development projects are not considered to be within the scope of the Proposed Action, i.e., development of the proposed Big Eddy-Knight Transmission Project analyzed in this EIS. However, to the extent that the potential environmental impacts of any new or proposed generation projects in the vicinity of the Proposed Action are cumulatively additive to the potential environmental impacts of the Proposed Action, these impacts are discussed and considered in the cumulative analysis in this EIS (see Chapter 4 Cumulative Impacts).

1.7.2 Regional Transmission Development

A comment suggested that BPA undertake a programmatic review of all of its proposed transmission infrastructure projects in the region. BPA does not have a region-wide program or plan to take actions related to its transmission system. These actions are proposed on a project-specific basis, when needed, to address various transmission reliability and service issues on certain portions of BPA's transmission system. In addition, increases in capacity that may occur on BPA's existing transmission system from proposed infrastructure improvements would be in response to already existing requests for transmission service, rather than designed to provide significant additional, unsubscribed capacity. Finally, while there may be synergies among the various proposed transmission infrastructure projects in the region, none of the proposed projects are dependent on any other project for its viability or success. Other proposed BPA transmission infrastructure projects in the region are therefore outside of the scope of the Proposed Action and this EIS.

1.7.3 Conservation

Another comment stated that BPA should consider creating a regional energy strategy that depends on energy conservation, energy efficiency, and demand reduction to meet future energy needs as an alternative to the Proposed Action. As discussed in Section 1.2 of this EIS, BPA is proposing the Big Eddy-Knight Transmission Project to respond to requests for transmission service. While BPA actively supports and helps facilitate a variety of energy conservation programs and activities in the region, energy conservation, energy efficiency, and demand reduction are not feasible methods for responding to these existing requests for transmission service. Also see Section 2.6, Alternatives Considered but Eliminated from Detailed Study.

1.8 Organization of this EIS

The ~~remainder of this~~ EIS is organized as follows:

Volume 1: Environmental Analyses

- Summary of the EIS.
- Chapter 1 provides project background and describes the need for action, the purposes to be achieved, the roles of various agencies, and the public involvement process.
- Chapter 2 describes the Proposed Action Alternatives, the No Action Alternative, and alternatives considered but eliminated from detailed consideration. It summarizes and compares the differences between the various Action Alternatives and the No Action Alternative, in particular concerning potential environmental impacts.

- Chapter 3 describes the existing environment that could be affected by the proposed project and the possible environmental consequences of the Proposed Action Alternatives and No Action Alternative. An assessment of the direct, indirect, and cumulative effects on land use and recreation, visual resources, vegetation, geology and soils, water resources and wetlands, wildlife, fish, cultural resources, socioeconomics, transportation, noise, public health and safety, air quality, and greenhouse gases is provided. Impacts can range from no or low to high impact.
- Chapter 4 discusses cumulative impacts.
- Chapter 5 discusses the permits and other approvals that must be obtained to implement the Proposed Action.
- Chapter 6 discusses the project's consistency with state substantive standards.
- Chapter 7 discusses the project's consistency with the USFS Management Plan for the Columbia River Gorge National Scenic Area.
- Chapters 8 through 11 list the individuals who helped prepare the EIS, the references used, and the individuals, agencies, and groups notified of the availability of this EIS, and a glossary.
- An index is included as Chapter 12.
- ~~Supporting technical information is in appendices.~~

Volume 2: Appendices

- Appendices provide supporting technical information.

Volume 3: Comments and Responses

- All comments received on the draft EIS and BPA's responses to the comments are provided.

Chapter 2
Proposed Action and Alternatives

This chapter describes the proposed Action Alternatives, the No Action Alternative, and alternatives that were considered but eliminated from detailed study. More specifically, this chapter provides the following information:

- An overview of the Action Alternatives
- A summary of how transmission lines are sited
- A description of project components
- A description of each Action Alternative
- A description of the No Action Alternative
- A discussion of alternatives that were considered but eliminated from detailed study
- A summary comparison of the Action Alternatives and the No Action Alternative

2.1 Overview of the Action Alternatives

BPA is proposing to build a 500-kilovolt (kV) lattice-steel-tower transmission line that would run from BPA's existing Big Eddy Substation near The Dalles, Oregon, to a proposed Knight Substation about 4 miles northwest of Goldendale, Washington. The project also includes work at BPA's existing Big Eddy and Wautoma substations and installation of new fiber optic cable for system communications. This section provides an overview of these facilities. The transmission line routing alternatives, existing substation upgrades, substation site options, and the fiber optic cable options define the project area (see Map 1-1).

Transmission Line Routing Alternatives. BPA is considering three routing alternatives for the transmission line: a West Alternative, a Middle Alternative, and an East Alternative (see Map 2-1). All routing alternatives are located in Wasco County, Oregon, and Klickitat County, Washington and would cross the Columbia River and portions of the eastern end of the Columbia River Gorge National Scenic Area. The three routing alternatives are about 27 or 28 miles long, and cross varying amounts of private, state, federal and Tribal lands. Representative views in the vicinity of each routing alternative are provided in Section 2.7 (see Figures 2-23 through 2-28 and 2-31 through 2-37).

The transmission line routing alternatives all would use a combination of existing BPA and new 150-foot wide right-of-way. BPA is considering different tower combination options including paralleling existing transmission lines. Because all alternatives would parallel portions of existing lines, there is the option to build next to those lines with single-circuit towers (towers that would carry one set of wires, in this case the wires that make up the proposed line) or to remove the existing line and build with double-circuit towers (towers that would carry two sets of wires, in this case the wires that make up the proposed and existing lines). (See Section 2.3 for more information about the project components—towers, wires, rights-of-way, access roads, etc.—and Section 2.4 for more detail about the routing alternatives and tower combination options.)

Substations. The project would include equipment additions within BPA's Big Eddy Substation (all proposed work would be within the existing fenced electrical yard) and BPA's Wautoma Substation (proposed work would require a 0.6 acre addition within BPA's substation property boundary). BPA is also proposing a new Knight Substation in Klickitat County, Washington. ~~BPA would acquire about 30 acres for the substation, with the~~ The fenced substation facility would occupy about 22 acres. ~~ing about 10 acres of the acquired property.~~

For maximum electrical system performance, the Knight Substation would need to be built within an approximate 2-mile length along BPA's existing Wautoma-Ostrander transmission line. BPA is considering two adjacent sites for Knight Substation~~; both sites would be under BPA's existing~~ in this area under the Wautoma-Ostrander transmission line (see Map 2-1). Site 1 is the most western site and is on private land. Site 2 is near Site 1 on state DNR land. (See Section 2.3 for more information about the project components, including substations, and Section 2.4 for more detail about Big Eddy Substation, Wautoma Substation and the two proposed Knight Substation sites; also see Figures 2-18 through 2-22 and 2-29 through 2-30 for representative views in the vicinity of the existing Big Eddy Substation and the proposed Knight Substation.)

Fiber Optic Cable. The proposed transmission line would require fiber optic cable to provide a communications link between the substations. BPA is considering two options for cable placement. For one option, the fiber optic cable would be strung on the proposed transmission line towers from Big Eddy Substation to Knight Substation then loop back to Big Eddy Substation on the same towers. For the second option, the cable would follow the same route to Knight Substation, but would then continue an additional 72 miles on BPA's existing Wautoma-Ostrander transmission line through Klickitat and Yakima counties, Washington to BPA's Wautoma Substation in northwest Benton County, Washington (see Map 1-1). The second option would cross about 30 miles of the Yakama Indian Reservation, as well as other private and state lands over which BPA has an existing easement for the Wautoma-Ostrander line. For more information about the proposed fiber optic cable see Sections 2.3 and 2.4.

Overhead Ground Wire. In addition to the ground wire that would be strung on the proposed line to protect equipment from lightning strikes, an overhead ground wire would be required on BPA's Wautoma-Ostrander line for about 1 mile on either side of Knight Substation. For more information about overhead ground wire and counterpoise see Sections 2.3 and 2.4.

2.2 Transmission Line Siting

Many factors are considered when siting transmission lines. BPA's transmission system planners and engineers are usually the first to begin the process of developing potential routes for a proposed new line. First, transmission system planners determine the size or voltage needed and the beginning and end points for the proposed transmission line. Engineers then determine the type of towers required and the amount of right-of-way needed for safety clearances. In general, a 150-foot wide right-of-way is typically required for 500-kV transmission lines. Each potential location for individual towers must also be accessible for construction and for maintenance, so road access is required.

With the technical requirements outlined, routing engineers use available information to consider how a new line and substation could impact people, plants and animals, farms and other businesses, and important local, cultural and regional features. They look for ways to site new transmission facilities to avoid or minimize these potential impacts to the extent practicable. Some of the factors considered in this initial transmission facility siting exercise include:

- **Electrical feasibility**. New electrical facilities must work electrically with the existing transmission system. Transmission line placement may be restricted near or next to existing lines (see **Line separation**), and the line length may be limited due to effects the length can have on electrical performance and power distribution across the system. Substations are strategically placed to accommodate and enhance the flow of power. For this project, the proposed Knight Substation sites are in a location on BPA's Wautoma-Ostrander line that would provide the maximum system performance together with a new transmission line.
- **Existing corridors and roads**. Engineers determine if BPA or other utilities have any existing corridors with vacant right-of-way or whether a new line could parallel another existing or proposed line, facility or road. Building in an established corridor tends to have incremental impacts to visual resources, land use and habitats. Existing access roads can be used, though they often need to be upgraded. Building adjacent to an existing line can also be less expensive because often there is extra right-of-way to accommodate a new line so there may be little or no need to purchase new easements, and it is easier for maintenance crews to maintain two lines next to each other, rather than two lines in different areas.
- **Line separation**. While use of existing transmission corridors has its advantages, there are situations in which BPA cannot build next to existing lines for reliability reasons. If utilities want to build a transmission line adjacent to an existing line, they are required by WECC and NERC reliability criteria to determine the likelihood and consequences of an outage that could affect both lines. Utilities determine the likelihood that the following events could cause a simultaneous outage of lines:
    - An aircraft flying into both lines
    - Fire in the right-of-way producing smoke, which can cause a flashover between lines
    - Sequential lightning strikes
    - A line conductor failing and falling into an adjacent line.

  The consequences of a simultaneous outage are greater with the loss of two critical lines in an area. These outages could be beyond what the system can withstand and greatly increase the chances for a blackout of the system. To reduce the chances of a cascading blackout resulting from outages of multiple critical lines in an area, transmission service could need to be significantly curtailed.

  If it is determined that the likelihood and consequence of an outage would not meet WECC and NERC reliability criteria, special design considerations are required. A new line would be required to be separated by at least one span length (about 1,200 feet) from the adjacent line or the distance the lines would be allowed to parallel each other would be limited to less than 1 mile.
- **Houses, other structures, and sensitive cultural resources**. Homes, schools, businesses, historic structures and sensitive cultural resource areas are avoided if possible. Since structures (houses, buildings, sheds) are not allowed to be within the right-of-way for safety reasons, BPA looks to avoid structures so they need not be removed.
- **Existing land uses**. In addition to existing houses and structures, land use is an important consideration. Engineers try to find more compatible land uses such as industrial and agricultural lands, while trying to minimize impacts to residential land, parks and any special districts or areas of local or regional interest. Gravel pits are also avoided, since the earth can be dug away around towers, leaving them exposed and unstable. BPA also avoids airstrips; tries to follow fence lines; and spans agricultural fields, orchards or vineyards where possible.
- **Terrain.** BPA looks for gentle terrain if available. When transmission towers are placed on steep slopes, it is harder to construct both the towers and the access roads, and there may be a greater

likelihood of erosion or landslides. For this project, crossing the Columbia River is also an engineering challenge because it requires a long span, which in turn requires taller towers. BPA looks for high points on either side of the narrowest points in the river for crossing locations.

- **Visual impacts.** The size of transmission towers and the potential need to clear trees and develop new roads can increase the visibility of a new line. BPA considers avoiding locations from which people would likely view the proposed line and substation such as homes and roads, river crossings, and parks and other recreation areas.
- **Sensitive habitats.** Engineers consider potential impacts to plants and animals and try to avoid wetlands, nesting sites, habitats of threatened and endangered species, and other sensitive areas wherever possible.
- **Costs.** BPA tries to find the lowest cost alternatives. Shorter transmission line routes usually decrease overall project costs. Straight transmission lines are less costly than lines that turn because when lines turn, stronger, heavier and more expensive towers are needed. Included in project costs are the costs of easements; easements across agricultural or forest lands are usually less expensive than easements across residential land.

2.3 Project Components

A transmission line project requires various components (rights-of-way, towers, conductors, substations, fiber optic cables, etc.). This section describes these components. (Please see Section 2.4 Proposed Action Alternatives, for specific descriptions of the proposed alternatives.)

2.3.1 Easements and Land

Much of the project area is private property, with some federal, state and Tribal ownership. Construction of the project would require easements for transmission line rights-of-way and access roads in some locations. Some portions of the transmission line routing alternatives are within existing BPA rights-of-way; some of these areas of existing BPA right-of-way are vacant and have no towers built in the right-of-way. Other sections are next to existing lines, but there is room to build another line in the right-of-way. In some locations, an existing line could be torn down and both the existing line and a new line could be carried together on one new double-circuit tower (see Figure 2-1).

In general, BPA would need a 150-foot wide right-of-way for the new transmission line and a 50-foot-wide easement for access roads. The width needed (150 feet) for the transmission line right-of-way is the BPA-standard width for 500-kV transmission line rights-of-way, and is intended to ensure that the line is a safe distance from other objects and structures such as trees and buildings. If BPA has existing right-of-way that can be used for the transmission line, fewer acres of new right-of-way would be needed.

In locations for the transmission line right-of-way and access roads outside any BPA existing right-of-way, BPA would purchase easements from the underlying landowner. Most easements for the transmission line would give BPA the rights to construct, operate, and maintain the line in perpetuity. However, easements for use of Tribal trust lands are negotiated with individual Tribes and may be for different lengths of time. On USFS property where BPA has no existing land rights for its transmission facilities, BPA would apply to the USFS to secure the necessary land rights. Although the underlying landowner would still own and use the property, BPA would not permit any uses of the transmission line right-of-way that are unsafe or might interfere with constructing, operating, or maintaining the transmission facilities. These restrictions would be part of the legal rights that BPA would acquire for the transmission line.

Construction of the project also would require the purchase of land for the proposed Knight Substation. Through this purchase, BPA would own fee (absolute) title to the property required for Knight Substation and for the road to access the substation. BPA would acquire about 30 acres for the proposed substation depending on the parcel selected.

2.3.2 Transmission Line

Transmission Towers

BPA is proposing to use either single or double-circuit 500-kV lattice steel towers for the proposed transmission line (see Figure 2-1). In general, single-circuit 500-kV towers would be between 105−205 feet tall (depending on terrain). Double-circuit towers are about 50 feet taller than the single-circuit towers, and would range from 170–250 feet tall. Tower heights would vary depending on the terrain, need for road and river crossings, and other factors. Towers required for the line to cross the Columbia River could be up to 440 feet tall and would be on high ground on either side of the river (see Figure 2-2). ~~Any towers taller than 200 feet (generally, double-circuit towers and towers used at river crossings) and transmission lines exceeding that height are considered an obstruction by the FAA. Shorter towers and line clearances can also be considered obstructions depending on their proximity to airport runways. As obstructions, they must be marked according to FAA rules, which may require lighting on each tower and marker balls on the transmission line.~~

Spans between individual towers are typically about 1,150 feet, with about five towers needed for each mile of line. Towers would be made of galvanized steel and may appear shiny for 2–4 years before they dull from weathering. About 125–135 towers would be needed for the proposed transmission line. The actual number of towers would depend on the length of the action alternative selected.

Figure 2-1. Typical 500-kV Lattice Steel Towers

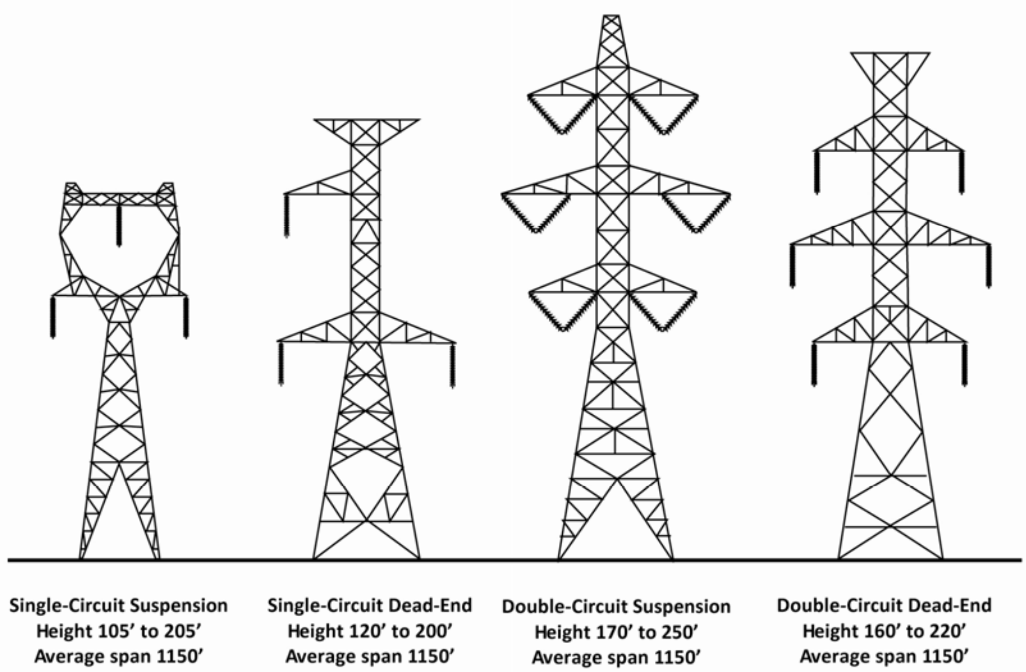
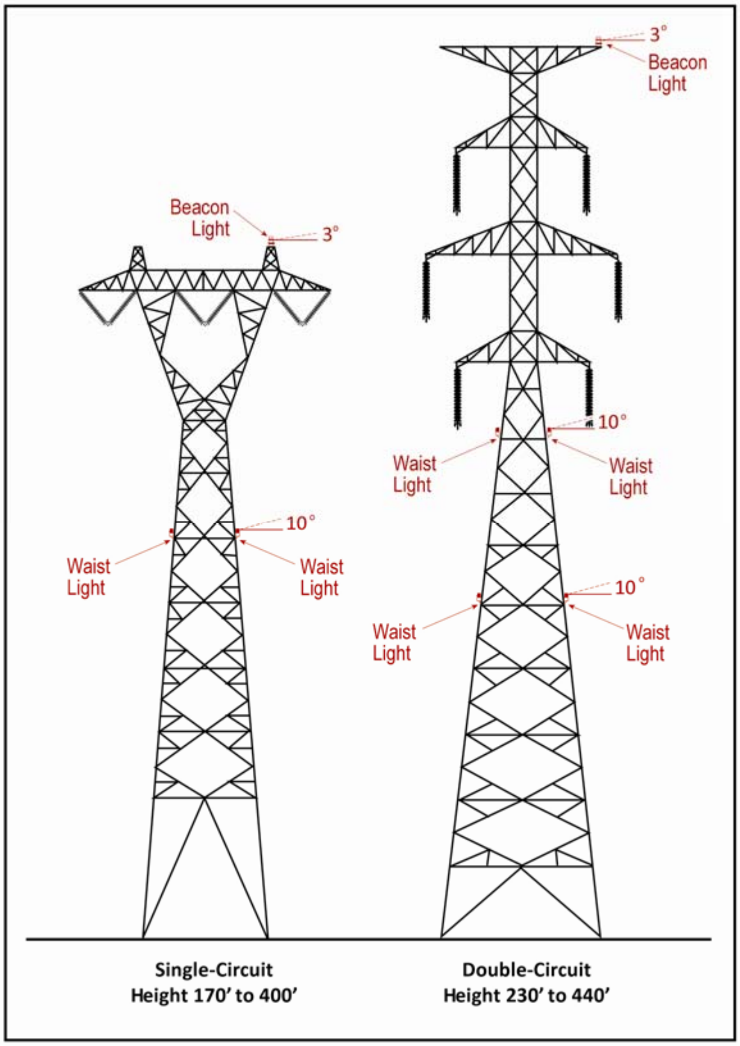


Figure 2-2. Columbia River Crossing Towers



The single-circuit transmission line towers proposed would have a delta configuration where one set of conductors hangs above the other two (see Figure 2-1). Double-circuit towers would have three sets of conductors on either side of the tower (see **Conductors**). Using the single-circuit delta configuration towers or using double-circuit towers helps reduce electric and magnetic field levels (see Section 3.12 Public Health and Safety).

In addition, there are two types of towers used for both single and double-circuit towers: suspension towers and dead-end towers. When the line is on a straight path, suspension towers would be used to hold the conductors. Dead-end towers would be used where the line turns or enters a substation. Dead-end towers are stronger and heavier than suspension towers (see Figure 2-1).

Towers that exceed certain height criteria (most double-circuit towers and towers used at river crossings) or are within a certain distance of airports are required by the Federal Aviation Administration (FAA) to be lighted and/or painted to make them more visible to aircraft in the area. For this project, no towers would require painting; however, several towers, including the two on either side of the Columbia River, would require lighting. Using the latest technology, which minimizes visual impacts on landowners and others on the ground, BPA would place a flashing, dual color (white by day/red by night) beacon on top of these towers and two nighttime, steady-burning, red beacons at the middle of each tower (waist lights). For towers greater than 351-feet tall, two sets of waist lights would be required. See Figure 2-2.

Footings

Transmission towers would be securely attached to the ground with footings. Footings are an assembly of metal in the ground at each of the four tower corners. Four types of footings could be used to secure the towers: plate, grillage, rock anchor, and concrete shaft.

- **Plate footings** are used for suspension towers. A plate footing is a 4-foot by 4-foot steel plate buried about 11 feet deep at the foot of each tower leg. The overall area excavated for a tower with plate footings would be up to 60 feet by 60 feet (this would be the area of permanent impact).
- **Grillage footings** are used for dead-end towers. A grillage footing is a 15-foot by 15-foot assembly of steel I-beams that have been welded together and buried about 14-16 feet deep at each tower foot. The overall area excavated for dead-end tower with grillage footings would be about 75 feet by 75 feet (this would be considered the area of permanent impact).
- **Rock anchor footings** are required when a tower is built on solid bedrock that is less than 2 feet below the surface. Six-inch diameter holes are drilled into the bedrock about 11 feet deep and steel anchor rods are secured within the hole with concrete. The area of permanent impact would be slightly less than for plate footings.
- **Concrete shaft footings** are used for towers at river crossings, on steep slopes, or in areas where the tower must sustain a higher load and requires additional support. Concrete shaft footings can be built on solid bedrock or in soils unfavorable for grillage footings. Concrete shaft footings are engineered columns of concrete about 4-8 feet in diameter reinforced by steel rods. Footing depth depends on site-specific engineering requirements including terrain and load on the towers. Total disturbance for these footings would be more than for plate footings.

For plate and grillage footings, a trackhoe would be used to excavate an area for the footings. The excavated area would be at least 2 feet larger than the plate or grillage footings to be installed (if the soil is loose or sandy, then a wider hole may be necessary). Soil and rock removed for plate or grillage footings would be used to backfill the excavated area once the footings are installed.

For rock anchor or concrete shaft footings, a drill would be used to make an appropriately-sized vertical shaft for the footings. Soil and rock removed for rock anchor or concrete shaft footings would either be spread out onto an approved location or removed from the project area.

With the larger grillage footings, single-circuit towers would occupy a permanent area of about 0.13 acre, with a temporary disturbance during construction of about 0.5 acre (equipment, soils, etc.); double-circuit towers would occupy a permanent area of about 0.17 acre, with a temporary disturbance during construction of about 0.69 acre (see Table 2-1). Rock anchor or concrete shaft footings have a smaller footprint than the typical plate or grillage footings.

All the transmission line alternatives have options that include removing existing lines. Where existing lines would be removed, the tower footings under the ground could also be removed. Wood pole lines would be completely removed (including the 7 to 9 feet of pole below the ground). The area disturbed for removal of wood pole towers would be about 0.11 acre. The lattice steel tower footings could be left in place; the steel would be cut-off about 2 feet below ground or deeper in cultivated areas. If the footings would interfere with construction of the proposed line, the footings would be removed; excavation would disturb about 0.43 acre.

Typical Excavation for Single-Circuit 500-kV Tower Footing During Construction

Table 2-1. Disturbance Areas for Single- and Double-Circuit Towers (in acres)

Types of Disturbance	Single-Circuit 500-kV	Double-Circuit 500-kV	Wood Pole 115-kV	Single-Circuit 230- or 345-kV
Permanent tower footprint	0.13 (based on grillage footing)	0.17	0.01	0.06
Temporary disturbance during tower construction	0.37 (based on grillage footing)	0.52	*N/A*	*N/A*
Total tower disturbance	0.5	0.69	*N/A*	*N/A*
Temporary counterpoise disturbance	0.1	0.09	*N/A*	*N/A*
Tower removal disturbance	*N/A*	*N/A*	0.11	0.43

Conductors

The wires that carry the electrical current on the transmission line are called conductors. The proposed transmission towers would support these conductors. The towers would carry three sets (called phases) of conductors arranged in a triangular design (see Figure 2-3). Each phase would consist of a bundle of three, 1.3-inch diameter conductors held together by spacer brackets about 20 inches apart. From a distance, a bundle looks like a single wire.

The conductors would be attached to the towers using insulators (see Figure 2-3). Insulators are bell-shaped devices that prevent electricity from jumping from the conductors to the tower and going to the ground. Insulators are made of porcelain or fiberglass and are non-reflective.

The conductor would need to be fitted together where one reel of conductor ends and a new reel begins. Conductor fittings could be made using hydraulic compression or implosive devices. Hydraulic compression uses a press that compresses the fittings on the conductor. With implosive fittings, an explosive device is set off with a sound like a gunshot, causing the fitting to collapse and tighten around the conductor to provide a solid connection. Nine conductors (three bundles each with three conductors) would need to be fitted once about every 1.5 to 2 miles. (See **Pulling and Tensioning Sites**, for a description of the area needed to pull and tighten conductors.)

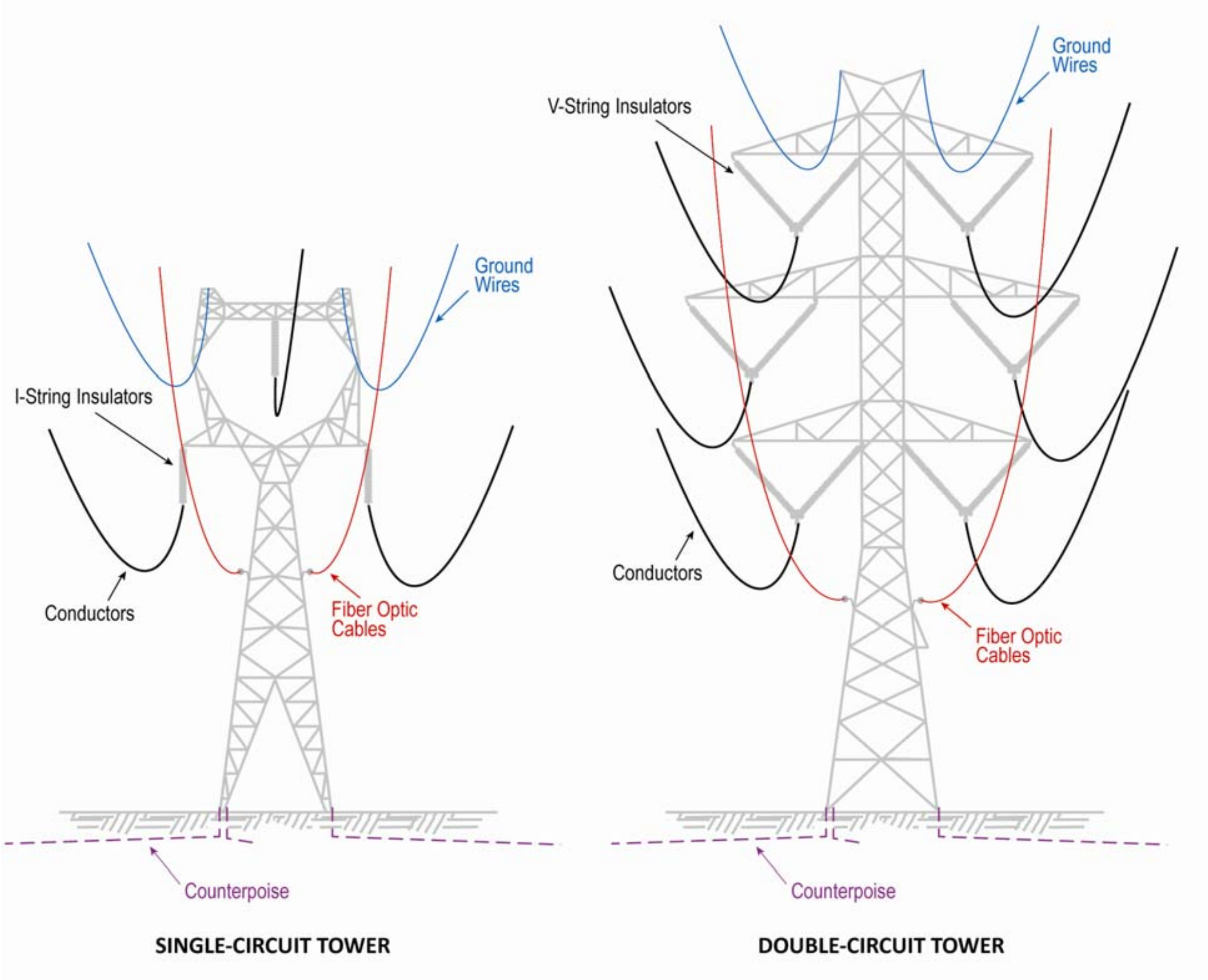
For safety reasons, BPA has established minimum conductor heights above ground and other obstacles that meet or exceed National Electrical Safety Code clearance requirements. For the proposed 500-kV line, standard minimum clearance of the conductor above the ground is 29 feet. The clearance requirement over highways is 45.5 feet; other clearances (railroads, rivers, trees, etc.) are determined on a case-by-case basis. The proposed line would be designed to meet or exceed these requirements. (See Appendix A for information on safety around power lines.)

Overhead Ground Wire and Counterpoise

Two small wires (0.5-inch diameter), called overhead ground wires, would be attached to the top of the transmission towers (see Figure 2-3). Ground wires are used for lightning protection. When lightning strikes, the overhead ground wire takes the charge instead of the conductors. Between towers that cross the Columbia River, the fiber optic cable (see **Fiber Optic Cable**) that would be installed would also act as the overhead ground wires (the fiber optic cable is reinforced to be strong enough for the long span required to cross the river).

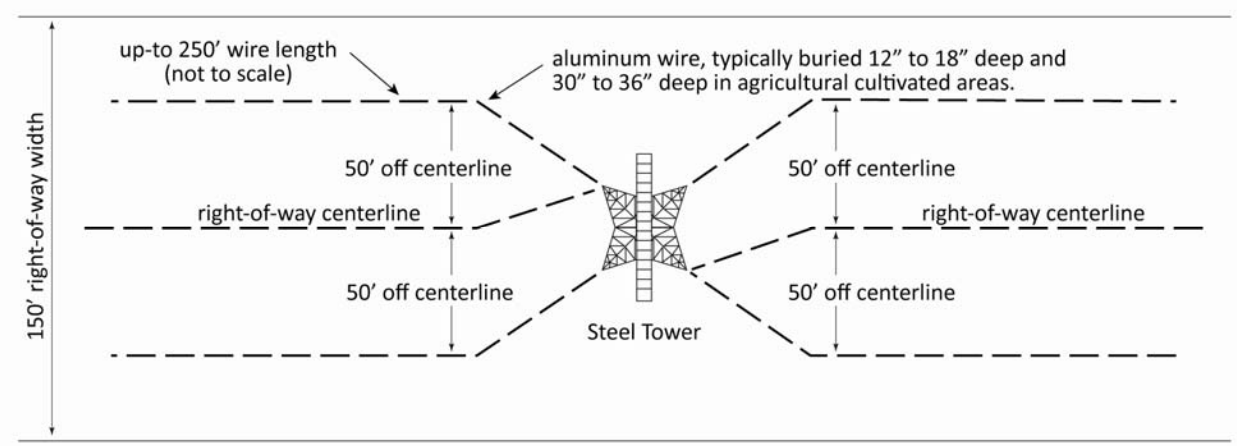
Wires that exceed certain height criteria (such as when spanning deep ravines) or are within a certain distance of airports are required by the FAA to be marked with marker balls to make them more visible to aircraft in the area. For this project, marker balls would be required on the uppermost ground wires crossing the Columbia River and could be required in other locations where the line routing alternatives cross deep ravines. The marker balls would be 36 inches in diameter and orange, white, and yellow in varied sequences on the line. They would be placed 400 feet apart on each of the two overhead ground wires, but would be staggered on the two lines so that they would be about 200 feet apart.

Figure 2-3. Components on a Transmission Tower



To take the lightning charge from the overhead ground wire and dissipate it into the earth, a series of wires called counterpoise would be buried in the ground at the base of the towers and within the transmission line right-of-way (see Figure 2-3 and Table 2-1). Counterpoise could be needed at every tower, depending on the soil types present. Up to six aluminum wires (3/8-inch in diameter) could be buried up to 250 feet from the tower (see Figure 2-4). The wire is usually buried 12-18 inches deep, except in cultivated areas where it would be buried about 30 inches deep or deeper if a farmer uses deeper plowing methods. Typically, one counterpoise wire would run down the center line of the right-of-way from each side of the tower. Two other wires would run at a 45-degree angle away from each side of the tower, then turn and run within the right-of-way at a distance of 50 feet off centerline (see Figure 2-4). Where there are obstructions, buried utilities, or environmentally sensitive areas, the counterpoise design would be changed to avoid these areas.

Figure 2-4. Typical Overhead View of Counterpoise



During construction, the counterpoise could be buried several ways. Installers could use backhoes, trenchers, vibrating plows, or occasionally hand dig trenches depending on the depth, soils, terrain and size of buried rock. With a backhoe the trench would be 12 or more inches wide. Removed soil and rocks would be piled to the side and placed back in the trench to cover the counterpoise. If a trencher is used, the trencher would open up a 4-6 inch trench and lift up the soil to the side. The soil would be pushed back into the trench after the counterpoise is installed. Large tractors use a vibrating plow to force a blade into the ground. The counterpoise would then run through a hole in the blade and trail out behind the blade at a specified depth. In areas where a tower would be built on solid rock, counterpoise would be placed in crevices where possible; otherwise counterpoise would not be used.

Fiber Optic Cable

Fiber optic cable also would be strung on the transmission towers (see Figure 2-3). Fiber optic cable would provide communication links for the transmission system. Fiber optics technology uses light pulses rather than radio or electrical signals to transmit messages. This communication system can gather information about the system (such as the line in service and the amount of power being carried, meter reading at interchange points, and status of equipment and alarms). Fiber optic cable also allows voice communications between power dispatchers and line maintenance crews and provides instantaneous commands that control power system operation.

The fiber optic cable would be less than 1 inch in diameter and would be mounted under and/or between the conductors (see Figure 2-3). Every 3-5 miles there would be a splice box/reeling location to string and then put tension on the fiber optic cable. The splice box would be about 22 inches by 8.5 inches by 6 inches and would be installed in the ground between the tower legs, mounted on the towers, or placed on the ground next to the tower and covered with rock. Vault boxes would be about 4 feet by 4 feet by 4 feet and would be installed at each substation site.

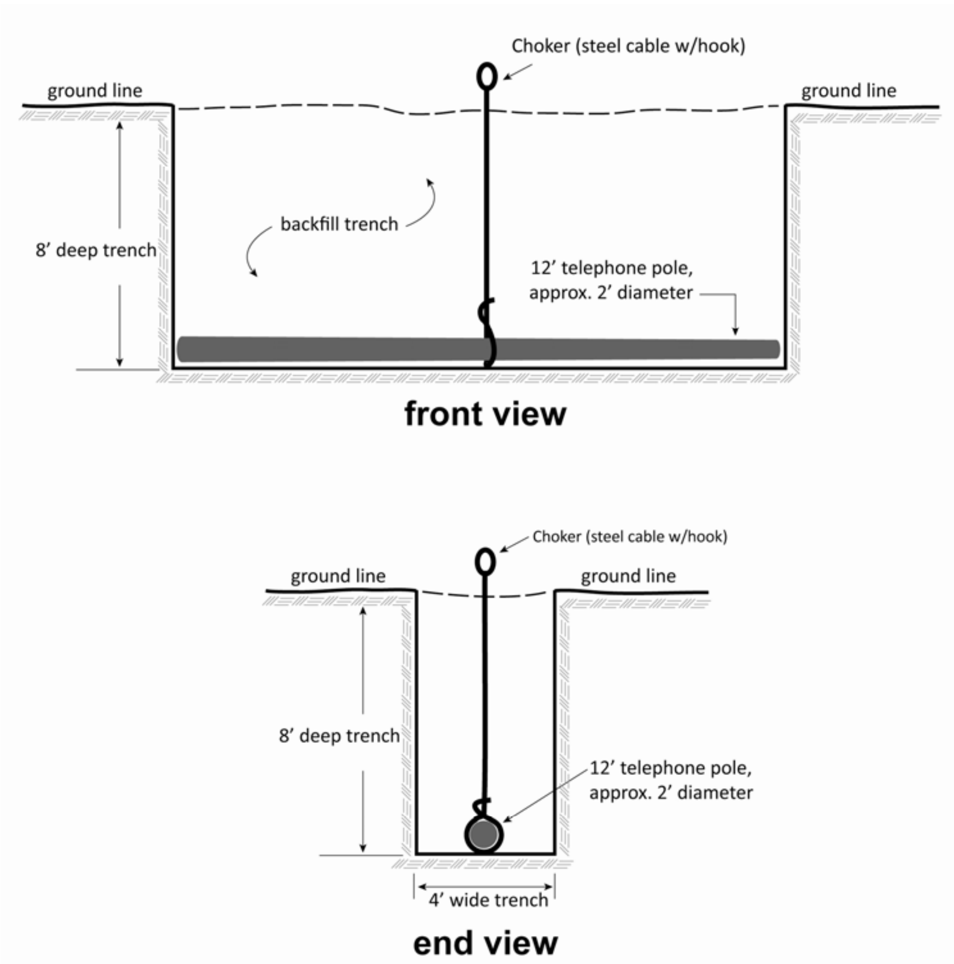
Between towers that cross the Columbia River, the fiber optic cable would also act as the overhead ground wires (see **Overhead Ground Wire and Counterpoise**). The fiber optic cable is reinforced to be strong enough for the long span required to cross the river.

Pulling and Tensioning Sites

Pulling and tensioning sites are areas used for pulling and tightening the conductor and fiber optic cable to the correct tension once they are mounted on the transmission towers. As is typical for high-voltage transmission lines, pulling and tensioning sites for the proposed line would be needed about every 1.75 miles along the transmission line route. About 18 pulling and tensioning sites would be required for construction of the proposed project. Pulling sites would be within or next to the right-of-way for the transmission line. These sites would include a flat area to place a large flatbed trailer that holds the reels of conductor or a tensioning machine. Depending on conditions, the site could be graded, graveled with crushed rock that includes some fines, reseeded, or a combination of these activities. An area about 100 feet wide by 300 feet long, or about 0.75 acre would be disturbed at each site.

Pulling and tensioning of the proposed lines also would require “snubs,” which are trenches about 8 feet deep by 4 feet wide by 12 feet long (see Figure 2-5). After the conductor is pulled through the towers and before it is strung under tension, it is tied off on poles buried in the snub. These trenches would be backfilled following construction.

Figure 2-5. Typical Snub Placement



The tension required to pull fiber optic cable is much less than the tension required to pull conductor and would involve lighter equipment to pull the cable (no snubs needed). The fiber optic cable pulling and tensioning sites would be about every 3 miles along the line and would disturb about a 0.25 acre area within or next to the right-of-way. The fiber optic cable pulling sites would be located with the conductor pulling sites where possible.

The appropriate locations for pulling sites are determined by the construction contractor using environmental and land use information provided by BPA. If the pulling sites are identified outside of the right-of-way, additional surveys for cultural resources and or flora and fauna could be required for those sites.

Staging Areas

One or two temporary staging areas would be needed along or near the proposed transmission line for construction crews to store materials, equipment and vehicles. Staging areas can be from 5–15 acres depending on the amount of materials and number of locations needed. The contractors hired to construct the transmission line would be responsible for determining appropriate staging area locations. Often the contractor rents empty parking lots or already developed sites for use as staging areas. Environmental review of staging areas would be conducted prior to approval for use if necessary.

2.3.3 Substations

Substations are vital hubs for transmission lines. They can connect different transmission lines together, isolate lines when necessary, regulate voltage on the system, and transform voltages.

For this project, a new Knight Substation would be required as well as new equipment at BPA's existing Big Eddy and Wautoma substations. ~~the southern end of the proposed transmission line would connect to BPA's existing Big Eddy Substation and the northern end would connect to a new Knight Substation.~~ The substations would require 500-kV bays with equipment to connect the proposed line to the system. Typical substation ~~The~~ equipment includes the following:

- **Power circuit breakers.** A breaker is a switching device that can automatically interrupt power flow on a transmission line at the time of a fault, such as a lightning strike, tree limb falling on the line, or other unusual event. The breakers would be installed at the substation to redirect power as needed. Several types of breakers have been used in BPA substations. The breakers planned for this project, called gas breakers, are insulated by special nonconducting gas (sulfur hexafluoride). These breakers would contain no oil, except a small amount of hydraulic fluid. Power circuit breakers are about 24 feet tall and about 22 feet long.
- **Switches**. These devices are used to mechanically disconnect or isolate equipment. Switches are normally located on both sides of circuit breakers. Switches are about 23 feet tall and about 16 feet long.
- **Bus Tubing and Pedestals.** These are ridged aluminum pipes that the power flows on within the substation.
- **Control House and Conduit.** The control house is typically a one-story building with communication equipment and switches necessary to turn equipment on and off. Some control houses are plumbed for bathroom facilities and have a work space for personnel. Underground conduit throughout the substation connects the yard equipment to the control house.
- **Substation Dead-end Towers.** These are the towers within the substation where incoming or outgoing transmission lines end. Substation dead-ends are typically the tallest structure within the substation.
- **Grounding Mat.** A wire mesh mat is laid about 18 inches below ground throughout the substation, extending outside the fence perimeter. Equipment is connected to the mat for grounding, as is required for the protection and safety of both equipment and personnel.

- **Substation Rock Surfacing**. A 3-inch layer of rock, selected for its insulating properties, is placed on the ground within the substation to protect operation and maintenance personnel from danger during substation electrical failures.
- **Substation fence**. A chain-link fence with barbed wire on top surrounds the substation for security and public safety. A 10-foot wide gravel buffer would be just outside the fence.
- **Stormwater Retention System**. Stormwater management involves careful measures to prevent sediment and other pollutants from entering surface or groundwater, treatment of runoff to reduce pollutants, and flow controls to reduce the impact of altered hydrology.
- **Shunt Reactor.** A shunt reactor is an electromagnetic device used to absorb reactive (capacitance) power and lower system voltage. They are used in locations where the voltage cannot be regulated below the upper voltage limit required.
- **Substation Electrical Service.** Substations need local electrical service to power the lights, fans, and equipment in the substation. That service is provided by the local utility via a wood pole electric line similar to lines that provide service to local area homes and businesses.
- **Back-up Generator.** The back-up generator would be used if the local substation electrical service fails. It uses a 2,500 gallon diesel tank.

Because this project is not proposing to integrate lower voltage power from generation facilities, but is proposing increasing the capacity of BPA's 500-kV transmission system, no new transformers would be needed at Big Eddy Substation or Knight Substation. Transformers are the only oil-filled equipment within an electrical substation, and because no transformers are required, there would be no new potential sources of oil at either substation.

Typical 500-kV Substation

2.3.4 Access Roads

Access roads are the system of roads that BPA's construction and maintenance crew would use to get to the tower sites along the transmission line and to get to substations. Engineers design roads to be used by cranes, excavators, supply trucks, boom trucks, log trucks, and line trucks. BPA's road system consists of a mix of permits or access road easements across public and private land. Roads are built within the transmission line right-of-way as much as possible. For this project, the transmission line routes and substation sites are usually within 2 miles of public roads. Access road approaches would be from these public roads. If existing access roads can be used, they would be upgraded as necessary. Some new access roads, both temporary and permanent, would be needed. Spur roads would be needed from the existing access roads to the new tower sites; spur roads would generally be within the right-of-way ~~(see Appendix B)~~.

Access roads to the transmission line would require a 14-foot-wide travel surface (wider on curves), with about a 20–40-foot-wide total area disturbed (including drainage ditches). The disturbed area would be wider in steep terrain where cut-and-fill would be required. Typically, a 50-foot-wide easement would be obtained from the landowner for new access roads. Maximum road grades would vary depending on the erosion potential of the soil: 6-8 percent on erodible soils, 10–15 percent for erosion-resistant soils.

Access roads to substations are wider and are built for a heavier weight load than those for the transmission line. Substation access roads would be graveled and would require a 30-foot-wide travel surface, with about a 75-foot-wide total area disturbed. A 75-foot-wide easement would be purchased for the road.

Dirt roads in the project area become slippery and impassible when wet. Gravel would be placed on roads where needed for dust abatement, stability, load bearing, and to keep them passable during wet soil conditions. Where new roads cross streams or drainages, culverts would be needed. Drain dips or water bars may also be needed on steep slopes or where access roads cross drainages that carry seasonal runoff.

If towers are placed in agricultural fields, BPA would typically only build temporary access to the tower site to construct the line. Once construction is complete, the road would be removed and the soil would be restored for continued agricultural use. If a permanent road is necessary, BPA would work with the landowner to determine if it could be built in a location beneficial to the landowner. If a tower has to be accessed for maintenance or emergency situations and BPA has to put in a road that impacts crops, BPA typically ~~would~~ pays the landowner for any crop damage, as appropriate, that occurs as a result of BPA's activities.

Many of the Klickitat County roads were developed as "Farm to Market" roads with minimal or no supporting structural material and are impassable or seasonally restricted during winter months. These roads would likely require upgrades prior to construction due to the heavy loads and relatively high number of trips that would occur during construction activities. In addition, roads could require restoration following project construction.

BPA, in coordination with landowners, places gates at the entrances to access roads to prevent public access to private lands and the transmission line right-of-way. There also would be gates in fences that separate animals or denote property lines. Gate locks would be coordinated with the landowners to ensure that both BPA and the landowner could unlock the gates.

2.3.5 Vegetation Clearing

When vegetation grows or falls close to a transmission line it can cause an electrical arc that can start a fire, cause an outage of the line, or injure or kill someone. Tall vegetation cannot be allowed to grow within the transmission line right-of-way. Tall trees that grow outside of the right-of-way that could fall into the line must also be removed. In deep valleys with sufficient clearance, trees may be left in place. Most of the vegetation along the transmission line routes is low-growing sagebrush or agricultural crops; both are compatible with transmission lines. There are some areas along the routes where tall-growing vegetation is present (see Section 3.3 Vegetation and Map 3-5).

Vegetation is not allowed to grow in substation electric yards or in the 10-foot buffer around the yard because it could interfere with the operation of the ground mat. A ground mat is a metal grid buried under the soil to "ground" the electrical equipment of the substation. A plant growing up through the ground mat could provide another grounding path for electricity. If a person were to touch the plant during a fault in or near the substation, he or she could be electrocuted.

2.3.6 Final Design and Construction

Prior to actual construction of the proposed transmission line and substation, final design work would be completed to determine the precise location of all project components. To determine exact tower locations along a transmission line right-of-way, BPA collects terrain data primarily using LiDAR, a remote sensing technology employing eye-safe laser pulses originating from a helicopter or airplane, augmented as necessary by other terrain data collection methods such as photogrammetry and survey crews working on the ground. High-resolution aerial imagery is also collected to aid in tower siting. Towers are positioned during final design using the terrain data and aerial imagery to provide adequate conductor clearances above ground and avoid obstacles while generally minimizing the frequency, height, and impact of the towers. This same data is used to locate access roads. Engineers also use environmental information, known utility locations, and information from discussions with landowners to help determine tower and access road locations.

Typical Single-Circuit 500-kV Tower After Construction

Typically construction begins with right-of-way clearing. The right-of-way would be cleared of any vegetation that might hinder line safety or construction access. For this project, relatively little vegetation would be cleared because tall-growing species are only present in a few areas. Access roads then would be built or upgraded. Holes for tower footings would be dug with a trackhoe (drilling or blasting may also occur if rock is present) and footings would be put in place at each tower site. Towers would be either assembled at the tower site and lifted into place by a large crane (30- to 100-ton capacity) or assembled at a staging area and set in place by a large skycrane helicopter. The towers would then be bolted to the footings.

Next, the conductor would be strung from tower to tower through pulleys on the towers. A sock line (thick rope) would be placed in the pulleys and pulled through by a helicopter much smaller than the skycrane. A hard line (smaller wire than conductor) would be attached to the end of the sock line and pulled back to where the conductor reel is located. The hard line would be connected to a plate that holds the bundle of conductors (one for each phase), which would be pulled through the pulleys to the other end of the pull and secured by snubbing the conductors in the snub trenches. The fiber optic cable and ground wire would also be strung using a helicopter, with pulling sites on the ground to tighten the cable.

After the towers, conductors and fiber optic cable are installed, the construction contractor would remove construction equipment and debris and restore the disturbed areas. Soils used for agriculture in the temporary disturbance area that become compacted would be restored and reseeded after project construction to reestablish close to original conditions.

At the substation site, several construction activities would occur. The site would be excavated to bring the topography to grade. Once a layer of soil material is laid down, the ground mat, conduit for control cables, concrete foundations for all the high voltage equipment and structures would be installed.

After all the below grade work is completed, the above grade construction work would begin with the erection of the dead-end towers and aluminum pedestals to support the electrical bus. Then other support structures would be installed for the high voltage equipment. The high voltage equipment would be bolted on the support structures and connected to the electrical bus by a short length of conductor. Control cables would then be attached to the high voltage equipment and routed to the control house.

2.3.7 Construction Schedule and Work Crews

Construction of the project would take about 20 months. The transmission line and substation would be constructed by one or more construction crews. A typical transmission line construction crew for a 500-kV line consists of the following:

- 50-60 construction workers (70-100 at the peak of construction)
- 20 vehicles (pickups, vans)
- 3 bucket trucks
- 1 conductor reel machine
- 3 large excavators (bulldozers, backhoes)
- 1 line tensioner, 1 puller, 1 reel trailer
- 2 helicopters (small helicopter and skycrane; size dependent on lifting required)
- Large (210 ton) and mid-sized (50 ton) cranes
- Road construction equipment (dump trucks, rollers, graders, dozers, excavators)

A crew can typically construct about 10 miles of transmission line in about 4 months. Actual workforce numbers would vary over time, with about 100 workers as the largest number working on the project at one time.

If a decision is made to build the project, construction would likely begin in summer 2011 and the line would be energized and operating by February 2013. Work at the substations would start first, followed by construction of the line. For areas where the project would require work on existing transmission lines — such as at Knight Substation or for options that would require existing lines to be removed and rebuilt — construction would have to be scheduled for times when the existing lines are lightly used and electricity could be rerouted.

2.3.8 Maintenance

During the life of the project, BPA would perform routine, periodic maintenance, and emergency repairs on the transmission line. For lattice steel towers, maintenance usually involves replacing insulators.

BPA typically conducts routine inspection patrols of the 15,000-mile federal transmission system in the Pacific Northwest by helicopter. BPA has conducted routine inspection patrols for its existing transmission lines in the project vicinity by helicopter since 1950. Helicopter inspection of the new line would occur twice a year.

Patrols are essential to determine where line maintenance is needed and to ensure continued reliability of the transmission system. Helicopter teams look for damaged insulators, damaged support members, washed-out roads, hazardous vegetation, encroachments, and problems indicating that a repair may be needed. Aerial inspections typically are followed by annual ground inspections for each line. Maintenance vehicles would use access roads where established and maintenance workers would walk through agricultural fields when able to avoid damage to crops. If repairs are needed or in emergency situations, vehicles and equipment would need to drive through fields and could cause damage to crops, vegetation, and other property. BPA determines the damages and, if appropriate, ~~would~~ compensates landowners for these damages.

Vegetation also would be maintained along the line for safe operation and to allow access to the line. The project area would need little vegetation maintenance because most vegetation in the area is grass and other low-growing plants.

BPA's vegetation management along its facilities, including transmission lines, access roads and substations, would be guided by its Transmission System Vegetation Management Program EIS and Record of Decision (August 23, 2000) (BPA 2000a,b). BPA adopted an integrated vegetation management strategy for controlling vegetation along its transmission line rights-of-way. This strategy involves choosing the appropriate method for controlling the vegetation based on the type of vegetation and its density, the natural resources at a particular site, landowner requests or agreements, regulations, and costs. BPA may use a number of different methods: manual (hand-pulling, clippers, chainsaws), mechanical (roller-choppers, brush-hogs), biological (insects or fungus for attacking noxious weeds), and herbicides. Since there is little tall-growing vegetation in the project area and the vegetation is slow growing, there would be little vegetation maintenance required along the proposed line. Any tree removal would likely be individual trees cut with a chainsaw. The substation rock electrical yard would be treated with pre- and post-emergent herbicides to ensure the safety of workers and equipment. Herbicides used in substations would likely be applied in granular form or with a backpack sprayer to spot treat individual plants. As with any BPA herbicide use, label instructions for application rates and weather conditions would be adhered to, which would eliminate potential run-off or air drift issues.

Noxious weed control is also part of BPA's vegetation maintenance program. BPA works with the county weed boards and landowners on area-wide plans for noxious weed control. In the project area, BPA contracts with the Klickitat and Wasco county weed boards; the counties work with landowners to control noxious weeds along the rights-of-way. Prior to controlling vegetation, BPA would send notices to landowners and request information that might help in determining appropriate methods and mitigation measures (such as herbicide-free buffer zones around springs or wells).

2.3.9 Estimated Project Cost

The total estimated project cost ranges between $90-115 million depending on the routing alternative and tower option.

2.4 Proposed Action Alternatives

The proposed action alternatives consist of a combination of transmission line routes, substations, and fiber optic cable options. The following lists the project elements being considered (preferred project elements are noted).

Transmission Line Routes:

- West Alternative
- Middle Alternative
- East Alternative (preferred)

Substations:

- Improvements at Big Eddy Substation (common to all alternatives)
- Addition to Wautoma Substation (common to all alternatives)
- New Knight Substation at
  - Site 1 (preferred) or
  - Site 2

Fiber Optic Cable:

- Loop Back Option or
- Wautoma Option (preferred)

See Section 2.7 for representative views in the vicinity of the transmission line routes, the Big Eddy Substation, and the Knight Substation sites (see Figures 2-18 through 2-37).

2.4.1 Big Eddy Substation

All action alternatives begin at Big Eddy Substation. Big Eddy Substation would require a new 500-kV bay to connect the proposed line into the electrical system. All work would occur and all equipment would be installed within the existing electrical yard and control house. Installing new equipment would disturb about 1 acre of a previously disturbed area on the north side of the yard.

Existing BPA Transmission Lines in the Project Area

There are several existing transmission lines in the project area that may be referred to throughout this section of the EIS. Some of these connect to Big Eddy Substation (see Map 2-1):

- McNary-Ross—a 345-kV lattice steel line that crosses the West and Middle alternatives and parallels a portion of the East Alternative
- Harvalum-Big Eddy—a 230-kV lattice steel line that parallels a portion of the Middle and East alternatives
- John Day-Big Eddy—a 500-kV lattice steel line that runs east from Big Eddy Substation
- DC Test Line—a lattice steel line that runs northeast from Big Eddy Substation for about 5 miles; no longer used
- Spearfish Tap—a 115-kV wood-pole line that parallels a portion of the West Alternative
- Chenoweth-Goldendale—a 115-kV wood-pole line used by Klickitat PUD that parallels a portion of the West and Middle alternatives and crosses the East Alternative
- Big Eddy-Spring Creek—a 230-kV lattice steel line that parallels a portion of the Middle Alternative and crosses the East Alternative
- Wautoma-Ostrander—a 500-kV lattice steel line that runs across the Knight Substation Sites
- North Bonneville-Midway—a 230-kV lattice steel line located parallel to the Wautoma-Ostrander line

2.4.2 West Alternative

From Big Eddy Substation, the West Alternative route extends north within mostly vacant BPA right-of-way to the Columbia River. After crossing the Columbia River, this route heads west and then north, paralleling BPA's existing Spearfish Tap 115-kV wood-pole transmission line (see box and Map 2-1). The route then angles northeast next to BPA's existing Chenoweth-Goldendale 115-kV wood-pole line for about 12 miles, to a point just south of the Little Klickitat River.

At this point, the West Alternative turns east and continues to follow the Chenoweth-Goldendale line for about 4 miles. The route then separates from the existing line and heads straight north for about 4 miles to the connection with BPA's Wautoma-Ostrander transmission line at either proposed Knight Substation site. This alternative is about 27 miles long.

There are various right-of-way and tower combination options for the West Alternative. For the portion of line between Big Eddy Substation and the Columbia River (line mile W1-2 [see box]), BPA has an existing 125-foot-wide easement that presently does not have any transmission lines in it. If this existing right-of-way were used for the project, BPA would need an additional easement for 25 feet of right-of-way. The existing easement crosses over a shed that has been inadvertently built within the easement, and also is close to a barn; both structures would need to be removed. BPA is considering adjusting the line design to avoid removing these structures.

> **Line Mile References for Route Alternatives**
>
> References to specific areas on each route alternative refer to that specific alternative and the line mile of that alternative measured from Big Eddy Substation. Each alternative is distinguished by a letter - "W" for the West Alternative, “M” for the Middle Alternative, and “E” for the East Alternative. The line mile or range of line miles is given after the letter, for example, "W1" means West Alternative at line mile 1; M1 means Middle Alternative at line mile 1, etc. Longer segments are identified with a line mile range such as W1-5 (West Alternative, between line miles 1 and 5). Where alternatives share the same corridor, multiple letters are used, such as ME3-6 (Middle and East alternatives, between line miles 3 and 6).

A 1.5-mile section of the West Alternative (line mile W4-5) would parallel the Spearfish Tap 115-kV line. The existing right-of-way along this line is 450 feet wide and would accommodate a proposed transmission line to the west without additional right-of-way.

BPA is also considering building the line as a double-circuit line for the first 5 miles from Big Eddy Substation. This would take the line across the Columbia River and up to BPA’s Spearfish Tap line. The double-circuit line in this area would be available for a possible future line, eliminating the need for another Columbia River crossing if a future line were built in the area.

Where the West Alternative would follow the Chenoweth-Goldendale line (line miles W6-22), the proposed line could either be built parallel (adjacent) to the existing line in new 150-foot-wide right-of-way or the Chenoweth-Goldendale line could be removed and the proposed line could be built in the existing 100-foot-wide right-of-way, with BPA needing to purchase an additional 50 feet of right-of-way.

Klickitat County Public Utility District (PUD) uses the Chenoweth-Goldendale line as a back-up power source during outages to its main line. ~~to serve its Goldendale Substation~~. If the line were to be removed, the operational impacts to the PUD would be considered.

Also being considered is the option of rebuilding the Chenoweth-Goldendale line as a double-circuit line to carry both the proposed Big Eddy-Knight line and the existing Chenoweth-Goldendale line.

In locations where the West Alternative does not parallel other lines, or where there is no existing easement, the line would require a new 150-foot-wide right-of-way.

With different tower type and right-of-way use possibilities, there are several combinations that create options for the West Alternative (see Table 2-2 and Figures 2-6 through 2-12).

Table 2-2. West Alternative Options—Tower Configurations by Line Mile

Option	Description
West Option 1	**Single-circuit towers** for the entire route (see Figure 2-6), including: • Use existing vacant right-of-way (W0-2) • Parallel to the existing Spearfish Tap line (W3.8-4.9) (see Figure 2-7) • Parallel to the existing Chenoweth-Goldendale (W5.7-22.5) (see Figure 2-8)
West Option 2	**Single-circuit towers** from Big Eddy Substation to intersection with Chenoweth-Goldendale line (W0-5.7) (see Figure 2-6), including: • Parallel to the existing Spearfish Tap line (W3.8-4.9) (see Figure 2-7) **Double-circuit towers** (Big Eddy-Knight and the Chenoweth-Goldendale line) (W5.7-22.5) with removal of the existing structures along this portion (see Figure 2-9) **Single-circuit towers** for the remainder of the route (W22.5 to Knight Substation) (see Figure 2-6)
West Option 3	**Single-circuit towers** for the entire route (see Figure 2-6), including: • Parallel to the existing Spearfish Tap line (W3.8-4.9) (see Figure 2-7) • Removal of the existing Chenoweth-Goldendale line along this portion (W5.7-22.5) and build Big Eddy-Knight line in its place (see Figure 2-10)
West Option 4	**Double-circuit towers** from Big Eddy Substation (Big Eddy-Knight and possible future line) to end of the Spearfish Tap (W0-4.9) (see Figure 2-11), including: • Parallel to the existing Spearfish Tap line along this portion (W3.8-4.9) (see Figure 2-12) **Single-circuit towers** for the remainder of the route (W4.9 to Knight Substation) (see Figure 2-6), including: • Parallel to the existing Chenoweth-Goldendale line (W5.7-22.5) (see Figure 2-8)
West Option 5	**Double-circuit towers** from Big Eddy Substation (Big Eddy-Knight and possible future line) to end of the Spearfish Tap (W0-4.9) (see Figure 2-11), including: • Parallel to the existing Spearfish Tap line along this portion (W3.8-4.9) (see Figure 2-12) **Single-circuit towers** from the Spearfish Tap to intersection with Chenoweth-Goldendale line (W4.9-5.7) (see Figure 2-6) **Double-circuit towers** (Big Eddy-Knight and the Chenoweth-Goldendale line (W5.7-22.5) with removal of existing Chenoweth-Goldendale structures along this portion (see Figure 2-9) **Single-circuit towers** for the remainder of the route (W22.5 to Knight Substation) (see Figure 2-6)
West Option 6	**Double-circuit towers** from Big Eddy Substation to end of the Spearfish Tap (W0-4.9) (see Figure 2-11), including: • Parallel to the existing Spearfish Tap line along this portion (W3.8-4.9) (see Figure 2-12) **Single-circuit towers** for the remainder of the route (W4.9 to Knight Substation) with removal of the existing Chenoweth-Goldendale line along this portion (W5.7-22.5) (see Figure 2-6)

Figure 2-6. Proposed Single-Circuit Tower (West, Middle and East Alternatives)

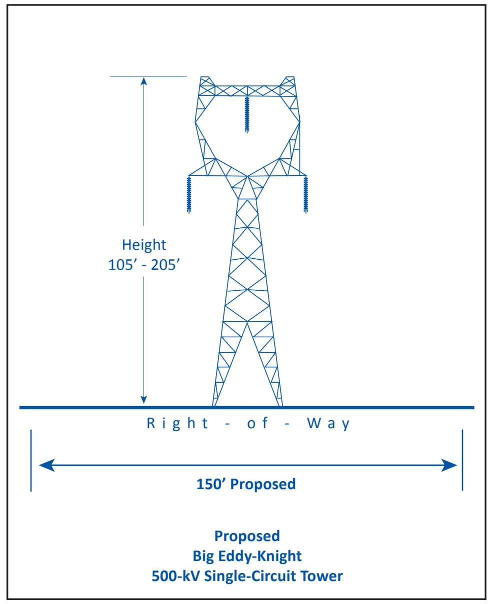


Figure 2-7. Proposed Single-Circuit Tower Parallel to the Spearfish Tap Line (West Alternative)

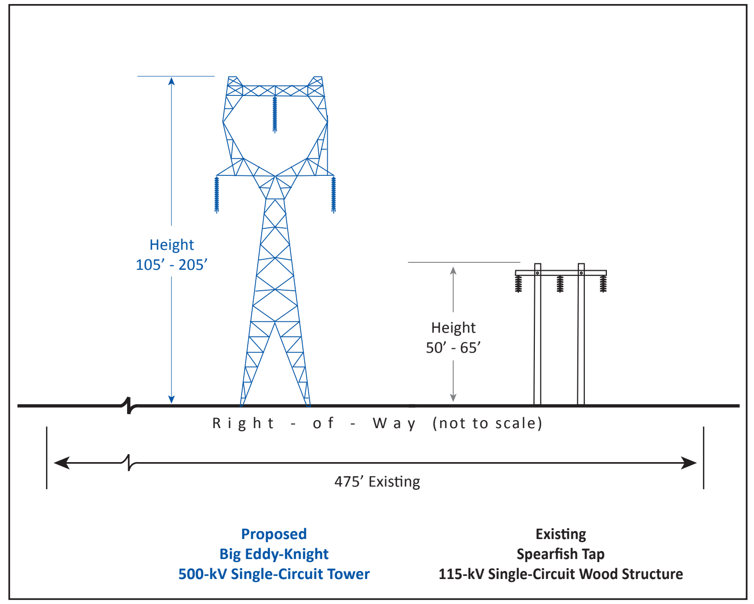


Figure 2-8. Proposed Single-Circuit Tower Parallel to the Chenoweth-Goldendale Line (West and Middle Alternatives)

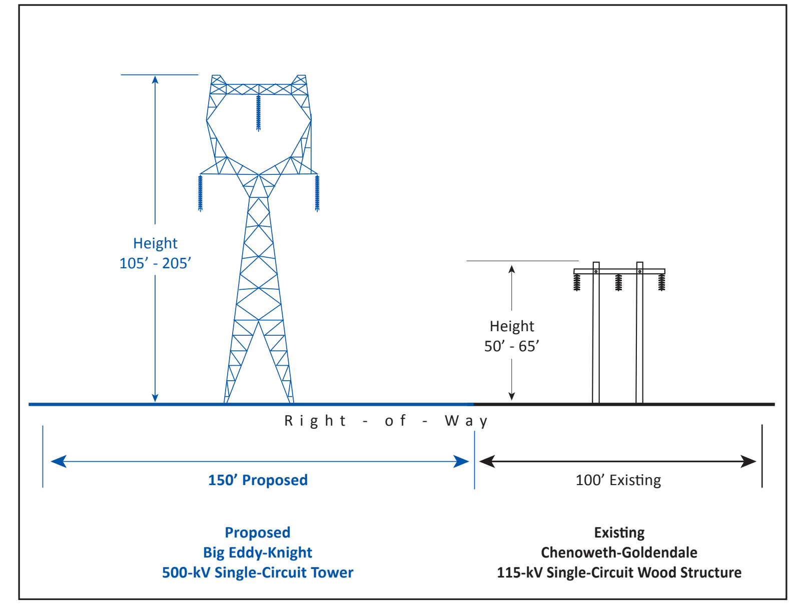


Figure 2-9. Proposed Double-Circuit Tower with the Chenoweth-Goldendale Line (West Alternative)

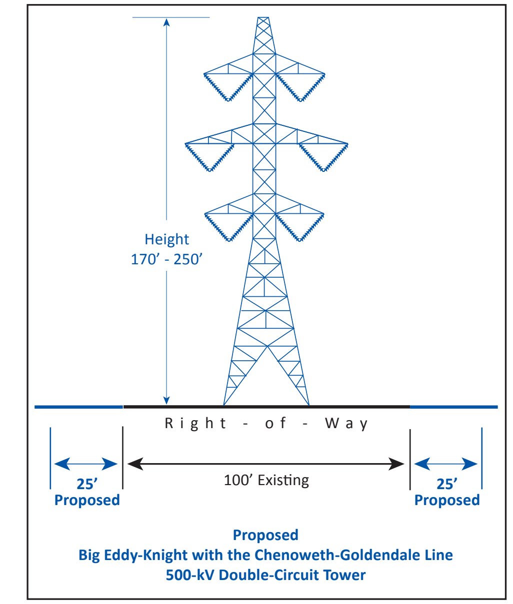


Figure 2-10. Proposed Single-Circuit Tower with the removal of the Chenoweth-Goldendale Line (West Alternative)

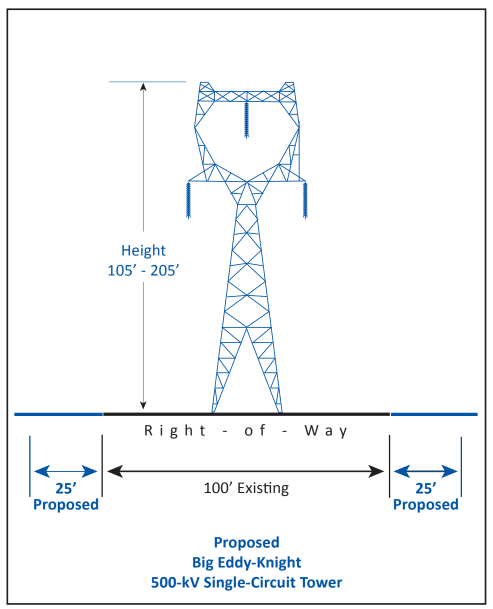


Figure 2-11. Proposed Double-Circuit Tower (West Alternative)

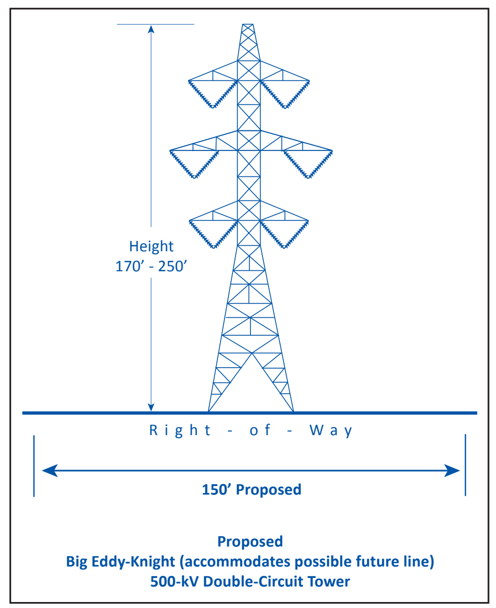


Figure 2-12. Proposed Double-Circuit Tower Parallel to the Spearfish Tap Line (West Alternative)

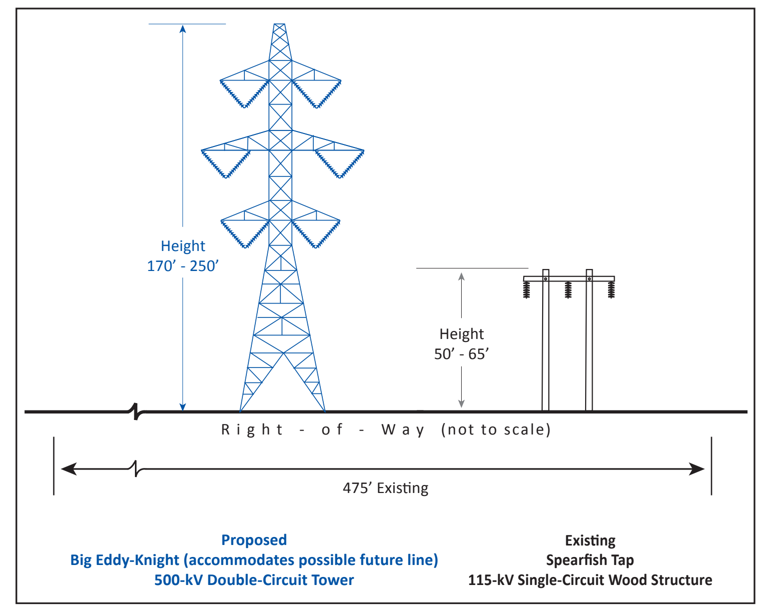


Figure 2-13. Proposed Single-Circuit Tower Parallel to the Harvalum-Big Eddy Line (Middle and East Alternatives)

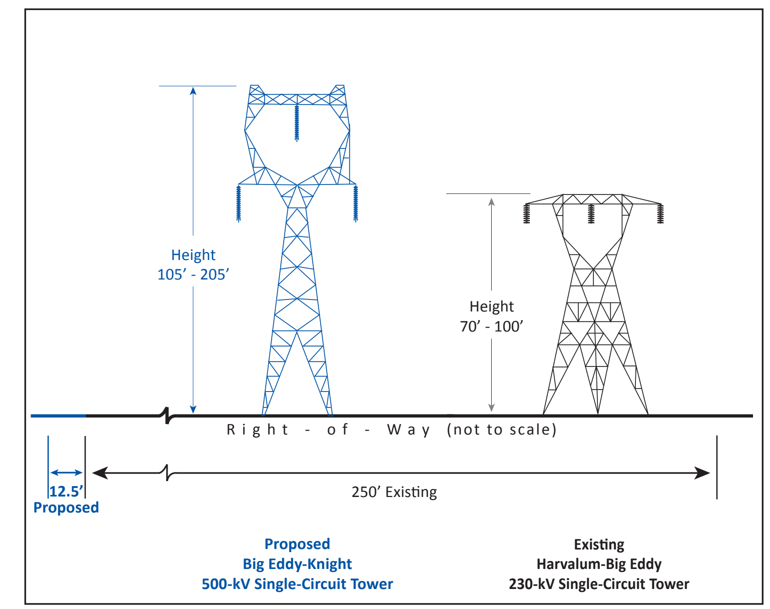


Figure 2-14. Proposed Double-Circuit Tower with the Harvalum-Big Eddy Line (Middle and East Alternatives)

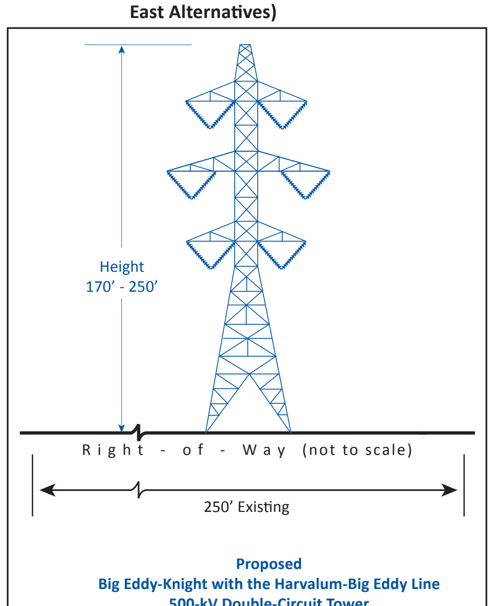


Figure 2-15. Proposed Single-Circuit Tower Parallel to the Big Eddy-Spring Creek Line (Middle Alternative)

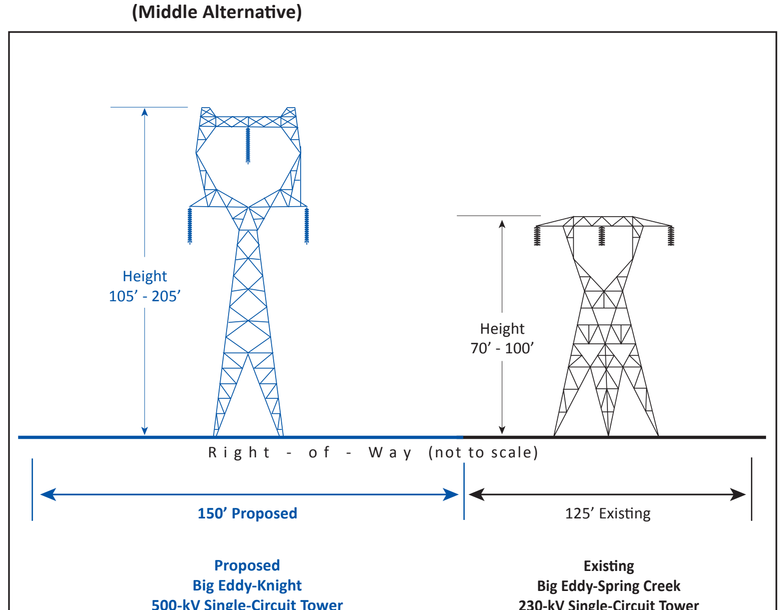


Figure 2-16. Proposed Single-Circuit Tower Parallel to the McNary-Ross and Harvalum-Big Eddy Lines (East Alternative)

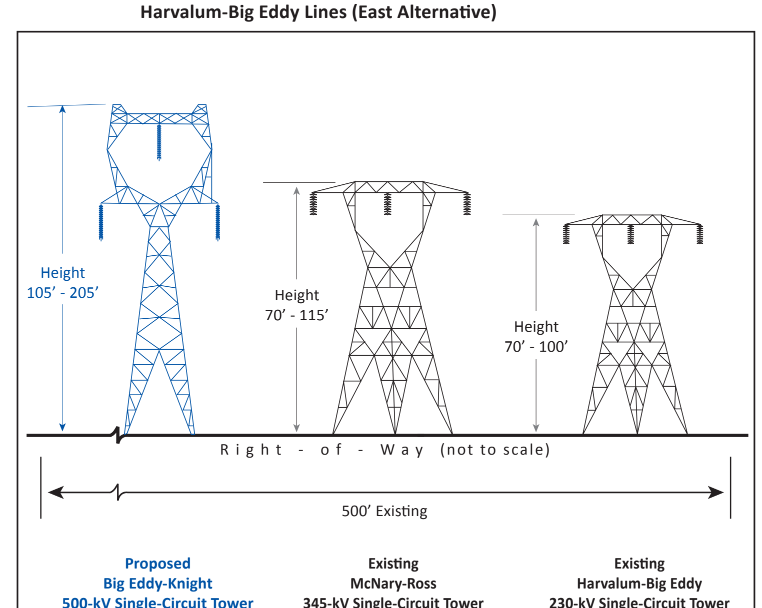
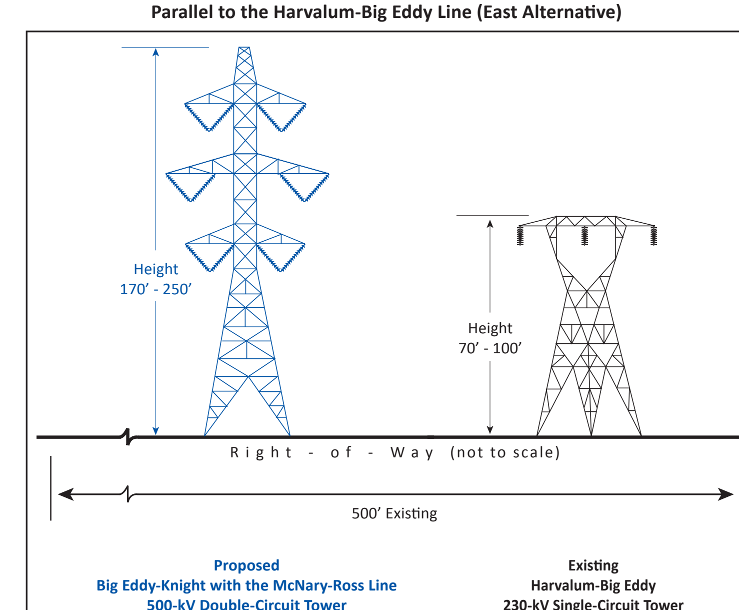


Figure 2-17. Proposed Double-Circuit Tower with the McNary-Ross Line Parallel to the Harvalum-Big Eddy Line (East Alternative)



The West Alternative's span across the Columbia River is about 4,167 feet long. The towers on either side of the river would have to be tall enough to keep the lowest part of the conductors a safe distance above the river (safety clearances are determined on a case-by-case basis). The height of the river crossing towers would depend on the terrain, the span, and whether single-circuit or double-circuit towers are used. On the Oregon side of the river, the towers would be about 365 feet tall if single-circuit towers are used and 433 feet tall if double-circuit towers are used. On the Washington side of the river, the towers would be about 401 feet tall for single circuit towers and about 438 feet tall for double-circuit towers. The entire length of the line would have overhead ground wire and counterpoise.

Although the project area in general has few trees, the West Alternatives would cross over several groves. Based on preliminary estimates, about 93-130 trees would need to be removed for the West Alternative (see Section 3.3 Vegetation and Map 3-5).

About ~~40~~ 36 miles of access roads would be needed for the West Alternative (see Table 2-3). Access roads would be a combination of new access roads, temporary roads (through cropland), improved existing BPA access roads (where the proposed alternative would parallel existing lines), and improved county roads (roads needing improvement because they are impassible when wet). See Appendix B for a map that shows proposed roads.

Table 2-3. Estimated Access Road Needs By Action Alternative

Road Needs	West Alternative	Middle Alternative	East Alternative
New Road (miles)	~~21~~ 18	~~19~~ 20	16
Temporary Road (miles)	3	~~3~~ 7	~~5~~ 9
Improve Existing Access Road (miles)	~~11~~ 15	~~15~~ 13	~~16~~ 13
~~**Improve County Road (miles)**~~	~~5~~	~~0~~	~~0~~
Total Roads needed (miles)	~~40~~ 36	~~37~~ 40	~~37~~ 38
Culverts[1]	~~25~~ 64	~~28~~ 50	~~30~~ 62
Potential Areas of Cut and Fill	None	Line Miles ME4-10, M10-14	Line Miles ME4-10, E10-15

[1] Although the number of stream crossings has decreased through more detailed design, it has been determined that in many locations more than one culvert would be needed.

~~There are three county roads that would need improvement as part of the access road system for For the West Alternative, the county roads are Ahola Ridge Road (from Horseshoe Bend Road south to Finn Ridge Road), Finn Ridge Road (from Harms Road to Ahola Ridge Road), and Palomino Drive (from Horseshoe Bend Road north).~~ For the West Alternative, the following county roads would likely require improvements for project construction vehicles: Dalles Mountain, Oak Creek, Harms, Randall, Niva, Finn Ridge, Ahola, Anderson, Horseshoe Bend, Olson, Esteb, Knight, Fish Hatchery, and Butts roads, and Centerville Highway.

Roads for the West Alterative would ~~require about 25 culverts where they would~~ cross about 26 intermittent streams which would require approximately 64 culverts. The terrain along the West Alternative is not as steep as the Middle and East alternatives; access roads for the West Alternative would not likely require cut and fill into hillsides during construction.

2.4.3 Middle Alternative

Like the West Alternative, the Middle Alternative begins at BPA's existing Big Eddy Substation, with the same substation improvements as described for the West Alternative. From Big Eddy Substation, the Middle Alternative route extends east and slightly north in existing right-of-way next to BPA's existing Harvalum-Big Eddy 230-kV lattice steel transmission line for about 7 miles before crossing the Columbia River. The route crosses the river just west of the Harvalum-Big Eddy line near Wishram, Washington, and continues to parallel this existing line for about 1.5 miles before heading north in new right-of-way.

The Middle Alternative then heads generally north for about 15 miles to the Knight Substation sites, with two jogs east along the way – one for about 1.5 miles along BPA's existing Big Eddy-Spring Creek 230-kV lattice steel transmission line, and the other for about 2 miles partially along BPA's existing Chenoweth-Goldendale line. This alternative is about 27 miles long.

There are various right-of-way and tower combination options for the Middle Alternative. As the Middle Alternative exits Big Eddy Substation, it would cross BPA property that surrounds the substation until it meets up with the existing Harvalum-Big Eddy transmission line. The Harvalum-Big Eddy line has extra right-of-way and building the proposed line on the west side of it would only require an additional 12.5 feet of right-of-way. BPA is also considering removing the Harvalum-Big Eddy line through this section (line mile ME1-9) and rebuilding the line with double-circuit towers to carry both the existing and proposed line. No new right-of-way would be required for the double-circuit tower option. However, for the double-circuit option, BPA is also considering moving an about 1-mile long section of the line near ME7 to the west so the river crossing tower on the Oregon side would be west of the existing crossing by about 1,000 feet (see potential route adjustment on Map 2-1). Changing this section, which is within the boundary of the National Scenic Area, would abandon the existing Columbia River crossing for the Harvalum-Big Eddy Line and establish a new combined corridor (of equal width) for this existing line and the proposed line. The termination point of the river crossing on the Washington side of the river would remain unchanged.

Where the Middle Alternative parallels the existing Big Eddy-Spring Creek and Chenoweth-Goldendale lines, the proposed line would be on the north side of the existing lines in new 150-foot-wide right-of-way.

In locations where the Middle Alternative does not parallel other lines, the line would require a new 150-foot-wide right-of-way.

With different tower type and right-of-way use possibilities, there are several combinations that create options for the Middle Alternative (see Table 2-4 and Figures 2-6, 2-8, and 2-13 to 2-15).

The Middle Alternative's span across the Columbia River is about 4,551 feet long. The towers on either side of the river would have to be tall enough to keep the lowest part of the conductors a safe distance above the river (safety clearances are determined on a case-by-case basis). The height of the river crossing towers would depend on the terrain, the span, and whether single-circuit or double-circuit towers are used. On the Oregon side of the river, the towers would be about 282 feet tall if single-circuit towers are used and 407 feet tall if double-circuit towers are used. On the Washington side of the river, the towers would be about 173 feet tall for single circuit towers and about 232 feet tall for double-circuit towers. The entire length of the line would have overhead ground wire and counterpoise.

There are few trees along the Middle Alternative. Based on preliminary estimates, about 14–26 trees would require removal for this alternative (see Section 3.3 Vegetation and Map 3-5).

About ~~37~~ 40 miles of access road would be needed for the Middle Alternative (see Table 2-3). The access roads would be a combination of new roads, temporary roads (through cropland), ~~and~~ improved existing BPA access roads (where the proposed alternative would parallel existing lines), and various county roads. ~~No county roads would be improved for the Middle Alternative.~~ For the Middle Alternative, the following county roads would likely require improvements for project construction vehicles: Dalles Mountain, Woods, Olson, Finn Ridge, Anderson, Horseshoe Bend, Esteb, Knight, Fish Hatchery, and Butts roads, and Centerville Highway.

Table 2-4. Middle Alternative Options—Tower Configurations by Line Mile

Tower Option	Description
Middle Option 1	**Single-circuit towers** for the entire route (see Figure 2-6), including: • Parallel to the existing Harvalum-Big Eddy line (M0.4-9.2) (see Figure 2-13) • Parallel to the Chenoweth-Goldendale line (M20-22.5) (see Figure 2-8) • Parallel to the existing Big Eddy-Spring Creek line (M11-12.5) (see Figure 2-15)
Middle Option 2	**Single-circuit towers** from Big Eddy Substation within the National Scenic Area boundary (M0-0.8), outside the National Scenic Area to the boundary with the National Scenic Area (M0.8-6.5) (see Figure 2-6) **Double-circuit towers** within the National Scenic Area (Big Eddy-Knight and the Harvalum-Big Eddy) (M6.5-9.2) with removal of existing Harvalum-Big Eddy towers along this portion (see Figure 2-14) **Single-circuit towers** for the remainder of the route (M9.2 to Knight Substation) (see Figure 2-6), including: • Parallel to the existing Big Eddy-Spring Creek line (M11-12.5) (see Figure 2-15) • Parallel to the Chenoweth-Goldendale line (M20-22.5) (see Figure 2-8)
Middle Option 3	**Single-circuit towers** from Big Eddy Substation to the intersection with the Harvalum-Big Eddy line (M0-0.4) (see Figure 2-6) **Double-circuit towers** to end of overlap with the Harvalum-Big Eddy line (Big Eddy-Knight and the Harvalum-Big Eddy) (M0.4-9.2) with removal of existing Harvalum-Big Eddy towers along this portion (see Figure 2-14) **Single-circuit towers** for the remainder of the route (M9.2 to Knight Substation) (see Figure 2-6), including: • Parallel to the existing Big Eddy-Spring Creek line (M11-12.5) (see Figure 2-15) • Parallel to the Chenoweth-Goldendale line (M20-22.5) (see Figure 2-8)

Access roads for the Middle Alternative ~~About 28 culverts would be needed where access roads~~ would cross about 20 intermittent streams that would require about 50 culverts. On either side of the Columbia River and where the Middle Alternative climbs over the Columbia Hills, the terrain is steep in areas and access road construction would likely require cut banks to keep road grades gentle enough for trucks and equipment to ascend (see Table 2-3 for line mile locations).

2.4.4 East Alternative (Preferred)

From Big Eddy Substation, the East Alternative route follows the same path as the Middle Alternative for about the first 9 miles to a point just north of Wishram, at which point the routes separate. The East Alternative continues east next to two existing BPA lines that parallel each other – BPA's Harvalum-Big Eddy 230-kV lattice steel line and BPA's McNary-Ross 345-kV lattice steel line – for an additional 5 miles before turning north in new right-of-way. The East Alternative then generally runs north for about 14 miles to the proposed Knight Substation sites. This alternative is about 28 miles long.

The East Alternative is BPA's Preferred Alternative.

There are various right-of-way and tower combination options for the East Alternative. Because the East Alternative follows the same route as the Middle Alternative for the first 9 miles, it would require the same amount of right-of-way and have the same tower options as the Middle Alternative (i.e., exit Big Eddy Substation on BPA land; be located to the west of the Harvalum-Big Eddy line with a new 12.5 foot wide right-of-way; and/or be built double-circuit with the Harvalum-Big Eddy line in existing right-of-way). As with the Middle Alternative, it would also include the possibility of moving an about 1-mile-long section of the line near ME7 to the west so the river crossing tower on the Oregon side would be west of the existing crossing by about 1,000 feet. Changing this section, which is within the boundary of the National Scenic Area, would abandon the existing Columbia River crossing for the Harvalum-Big Eddy Line and establish a new combined corridor (of equal width) for this existing line and the proposed line. The termination point of the river crossing on the Washington side of the river would remain unchanged.

At Wishram where the East Alternative continues east and the McNary-Ross line joins the transmission corridor, the proposed line could be built as a single-circuit line running parallel on the north side of the existing lines. The existing corridor has extra right-of-way that would accommodate the proposed line; no additional right-of-way would be required. BPA is also considering removing the McNary-Ross line through this section (line mile E9-14) and rebuilding the line with double-circuit towers to carry both the existing and proposed line. As with the single-circuit option, no new right-of-way would be required for the double-circuit tower option in this section (E9-14).

With different tower type and right-of-way use possibilities, there are several combinations that create options for the East Alternative (see Table 2-5 and Figures 2-6, 2-13, 2-14, 2-16, and 2-17). East Alternative Option 3 is the preferred option along with the potential route adjustment at ME7.

The East Alternative would have the same river crossing towers as the Middle Alternative. The span across the Columbia River at this location is about 4,551 feet long. The towers on either side of the river would have to be tall enough to keep the lowest part of the conductors a safe distance above the river (safety clearances are determined on a case-by-case basis). The height of the river crossing towers would depend on the terrain, the span, and whether single-circuit or double-circuit towers are used. On the Oregon side of the river, the towers would be about 282 feet tall if single-circuit towers are used and 407 feet tall if double-circuit towers are used. On the Washington side of the river, the towers would be about 173 feet tall for single circuit towers and about 232 feet tall for double-circuit towers. The entire length of the line would have overhead ground wire and counterpoise.

There are few trees along the East Alternative. Based on preliminary estimates, about 6-16 trees would be removed for this alternative (see Section 3.3 Vegetation and Map 3-5).

About ~~37~~ 38 miles of access roads would be needed for the East Alternative (see Table 2-3). Access roads would be a combination of new roads, temporary roads (through cropland), ~~and~~ improved existing BPA access roads (where the proposed alternative would parallel existing lines) and various county roads. ~~No county roads would be improved for the East Alternative.~~ For the East Alternative, the following county roads would likely require improvements for project construction vehicles: Dalles Mountain, Oak Creek, Harms, Randall, Niva, Finn Ridge, Aloha, Anderson, Horseshoe Bend, Olson, Esteb, Knight, Fish Hatchery, and Butts roads, and Centerville Highway.

Access roads for the East Alternative ~~About 30 culverts would be needed where access roads~~ would cross about 24 intermittent streams, which would require about 62 culverts. On either side of the Columbia River and where the East Alternative climbs over the Columbia Hills, the terrain is steep in areas and access road construction would likely require cut banks to keep road grades gentle enough for trucks and equipment to ascend (see Table 2-3 for line mile locations).

Table 2-5. East Alternative Options—Tower Configurations by Line Mile

Tower Option	Description
East Option 1	**Single-circuit towers** for the entire route (see Figure 2-6), including: • Parallel to the existing Harvalum-Big Eddy line (E0.4-9.2) (see Figure 2-13) • Parallel to the existing Harvalum-Big Eddy line (E9.2-14) and McNary-Ross line (E9.2-14) (see Figure 2-16)
East Option 2	**Single-circuit towers** from Big Eddy Substation within the National Scenic Area boundary (E0-0.8), outside the National Scenic Area to the boundary with the National Scenic Area (E0.8-6.5) (see Figure 2-6) **Double-circuit towers** within the National Scenic Area (Big Eddy-Knight and the Harvalum-Big Eddy line) (E6.5-9.2) with the removal of existing Harvalum-Big Eddy towers along this portion (see Figure 2-14) **Double-circuit towers** within the National Scenic Area (Big Eddy-Knight and the McNary-Ross line) (E9.2-14) with removal of existing McNary-Ross towers along this portion. This portion also parallels the existing Harvalum-Big Eddy line (E9.2-14) (see Figure 2-17) **Single-circuit towers** for the remainder of this route (E14 to Knight Substation) (see Figure 2-6)
East Option 3 (Preferred)	**Single-circuit towers** from Big Eddy Substation to the intersection with the Harvalum-Big Eddy line (E0-0.4) (see Figure 2-6) **Double-circuit towers** to end of overlap with the Harvalum-Big Eddy line (Big Eddy-Knight and the Harvalum-Big Eddy) (E0.4-9.2) with removal of existing Harvalum-Big Eddy towers along this portion (see Figure 2-14) **Double-circuit towers** where the proposed line parallels the existing McNary-Ross line (Big Eddy-Knight and the McNary Ross line) (E9.2-14) with removal of existing McNary-Ross towers along this portion. This portion also parallels the existing Harvalum-Big Eddy line (E9.2-14) (see Figure 2-17) **Single-circuit towers** for the remainder of this route (E14 to Knight Substation) (see Figure 2-6)

2.4.5 Knight Substation Options

Each of the action alternatives would connect to BPA's Wautoma-Ostrander transmission line at the proposed Knight Substation. Two site options have been identified for this proposed substation, and all three alternatives could use either option. The proposed substation sites are located in an area under the Wautoma-Ostrander line that is at the optimum electrical distance from BPA's Big Eddy, Wautoma and Ostrander substations. This location would provide the maximum electrical system performance for a connection to the Wautoma-Ostrander line and the proposed Big Eddy-Knight line. The new substation would redistribute the flow of electricity across a number of BPA's high-voltage transmission lines, provide additional capacity on those lines, and increase reliability of the transmission system.

Knight Substation would ~~require about 30 acres and would be an enclosed 10~~ a fenced 22-acre facility. As is typical when building new high-voltage substations, BPA would acquire ~~have~~ additional land ~~available~~ for site design flexibility to accommodate potential future substation needs. The substation would be located under the transmission line corridor that contains BPA's Wautoma-Ostrander 500-kV and North Bonneville-Midway 230-kV lines.

The substation would have three electrical bays: two for the existing lines to connect to and one for the Big Eddy-Knight line. (Please see Section 2.3 Project Components, for a description of equipment within a substation.) The electrical yard would have room for four additional bays for possible future lines.

The station control house would be a 170-foot by 49-foot concrete block building that would stand about 15 feet tall. Because the substation sites are somewhat hilly, the substation would be terraced. The substation would require excavation of about ~~250,000~~ 147,000 cubic yards of soil. Depending on the substation site, the soil would either be stockpiled on the substation property or hauled to an approved off-site landfill.

The substation would include a stormwater retention system. The pond would have a water surface area of about 38,000 square feet, and a depth that varies between 1.5 feet and 10 feet. The pond would be sized to detain the 100-year Type 2 storm event in accordance with Ecology 's requirements for eastern Washington. ~~The system would include a pond, which would occupy about 1 acre and have a volume of about 3 acre-feet.~~

Local electrical station service to Knight Substation would be provided by Klickitat County PUD. A new wood pole line would be routed south from Pine Forest Road down Knight Road for about 1.3 miles. ~~a half mile~~ About 25–30 wood poles would be needed. The poles would be about 50–60 feet tall with spans of 300–400 feet. Just north of the existing transmission line corridor, the PUD line would turn west and follow a proposed substation access road on DNR property along the northern property boundary. In this area the PUD line would likely be underground.

To protect Knight Substation from potential lightning strikes, overhead ground wire and counterpoise would need to be installed on the Wautoma-Ostrander line for about 1 mile on either side of the substation (see **Overhead Ground Wire and Counterpoise** in Section 2.3.2). A new dead-end tower would be required on either end of the ground wire: one just west of Hill Road, and one east of Pine Forest Road (see Map 2-2). Depending on the season of construction, a temporary access road may need to be built along the line to install the ground wire and counterpoise. All work would be within the existing BPA right-of-way, which, in this area, is owned in fee by BPA except for the portion that crosses DNR land.

Knight Substation Site 1 (Preferred)

Knight Substation Site 1 would be on private property about 0.5 mile west of Knight Road. The property has gentle rolling terrain and is currently being farmed, but is for sale. Because siting the substation on the property would likely sever it from the remaining ownership and agricultural use, 80 acres would likely be purchased (the parcel is 80 acres, but BPA presently owns 8 acres of it for the right-of-way of the existing lines crossing through it).

The approximately 147,000 cubic yards of soil excavated from Substation Site 1 would be spread on about 19 acres of the property just north of the substation. The soil would be spread to match the existing property contours, would not exceed 12 percent grade, and would raise the site ground level by about 4 feet. Excavated topsoil would be placed on top of the spread soil to ensure productivity of the area.

Construction at Substation Site 1 ~~would~~ could require a 1 mile temporary access road, from ~~likely off~~ Hill Road east along the existing transmission line right-of-way to the substation site. ~~from the west, Butts Road from the south, or from Pine Forest Road from the north. These county roads may~~ About 1 mile of Hill Road (from Butts Road to the Wautoma-Ostrander line) would require upgrading (grading and gravel). Permanent access ~~would be~~ required for operations after construction would come ~~likely~~ from Knight Road across the northern boundary of the DNR property and south into the substation. The road would be about 1 mile long (see Map 2-2 and Section 2.3.4). The Big Eddy-Knight line would approach the substation from the south across private property.

Knight Substation Site 2

Knight Substation Site 2 would be designed and built in the same manner as Site 1. Site 2 is next to Site 1 on a 544-acre parcel, owned by DNR, which abuts the west side of Knight Road.

The parcel is in the Conservation Reserve Program (CRP) and in dryland grain production. BPA would purchase a 30-acre portion of the parcel.

Less soil would have to be excavated for Substation Site 2 than for Site 1. The soil excavated from Substation Site 2 would be hauled off site. Site 2 would be accessed from the east off Knight Road as described above for the Substation Site 1 permanent access road. The proposed line would approach the substation from the south along DNR property.

2.4.6 Wautoma Substation

To support and enhance the electrical system with the addition of the proposed Big Eddy-Knight transmission line and Knight Substation, equipment would need to be installed at BPA's Wautoma Substation in Benton County, Washington (see Map 1-1). The equipment would be needed to neutralize inductive reactance in long transmission lines that can raise the voltage level. The equipment would include a 500-kV shunt reactor (about 25 feet by 32 feet by 42 feet) to bring the voltage level back to normal conditions, as well as power circuit breakers and disconnect switches. It would require a 175-foot by 150-foot expansion of the existing electrical yard, all within BPA property. Two metal halide 250W floodlights would be mounted on a monopole. They would be operated by an electrical switch only when personnel are on site. No additional personnel would be needed. The reactor addition would be connected to the existing drainage system.

Construction crews of 10–15 people would use heavy loaders, excavators, and cranes during a construction period of 4–5 months. Excavation of the site would be to a maximum depth of 10 feet. About 75,000 cubic feet of backfill would be excavated from the site. Once the foundation is poured, this excavated material would be used for fill and any excess material would be disposed off-site. About 125 feet of transmission line access road would need to be rerouted to the edge of BPA's property boundary.

2.4.7 Fiber Optic Cable Options

All three action alternatives would require installation of fiber optic cable for system communications. Two options have been identified for routing this cable: a Loop Back Option and a Wautoma Option. All three alternatives could use either fiber optic cable option.

Loop Back Option

The proposed transmission line would require a fiber optic cable for communications between substations (see **Fiber Optic Cable** in Section 2.3.2). The fiber optic cable needed for electrical system communications would be strung on the proposed transmission line towers from Big Eddy Substation north to Knight Substation. Fiber must make a complete loop with other fiber networks to function. For this option, the cable would be strung on the proposed new transmission towers, then another cable would be run south to Big Eddy Substation on the new towers to form a loop. The two cables would be separated by about 10 feet (attached on opposite sides of the tower). Cable installation would occur concurrently with construction of the new transmission line.

Wautoma Option (Preferred)

In this option only one fiber optic cable would be strung on the new towers from BPA's Big Eddy Substation north to Knight Substation. Instead of returning a second cable to Big Eddy Substation, however, the fiber optic cable would be strung from Knight Substation to Wautoma Substation on the existing transmission towers that support BPA's Wautoma-Ostrander transmission line. The cable would extend northeast for about 72 miles on this existing line to BPA's existing Wautoma Substation in northwest Benton County, Washington (see Map 1-1). Every 3 to 5 miles a splice box would be installed and a reeling site established to string and put tension on the cable. About 16 splice boxes would be placed on the transmission towers or in the ground adjacent to the towers. At each site, about 0.25 acre of ground in line with the conductors within the existing right-of-way would be temporarily disturbed by a reeling truck and tensioning equipment.

Equipment used along the route would consist primarily of standard utility equipment, such as bucket trucks, light duty trucks, cranes, four-wheel drive pickup trucks, line truck with pulling and tensioning reel, helicopter, and all-terrain vehicles. Use of helicopters and/or loud equipment would be minimized before 8 a.m. or after dusk to avoid disturbing landowners. All utility equipment would stay within the right-of-way and use existing access roads. There would be no staging areas.

Because the fiber optic cable under this option would be installed on existing towers, cable installation would be expected to proceed relatively quickly. Typically, fiber optic crews can install about 5–10 miles of cable per week, depending on terrain. Installation of the cable under the Wautoma Option would be expected to take from 2–4 months, with most installation activities at a given location along the line completed in about a day.

Some work would also take place at local substations. Two concrete vault boxes (4 feet x 4 feet x 4 feet) would be installed outside the yard at Knight and Wautoma substations. Other fiber optic equipment needed as part of the communications network would also be installed within existing substation yards. Existing access roads would be used for construction.

The Wautoma Option would optimize the transmission communications system by creating a large communication loop that could be used by multiple substations.

2.5 No Action Alternative

Under the No Action Alternative, BPA would not build the proposed Big Eddy-Knight transmission line, Knight Substation, or install fiber optic cable. Without building these facilities, BPA would be unable to provide long-term firm transmission service for the service requests that the proposed line is intended to accommodate. However, BPA may be able to provide other forms of transmission service to some of these customers, such as non-firm transmission service (non-firm is not guaranteed to be available and is only available after commitments for firm service have been met).

2.6 Alternatives Considered but Eliminated from Detailed Study

BPA has considered a number of potential alternatives to the Proposed Action. These include alternatives developed by BPA based on its knowledge of and experience in transmission line design and possible environmental issues, as well as alternatives that either were suggested or responded to concerns raised during the scoping process for this EIS. For each potential alternative, BPA assessed whether the alternative was reasonable under NEPA and thus merited detailed evaluation in this EIS, or was unreasonable and could be eliminated from detailed study.

BPA considered several factors in making this assessment of potential alternatives. BPA considered whether the potential alternative would meet the identified need for the Proposed Action and achieve the project's purposes (see Section 1.3). In addition, BPA considered whether the alternative would be practical and feasible from a technical and economic standpoint and using common sense, consistent with CEQ guidance on assessing the reasonableness of alternatives. Finally, BPA considered whether an alternative would have obviously greater adverse environmental effects than the Proposed Action. The alternatives that did not meet these considerations and were eliminated from detailed study in this EIS are described in this section.

2.6.1 Non-Transmission Alternatives

BPA considered whether there could be a solution to the project need that would not require construction of a new transmission line. Some examples of non-transmission alternatives include: distributed generation (siting generation closer to the load so power does not have to be transmitted over the line in question), demand side management (reduces the load during peak demand times), and general conservation (reducing load by using more energy-efficient appliances). A Remedial Action Scheme (RAS) is another non-transmission alternative. Concerning distributed generation, demand side management, and general conservation, BPA's proposed action involves responding to existing requests for transmission service over a portion of its transmission system that has limited available transmission capacity (ATC). These three non-transmission alternatives would not address the specific need for additional capacity in the project area. Because they would not meet this identified need, these non-transmission alternatives were considered but eliminated from detailed study in this EIS.

RAS is a system of dropping generation from the system to prevent overloads. BPA uses RAS to prevent transmission planning reliability criteria violations (such as facility overloads and system instability) resulting from severe unplanned transmission line outages. RAS equipment requires local generators to automatically cut or "drop" their generation to protect the transmission system when the capacity of the system is reached and an unplanned outage occurs. Typical actions include tripping generators off-line and switching reactive power devices with high speed control systems. BPA has used the maximum possible RAS-initiated generation dropping to manage existing commitments on the transmission system in eastern Oregon west of the John Day Dam area. RAS currently allows BPA to provide safe and reliable system operation with the existing generators in this area.

To address the transmission service requests with RAS, BPA would have to determine all the generation associated with the transmission service requests. The requests for service are for firm (non-interruptible) transmission service. Therefore, placing them on a RAS would not fulfill the requests. Also, in order to maintain transmission system reliability, BPA must limit the total amount of generation that may be tripped by RAS for credible contingencies. Studies show dropping any additional generation beyond what has already been included to accommodate the additional firm transmission service requested will compromise the stability of the system. BPA's planning studies showed also that even with all of the proposed new generation included in the RAS to optimize transfer capability, BPA could not grant the 1,150 MW of additional firm transmission service. Therefore, this alternative was eliminated from further consideration.

2.6.2 Transmission Line Alternatives

Use the Existing Transmission System without Upgrades

This alternative attempts to meet the project need just by using the existing transmission system without upgrading any facilities. The transmission studies conducted by BPA have shown that adding 1,150 MW of the requested firm service to its existing firm commitments, without providing system upgrades, could result in violations of planning reliability standards. Providing this requested service would exceed the available transmission capacity of BPA's existing transmission lines in the area, which likely would result in thermal overloads, as well as voltage and transient stability criteria violations, and line outages. Given the interconnected nature of the regional transmission system, critical outages could cascade to other transmission lines owned by BPA or other utilities. The outages would most likely start with lines in the area (such as the John Day-Big Eddy line). However, other portions of the regional transmission system could also be affected through further cascading outages.

Because of the severe operational issues and risks in managing the existing transmission system without upgrades, this alternative would not meet the identified need and maintain system reliability. Therefore, this alternative was eliminated from further consideration.

Lower Voltage Line Upgrades or Additions

BPA also considered upgrading lower voltage transmission facilities to meet the need. There are no lower voltage facilities currently at risk of exceeding their operating limits if a major critical line went out, i.e., upgrading these lines would not provide the additional capacity needed to meet the need for the project. In addition, building many 230-kV lines or 115-kV lines in place of one 500-kV line would increase line losses and costs, and require additional new right-of-way and materials. Therefore, upgrading or adding lower voltage lines was eliminated from further consideration.

2.6.3 Undergrounding the Transmission Line

During the ~~scoping~~ public process, some people suggested burying the new transmission line or burying portions of the line. In the past, because typical construction costs ~~are~~ can be much higher than overhead transmission lines, BPA has used underground cable only in limited situations. Underground cables are considered where an overhead route is impossible, such as for long water crossings (e.g., in the San Juan Islands of Washington). In addition, underground transmission cables are used for relatively short distances in comparison to typical overhead transmission lines. BPA's longest underground transmission cable is a 69-kV submarine cable that is 9 miles long in the San Juan Islands.

Underground Cable Types

There are several cable and insulation types available for underground cable systems. The system most suitable for long distances would be high voltage extruded dielectric (HVED) cable with cross-linked polyethylene (XLPE) as the primary insulation material. Of the XLPE systems installed throughout the world, only three have been 500-kV, the longest is 25-miles long in Japan, used in an existing tunnel system.

Construction Methods

The most common method of underground cable installation in the U.S. uses concrete encased ducts, commonly called a duct bank system. Large excavators and other heavy equipment are used to dig three ~~a~~ continuous cable trenches a minimum of ~~10~~4 feet wide and 6 to 10 feet deep for the cables. Each trench would include one cable per phase (nine separate cables). Separate trenches would be needed for each phase to allow for adequate heat dissipation. Every 1,500 to 1,800 feet a 30-foot long, 10-foot deep manhole is installed to allow for splicing and racking the cables. Transition stations are required when undergrounding the line is not feasible, such as at large river crossings. Transition stations terminate underground cables and connect to overhead transmission lines. These stations require 4 to 5 acres of land and are needed at both ends of the underground circuit. Transition stations are in addition to substations needed at either end of the transmission line. If only portions of the line were to be underground, these stations would be required at either end of the underground section.

In areas where open trench methods are not feasible, such as river crossings, railroad crossings, and in environmentally sensitive areas, directional drilling is used to install the line. Exit and entry pits (about 800 square feet) are required at sufficient depth for the cable. The conduit is then bored using a jack or drill. For larger underground crossings that require a bend in the conduit, drilling fluid is used to lubricate the drill head and four cable holes are drilled to allow for adequate heat dissipation at higher depths. A transition station would be installed at the end of each crossing to transition from three cables to four and back again. Directional drilling increases the risk of fracturing, where the surrounding soil matrix gives way to drill pressure, can have negative effects to waterways and sensitive areas if the fluid bubbles to the surface and smothers sensitive species or habitat.

~~In addition to significantly higher construction costs, underground transmission cables in terrestrial settings also result in much higher maintenance costs, and environmental impacts that are typically greater than impacts associated with an overhead line.~~

Environmental Impacts

Prior to excavating the trench to install the conduit, all trees and brush are permanently cleared along ~~this~~ the construction corridor to prevent root intrusion and to make the line available for maintenance and repair. This clearing and trenching ~~This construction activity~~ would cause surface and subsurface disturbance, soil erosion potential, potential impacts to cultural resources, plants and habitat (all of which can often be spanned with overhead lines) along the transmission line route. In areas where bedrock is near the surface, construction would also require blasting, which would result in noise and air quality impacts. In areas where the cable crosses water bodies such as the Columbia River, construction could require excavation in wetlands and riparian areas that could largely be avoided with an overhead transmission line. ~~The cables that would be installed likely would be oil-filled, which would require above-ground termination and oil storage equipment at several locations along the line. This equipment would result in visual impacts.~~

Once the cables are installed, a permanent corridor between 40 and 100 ~~approximately 150~~ feet wide is required, with a continuous parallel access road along the route of the buried transmission line to allow necessary maintenance and repair of the cables. Where existing areas can often be returned to preconstruction conditions when an overhead transmission line is constructed (such as with recreation and agricultural uses), an underground line requires continuous clearance of the right-of-way without exception. ~~Repairs would require excavation along the affected reach.~~

Maintenance and Reliability

Routine maintenance (every 6 months) would be needed to ensure continuous reliability of the underground cable system. Maintenance would include periodic visual inspection of all underground components, including access roads, clearance areas, manholes, and transition stations. The increased maintenance requirements of the underground line when compared to an overhead line would require more time from existing BPA maintenance crews who have less experience dealing with underground line issues.

Because the cables would be underground, ~~the cables~~ they would be more susceptible to damage and failure due to geological hazards such as seismic activity, landslides, and soil erosion. Failures also can result from aging of the cables, heat stress, and a variety of other external and internal causes. In addition, because the cables would be buried, it would be much more difficult to locate failed or damaged cables, and service likely would take weeks or months to restore compared to the hours or days it takes to restore service on an overhead line.

Underground cable systems suffer system losses much higher than those experienced with overhead transmission line systems. An increase in capacitance is an important design consideration and would cause a reduction in the amount of power that could be transmitted through a cable circuit. Series compensation could recover some of the lost capacity (at additional cost), but would not allow for any future capacity increase. There has been no experience in the world with installing an XLPE duct bank system for the length needed for the Big Eddy-Knight (about 27 miles). With only a few installations throughout the world, underground cable systems have not proven themselves to maintain the high reliability demands of today's electric grids.

Costs

Underground transmission cables are highly complex when compared to overhead transmission lines and can cost at least 10 times more than overhead lines because of the level of subsurface work needed along potentially hazardous terrain, the cost of specialized materials and maintenance needs through the life of the project. ~~and lower-voltage distribution cables used to deliver power to individual homes~~. ~~For a 500-kV line, three individual cables would have to be manufactured and installed at a cost about 10 times the cost of an overhead design.~~

Underground cable remains a tool available for low-voltage distribution and for special high-voltage situations, but because of its high cost and environmental impacts, undergrounding the entire line or portions of the line is not considered a reasonable alternative to solve the high voltage transmission need identified in Chapter 1, and was eliminated from detailed evaluation.

2.6.4 Transmission Line Routing Options

Northern Portion of the Original West Alternative

When BPA proposed the Big Eddy-Knight project, the West Alternative continued north toward the Wautoma-Ostrander line rather than turning east with the Chenoweth-Goldendale line. When it reached the Wautoma-Ostrander line, the route turned east and paralleled the Wautoma-Ostrander for over a mile before reaching the original Substation Site A (which has also been eliminated) (see Map 2-3~~1~~). The northernmost portion of the original West Alternative was eliminated because a section of the route heading to the original Substation Site A would have needed to be separated from the existing lines by 1,200 feet or more (see **Line separation** in Section 2.2) and would require the purchase of a new right-of-way with several homes that would need to be removed. The other proposed project routes would not have this requirement. Therefore, this portion of the original West Alternative was eliminated from detailed evaluation.

Blockhouse Routing Option

After BPA proposed the project and held public meetings, an existing 100-foot-wide vacant BPA easement was identified. The easement is located from line mile W18 from the Chenoweth-Goldendale line directly north to the Wautoma-Ostrander line. This easement was acquired in the late 1940s, was not used, was not in BPA's recent records, and was not patrolled. BPA considered using this easement, in conjunction with the purchase of an additional 50-foot-wide right-of-way, for the northern portion of the West Alternative. This route was referred to as the Blockhouse Option. Over the years, three homes and more recently the Project Patch facilities (a retreat center for troubled youth and their families) have been inadvertently built within the easement. Because several homes and the retreat center would have required removal and the other alternatives would not have this requirement, this option was eliminated from detailed evaluation.

Link Routing Option

BPA also considered an additional route to link the West, Middle, and East alternatives that would have been located south of where the West Alternative turns to the east. This route was eliminated from detailed evaluation because BPA could use the existing right-of-way of the Chenoweth-Goldendale line and the Link Option did not provide any advantages not found in that option.

Southern Routes and Alternatives

BPA considered three possible routing alternatives that would have routed the proposed transmission line generally farther south than the routing alternatives identified in Section 2.4 of this EIS. Two of these routes were a variation to the East Alternative, while the third was an alternative to the Big Eddy-Knight line. All three of these alternatives would have started at Big Eddy Substation and then headed generally east towards Biggs Junction in Oregon. Two of these routes then would have headed north to the proposed Knight Substation site, while the third would have continued east to BPA's existing John Day Substation near Rufus, Oregon. The following describes these alternatives in more detail and the reasons they were considered but eliminated from detailed study in this EIS.

South Route 1: From Big Eddy Substation, this route would have headed east along BPA's two existing John Day-Big Eddy 500-kV transmission lines to a point approximately 2 miles west of Biggs Junction, Oregon. Along this segment, South Route 1 would have crossed about 3 miles of the Columbia River Gorge National Scenic Area, as well as the Deschutes River State Recreation Area. From near Biggs Junction, this route would have then turned north to cross the Columbia River into Washington near Maryhill Museum. Once in Washington, the route would have continued north to Knight Substation along the same route as the East Alternative. This route would have been about 29 miles long (see Map 2-3).

South Route 1 would have required new 150-foot wide right-of-way and new access roads for the entire route, and where it would have paralleled the existing John Day-Big Eddy transmission lines, it would have been required to be separated from these existing lines by at least 1,200 feet (see **Line separation** in Section 2.2). These requirements would have substantially increase land use and visual impacts as compared to the routing alternatives identified in Section 2.4 of this EIS, as well as the amount of acres of wildlife habitat and soils impacted because of the lack of existing access roads. In addition, this route would have created a new crossing of the Columbia River and the Deschutes River, a designated Wild and Scenic river, and would have impacted recreational use at its crossing of the Deschutes River State Recreation Area.

Furthermore, this route would have been 1–2 miles longer than the routing alternatives identified in Section 2.4 of this EIS, which would have increased costs by $1.6 million per mile and decreased electrical system performance of the line. Because the proposed line's electrical performance is distance dependent, the added length of the route would have negatively affected electrical performance and power distribution on the Wautoma-Ostrander transmission line. Given the short increase in length as compared to the proposed routing alternatives, this negative effect would potentially been minimal, but would have been negative nonetheless. Finally, South Route 1 would have had an expensive and technically difficult Columbia River crossing: the span would have been 2,000 feet to 3,000 feet longer than the proposed Columbia River crossings. Accordingly, this route was considered but eliminated from detailed study because it would have increased land use, wildlife, soils and visual impacts from the longer line length and new right-of-way and access roads, would not have performed electrically as well, would have been technically more difficult, and would have increased costs.

South Route 2: This route would have headed in a more southerly direction from Big Eddy Substation than South Route 1, largely to further avoid any additional crossings of the Columbia River Gorge National Scenic Area once this route exited the Scenic Area near Big Eddy Substation. South Route 2 would have headed generally southeast to a point along the Deschutes River, where it would have crossed this river and then headed northeast to a point along BPA's existing John Day-Big Eddy transmission lines approximately 2 miles west of Biggs Junction. This route then would have followed the same route to the proposed Knight Substation site as South Route 1. South Route 2 would have been about 32 miles long.

Like South Route 1, South Route 2 would have required new 150-foot-wide right-of-way and new access roads for the entire route, which would have substantially increased land use and visual impacts as compared to the routing alternatives identified in Section 2.4 of this EIS, as well as the amount of acres of wildlife habitat and soils impacted because of the lack of existing access roads. Although this route would have avoided crossing the Deschutes River State Recreation Area, it still would have created a new crossing of the Deschutes River where it is designated as a Wild and Scenic river and the Columbia River. In addition, this route would have been 4–5 miles longer than the routing alternatives identified in Section 2.4 of this EIS; like South Route 1, this longer length would have increased costs by $1.6 million per mile and decreased electrical system performance of the line. In particular, the many miles of additional length of this route would have had a more substantial negative effect on electrical performance and power distribution on the Wautoma-Ostrander transmission line as compared to the proposed routing alternatives or South Route 1. Furthermore, South Route 2 would have an expensive and technically difficult Columbia River crossing, similar to South Route 1. Finally, South Route 2 would have had additional technical issues because the southern portion of the line would have crossed over existing transmission lines eight times (twice over the two John Day-Big Eddy 500-kV lines, twice over the John Day - Marion 500-kV line, and once each over the Big Eddy-Harvalum 230-kV and the McNary-Ross 345-kV lines). Line crossings, especially over 500-kV lines, require significantly taller towers (with associated greater visual impacts and costs) to meet reliability criteria. Crossing a 500-kV line also requires special considerations for scheduling outages of the existing lines during construction or maintenance. Therefore, South Route 2 was considered but eliminated from detailed study because it would have increased land use, wildlife, soils and visual impacts from the longer line length and new right-of-way and access roads, would not have performed electrically as well, would have been technically more difficult, and would have increased costs.

South Alternative: This alternative would have headed east from Big Eddy Substation along and parallel to BPA's existing John Day-Big Eddy transmission lines to the John Day Substation. The line would have been about 19 miles long. The South Alternative would have either required new 150-foot wide right-of-way and new access roads for the entire route, and would have needed to be separated from the existing John Day-Big Eddy transmission lines by at least 1,200 feet for its entire length, or would have involved removing the existing line and rebuilding the 19 miles of line as a double circuit line. This route would have had the same impacts of crossing the Deschutes River as described for South Route 1. While the South Alternative would have been shorter than the proposed routing alternatives, the electrical performance benefits of the South Alternative would have been limited to only increasing the transfer capability of the West of John Day path and would not have provided additional system reliability benefits that the proposed alternatives would provide. The South Alternative would have also increased electrical loading on BPA's existing heavily loaded Wautoma-Rock Creek- John Day line and would have increased the need for an additional voltage support reinforcement project. For these reasons, the South Alternative was considered but eliminated from detailed study in the EIS.

~~BPA considered a South Alternative line route that started at Big Eddy Substation and continued east in Oregon parallel to two of BPA's existing John Day-Big Eddy lines. This route would have crossed the Deschutes River, and then turned north to cross the Columbia River into Washington near Maryhill Museum. Once in Washington, the route would have continued north to Knight Substation along the same route as the East Alternative.~~

~~Although the route would have paralleled existing lines in Oregon, the proposed line would have had to have been separated from the John Day- Big Eddy lines by at least 1,200 feet (see Line separation in Section 2.2), requiring a new 150 foot-wide right-of-way and creating a new corridor for its entire length. The route also included a new, difficult Columbia River crossing. Although the route was suggested as one that could avoid crossing the National Scenic Area, it did not completely circumvent the area. The route crossed the Deschutes River at a state recreation area and at a location where the Deschutes River is designated as a Wild and Scenic River. At over 30 miles long, the route was 2-3 miles longer than the other routes. The route also required all new right-of-way.~~

~~The added length of the route would have negatively affected electrical performance and power distribution on the Wautoma-Ostrander transmission line. The additional length would have also increased the costs of the project. Because this longer line route could not meet the electric performance standards required for the project, this South Alternative was eliminated from detailed evaluation.~~

2.6.5 Alternate Substation Site

BPA considered a substation site, called Substation Site A, at the northern end of the original West Alternative. This substation site did not perform electrically as well as the proposed substation sites (1 and 2) to the east (Map 2-3~~1~~). In addition, because the portion of the West Alternative that connected to that site has been eliminated and the Middle and East routes would be required to be separated from the Wautoma-Ostrander line by 1,200 feet (see **Line separation** in Section 2.2), Substation Site A was eliminated from detailed evaluation.

2.7 Representative Views

The following photos are representative views in the vicinity of each routing alternative, the existing Big Eddy Substation, and the proposed Knight Substation.

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Figures 2-18 through 2-37 are located in a separate file due to size:

See: BEK_FEIS_Representative_Views.pdf

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Figures 2-18 through 2-37 are located in a separate file due to size:

See: BEK_FEIS_Representative_Views.pdf

2.8 Comparison of Alternatives

BPA has evaluated the action alternatives and the No Action Alternative, and has compared the alternatives based on the purposes of and need for the proposed project, the affected environment, and environmental consequences. The results of the comparison are summarized in Tables 2-6 and 2-7. All action alternatives (West, Middle, and East) would meet the need for the project; the No Action Alternative would not. Mitigation measures that would apply to all the action alternatives are listed in Table 2-8.

Table 2-6. Comparison of Proposed Action Alternatives to Project Purposes

Purpose	West Alternative	Middle Alternative	East Alternative	Knight Substation Site 1	Knight Substation Site 2	Fiber Optic Cable Loop Back Option	Fiber Optic Cable Loop Wautoma Option	No Action Alternative
Optimize electrical capacity/performance of the proposed new line and substation	The length and design would provide optimal electrical capacity and performance.	Same as West Alternative	Same as West Alternative	This substation site is strategically placed to optimize electric system performance.	Same as Knight Substation Site 1	Would provide basic communication service for the project, but would not enhance overall transmission system communications.	Would optimize the transmission communications system by creating a large communication loop that could be used by multiple substations.	Leaving the system as is (not constructing the project) would limit BPA's ability to provide service for new transmission requests.
Maintain reliability of BPA's transmission system to BPA and industry standards	Would allow BPA to grant requests for transmission service while maintaining reliability of the electrical grid to BPA and industry standards. In addition, it would increase the ability to serve Portland during winter and increase system flexibility should there be an interruption in the operation of one of the area's other transmission lines.	Same as West Alternative	Same as West Alternative	Knight Substation would increase the reliability of the electrical grid by creating a new location where electricity can be diverted to alternate paths.	Same as Knight Substation Site 1	Would provide basic communication service for the project, but would not enhance overall transmission system communications.	Would optimize the transmission communications system by creating a large communication loop that could be used by multiple substations.	Would limit BPA's ability to provide service to new transmission request as the capacity of existing lines in the area cannot accommodate the requests without compromising reliability of the system. Also, additional benefits of proposed line (increased system flexibility and capacity to Portland in the winter) would not be gained.
Meet BPA's contractual and statutory obligations	While BPA has no express contractual or statutory obligation to build the proposed project, the project would help BPA further its statutory mandates and tariff provisions that direct BPA to construct additions to the transmission system to integrate and transmit electric power and maintain system stability and reliability, as appropriate.	Same as West Alternative	Same as West Alternative	Same as West Alternative	Same as West Alternative	Same as West Alternative	Same as West Alternative	By not constructing the line, BPA would not be acting in furtherance of its applicable statutory mandates or tariff provisions.
Minimize project costs where practical	Would be more expensive than the Middle Alternative for single-circuit options for entire route and the most expensive alternative for double-circuit in all appropriate locations. Tearing down the existing Chenoweth-Goldendale line and building in the existing right-of-way would be more expensive than building the line parallel to Chenoweth-Goldendale.	Would be the least expensive action alternative comparing both single-circuit options for entire route and double-circuit options where appropriate.	Would be the most expensive action alternative for single-circuit options for entire route. Would be more expensive than Middle Alternative and less expensive than West Alternative for double-circuit options where appropriate.	Likely more expensive than Substation Site 2 because BPA would have to purchase more acreage due to possible severance of property – but property is for sale	Likely less expensive than Substation Site 1 due to possible purchase of amount needed only.	Less expensive than Wautoma Option	More expensive than Loop-Back Option	No immediate costs would be involved if the line were not built.
Minimize impacts to the environment	The project has been designed to minimize impacts to the environment where feasible, and mitigation measures are identified to avoid or reduce these impacts. Please see Table 2-7 for a comparison of the environmental impacts of the alternatives.	Same as West Alternative	Same as West Alternative	Same as West Alternative	Same as West Alternative	Would have fewer impacts than the Wautoma Option as it would not disturb any areas that would be not already be disturbed through the construction of the Big Eddy-Knight line.	Would have greater impacts than the Loop-Back Option as, although the fiber would be on an existing line, areas would be disturbed for pulling and vaults along the Wautoma-Ostrander line.	If the line were not built there would be no environmental impacts due to construction or operation.
Minimize Future Impacts	Building the first 5 miles using double-circuit towers would accommodate a future line, eliminating the need for an additional river crossing in the future. Removing the Chenoweth-Goldendale line may require future line work to service Klickitat County PUD.	Building 9 miles of double-circuit towers to include the Harvalum-Big Eddy line would allow for a future upgrade of that portion of line without new towers.	Building 14 miles of double-circuit towers to include the Harvalum-Big Eddy and McNary-Ross lines would allow for a future upgrade of that portion of line without new towers.	N/A	N/A	Would provide service for Knight Substation.	Because this option would create a greater fiber loop and increase flexibility of the communication system; the need for future fiber optic cables in the area would be less.	Does not provide any future benefits to system

Table 2-7. Summary of Environmental Impacts by Alternative[3]

Resource	West Alternative	Middle Alternative	East Alternative (Preferred)	Big Eddy Substation	Knight Substation Site 1 (Preferred)	Knight Substation Site 2	Wautoma Substation	Fiber Optic Cable – Loop Back Option	Fiber Optic Cable Wautoma Option (Preferred)	No Action Alt.
Land Use and Recreation	***Moderate-to-high*** impact. It would impact the most (of the alternatives) ~~park and~~ conservation/recreation/ preserve land (~~23-29~~ 21–27 acres). Would impact rangeland (~~78-95~~ 83–100 acres), with some impacts to nonirrigated cropland (~~10-12~~ 6–8 acres), and a small amount of irrigated cropland (~~0.5~~ 0.2–0.3 acre) and orchard (~~0.2~~ 0.3 acre). New right-of-way = 233-432 acres. Would follow existing BPA right-of-way for 16 of 27 miles. The longest amount of line in the National Scenic Area, about 9.5 miles.	***Low-to-moderate*** impact. It would impact ~~some~~ minimal ~~park and~~ conservation/recreation land (~~3~~ 0.3 acres); have the least impact on rangeland (~~73-74~~ 74–75 acres), with the most impacts to nonirrigated cropland (~~24–25~~ 20–21 acres), and a small amount of irrigated cropland (~~0.5~~ 0.2–0.3 acre) and orchard (~~0.2–0.03~~ 0.1–0.2 acre). New right-of-way = 284-309 acres. It would follow existing BPA right-of-way for 9 of 27 miles. The shortest amount of line in the National Scenic Area: 5.5 miles.	***Low-to-moderate*** impact. It would impact ~~some~~ minimal ~~park and~~ conservation/recreation land (~~2~~ 0.1–0.2 acres ~~permanent impact~~). Would impact the most rangeland (~~81-83~~ 86–88 acres), with some impacts to nonirrigated cropland (~~17-18~~ 12–13 acres), and a small amount of irrigated cropland (~~0.8~~ 0.4 acre) and orchard (~~0.2-.03~~ 0.1–0.2 acre). New right-of-way = 258-269 acres. It would follow existing BPA right-of-way for 14 of 28 miles. Crosses the National Scenic Area for about 7.5 miles.	***No*** impact because all work would occur within the existing substation yard.	***Moderate*** impact. It ~~would~~ could ~~convert~~ remove ~~more than~~ up to ~~70~~ 86.3 acres of prime farmland ~~to~~ from ~~non~~agricultural use for the substation, access road, and dead-end towers.	***Moderate*** impact. It would ~~convert 30~~ remove up to 36.7 acres of prime farmland ~~to~~ from ~~non-~~agricultural use, but could make farming difficult on northern portion of the site.	***No*** impact. The 0.6-acre expansion would occur on BPA property.	Same overall impact as the selected action alternative. Incremental impacts from stringing the cable would be minimal.	***Low*** impact because little land would be disturbed and no new easements would be required. Visitors in one nearby state park would be temporarily impact by construction activity.	***No*** impact.
Visual Resources	***High*** impact. It is the longest route in the National Scenic Area (9.5 miles) and would include a new Columbia River crossing. Although ~~portions~~ some route segments would parallel or replace an existing wood-pole transmission line, the new steel towers would be noticeably taller and more industrial-looking than the existing wood-pole line. It would be visible from the highest number of parks (9), scenic highways (3) and trails (4). It would run near (within 1,000 feet of) the fewest homes – 17-24 – but potentially interfere with expansive views for some current residents and those building homes in several new, large-lot subdivisions near the Little Klickitat River.	***Moderate-to-high*** impact. It would run the shortest distance through the National Scenic Area (5.5 miles) and parallel or share an existing Columbia River transmission line crossing. Portions in the Gorge would be next to or replace an existing transmission line ~~with~~ amid much existing infrastructure (highways, railroad tracks, other development), but would be visible where it climbs in new right-of-way up the Columbia Hills. Visible from the fewest number of parks (3), scenic highways (2) and trails (1). It would run near the greatest number of homes – 42-46 – of which 25 are in Wishram. Would potentially interfer with some current and future residents' expansive views.	***Moderate-to-high*** impact. While it would run for 7.3 miles through the National Scenic Area, ~~and share~~ sharing some of the Middle Alternative's route here, it would parallel or replace an existing transmission line through this area. It would climb the Columbia Hills in new right-of-way through a field of taller wind turbines. It would be visible from a few parks (4), scenic highways (3) and trails (1) and would run by 39-42 homes, 25 of them in Wishram. Would potentially interfer with some current and future residents' expansive views.	***No*** impact because all work would occur within the existing substation yard ~~with existing infrastructure~~.	***Low-to-moderate*** impact because, although there are few sensitive viewers nearby, the substation would place a commercial building in an existing agricultural field somewhat visible to motorists on Knight Road and possibly by a current and potential future resident.	***Moderate*** impact. Slightly greater impact than Site 1 because it is located closer to motorists on Knight Road and to a future housing development across the road.	Temporary ***low*** impacts possible during construction for one homeowner within 1 mile.	Same overall impact as the selected action alternative.	***Low*** impact. Stringing of cable along the existing line would occur in a relatively unpopulated area and construction work would be brief at each work site. Once strung, the cable would blend in with existing lines on the towers.	***No*** impact.
Vegetation	***High*** impact because it could impact eight of nine special-status species found or potentially present along the line and two priority ecosystems. Also would be the only action alternative to impact high-quality grassland. It would predominantly impact disturbed shrub-steppe/ grassland, about the same amount as other action alternatives, and a small amount of high-quality shrub-steppe. It would require removal of the greatest number of trees, 93-130.	***Moderate*** impact. It could impact two special-status species found or potentially present along the line. It would predominantly impact disturbed shrub-steppe/grassland and a small amount of high-quality shrub-steppe. About 26 trees would be removed in upland areas. It would not cross any priority ecosystems.	***Low*** impact. It could impact one special-status species potentially present along the line. It would predominantly impact disturbed shrub-steppe/grassland, but no high-quality species. About 16 trees would be removed in upland areas. It would not cross any priority ecosystems.	***No*** impact because all work would occur within the existing substation yard.	***No*** impact on special-status species, priority ecosystems, any type of shrub-steppe/grassland or woodlands. ***Low*** overall impact on vegetation; disturbs nonirrigated cropland only.	***No*** impact on special-status species, priority ecosystems, any type of shrub-steppe/grassland or woodlands. ***Low*** overall impact on vegetation; disturbs nonirrigated cropland only.	No-to-low impact because no special-status species, priority ecosystems, any type of shrub-steppe/grassland or woodlands would be disturbed.	Same overall impact as the selected action alternative.	***No-to-low*** impact because no special-status species, priority ecosystems, any type of shrub-steppe/grassland or woodlands would be disturbed. Impacts would occur only where vegetation has been previously disturbed.	***No*** impact.

[3] Permanent impacts, unless noted. Construction impacts are temporary and only discussed in this summary table where relevant for some resources.

Resource	West Alternative	Middle Alternative	East Alternative (Preferred)	Big Eddy Substation	Knight Substation Site 1 (Preferred)	Knight Substation Site 2	Wautoma Substation	Fiber Optic Cable – Loop Back Option	Fiber Optic Cable Wautoma Option (Preferred)	No Action Alt.
Geology and Soils	***Low*** soil erosion and landslide impacts. Building the line and about ~~40~~ 36 miles of access roads would disturb about ~~169-268~~ 148-240 acres. With mitigation, resulting erosion rate would be similar to naturally occurring erosion rates for the area. Least disturbance within potential landslide areas – about ~~2.5~~ 2.2 acres. Structures would be designed for soil type and stability; if landslides did occur, habitat, roads, exisiting transmission lines etc. could be damaged.	***Low-to-moderate*** soil erosion and landslide impacts. Building the line and about ~~37~~ 40 miles of access roads would disturb about ~~159-179~~ 109-132 acres. With mitigation, resulting erosion rate would be ~~similar to~~ slightly less than naturally occurring rate. Disturbance within potential landslide areas – about 8-~~9~~ 10 acres – would be more than the West Alternative, but much less than the East Alternative. Structures would be designed for soil type and stability; if landslides did occur, habitat, roads, exisiting transmission lines etc. could be damaged.	***Moderate-to-high*** soil erosion and landslide impacts because it would cross a greater amount of steep terrain. Building the line and about ~~37~~ 38 miles of access roads would disturb about ~~169-212O~~ 125-136 acres. With mitigation, resulting erosion rate would be slightly higher than the naturally occurring rate. Disturbance within potential landslide areas – about ~~22-30~~ 19-26 acres – is the greatest among the action alternatives. Structures would be designed for soil type and stability; if landslides did occur, habitat, roads, exisiting transmission lines etc. could be damaged.	***Low*** soil erosion impact. Amount of soil disturbed by substation and access road construction would be relatively small and the site is mostly flat. ***No*** landslide impact.	***Moderate*** soil impacts. About 29.65 acres permanently impacted and 42.5 acres temporarily impacted. About 147,000 cubic yards of soil would require excavation and would be spread over 19 acres to the north of the substation yard ***No*** landslide impact.	***Low-to-moderate*** ~~***Moderate***~~ soil impacts. About 28.65 acres permanently impacted and 15.5 acres temporarily impacted. The site is flatter than Site 1. ***No*** landslide impacts.	***No-to-low*** impact. Expansion site is previously disturbed and relatively flat.	Same overall impact as the selected action alternative.	***No-to-low*** impact because limited digging and compaction would occur and mitigation would help alleviate these impacts.	***No*** impact.
Water Resources and Wetlands	***Low*** overall impact on waterways. Least disturbance (2 acres) by tower footings within 50 feet of streams. Highest number of stream crossings by new and improved access roads (~~32~~ 26); however, only intermittent streams, drainages and dry washes would be impacted. ~~Lowest number (25) of~~ Up to 64 ~~new~~ culverts required. No impact on floodplains. Only one riparian area potentially impacted along intermittent Threemile Creek where removing some shade trees could slightly affect water temperatures. ***High*** potential impact on wetlands. Between ~~1.7-3~~ 1.8-3.3 acres ~~of~~ in 18 wetlands would be temporarily or permanently impacted, including three high-quality wetlands that would have small portions disturbed.	***Low*** overall impact on waterways. About 2.2 acres within 50 feet of streams would be disturbed by tower footings. New and improved access roads would cross 20 intermittent streams or drainages; up to ~~28~~ 50 ~~new~~ culverts could be installed. A small portion of Fifteenmile Creek's floodplain would be impacted by improvements to an existing access road. No riparian areas would be disturbed. ***Moderate-to-high*** impact on wetlands. Between 1.4-1.7 acres in 13 wetlands ~~acres~~ would be impacted, including one high-quality wetland that would have a small portion disturbed.	***Low*** overall impact on waterways. About 2.7-2.9 acres of land within 50 feet of streams would be disturbed by tower footings. New and improved access roads would cross ~~30~~ 24 intermittent streams or drainages; up to ~~30~~ 62 ~~new~~ culverts could be installed. A small portion of Fifteenmile Creek's floodplain would be impacted by improvements to an existing access road. No riparian areas would be disturbed. ***Low-to-moderate*** impact on nine wetlands, of which less than 1 acre would be disturbed. No high-quality wetlands have been identified along this alternative.	***No*** impact because there are no water resources present within the existing substation yard.	***No*** impact on waterways or wetlands.	***No*** impact on waterways or wetlands.	***No*** impact on waterways or wetlands.	Same overall impact as the selected action alternative.	***No*** impact on waterways or wetlands, because all would be avoided (spanned).	***No*** impact.
Wildlife	***Moderate-to-high*** impact because it would disturb some high-quality habitat, including grasslands, shrub-steppe, woodlands, rock, cliff and wetlands, and some special-status species. Slight impacts would be likely on the Western gray squirrel; amphibians, turtles, and wetland invertebrate species; the sage lizard; and some common species of birds and wildlife.	***Low-to-moderate*** impact because it would predominantly disturb common habitat abundant in the area. It would disturb a small amount of high-quality habitat (the fringe of one shrub-steppe area) and slightly impact woodlands and wetlands. There would be few potential impacts on special-status species (amphibians and certain turtles; bald eagle; white pelican; and mule and black-tailed deer).	***Low-to-moderate*** impact because it would predominantly disturb common habitat abundant in the area. It would not disturb high-quality habitats and would only slightly impact woodlands and wetlands. It would have the least potential impact on special-status species (bald and golden eagles; prairie and peregrine falcons; white pelican; amphibians and certain turtles; and mule and black-tailed deer).	***No*** impact because all work would occur within the existing substation yard.	***Low*** impact because ~~substation construction would remove 10~~ acres ~~of cropland from use~~, a small percentage of ~~this~~ widespread and relatively low-quality habitat would be disturbed. No special-status species, nests or burrows were found on site.	***Low*** impact; same as Site 1.	***No-to-low*** impact. Expansion site is sparsely vegetated with grassland and is low-quality habitat. No special-status species are present.	Same overall impact as the selected action alternative.	***Low-to-moderate*** impact because it could cause temporary displacement in some areas. The higher impact would occur if construction took place during breeding seasons for migratory birds or the Western gray squirrel.	***No*** impact.

Resource	West Alternative	Middle Alternative	East Alternative (Preferred)	Big Eddy Substation	Knight Substation Site 1 (Preferred)	Knight Substation Site 2	Wautoma Substation	Fiber Optic Cable – Loop Back Option	Fiber Optic Cable Wautoma Option (Preferred)	No Action Alt.
Fish	***No-to-low*** impact. Four fish-bearing streams would be crossed (same number as other action alternatives, although some would cross at different locations), but towers would be placed well away from the water's edge, no culverts would be installed, and no riparian trees would be removed. The Columbia and Little Klickitat rivers and Fifteenmile Creek have special-status fish species present where crossed, but construction work would not occur near these waterways. Culverts would be placed only in seasonal non-fish-bearing tributaries or dry washes.	***No-to-low*** impact. It would cross four fish-bearing streams, with no towers near streams, no culverts installed, and no riparian trees removed. There would be no impacts on special-status fish species where it crosses the Columbia and little Klickitat rivers and Fifteenmile Creek. An existing access road along Fifteenmile Creek would require upgrading; mitigation measures would ensure no sediment reaches the creek. Culverts would be placed only in seasonal non-fish-bearing tributaries or dry washes.	***No-to-low*** impact. It would cross four fish-bearing streams, with no towers near streams, no culverts installed, and no riparian trees removed. There would be no impacts on special-status fish species where it crosses the Columbia and little Klickitat rivers and Fifteenmile Creek. An existing access road along Fifteenmile Creek would require upgrading; mitigation measures would ensure no sediment reaches the creek. Culverts would be placed only in seasonal non-fish-bearing tributaries or dry washes.	***No*** impact because there are no fish-bearing waterways within or in the vicinity of the existing substation yard.	***No*** impact because no fish-bearing streams are in the vicinity.	***No*** impact because no fish-bearing streams are in the vicinity.	***No*** impact because no fish-bearing streams are in the vicinity.	Same overall impact as the selected action alternative.	***No*** impact because all waterways and riparian areas would be avoided.	***No*** impact.
Cultural Resources	***Moderate*** impact. Would pass within 1 mile of 157 cultural resource sites, 11 of which are within the right-of-way. It would also cross through Homesteads of the Dalles Mountain Ranch Historic District and an area of the Columbia Hills that could contain unknown cultural resources. While surveys conducted before construction would help identify these, potential impacts on cultural resources are higher than the other action alternatives. ***High*** impact on BPA's historic Chenoweth-Goldendale transmission line, if replaced.	***Low*** impact. Would pass within 1 mile of ~~133~~ 138 cultural resource sites, of which ~~nine~~ 14 are within the right-of-way. It would also cross over an Oregon Trail segment (no longer visible) at two places. However, the most significant cultural site would be separated by a vertical distance that precludes disturbance. ***High*** impact on BPA's historic Harvalum-Big Eddy transmission line if 9 miles are replaced.	***Low*** impact. Would pass within 1 mile of ~~123~~ 129 cultural resource sites, of which ~~10~~ 16 are within the right-of-way. It would also cross over an Oregon Trail segment (no longer visible) at two places. However, the most significant cultural site would be separated by a vertical distance that precludes disturbance. ***High*** impact on BPA's historic Harvalum-Big Eddy transmission line if 9 miles are replaced. ***Low*** impact on BPA's historic McNary-Ross line because only 5 miles would be replaced, a relatively small portion.	***No*** impact because all work would occur within the existing substation yard; no sites are present.	***No-to-low*** impact because the likelihood of disturbing cultural resources on the site is minimal. There are no known cultural sites in the vicinity~~; limited archaeological testing on site found none.~~ and no sites were found during pedestrian surveys.	***No-to-low*** impact because the likelihood of disturbing cul-tural resources on the site is minimal. There are no known cultural sites in the vicinity.	***No*** anticipated impact. There are no known cultural sites in the vicinity and no sites were found during pedestrian surveys.	Same overall impact as the selected action alternative.	***Low*** impact because new ground disturbance would be minimal. (BPA is also surveying the area and consulting with Tribes.)	***No*** impact.
Socio-economics	***Low*** impact on the local and regional economy. It would primarily impact agricultural land, removing a small portion from use and reducing revenues by a correspondingly small percentage. Landowners would be reimbursed for land required for new right-of-way or access roads. The state of Washington and Klickitat County would benefit from one-time tax gains from "use" taxes levied on transmission line materials. Impacts on property values would be variable and limited. There would be no impact on most public services (potential low impact on firefighting services). For the West Alternative only: one tower option would permanently remove the Chenoweth-Goldendale line, which would have a ***moderate*** impact on the Klickitat County Public Utility District, which uses the line for backup service.	***Low*** impact, same as West Alternative.	***Low*** impact, same as West Alternative.	***No*** impact because all work would occur within the existing BPA owned substation yard.	***Low*** impact. While ~~some of the overall~~ as much as ~~80~~ 86.3 acres ~~site would~~ could be removed from crop production, some acreage between 50-70 acres could be leased out for cultivation in the future. In addition, the landowner would be compen-sated if BPA buys the property. Loss in property taxes to Klickitat County would be minimal.	***Low*** impact. While about ~~30~~ 36.7 acres of leased cropland would be removed from production, financial losses for the owner (Washington DNR) would be a small fraction of annual revenues. DNR would also be compensated if BPA buys the land. There would be no impacts on property taxes.	***No*** impact as all work would occur on BPA land.	Same overall impact as the selected action alternative.	***No*** impact because no land would be taken out of production.	***No*** impact.

Resource	West Alternative	Middle Alternative	East Alternative (Preferred)	Big Eddy Substation	Knight Substation Site 1 (Preferred)	Knight Substation Site 2	Wautoma Substation	Fiber Optic Cable – Loop Back Option	Fiber Optic Cable Wautoma Option (Preferred)	No Action Alt.
Transpor-tation	***Low-to-moderate*** impact. Motorists could experience temporary delays during construction, although many Klickitat County roads in this area are lightly traveled. The project would require ~~21~~ 19 miles of new access roads, ~~11~~ 10 miles of existing access road upgrades, ~~5 miles of~~ several county road upgrades, and 3 miles of temporary access roads. After construction, operations and maintenance traffic would be infrequent and minimal. The West Alternative would pass relatively close to two airports and have at least 11 towers exceeding 200 feet, requiring FAA review. The FAA has already ~~would~~ determined the two ~~which~~ towers on either side of the Columbia River would require lighting and ~~which~~ the topmost wire spanning the river would require marker balls.	***Low*** impact. Some motorists could experience temporary delays during construction. The project would require ~~19~~ 20 miles of new access roads, ~~15~~ 13 miles of existing access road upgrades, several county road upgrades, and ~~3~~ 7 miles of temporary access roads. After con-struction, operations and maintenance traffic would be infrequent and minimal. At least five towers would exceed 200 feet and require FAA review for safety requirements. Same Columbia River tower lighting and wire marking requirements as the other action alternatives.	***Low-to-moderate*** impact. Some motorists could experience temporary delays during construction. The project would require 16 miles of new access roads, ~~16~~ 13 miles of existing access road upgrades, several county road upgrades, and ~~5~~ 9 miles of temporary access roads. After con-struction, operations and maintenance traffic would be infrequent and minimal. At least eight towers would exceed 200 feet; however ~~and require~~ the FAA has already reviewed ~~for safety requirements~~ the East Alternative and determined only the two Columbia River towers would need lighting and only the topmost wire spanning the river would need marker balls.	***No*** impact because construction and operations and maintenance vehicles would use existing roads to access the substation.	***Low*** impact. During construction, equip-ment would access the site by traveling on Knight Road. Possible temporary access from Hill Road would require Hill Road upgrades. A few local motor-ists may experience traffic delays. Permanent access would be from Knight Road, on which operations and maintenance traffic would be infrequent.	**Low** impact. During con-struction, equip-ment would access the site from Knight Road. A few local motorists may experience traffic delays. Perm-anent access would be from Knight Road, on which operations and maintenance traffic would be infrequent.	***No-to-low*** temporary impact during construc-tion when equip-ment is brought to/from site on local public roads. An existing transmission line access road onsite would be rerouted to accommodate construction and maintenance.	Same overall impact as the selected action alternative.	***No*** impact because the project would only require one crew and would use existing county roads and BPA access roads.	***No*** impact.
Noise	Temporary ***moderate-to-high*** construction noise impacts, which would affect a few residents or business owners at a time as crews complete line segments and move on. ***Low*** impacts from operations and maintenance of the line. Corona noise generated by the new conductors would be higher in foul weather and usually masked by ambient noise. Inspections by ground crews or helicopter would generate short-lived noise once or twice annually.	Temporary ***moderate-to-high*** construction noise impacts, same as West Alternative. ***Low*** impacts from operations and maintenance of the line, with the exception of one Wishram home that could be within 71 feet of the center-line (single-circuit option only) and may experience slightly higher noise impacts if corona is present on the line. Inspections by ground crews or helicopter would generate short-lived noise once or twice annually.	Temporary ***moderate-to-high*** construction noise impacts, same as West Alternative. ***Low*** impacts from operations and maintenance of the line, with the exception of one Wishram home that could be within 71 feet of the center-line (single-circuit option only) and may experience slightly higher noise impacts if corona is present on the line. Inspections by ground crews or helicopter would generate short-lived noise once or twice annually.	Temporary ***moder-ate*** construction noise impacts on a few nearby resi-dents; ***high*** if blast-ing is required. ***No-to-low*** noise impacts from operations and maintenance, because the sub-station's existing equipment and nearby transmission lines would remain the primary sources of environmental noise.	Temporary ***low-to-moderate*** construc-tion noise impacts because there are no residences within ~~1,000~~ 800 feet. ***No-to-low*** operations and maintenance noise impacts because the existing adja-cent transmission line would remain the predominant source of environ-mental noise.	Same impacts as Site 1.	Temporary ***low*** construction noise impacts possible on one homeowner within 1 mile.	Same overall impact as the selected action alternative.	Temporary ***low*** construction noise impacts because of the few number of residents. ***No*** operations and maintenance noise impacts beyond those of the existing transmission line.	***No*** impact.
Public Health and Safety	***Low*** general safety impacts, because all safety standards would be followed during construction, operations and maintenance. Electric and magnetic field (EMF) impacts would be similar for each action alternative. Construction standards and grounding requirements would minimize potential nuisance shocks from electric fields near the right-of-way. Magnetic field levels at houses in the area would remain comparable to ambient levels.	***Low*** general safety impacts, same as the West Alternative. EMF impacts would be the same as the West Alternative, with one exception: if a single-circuit option were used, the Middle Alternative would run within 71 feet of one home, potentially boosting magnetic fields there slightly over ambient levels.	***Low*** general safety impacts, same as the West Alternative. EMF impacts would be the same as the West Alternative, with one exception: if a single-circuit option were used, the East alternative would run within 71 feet of one home, potentially boosting magnetic fields there slightly over ambient levels, for a potentially higher impact on that one home.	***No*** general safety or EMF impacts beyond those already posed by the existing substation. Addition of the new 500-kV line would not incrementally increase EMF.	***Low*** general safety impacts, because all safety standards would be followed during construction, operations and maintenance. ***No*** EMF impact. EMF levels at perimeter of substation yard would reflect fields generated by existing and proposed lines.	Same impacts as Site 1.	***No*** general safety or EMF impacts.	Same overall impact as the selected action alternative.	~~***Low***~~ ***No*** general safety impacts, because all safety standards would be followed during cable stringing, operations and maintenance. ***No*** EMF impacts.	***No*** impact.

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					~~the new 500-kV line and dissipate to ambient levels within several hundred feet.~~					
Air Quality	***No-to-low*** impact. Construction would generate temporary increases in windblown dust and exhaust emissions, but the amount would be small and comparable to that typically created by agricultural equipment in the area.	***No-to-low*** impact, same as West Alternative.	***No-to-low*** impact, same as West Alternative.	***No-to-low*** impact. Construction within the yard would generate temporary increases in windblown dust and exhaust emissions, but the amount would be small.	***No-to-low*** impact, same as action alternatives.	***No-to-low*** impact, same as action alternatives.	***No-to-low*** impact. Con-struction would generate tempor-ary increases in windblown dust and exhaust emissions, but the amount would be small.	Same overall impact as the selected action alternative.	***No*** impact.	***No*** impact.
Greenhouse Gases	***Low*** impact. Removal or disturbance of trees, vegetation and soil, and exhaust from construction equipment and maintenance vehicles would incrementally increase carbon dioxide, methane and nitrous oxide emissions, but by a relatively small amount.	***Low*** impact, same as West Alternative.	***Low*** impact, same as West Alternative.	***Low*** impact. No trees or vegetation would be disturbed, because work would occur within the graveled substation yard. Emissions from construction vehicles would be minimal.	***Low*** impact, same as action alternatives.	***Low*** impact, same as action alternatives.	***No*** measurable impact.	Same overall impact as the selected action alternative.	**No** measurable impact.	***No*** impact.

Table 2-8. Proposed Mitigation Measures for the Action Alternatives

Resource	Proposed Mitigation Measures
Land Use and Recreation	• Provide a schedule of construction activities to all landowners that could be affected by construction. • Limit construction to daylight hours, minimizing disturbance to those residents who work during the day. • Compensate landowners for any new land rights required for right-of-way or access road easements. • Compensate landowners for any damage to property during construction. • Compensate landowners for reconfiguration of irrigation systems due to placement of towers or access roads. • Restore compacted cropland soils ~~to~~ as close as possible to preconstruction conditions using tillage. • Do not allow mixing of excavated material with topsoil outside of tower footprint on farms or croplands. • Work with landowners to determine mitigation measures needed to maintain CRP conservation status, if needed. • Follow applicable goals and objectives of the National Scenic Area Management Plan with guidance from the USFS and CRGC in the National Scenic Area. • Reseed disturbed areas (see mitigation measures in Vegetation). • Implement measures to reduce the possible spread of noxious weeds (see mitigation measures in Vegetation). • Implement measures to control dust (see mitigation measures in Geology and Soils) • Implement measures to control construction noise (see mitigation measures in Noise). • Install gates, barriers, and postings ~~Minimize or eliminate public access to project facilities through postings and installation of gates and barriers at appropriate access points, and~~ at the landowner's request, to minimize or eliminate public access to project facilities.
Visual Resources	• Site all construction staging and storage areas away from locations that would be clearly visible from sensitive scenic areas, trails and scenic highways as much as practical. • Treat galvanized steel towers and transmission line conductors to dull the shininess of the steel. • Implement construction site maintenance and clean-up. Keep construction areas free of debris. • Provide regular maintenance of access roads and gates within and leading to the corridor. • Reseed disturbed areas (see mitigation measures for Vegetation). • Implement measures to reduce the possible spread of noxious weeds (see mitigation measures in Vegetation). • Implement measures to control erosion and dust (see mitigation measures in Geology and Soils, and Air Quality). • ~~Implement measures to control construction noise (see mitigation measures in Noise).~~
Vegetation	• Locate towers and roads outside of priority ecosystems, high-quality vegetation communities, and areas of special-status plants as much as possible. Avoid these areas during construction (staging areas, pulling sites, etc.). • Avoid tree removal to the extent possible. • Cut or crush vegetation rather than blade in areas that would remain vegetated to maximize the ability of native plants to resprout.

Resource	Proposed Mitigation Measures
Vegetation (continued)	• Work with the appropriate state agency to mitigate impacts to federal species of concern, ~~or~~ state-listed species, or protected habitats if impacts are unavoidable. Site-specific mitigation to be determined after a project decision is made and during tower location and design. Measures could include the following: ➢ Ecologically optimizing siting of facilities ➢ Special construction techniques to minimize soil disturbance ➢ Seasonal restrictions ➢ Identifying and securing replacement lands ➢ Identifying appropriate seed or plant sources for revegetation ➢ Monitoring and response provisions. • Seed all disturbed areas to prevent colonization by weeds and facilitate reestablishment of the preconstruction plant community. Use native seed mixtures that consist of locally dominate native species, unless requested differently by the landowner. On CRP lands, use native seed mixtures approved by the local Farm Service Agency. ~~Use approved (local Farm Service Agency) native seed mixtures in high quality vegetation communities and a combination of native and non-native seed in disturbed vegetation communities. Include the dominant native species from the impacted community in the seed mix.~~ • Restore compacted soils if needed prior to seeding (see mitigation measures in Section 3.1 Land Use). • Prepare and implement an Early Detection Rapid Response Plan to control the infestation or spread of noxious weeds that would include the following measures: ➢ Collaborate with the Klickitat County Weed Board or Wasco County Weed Department and landowners to determine and carry out the best control measures deemed locally effective for weed control during construction and over the life of the line. ➢ Conduct invasive weed surveys prior to and following construction to determine potential weed spread and appropriate corrective actions. ➢ Where possible, treat identified infestations prior to construction. ➢ Pressure or steam wash vehicles and other equipment that have been in weed-infested areas at established wash stations upon leaving the infested areas to prevent spreading weeds to uninfected areas during construction. ➢ Monitor and treat existing and new infestations during construction on a minimum annual basis and for 3 years after construction. • ~~Conduct invasive weed surveys prior to and following construction to determine potential weed spread and appropriate corrective actions.~~ • ~~Collaborate with the Klickitat County Weed Board or Wasco County Weed Department and landowners to determine and carry out the best control measures deemed locally effective~~ • ~~Pressure or steam wash vehicles and other equipment that have been in weed-infested areas at established wash stations upon leaving the infested areas to prevent spreading weeds to uninfected areas during construction.~~ • Equip all vehicles with basic fire-fighting equipment, including extinguishers and shovels to prevent fires that could encourage weed growth. • Use certified weed-free mulch, if mulch is used for erosion control.
Geology and Soils	• Minimize the project ground disturbance footprint, particularly in sensitive areas (i.e., steep slopes and landslides areas). • Prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) for construction activities to lessen soil erosion and improve water quality of stormwater runoff.

Resource	Proposed Mitigation Measures
Geology and Soils (continued)	• For the SWPPP, use management practices contained in the Storm Water Management Manual for Eastern Washington (e.g., use silt fences, straw bales, interceptor trenches, or other perimeter sediment management devices; place them prior to the onset of the rainy season and monitor and maintain them as necessary throughout construction). • Prepare a Fugitive Dust Control Plan to control dust. • Water or use palliatives on exposed soil surfaces in areas disturbed during construction. • Water, use palliatives, or cover construction materials if they are a source of blowing dust. • Gravel access road surfaces in areas of sustained wind and potential dust erosion. • Ensure construction vehicles travel at low speeds on access roads and at construction sites to minimize dust. • Limit the amount of time soils are left exposed. • Reseed disturbed areas (see mitigation measures in Vegetation). • Restore compacted soils (see mitigation measures in Section 3.1 Land Use). • Conduct additional site-specific evaluations in areas of potential landslides to determine degree of recent activity, likelihood of activation or reactivation, potential setbacks, and site-specific stability as appropriate. • Design roads to limit water accumulation and erosion; install appropriate access road drainage (ditches, water bars, cross drainage, or roadside berms) to control and disperse runoff. • Design transmission tower footings and roads for specific site conditions through detailed geologic hazard assessments, including review of geologic maps and aerial photography, surface condition assessments, and geological testing at representative sites. • Minimize construction on steep or unstable slopes, if possible. • Relocate towers or roads located within previously unidentified active slides, bedrock hollows, or other geologic hazard areas, where possible.
Water Resources and Wetlands	• Minimize the project ground disturbance footprint, particularly in sensitive areas such as stream crossings and wetlands, and stream and wetland buffers. • Develop and implement a Spill Prevention, Control and Countermeasure Plan to minimize the potential for spills of hazardous material, including provisions for storage of hazardous materials and refueling of construction equipment outside of riparian zones, spill containment and recovery plan, and notification and activation protocols. • Prepare and implement a SWPPP (see mitigation measures in Geology and Soils) to improve water quality of stormwater runoff. • Prepare to manage dewatering, including proper disposal of drilling fluids and mud away from wetlands or surface waters. • Prepare for management of excess concrete. • Remove and dispose of sediment properly, away from wetlands or surface waters. • Install culverts for access roads in the dry season or during low-flow conditions if possible to minimize sediment delivery to streams. • Limit tracking of soil onto paved roads by gravelling road approaches, washing vehicle wheels, and cleaning mud and dirt from paved roads to reduce sediment delivery to roadside ditches and nearby streams. • Avoid use of heavy equipment and vegetation removal in wetlands and wetland buffer zones to avoid soil compaction, destruction of live plants, and potential alteration of surface water patterns. Use track equipment or matting, if appropriate. • Avoid placing staging areas in wetlands or stream buffers.

Resource	Proposed Mitigation Measures
Water Resources and Wetlands (continued)	• Avoid placing new access roads through wetland complexes around the Columbia River, Fifteenmile Creek, Little Klickitat River, Spring Creek, Swale Creek, and Blockhouse Creek to minimize the potential for altering surface water patterns and isolating connected wetlands. • Obtain all appropriate permits with approved wetland delineations and compensatory mitigation plans prior to construction as needed. • Use high-visibility fencing around wetland buffer zones to avoid inadvertent activity (e.g., parking and driving) in wetlands or buffers or streams. • Reseed disturbed areas (see mitigation measures in Vegetation).
Wildlife	• Minimize the project ground disturbance footprint, particularly in special-status areas such as priority ecosystems, which can include riparian areas, wetlands, and grassland/shrub-steppe. • Avoid tree removal to the extent possible. • In locations where nests for special-status species have been identified, determine construction schedules through consultation with WDFW or Oregon Department of Fish and Wildlife to avoid breeding season disturbance. The following mitigation schedules will be ~~considered~~ implemented where possible: ➢ Peregrine falcon—avoid construction activities within 0.25 mile of any active nests during the breeding season (~~March 15~~ February 1 through July 15 ~~August 31~~ or until young have fledged). ➢ Prairie falcon—avoid construction activities within 0.25 mile of any active nests during the breeding season (March 1 through July 30 or until young have fledged). ➢ ~~Prairie falcon~~ Bald eagle and golden eagle—avoid construction activities within 0.25 mile of active nests during the breeding season (~~February 15~~ January 1 through ~~July 15~~ August 31 or until young have fledged). ➢ Western gray squirrel—avoid construction activities within 400 feet of all nest trees during the breeding season (March 1 through August 31). Avoid blasting within 0.25 mile of nest trees during this same period. Protect all western gray squirrel nests and nest trees. Maintain a 50-foot no-cut buffer around each nest tree. • Install bird diverters on overhead ground wires in high risk areas (over river and stream crossings and near wetlands). • Prepare and implement a SWPPP and a Spill Prevention and Contingency Plan (see mitigation measures for Geology and Soils and Water Resources and Wetlands) to protect wetland habitats. • Reseed disturbed areas (see mitigation measures for Vegetation). • Prepare for fire control (see mitigation measures for Vegetation) to protect habitats. • Work with the appropriate state agencies to mitigate impacts to federal species of concern, state-listed species, or protected habitats if impacts are unavoidable (see mitigation measures for Section 3.3 Vegetation).
Fish	• Minimize the project ground disturbance footprint, reseed disturbed areas, and install culverts during the dry season (see mitigation measures for Vegetation and Water Resources and Wetlands) to limit sedimentation affecting fish habitat. • Prepare and implement a SWPPP and a Spill Prevention and Contingency Plan (see mitigation measures for Geology and Soils and Water Resources and Wetlands) to protect and fish habitats. • Avoid blasting within 200 feet of fish-bearing streams.

Resource	Proposed Mitigation Measures
Cultural Resources	• Locate transmission line towers and access roads to avoid cultural resources, where possible. • Use existing access roads where possible to limit possibility of new disturbances. • Consult with the Washington DAHP or Oregon State Historic Preservation Office (SHPO), as applicable, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Nation, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation, state agencies (if sites found on state lands), and the USFS (if sites found on USFS land or within the National Scenic Area) regarding NRHP eligibility of cultural resources. • Develop an Inadvertent Discovery Plan that details crew member responsibilities for reporting in the event of a discovery during construction. This plan should include directives to stop work immediately and notify local law enforcement officials (if appropriate), appropriate BPA personnel, Tribes, USFS (if appropriate) and the Washington DAHP or Oregon SHPO if cultural resources are discovered. • Ensure cultural resource monitors are present during construction in the area of known cultural resources to monitor sites during excavation and to prevent unauthorized collection of cultural materials. • Prepare a mitigation plan to protect sites if final placement of project elements results in unavoidable adverse impacts to a significant cultural resource.
Socioeconomics	• Compensate landowners at market value for any new land rights for right-of-way or access road easements. • Compensate landowners for damage to property or crops during construction or operation and maintenance activities, as appropriate. • Compensate landowners for irrigation systems that must be reconfigured to accommodate new transmission infrastructure. • Consult with the NRCS and the Farm Service Agency to mitigate impacts to CRP land to maintain existing CRP status of lands and federal payments to landowners, where practicable. • Prepare for fire management (see mitigation measures in Vegetation).
Transportation	• Coordinate with Klickitat County roads department for upgrades of county roads. • Coordinate routing and scheduling of construction traffic with state and county road staff, Columbia River operators, and railroad operators. • Employ traffic control flaggers and post signs warning of construction activity and merging traffic, when necessary for short interruptions of traffic. • Conduct regular maintenance on access roads and gates within and leading to the corridor. • Prepare and implement a SWPPP (see mitigation measures in Geology and Soils) to prevent sediments from being transported onto adjacent roadways. • Limit tracking of soil onto paved roads (see mitigation measures in Geology and Soils). • Design roads to limit erosion (see mitigation measures in Geology and Soils). • Restore public roadways to preconstruction conditions upon completion of project construction activities. • Coordinate with the WSDOT Aviation Division and comply with FAA regulations for marking or lighting (including painting and/or lighting towers and installing marker balls on overhead ground wires in specific locations). • Consult with the owner of Piper Canyon Airport to ensure aircraft safety at Piper Canyon Airport.

Resource	Proposed Mitigation Measures
Noise	• Ensure standard sound-control devices, including mufflers, are on all construction equipment and vehicles. • Limit construction activities to daytime hours. • Notify landowners located along the corridor prior to construction activities, including blasting.
Public Health and Safety	• Notify landowners located along the corridor prior to construction activities, including blasting. • If blasting is required, take appropriate safety measures and follow all state and local codes and regulations. Lock up or remove all explosives from work sites at the end of the workday. • Hold crew safety meetings at the start of each construction workday to review potential safety issues. • Prepare and implement a Spill Prevention, Control and Countermeasure Plan (see mitigation measures in Water Resources and Wetlands) to manage hazardous materials and respond to emergency situations. • Prepare and maintain an on-site safety plan in compliance with state requirements. • Prepare for fire control (see mitigation measures in Vegetation). • Fuel all highway-authorized vehicles off-site to minimize the risk of fire. Fueling of construction equipment that is transported to the site via truck and is not highway authorized will be done in accordance with regulated construction practices and state and local laws. Helicopters will be fueled and housed at local airfields or at staging areas. • Secure the site at the end of each workday to protect equipment and the general public. • Ensure that BPA contractors flying helicopters prioritize public safety during flights. For example, establish flight paths to avoid populated areas or schools (Helicopter Association International 1993). • Implement appropriate airport safety measures (see mitigation measures in Land Use and Recreation). • Clear vegetation according to BPA standards to avoid contact with transmission lines prior to project construction and throughout the life of the line. • Prepare and implement a lead abatement plan that would cover removal and disposal of any contaminated paint chips in accordance with applicable federal, state and local environmental and safety standards. • Report possible hazardous materials, toxic substances, or petroleum products discovered along the transmission line route that would pose an immediate threat to human health or the environment, including large dump sites, drums of unknown substances, suspicious odors, stained soil, etc.). • Adhere to appropriate specifications for grounding fences and other objects on and near existing and proposed rights-of-way. • Construct and operate the new transmission line according to the NESC. • Restore reception quality if radio or television interference occurs as a result of constructing the transmission line so that reception is as good as or better than before the interference.

Resource	Proposed Mitigation Measures
Air Quality	• Prepare and implement a SWPPP (see mitigation measures in Geology and Soils) to limit erosion and dust generation. • Prepare a Fugitive Dust Control Plan to control ~~Control~~ windblown dust (see mitigation measures in Section 3.4 Geology and Soils). • Reseed disturbed areas (see mitigation measures in Vegetation) to prevent dust from erosion. • Shut down idling construction equipment, if feasible. • Ensure all vehicles are in compliance with applicable federal and state air quality regulations for tailpipe emissions. Certification that vehicles meet applicable regulations will be provided by contractors to BPA in writing. • Maintain and certify in writing that all construction equipment is in proper working condition according to manufacturer's specifications. • Obtain rock and concrete from sources with appropriate environmental permits.
Greenhouse Gases	• Implement vehicle idling and equipment emissions measures (see mitigation measures in Air Quality). • Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions. • Locate all staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites. • Locate staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance where practicable. • Use the proper size of equipment for the job. • Use alternative fuels for generators at construction sites such as propane or solar, or use electrical power where practicable. • Reduce electricity use in the construction office by using compact fluorescent bulbs, and powering off computers every night. • ~~Submit a plan for approval to~~ Recycle or salvage non-hazardous construction and demolition debris to the maximum extent practicable. • Submit a plan for approval to dispose of wood poles locally where practicable. • Use locally sourced rock for road construction, if possible..

Chapter 3
Affected Environment, Environmental Impacts, and Mitigation Measures

Overview

This chapter describes the existing environmental resources that could be affected by the project and the potential impacts that the project alternatives would have on those resources.

The transmission line routing alternatives, substation site options and fiber optic cable options define the project area. The affected environment and potential impacts were determined through research and field observations along the proposed transmission line routes and at the substation sites by environmental specialists, and from information provided in agency and public comments. Field surveys were conducted along the transmission line alternatives and Knight Substation sites in August 2009 and spring 2010. For each resource, potential mitigation measures to reduce or avoid impact are also identified. The resources that could be affected by the project include the following:

- Land Use and Recreation
- Visual Resources
- Vegetation
- Geology and Soils
- Water Resources and Wetlands
- Wildlife
- Fish
- Cultural Resources
- Socioeconomics
- Transportation
- Noise
- Public Health and Safety
- Air Quality
- Greenhouse Gases

In each of the resource sections in this chapter, the impacts associated with work needed at Big Eddy Substation, construction of the proposed transmission line, access roads, the fiber optic cable Loop Back Option, and Knight Substation are described. Because the Wautoma Option for the fiber optic cable and work at BPA's Wautoma Substation would be in a different geographic ~~an~~ area ~~separate~~ from the proposed transmission line, ~~this option is~~ the environmental analysis or these project components are discussed in a separate section (see Section 3.15 Fiber Optic Cable Options and Wautoma Substation). This chapter concludes with EIS sections required by applicable NEPA regulations and guidance.

Determining Impacts

To determine the impacts of the proposed action alternatives, the area that would be permanently removed from use for tower and road bed footprints and the area of temporary disturbance during construction were calculated.

The tower footprint that would be removed permanently from use for single-circuit towers would be about 0.13 acre; the footprint for double-circuit towers would be about 0.17 acre. New road bed impact acreage was estimated based on an average road width of about 30 feet ~~wide~~ (smaller on straight runs, larger at turns and for steep grades). The same 30-foot width was used for upgrading existing roads, even though the road bed exists and upgrades would only involve grading, widening, and gravel. Upgrading existing roads would obviously not have as great an impact as cutting and blading-in new roads, but since the extent of improvements in specific locations is unknown at this point in project planning, the "worst case" amount of impact disturbance in acres is provided.

Temporary impacts would occur in construction areas surrounding new towers, including counterpoise, pulling and tensioning sites, and staging areas. The area of temporary impact at each tower site would about be about 0.5 acre for single-circuit towers and about 0.8 acre for double-circuit towers. Where an existing line would be removed, wood pole removal would disturb about 0.1 acre and lattice steel tower removal would disturb about 0.43 acre. The estimated 18 conductor tensioning sites that would be required for any of the alternatives would impact a total of about 14 acres.

The various options for each alternative use a combination of single-circuit and double-circuit towers (see Chapter 2). The impacted acreages in the resource sections are provided as ranges, representing the use of the different tower options. Because the single-circuit towers have a smaller footprint than double-circuit towers, options with the greatest use of single-circuit towers impact the least acreage, and options with the greatest use of double-circuit towers impact the most acreage; all other options fall between these two amounts. For options that include tower removal, those impact acreages are included as temporary impacts. Road locations would be the same for all options of a given alternative, so no ranges are provided for roads.

Some of the options for each alternative remove existing lines and build in the alignment of that line. Although the options that involve line removal show greater acreage amounts impacted because they include the removal disturbance and may involve double-circuit towers, overall impacts would tend to be less since tower footprints could be combined and right-of-way use would be less.

At the end of the description of impacts for each alternative there is a brief discussion of which option has the least or most potential impacts.

3.1 Land Use and Recreation

This section describes the land ownership and land use, including recreation, in and near the proposed project, and how the project alternatives could affect these resources.

3.1.1 Affected Environment

The proposed project is in Wasco County, Oregon, and Klickitat County, Washington. Some of the proposed project is in the National Scenic Area. Land potentially affected by the proposed project is predominately rural and privately owned, with some publicly owned and tribal lands (see Map 3-1 and Table 3-1).

BPA owns land around Big Eddy Substation and all alternatives cross BPA land as they exit the substation. The Middle and East alternatives cross two different USFS parcels in Washington. The Middle Alternative crosses a USFS parcel that does not have an existing BPA right-of-way. The East Alternative crosses a parcel with an existing BPA right-of-way.

The Middle and East alternatives cross tribal trust land: Warm Springs tribal land in Oregon, and Yakama tribal land in Washington. The tribal trust land is managed by the Bureau of Indian Affairs. The tribal trust lands crossed have existing BPA right-of-way, except for a Yakama parcel where the Middle Alternative climbs over the Columbia Hills.

Line Mile References for Route Alternatives

References to specific areas on each route alternative refer to that specific alternative and the line mile of that alternative measured from Big Eddy Substation. Each alternative is distinguished by a letter - "W" for the West Alternative, “M” for the Middle Alternative, and “E” for the East Alternative. The line mile or range of line miles is given after the letter, for example, "W1" means West Alternative at line mile 1; M1 means Middle Alternative at line mile 1, etc. Longer segments are identified with a line mile range such as W1-5 (West Alternative, between line miles 1 and 5). Where alternatives share the same corridor, multiple letters are used, such as ME3-6 (Middle and East alternatives, between line miles 3 and 6).

The West Alternative crosses the most state-owned land: land managed by Washington Parks and Recreation (Parks) (Columbia Hills State Park), two DNR parcels (Columbia Hills Natural Area Preserve and agricultural leased land), and a parcel managed by the Washington Department of Fish and Wildlife (WDFW). BPA has an existing 100-foot wide right-of-way occupied by BPA’s Chenoweth-Goldendale wood-pole line across these parcels. The West Alternative also crosses a DNR parcel leased for agriculture as the alternative heads toward Substation Site 2.

The Middle Alternative only crosses state land on the same DNR parcel crossed by the West Alternative as it heads to Substation Site 2.

The East Alternative crosses a DNR parcel used for wind production, and the DNR parcel crossed by the other alternatives as it heads to Substation Site 2.

Substation Site 2 is on DNR property that is leased for agriculture.

Table 3-1. Public and Tribal Lands in the Project Area

Public Entity	Landowner/ Land Manager	Land Use	Location
Federal	BPA	Big Eddy Substation	W0, ME0
	USFS	Conservation and Dispersed Recreation	ME10–11
Tribal	Warm Springs and Yakama Tribes, Tribal Members	Tribal Trust Land: Agricultural	W3–4, ME3–4, ME8, M9–10, and E9–13
State	State of Washington, Parks and Recreation	Recreation and Conservation (Columbia Hills State Park)	W7–8
	State of Washington, DNR	Preserve ~~Recreation and Conservation~~ (Columbia Hills Natural Area Preserve)	W8.5–10.5
	State of Washington, DNR	Washington State Trust Lands – Leased Agriculture and Dispersed Recreation	W16–17, WM26, E28, Substation Site 2
	State of Washington, DNR	Washington State Trust Lands – Wind Power Production	E15
	State of Washington, WDFW	Conservation	W11

Columbia River Gorge National Scenic Area

The National Scenic Area was designated to protect and enhance the scenic, natural, cultural, and recreation resources of the Columbia River Gorge, while encouraging new growth to occur in existing urban areas (USFS 2010). As such, it has its own management plan that guides development and designates land uses in the National Scenic Area (CRGC and USFS 2007). In the National Scenic Area the West Alternative crosses land that is designated as urban area, large-scale agriculture, and special agriculture; the Middle and East alternatives cross two urban areas, large-scale agriculture, and tribal lands (listed as Bureau of Indian Affairs [BIA] lands). More information on the National Scenic Area and consideration of consistency with land use designations is provided in Chapters 5 and 7.

Agriculture

Farming is a dominant land use in Klickitat and Wasco counties. All route alternatives cross Prime Farmland and Farmland of Statewide Importance (NRCS 2009c), and both substation sites are on Prime Farmland. These classifications identify land most suitable for producing “food, feed, fiber, forage, and oilseed crops” as determined by the Natural Resources Conservation Service (NRCS) (Prime Farmland), and the states (Farmland of Statewide Importance) (NRCS 2007), and are based primarily on soil type.

Most land in the project area is rangeland. Livestock includes primarily cattle and sheep. The greatest concentrations of rangeland are found where the route alternatives cross the Columbia Hills, where the West Alternative runs northeast, and along the Little Klickitat River. (See Map 3-2 for the general land cover types in the area; see Map 3-3 for the land uses found along the project alternatives during field surveys.)

Cropland is found interspersed with rangeland along the alternatives in Oregon, where the route alternatives each cross through the Centerville Valley, and where they combine in one route to head to the substation sites. Cropland and rangeland are frequently intermingled, resulting in irregularly shaped fields. Most cropland is dryland wheat and barley, with wheat being the most common crop. Both substation sites are used for nonirrigated crops.

Irrigated cropland and pasture occur infrequently; two irrigated alfalfa fields were identified during surveys near line miles WM22 and E23 (see Map 3-3).

There are several small cherry orchards in Oregon crossed by the alternatives (line miles W0.5 and ME0.5) and a vineyard in Washington near Highway 14 crossed by the West Alternative (line mile W4.5).

Some agricultural land has been removed from production through the Conservation Reserve Program (CRP). Under this program, farmers receive annual rental payments to remove highly erodible or other sensitive land from production, and subsequently reestablish and maintain natural communities for a certain number of years (NRCS 2010). In Oregon, three landowners have property in CRP crossed by the Middle and East alternatives. In Washington, about 25 landowners with property crossed by the alternatives also have property in CRP (more specific information pertaining to CRP land crossed by the proposed alternatives in Washington was unavailable).

Residential

There are four population centers in the area: The Dalles, Oregon, and Goldendale, Wishram, and Centerville, Washington. Outside these population centers, low density residential development is generally associated with farms. Houses are located in Oregon near line miles W0.5, ME0.5, ME3.0, ME7, and in Washington near line miles ME9, W12-13, W17-18.5, W19.5, WM20-20.5, M13, M17, E22-23, and WME27 (see Appendix B for a map showing locations of houses within 800 feet of the route alternatives). Around line mile W5, the West Alternative crosses about one mile of area zoned in Klickitat County as rural residential (which allows lots sizes of 1 to 2 acres), but there are few homes currently in the area. There are also at least four subdivisions plotted with 20-acre residential lots near the Little Klickitat River along the Middle and West alternatives and some 5-acre lots located west of Knight Rd and Knight Substation Site 2. There are very few homes developed on these lots. (See Chapter 5 for information about county zoning.)

Two small private residential airplane runways are located along the project; one on the West Alternative and one on the East Alternative. See Section 3.10 Transportation for a discussion of impacts.

Industrial

Industrial facilities include The Dalles Dam, the Klickitat County Port District, and the Dallesport area of Klickitat County.

The eastern portion of the Columbia River Gorge is home to many wind power generation facilities. Klickitat County has designated much of the county as an Energy Overlay Zone. One wind project—Windy Flats—is located in the project area on the Columbia Hills north of the National Scenic Area boundary. The East Alternative crosses through Windy Flats where it is on DNR land at line mile E15 (see Map 3-3), and a potential expansion area for the project is located in the vicinity of the West and Middle alternatives.

Conservation, ~~and~~ Recreation, and Preserve

Along the route alternatives, various lands are used to protect and conserve native habitats and rare species. The Columbia River and Columbia River Gorge are also host to a number of recreational activities including hiking, windsurfing, biking, kiteboarding, camping, fishing, boating, photography, picnicking, and wildlife viewing, with facilities managed by municipalities, counties, regional government, states, and the federal government.

Columbia Hills Natural Area Preserve. The West Alterative crosses the DNR-managed Columbia Hills Natural Area Preserve from about line miles W8.5–10.5. The preserve is dedicated, under the Washington Natural Area Preserves Act, to the preservation of high quality and rare natural areas, as well as threatened and endangered species as part of the Washington Natural Heritage Program (WNHP) (WNHP 2007, 2009b) (see Map 3-3). It covers about 3,600 acres north of Columbia Hills State Park and is the largest natural area preserve in Washington. The preserve contains lands that "represent the finest natural, undisturbed ecosystems in state ownership," and was established to "protect the highest quality examples of native ecosystems and rare plant and animal species" in the state of Washington (WNHP 2010). While preservation is its primary mission, the preserve is also used for research~~,~~ and education (DNR 2006). ~~, and recreation. Recreation~~ Public use of ~~in~~ the preserve is otherwise limited to ~~consists primarily of~~ hiking, wildflower viewing, and wildlife observation along The Dalles Mountain Road (DNR 2006; WNHP 2009a).

USFS Land. The USFS has two parcels along the Middle and East alternatives (line miles M10 and E10). These parcels are managed for natural resource values and are open to the public for hiking, hunting, etc.

WDFW Lands. WDFW manages property that is used for conservation of plants and animals and is open to the public for recreation along the West Alternative at line mile W11.

Eckton Ranch. A private landowner donated permanent conservation easements on Eckton Ranch to the Columbia Land Trust, a nonprofit nature conservancy. The West Alternative crosses Eckton Ranch at line mile W18. The purpose of the conservation easements is to promote the long-term conservation of natural resources in the Little Klickitat River watershed while maintaining agricultural and rural residential uses (McEwen 2009).

Parks. Columbia Hills State Park, crossed by the West Alternative at about line miles W6.5–8.5, covers about 3,300 acres and has about 7,500 feet of Columbia River shoreline (Washington State Parks 2009). The park includes Horsethief Lake (a national historic site) and Dalles Mountain Ranch. The West Alternative crosses the Dalles Mountain Ranch portion of the park, which is managed for its natural, historic, and cultural resources, and used by the public for hiking and education. This recreation area is characterized by natural settings and scenic views. The proposed right-of-way would pass within about 0.3 mile of the ranch. In addition, the right-of-way would pass next to a parking area on the north end of the park.

The West Alternative would pass through portions of the park designated as Resource Recreation (the most common designation), and Natural Area (Washington State Parks and Recreation Commission 2003). Resource Recreation is a mid-intensity classification intended to allow recreational opportunities of a higher intensity, while still protecting the integrity of the natural landscape. The Natural Area designation is applied to areas identified as supporting rare or sensitive native plants or important wildlife habitat, and is intended to emphasize protection and enhancement of the natural environment through increased management efforts.

The following parks are in the vicinity of the project, but are not crossed by the project alternatives (see Map 3-1):

- Spearfish and Little Spearfish Lake, both about 0.5 miles southwest of the West Alternative in the southwest portion of the project area, provide shore-based and small-boat fishing opportunities. Access to the lakes is provided through Spearfish Park, managed by the Army Corps of Engineers (Corps). The park contains a boat ramp and picnic area.

- Seufert Park is the home of The Dalles Dam Visitor Center on the Oregon side of the Columbia River about 1.5 miles southwest of the West Alternative. The park is operated by the Corps.
- Hess Park is a small day-use park on the Washington side of the Columbia River off U.S. Highway (U.S.) 197 about 1.5 miles southwest of the West Alternative near the Klickitat Port District complex adjacent to The Dalles Dam.
- Celilo Park is a popular local launch location for windsurfers and kiteboarders about 1 mile east of the Middle and East alternatives.
- Riverfront Park (about 3 miles west of Big Eddy Substation), Avery Recreation Area (about 3 miles west of the Middle and East alternatives), Sorosis Park (about 3 miles west of Big Eddy Substation), Thompson Park (about 2 miles west of Big Eddy Substation), Deschutes River State Park (about 2.5 miles south of the Middle and East alternatives), and Goldendale Observatory State Park (about 2.5 miles east of all three route alternatives) are parks 2 or more miles from the nearest alternative.

Trails. The Klickitat Trail was established by the National Rails-to-Trails Conservancy and follows the historical route of the first railroad connecting Lyle and Goldendale (see Map 3-3). The West Alternative crosses the trail at line mile W11. The trail is now jointly managed by Washington State Parks, the USFS, and the Klickitat Trail Conservancy. The 31-mile trail offers scenic views and opportunities for hiking, mountain biking, bird-watching, and fishing (Klickitat Trail Conservancy 2009). It follows parts of both the Klickitat River and Swale Creek Canyon through the southwestern portion of the project area.

The Lewis and Clark National Historic Trail, managed by the National Park Service (NPS), follows the course of the Lewis and Clark Expedition along the Columbia River. Although there is no physical evidence of the expedition, historical markers can be found at Celilo Park, the Maryhill Museum of Art, and Columbia Hills State Park. Both State Route (SR)-14 in Washington and Interstate (I)-84 in Oregon are part of the Lewis and Clark National Historic Trail driving route (NPS 2009). All three transmission line alternatives cross SR-14 and I-84.

The Oregon National Historic Trail, which follows the historic Oregon Trail, passes south of the project from Biggs Junction to The Dalles. The trail passes through The Dalles to the south of Big Eddy Substation. Nearby trail sites include the Deschutes River Crossing at the Deschutes River State Park and the wagon ruts near Biggs Junction near the intersection of US-97 and I-84 (NPS 2006).

Private and Informal Recreation. Opportunities for informal recreational activities are plentiful. The Columbia River, the Little Klickitat River and Swale Creek in Washington, Fifteenmile Creek in Oregon, and other smaller waterways in both states provide opportunities for boating, swimming, and fishing. DNR lands that are leased for agricultural use are also available for dispersed recreation. Areas that could be used for wildlife observation, hiking, biking, hunting, and other outdoor activities also occur throughout the area on private lands.

Two private facilities open to the public occur in the southeastern portion of the project area along SR-14 just south of the East Alternative near line mile E14. The Maryhill Winery operates an onsite tasting room, hosts outdoor concerts, and is available for weddings and other social events (Maryhill Winery 2009). The Maryhill Museum of Art and its 6,000-acre property are listed on the National Register of Historic Places, and as official sites on the Lewis and Clark National Historic Trail (Maryhill Museum of Art 2009). The property includes several outdoor art installations, a series of gardens, a replica of Stonehenge, and the Klickitat County War Memorial.

Scenic Byways. The following national scenic byways occur in the project vicinity:

- SR-14 in Washington is designated both as the Columbia River Gorge Scenic Byway within the National Scenic Area (also designated as a National Forest Scenic Byway and All-American Road), and the Lewis and Clark Trail Highway from about Maryhill to west of the project area (National Scenic Byways Program 2009a). SR-14 is crossed by all three alternatives.
- U.S. Highway (US)-30 in Oregon is designated as the Historic Columbia River Highway. None of the action alternatives cross over the Historic Columbia River Highway, which ends about 2 miles west of Big Eddy Substation.
- US-97 in Oregon is designated as the Journey through Time Scenic Byway (also designated as the Yakama Scenic Byway in Washington). None of the alternatives cross over US-97, which is about 3 miles east of the East Alternative.

3.1.2 Environmental Consequences

General impacts that would occur for all route alternatives are discussed in this section, followed by impacts unique to each alternative.

Common Impacts

Impacts on land use would include limitations of use within the right-of-way, removal of land from use due to tower footprints, roads, and Knight Substation, disruption of use due to the presence of the line through properties, and disturbance during maintenance and construction activities.

Use limitation within the right-of-way would include keeping the right-of-way clear of all structures, fire hazards, ~~tall-growing~~ many vegetation types and any other use that may interfere with the safe operation or maintenance of the line. Buildings or swimming pools could not be constructed with the right-of-way.

The ability to have vegetation growing within the proposed right-of-way is a use that would be reviewed by BPA to determine whether the use is safe, if there is adequate clearance under the conductor, and whether the use creates an interference to the operation and maintenance of the transmission facilities. If BPA determines that the use is compatible, a written agreement could be entered into between BPA and the landowner. Most crops less than ~~10~~ 4 feet high could be grown safely under the transmission line. However, orchards, Christmas trees, tall-growing landscape or natural vegetation, and crops supported by structures (e.g., trellises) would require BPA review of special consideration, but would likely not be allowed within the right-of-way. With a few exceptions described in Table 3-12, the proposed line has been designed to accommodate ~~E~~existing fields, rangeland grasses, orchards, vineyards, riparian vegetation and slow-growing trees or trees located in deeply incised channels; these uses would still require a written agreement with the easement. ~~may be allowed to remain if the line could be designed to accommodate them.~~ Trees outside of the right-of-way that have the potential to fall or grow close enough to the conductors to cause an electrical arc would also be removed.

Many uses would not be restricted, but certain precautions would need to be taken, for example, no object should be raised higher than 14 feet above the ground within the right-of-way (i.e., when moving irrigation pipes, they should be kept low and parallel to the ground); ground elevation should not be altered (such as piling of dirt within the right-of-way); irrigation spray should not create a continuous stream onto the conductors or towers; fences should be grounded; and installing underground pipes or cables through the right-of-way needs to be coordinated with BPA so that they do not interfere with transmission line grounding systems. Vehicles and large equipment that do not extend more than

14 feet high, such as harvesting combines, cranes, derricks and booms could be operated safely under the line where it passes over roads, driveways, parking lots, cultivated fields or grazing lands. See Section 3.12 for safety issues and Appendix A for details about living and working safely around high-voltage power lines.

Rangeland tends to be compatible with transmission lines, because animals would be able to graze within the right-of-way. Although tower footprints and road beds would occupy land and remove that area of vegetation from grazing, livestock could still maneuver around the towers and roads to access their range. As with most land uses, disturbance during construction and vegetation removal could introduce or spread noxious weeds. Noxious weed infestations would impact rangeland quality and potentially harm sheep and cattle. (See Section 3.3 Vegetation for more discussion about noxious weeds and their presence along the alternatives.)

As part of the access road system, existing gates would be used or new gates would be installed at property boundaries. During construction and line maintenance, workers would need to take care to ensure that gates are closed and not let livestock escape. ~~(Please see Section 3.10 Transportation for a discussion about potential increased trespass.)~~

Growing crops also would be generally compatible with the transmission line, but with more restrictions than rangeland. Crops would be allowed within the right-of-way, but as with rangeland the tower footprints and road beds would remove acreage from production. Working with the landowner, BPA would try to locate access roads along fences, using temporary construction access across fields to the tower locations. Temporary roads would be removed after construction and the land could be cultivated.

Towers would create an obstacle to till and work around, and if irrigation is used, it may need to be modified such that pipes may maneuver between the towers. Crop dusting would also be more difficult and dangerous with a transmission line crossing the field. Since the area around towers would not be tilled, these areas could become infested with noxious weeds, creating a seed source for contaminating the field in which the tower is located.

Depending on the time of year construction would occur in a particular area, crops could be damaged within the temporary construction footprint. Heavy machinery, materials on the ground, trenches for counterpoise, etc. would damage crops and compact soils, causing a temporary loss of soil productivity. The damage would depend on the type of crop (vineyards, orchards, annuals), the season (during summer growing season, harvest, or dormant winter), and if the land was in use or fallow. Compensation would be given for crop loss during construction (see Section 3.9 Socioeconomics), and soils would be restored as fully as possible to preconstruction conditions using tillage (Peters pers. comm. 2011).

During construction, livestock grazing, farming, and crop dusting in the area would have to be temporarily restricted to avoid conflicts between livestock or farm equipment and construction equipment.

CRP lands could potentially be impacted by locating a transmission line across those properties. Change in status would affect payments landowners would receive. However, the FSA Handbook Agricultural Resource Conservation Program for State and County Offices (USDA 2008) allows for CRP lands to be crossed by public utilities provided the county committee approves the use and the use is certified to have a minimum effect (vegetative cover is restored and impacts on erosion, wildlife and wildlife habitat, water, and air quality are kept to a minimum). In the unlikely event that the use was not approved, BPA would compensate for the affected acreage. Since BPA would work with landowners to provide information and mitigation measures to maintain CRP status, or provide compensation if the usage was not allowed, there would be ***no-to-low*** impacts on CRP lands for all route alternatives.

Residents that would be near the transmission lines would be limited from placing houses or outbuildings and from planting vegetation (that could grow above 10-feet tall at maturity) within the 150-foot right-of-way. The transmission line would also potentially create other possible issues for residents, such as impacts to views from homes, or concerns about property values and electric and magnetic field exposure (please see Sections 3.2 Visual Resources, 3.9 Socioeconomics, and 3.12 Public Health and Safety for more detailed discussions on these topics).

During construction activities residents would be disturbed by noise, dust, and traffic (please see Sections 3.10 Transportation, 3.12 Public Health and Safety, and 3.13 Air Quality for more detailed discussions on these topics).

Impacts of the project on recreation would occur if tower or road placement changed the recreational function by limiting the use or requiring the removal of facilities such as picnic areas, boat ramps, trails, access, etc. However, most impacts to recreation would be experiential; visual intrusions to the scenic character of the area (see Section 3.2 Visual Resources). These experiential impacts would occur at specific recreational sites and for general dispersed or informal recreational uses. Temporary construction activity could delay access to sites or impact a person's experience through noise, dust, and traffic.

Conservation uses would be impacted if the alternatives affected protected species or habitats. See Sections 3.3 and 3.6 regarding impacts to protected vegetation and wildlife species and habitats.

Maintenance of the transmission line would disrupt land use through noise, truck traffic, and potential crop damage. Twice each year helicopter flyovers would cause temporary noise that could disturb grazing animals and people living, working or recreating along the transmission line. Annual ground inspections of the line may be noticeable to landowners as crews drive on access roads and walk to towers. In fields, where temporary roads would be removed and converted back to agricultural use after construction, maintenance personnel would walk to access the line, with little impact to the crop. If repairs would be required (e.g., insulators changed), then trucks would have to drive through fields to get equipment to the towers. The landowner or lessee would be compensated for crop damage, as appropriate. Equipment noise during repairs may be noticeable. Vegetation management activities would also require personnel to drive along the access roads or walk the right-of-way to determine vegetation clearing needs. Cutting trees with chainsaws and removing debris would cause noise and dust.

Overall, maintenance impacts for the alternatives would be ***low*** because the activities would not change land use; would be short term and limited to noise, dust and a small amount of vehicle traffic; there are few if any areas along the alternatives that would require tree removal on a regular basis; and BPA would compensate for crop damage.

BPA access roads could potentially create an avenue for unauthorized access onto properties. At the request of landowners, BPA would place gates at the entrance of access roads to prevent public access onto properties and the project corridor. There is the potential that even with gates, unauthorized access and use of the right-of-way and adjacent properties could occur. ~~Washington DNR, which manages various state lands that would be crossed by all the alternatives, has raised concerns about potential impacts to state lands from this unauthorized access and use. Because transmission line corridors are linear facilities that typically can be accessed fairly easily by the general public, DNR is concerned that the project could contribute to unauthorized use and damage to state lands and public resources on these lands. DNR also is concerned that gates by themselves are not sufficient to prevent~~

~~unauthorized access and use to its lands where the project and associated roads would be present.~~ In general, potential impacts from unauthorized public access and use include increased soil erosion, fire danger, introduction of noxious weeds, and illegal dumping, as well as disturbance of vegetation, wildlife and their habitat, and cultural resources. Increased soil erosion could occur from unauthorized uses such as off-road vehicles and other unmanaged recreational activities accessing areas and disturbing the soils that are present, which can lead to erosion of these soils from rainfall and other events. Over time, unauthorized uses of gravel or dirt roads in the vicinity of the project corridor also could lead to accelerated deterioration of these roads through disturbance and erosion. Increased fire danger can result from activities by unauthorized users on or near the project from a variety of means, such as campfires, lit cigarettes, and vehicle exhaust systems coming into contact with vegetation. Potential impacts from soil erosion and increased fire danger are discussed in Sections 3.4 Geology and Soils, and 3.12 Public Health and Safety.

The potential introduction of noxious weeds from unauthorized public access and use can primarily occur from unauthorized vehicles inadvertently transporting and spreading seeds of noxious weeds into the project corridor and adjacent lands. Soil disturbance from these vehicles increases the potential for the introduced noxious weeds to become established in these disturbed areas. Impacts associated with the introduction of noxious weeds are discussed in Section 3.3 Vegetation.

Unauthorized access and use also can potentially disturb vegetation, wildlife and their habitat, and cultural resources. Vegetation and wildlife habitat can be disturbed by unauthorized vehicles driving over and crushing or uprooting plants, as well as by any vegetation clearance associated with an unauthorized use. Wildlife can be disturbed or displaced by the presence of and noise from unauthorized uses, and these uses can increase stress, disruption of normal foraging and reproductive habits, abandonment of unique habitat features, and energy expenditure of wildlife species in the area. Cultural resources can be disturbed by the damaging of known or previously undiscovered cultural resource sites or the unauthorized collection of artifacts or other cultural resources. Potential impacts associated with disturbance of vegetation, wildlife and their habitat, and cultural resources are discussed in Sections 3.3 Vegetation, 3.6 Wildlife, and 3.8 Cultural Resources.

Because BPA would use mitigation measures to decrease the potential for unauthorized public access and use and occurrences of this type of activity would generally be infrequent, impacts from unauthorized public access and use would be ***low***.

Washington DNR, which manages various state lands that would be crossed by the alternatives, has raised concerns about potential impacts to state lands from this unauthorized access and use. Because transmission line corridors are linear facilities that typically can be accessed fairly easily by the general public, DNR is concerned that the project could contribute to unauthorized use and damage to state lands and public resources on these lands. DNR also is concerned that gates by themselves are not sufficient to prevent unauthorized access and use to its lands where the project and associated roads would be present. To address DNR's concerns about unauthorized access to its lands as a result of the project, BPA would continue to work with DNR concerning possible avenues for controlling or minimizing the potential for unauthorized public access and use on state lands. DNR believes that unauthorized use disproportionally affects DNR lands and that the impact would be ***moderate-to-high***.

Work at Big Eddy Substation would occur for all the routing alternatives. Because the work at Big Eddy Substation would be limited and within the existing fenced electrical yard, there would be no change in land use (use would continue to be electrical/industrial use). During construction, activities would create short-term noise and some increased traffic from workers and equipment delivery that could disturb local residents or other landowners. However, the existing substation yard is somewhat isolated on a hill about a quarter mile from the nearest residence. No recreation areas would be affected by work at Big Eddy Substation because none are close enough to see or be within earshot of construction activities. Overall, there would be ***no*** land use impacts for work at Big Eddy Substation because land uses would not change and construction disturbance would be isolated and temporary.

West Alternative

The West Alternative would follow existing BPA right-of-way for about 16 of its 27 miles. Between 233 and 432 acres of new right-of-way easement would need to be acquired: 233 acres for options that remove the existing Chenoweth-Goldendale line and use the existing 100-foot easement (West Options 2, 3, 4 and 5), and 432 acres if the proposed line were to be built parallel to the existing line (Option 1). The options that would use the existing right-of-way would require the least amount of new easement of all the route alternatives, whereas building the line parallel would require the greatest amount of new right-of-way of all the route alternatives (see Table 3-2). Easements would also be acquired for new access roads (see Table 3-3).

Table 3-2. Approximate Transmission Line Lengths and New Right-of-Way by Land Ownership and Action Alternative

	West Alternative		Middle Alternative		East Alternative	
Landowner	Miles of Line	New Right-of-Way (acres)	Miles of Line	New Right-of-Way (acres)	Miles of Line	New Right-of-Way (acres)
Private[1]	**20 (+1)**	**187–325 (+14)**	**24 (+1)**	**251–275 (+14)**	**24 (+1)**	**233–244 (+14)**
Federal	**0.4**	**1**	**1.0**	**9.7**	**0.8**	**0.7**
BPA	0.4	1	0.5	0.7	0.5	0.7
USFS	0	0	0.5	9.0	0.3	<0.1
Tribal	**0**	**0**	**1.1**	**9.0–9.8**	**1.6**	**0.8–1.3**
Warm Springs	0	0	0.6	0–0.8	0.6	0.8
Yakama	0	0	0.5	9	1.0	0-0.5
State[1]	**5.1 (+1)**	**31–92 (+14)**	**0 (+1)**	**0 (+14)**	**0.5 (+1)**	**9 (+14)**
Parks	1.8	11–33	0	0	0	0
DNR[1]	3 (+1)	18–54 **(+14)**	0 (+1)	0 **(+14)**	0.5 (+1)	9 **(+14)**
WDFW	0.3	2–5	0	0	0	0
Total	**27**	**233–432**	**27**	**~~270–309~~ 284–309**	**28**	**~~244–269~~ 258–269**
National Scenic Area	**9.5**	**72-119**	**5.5**	**40-43**	**7.5**	**1-5**

Note: An additional 1 mile of line and 14 acres of right-of-way would be needed for the last portion of the route going into the Knight Substation Site for all three route alternatives, which would be added to the private lands category for Site 1 and State DNR lands category for Site 2. Substation site acreages are not included (see Knight Substation Options in this section).

As with all the action alternatives, the right-of-way for the West Alternative would occupy more acres of private land than any other land use category. The West Alternative also would occupy the most acreage of state-owned land; about 31-106 acres of state land would need to be acquired for the transmission line right-of-way, depending on the line option and whether the route would go to Substation Site 1 or 2. Since the West Alternative would not cross tribal trust land, no right-of-way would be required across tribal land with this alternative. The only right-of-way across federal land under the West Alternative would be located on the BPA-owned land that surrounds Big Eddy Substation.

The West Alternative would have the longest amount of proposed line in the National Scenic Area; about 9.5 miles of line, which would require about 72-119 acres of new right-of-way. See Chapter 7, National Scenic Area Standards, for amounts of impact on the land uses within the National Scenic Area, and a discussion of project consistency with National Scenic Area land use designations crossed by the West Alternative.

Table 3-3. Permanent Access Road Miles by Land Ownership and Action Alternative

	West Alternative			Middle Alternative			East Alternative		
Landowner	**New**	**Upgrade Existing**	**Total**	**New**	**Upgrade Existing**	**Total**	**New**	**Upgrade Existing**	**Total**
Private	~~17~~ 15	~~11~~ 10	~~28~~ 25	17	~~15~~ 11	~~32~~ 28	~~13~~ 15	~~14~~ 10	~~27~~ 25
Federal	~~1~~ 0	~~<0.1~~ 0	~~1~~ 0	~~3~~ 1	~~<0.1~~ 1	~~3~~ 2	~~1.8~~ 0.5	~~0.4~~ 1	~~2.2~~ 2
BPA	~~1~~ 0	~~<0.1~~ 0	~~1~~ 0	~~2~~ 0.3	~~<0.1~~ 1	~~2~~ 1.3	~~1.7~~ 0.3	~~<0.1~~ 1	~~1.7~~ 1
USFS	0	0	0	1	~~<0.1~~ 0	1	~~0.1~~ 0.2	0.4	~~0.5~~ 0.6
Tribal	0	0	0	0.9	~~0.8~~ 0.7	~~1.7~~ 1.6	~~1.3~~ 1	~~2.7~~ 2	~~4~~ 3
Warm Springs	0	0	0	0.4	~~0.5~~ 0.4	~~0.9~~ 0.8	0.4	~~0.5~~ 0.4	~~0.9~~ 0.8
Yakama	0	0	0	0.5	0.3	0.8	~~0.9~~ 0.8	~~2.2~~ 1	~~3.1~~ 2
State	~~4~~ 3	5	~~9~~ 8	~~0.7~~ 0	~~0.1~~ 0	~~0.8~~ 0	~~0.8~~ 0.2	~~0.1~~ 0	~~0.9~~ 0.2
Parks	1	2	3	0	0	0	0	0	0
DNR	~~3~~ 2	3	~~6~~ 5	~~0.7~~ 0	~~0.1~~ 0	~~0.8~~ 0	~~0.8~~ 0.2	~~0.1~~ 0	~~0.9~~ 0.2
WDFW	~~<~~0.1	0	~~0~~ 0.1	0	0	0	0	0	0

Agriculture

The West Alternative would impact lands classified as farmlands of statewide importance and prime farmland. The tower and road footprints would remove about 38-51 acres of farmlands of statewide importance in Klickitat County, which is about 0.04 percent of land in this classification in the county, and about 4 acres in Wasco County, which is less than 0.001 percent of land in this classification in the county. Impacts to prime farmland would be about 12 acres in Klickitat County, which is less than 0.01 percent of land in this classification in the county, and about 1 acre in Wasco County, which is less than 0.3 percent of land in this classification in the county.

About ~~78–95~~ 83–100 acres of rangeland would be removed from use due to tower footings and access roads (see Table 3-4), and an additional 33–84 acres of rangeland would be temporarily disrupted during tower construction.

About ~~10–12~~ 6–8 acres of nonirrigated cropland would be permanently taken out of production by tower footings and access roads, with an additional ~~16-21~~ 11–15 acres temporarily impacted during construction. For options in which the proposed line would parallel the existing Chenoweth-Goldendale line, the towers would not be next to each other because the span length of the proposed line would be longer than that of the wood-pole line. Towers would be staggered, which would create more obstacles to farm around. For options in which the wood-pole line would be removed, existing farming conditions could actually be improved because, although the footprint of the proposed tower would be larger than the existing wood-pole line, the proposed line may be able to span fields more easily. In addition, for options that include the removal of the existing line Chenoweth-Goldendale line (about 16 miles), about 1.5 acres now used for the footprint of the existing towers (about 0.01 acre per tower) could either be farmed or reused for the new tower construction.

Table 3-4. Impacts on Land Use by the West Alternative

	Permanent Impacts				Temporary Impacts		
	Towers[1] (acres)	New Roads (acres)	Upgraded Existing Roads (acres)	Total Permanent Impacts per Land Use (acres)[1]	Towers[1,2] (acres)	Temporary Roads (acres)	Total Temporary Impacts per Land Use (acres)[1]
Irrigated Cropland	0.1–0.2	~~0.3~~ 0.1	0	**~~0.5~~ 0.2-0.3**	0	0	**0**
Nonirrigated Cropland	2–4	~~8~~ 4	~~0.3~~ 0.2	**~~10–12~~ 6–8**	~~7–12~~ 7-11	~~9~~ 4	**~~16–21~~** 11–15
Orchards/ Vineyards	0	0.2	~~≤~~ 0.1	**~~0.2~~ 0.3**	0	~~0~~ 5	**~~0~~** 5
Rangeland	11–28	52	~~15~~ 20	**~~78–95~~ 83–100**	33–84	0	**33–84**
Conservation/ Recreation/ Preserve	3–9	~~11~~ 8	~~9~~ 10	**~~23–29~~ 21–27**	9–27	0	**9–27**
Totals by Type of Impact	**16–41**	**~~29~~ 64**	**~~35~~ 30**	**~~112–137~~ 111–136**	**48–122**	**9**	**57–131**
National Scenic Area	6–14	~~23~~ 22	~~23~~ 30	**~~52–60~~ 58–66**	17–41	1	**18–42**

[1] Impacts are presented as ranges from all possible tower options. ~~Double-circuit options would have the greatest impacts from towers~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 1.5 acres for the West Alternative.

[2] The "Temporary Tower Impacts" column provides the total of the temporary tower construction impacts and removal of existing towers when applicable).

The small amount of irrigated cropland found along the West Alternative at line mile W21.5 would potentially be impacted by about ~~0.3~~ 0.1 acre of new access road. Irrigation would likely be able to continue under the right-of-way without reconfiguration as the existing Chenoweth-Goldendale line already crosses the area.

Other agricultural impacted would include an orchard near line mile W1 and a vineyard between line miles W4 and W5. About 5 poplar windbreak trees would have to be removed where the line would cross over the orchard. The gap in trees could affect the orchard through increased exposure, but would not be on a side that sustains heavy winds. The vineyard could be impacted by about ~~0.2~~ 0.3 acre of access road, but no plants would be removed.

Residences

The West Alternative would pass within 800 feet of 17–24 houses (see Appendix B). There are no houses within the proposed right-of-way, so none would need to be removed or relocated. However, in Oregon at line mile W0.5 a large outbuilding within the existing easement could potentially need to be relocated depending on whether the existing easement could be adjusted. About four houses would be within 300 feet of the new line, which could mean that the right-of-way would pass through parts of the property used for residential purposes. Some of these houses have the existing Chenoweth-Goldendale line encumbering the properties. About line mile WM25.5, a house within 330 feet of the proposed line would likely have residential uses impacted (no buildings, tall trees, etc.) by a new 150-foot wide right-of-way. Impacts to these properties would be less for the options that would use the existing right-of-way with a 50-foot wide addition (Options 2, 3, 5), than for the options that would parallel the existing Chenoweth-Goldendale line (Options 1 and 4) that would require an additional 150-wide right-of-way.

The West Alternative would also cross 17 of the 20-acre parcels being sold as residential lots along the Little Klickitat River from about line miles W17.5–21.5 (see parcel divisions on Map 3-1). These properties are presently encumbered by the existing Chenoweth-Goldendale line and the amount of additional encumbrance would depend on the option – less for Options 2, 3, and 5 and greater for Options 1 and 4.

During construction, noise and dust could impact residents in the area to some extent, with greater impacts the closer a home is to the proposed tower or road work.

Conservation, Recreation, and Preserve

The West Alternative would impact the most parks, preserves, and conservation lands of the route alternatives. About ~~23–29~~ 21–27 acres of land managed for conservation or recreation would be converted to tower footings and access roads (Table 3-4) and another 9–27 acres would be temporarily disrupted due to construction.

The West Alternative would require the installation of about 10 towers and 2 miles of line in Columbia Hills State Park and in the adjacent Columbia Hills Natural Area Preserve. In addition, new roads would be required and existing BPA roads that access the existing Chenoweth-Goldendale line through these areas would be upgraded (widened, bladed, graveled). The towers and roads would be located such that they would not impact the function of either the park or preserve; facilities would not be affected and recreational activities would not be restricted. However, because the proposed line would add an industrial, human-made element to the area, there would be experiential impacts to recreationists (see Section 3-2 Visual Resources). In addition, the proposed line would impact areas within both the park and preserve that support sensitive native plants and wildlife habitat and are managed for protection and enhancement of these natural environments (DNR 2006; Washington State Parks and Recreation Commission 2003). Impacts to these environments would also affect research and education functions of both the park and preserve. Towers and roads would remove some sensitive plant species designated for protection (see Section 3-3 Vegetation and Section 3-6 Wildlife for more information).

About 0.25 mile of the West Alternative would cross a corner of the Eckton Ranch conservation property near line mile W18. At least one tower and some access road work would be required on the property. Tower options 1 and 4 (alignment parallel to the existing line) would remove about 10 ponderosa pine trees in this location, whereas Options 2, 3, and 5 would not remove any trees. No sensitive plant species or habitat would be affected on this property and agricultural uses would be able to continue, though with some additional obstacles (especially for Options 2, 3, or 5).

The WDFW land crossed by the West Alternative at line mile W11 would likely have one tower and about 0.25 mile of right-of-way on the property. Although the proposed line would encroach on the conservation use of this area, the one special-status species found in this area would not be impacted (see Section 3-3 Vegetation).

Although the West Alternative would cross the Klickitat Trail at Swale Creek (near line mile W11) and parallel the trail (within about 500 feet) for about 0.3 mile, the trail would remain unaltered. However, the proposed line would create experiential impacts to hikers and bikers along this short segment of trial, degrading their experience of the natural environment.

There would be no functional impacts to informal recreational uses (biking, swimming, hunting, etc.) along the West Alternative, but the recreational experience of those participating in these activities in the vicinity likely would be affected by the presence of the proposed new line.

The quiet and scenic landscape of the recreational areas crossed would be disturbed by construction activities, but facilities would still be accessible.

In summary, the West Alternative would remove acreage from range and crop land, but use could continue; slightly impact an orchard and not substantially impact a vineyard; restrict residential use in the right-of-way, but not remove any homes; and impact conservation efforts of the Columbia Hills State Park and the Columbia Hills Natural Area Preserve by permanently removing sensitive species designated for conservation. Although all land uses would be impacted, most are abundant in the surrounding area. Because the Columbia Hills State Park and the Columbia Hills Natural Area Preserve are designated to protect established resources specific to that area, impacts would be great. Therefore, overall impacts of the West Alternative on land use would be ***moderate-to-high.***

Although still a moderate-to-high impact, the option that would remove the existing wood-pole line and use single-circuit towers in the existing alignment (West Option 3), would have the least impact of the tower options because it would have a smaller tower footprint, require the least amount of additional right-of-way, lessen the number of towers to navigate around during farming activities, and allow returned use of fields and grazing where the wood-pole structures are currently located. The options that would parallel the existing Chenoweth-Goldendale line (West Options 1 and 4) would have the greatest impact because they would require the greatest amount of new right-of-way and would create staggered towers across agricultural fields. The amount of impacts of West Options 2, 5, and 6 would be between these options.

Middle Alternative

The Middle Alternative would follow existing BPA right-of-way for about 9 of its 27 miles. Between 284 and 309 acres of new right-of-way easement would be acquired (see Table 3-2); 284 acres for the option that would rebuild the existing Harvalum-Big Eddy line with double-circuit towers (Option 3), 309 acres for the option that would parallel that line (Option 1). Acreage for Option 2 (which is a mix of the single and double-circuit towers along the existing lines) falls between these two acreages. Even if the line paralleled the Harvalum-Big Eddy line, there is vacant adjacent easement and only 12.5 feet of additional right-of-way width would be required. The remainder of the Middle Alternative would require a new 150-foot-wide right-of-way. Easements would also be acquired for new access roads (see Table 3-3).

For the route adjustment at line miles ME6-8, new right-of-way would need to be acquired and the existing right-of-way would be abandoned. There would be no overall change in the amount of easement BPA would hold.

As with all the action alternatives, the right-of-way for the Middle Alternative would occupy more acres of private land than any other land use category. The Middle Alternative would not occupy any state-owned land if the route goes to Substation Site 1; if the Middle Alternative goes to Substation Site 2, the transmission line right-of-way would occupy 14 acres of easement across state land. About 0.6 miles of the Middle Alternative would cross Warm Springs Tribal trust land; about 12.5 feet of additional right-of-way (0.8 acres) would be occupied for options that parallel the existing line in this area (Options 1 and 2). In Washington, about 0.5 miles of Yakama Tribal trust land would be crossed where there is no existing line, requiring about 9 acres of new right-of-way. Federal land that would be crossed includes BPA-owned land surrounding Big Eddy Substation and about 0.5 miles of USFS land. There is no existing line across this USFS land, so about 9 acres of right-of-way would be obtained.

The Middle Alternative would have the shortest amount of proposed line in the National Scenic Area; about 5.5 miles of line would require about 40-43 acres for new right-of-way. See Chapter 7, National Scenic Area Standards for acreages of impact on the land uses within the National Scenic Area and a discussion of project consistency with National Scenic Area land use designations crossed by the Middle Alternative.

Agriculture

The Middle Alternative would impact lands classified as farmlands of statewide importance and prime farmland. The tower and roads footprints would remove about 23 acres of farmlands of statewide importance in Klickitat County, which is less than 0.005 percent of land in this classification in the county, and about 8 acres in Wasco County, which is less than 0.002 percent of the land in this classification in the county. Impacts to prime farmland would be about 15 acres in Klickitat County, which is about 0.01 percent of land in this classification in the county, and about 3 acres in Wasco County, which is about 0.8 percent of land in this classification in the county.

About ~~73–74~~ 74–75 acres of rangeland would be removed from use for tower footings and access roads, and an additional 31–47 acres of rangeland would be temporarily disrupted during project construction (see Table 3-5).

The Middle Alternative would impact the most cropland of all the route alternatives. About ~~24–25~~ 20–21 acres of nonirrigated cropland would be permanently taken out of production by tower footings and access roads, and another ~~25–27~~ 29–31 acres of nonirrigated cropland would be temporarily disrupted during project construction. The small amount of irrigated cropland found along the Middle Alternative at line mile WE21.5 (the same irrigated land that the West Alternative would impact), would potentially be impacted by about ~~0.5~~ 0.2–0.3 acre of new access road. Irrigation would likely be able to continue under the right-of-way without reconfiguration because the Chenoweth-Goldendale line already crosses the area.

The orchards crossed by the Middle Alternative near Big Eddy Substation would have a portion of a tower and some road within the vicinity, but no orchard trees would be removed because the line would be designed to span the orchard.

For options that would remove existing towers (the first 9 miles of line), about 2 acres, now used for the footprint of the existing towers, could be planted and farmed or used for grazing.

The potential route adjustment at line miles ME6-8 would impact the same type of crop land use, but would have a smaller footprint impact by about 0.2 acre because the route adjustment would require one less tower.

Residences

The Middle Alternative would pass within 800 feet of 42-46 houses (see Appendix B); most are either in Oregon or in Wishram, Washington. There are no houses within the proposed right-of-way, so none would be removed. About three–five houses would be within 300 feet of the new line, which could mean that the line would pass through parts of the property used for residential purposes. All but one of these houses has the existing Harvalum-Big Eddy line encumbering the properties, so no additional right-of-way restrictions would be imposed for the option that would rebuild the existing line as double-circuit (Middle Option 3) within the existing right-of-way. For options that would parallel all or portions of the existing Harvalum-Big Eddy line (Middle Options 1 and 2), an additional 12.5-foot width of new right-of-way would impose new land use restrictions to these properties. At about line mile WM25.5, a house within 330 feet of the proposed line would likely have residential uses impacted (no buildings, tall trees, etc.) by a new 150-foot wide right-of-way.

Table 3-5. Impacts on Land Use by the Middle Alternative

	Permanent Impacts				Temporary Impacts		
	Towers[1] (acres)	New Roads (acres)	Upgraded Existing Roads (acres)	Total Permanent Impacts per Land Use (acres)[1]	Towers[1,2] (acres)	Temporary Roads (acres)	Total Temporary Impacts per Land Use (acres)[1]
Irrigated Cropland	0.1–0.2	~~0.3~~ 0.1	0	**~~0.5~~ 0.2–0.3**	0.4–0.6	0	**0.4–0.6**
Nonirrigated Cropland	4–5	~~16~~ 10	~~5~~ 6	**~~24–25~~ 20–21**	~~13–16~~ 13–15	~~12~~ 16	**~~25–27~~ 29–31**
Orchards/ Vineyards	0.1–0.2	~~0.1~~ 0	0	**~~0.2–0.3~~ 0.1–0.2**	0.4–0.5	~~0~~ 4	**~~0.4–0.5~~ 4**
Rangeland	11–12	~~42~~ 44	~~21~~ 19	**~~73–74~~ 74–75**	31–47	0	**31–47**
Conservation/ Recreation	0.3	~~2.3~~ 0	0	**~~3~~ 0.3**	0.8	0	**0.8**
Total by Type of Impact	**16–18**	**~~60~~ 54**	**~~25~~ 26**	**~~101–103~~ 96–98**	**46–64**	**~~13~~ 20**	**~~58–76~~ 66–84**
National Scenic Area	3–4	~~14~~ 21	~~6~~ 20	**~~23–24~~ 44–45**	10–15	~~1~~ 4	**~~11–16~~ 14–19**

[1] Impacts are presented as ranges from all possible tower options. Double-circuit options would have the greatest impacts from towers, The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 2.0 acres for the Middle Alternative.

[2] The "Temporary Tower Impacts" column provides the total of the temporary tower construction impacts and removal of existing towers (when applicable).

The Middle Alternative would also cross five 20-acre parcels being sold as residential lots along the Little Klickitat River from about line miles M20.5–21.5. These properties are presently encumbered by the existing Chenoweth-Goldendale line and the amount of additional encumbrance would depend on the option – less for Options 2, 3, and 5 and greater for Options 1 and 4.

During construction, noise and dust could impact residents in the area to some extent, with greater impacts the closer a home is to the proposed tower or road work.

Conservation and Recreation

About ~~3~~ 0.3 acres of USFS land managed for conservation and dispersed recreation would be impacted by a tower and new access road along the Middle Alternative, with an additional 0.8 acre of temporary impacts from tower construction. No special-status species, priority ecosystems, wetlands, or streams would be impacted on this property, so impacts to conservation efforts would be minimal. No recreation facilities would be affected. Dispersed recreation on this property, or elsewhere along the Middle Alternative (including uses on the Columbia River or areas near the Little Klickitat River) would not be impacted functionally, but those participating in those activities may be affected by the presence of the line.

In summary, because the Middle Alternative would remove acreage from range and crop land, but use could continue; would have little impact to residential use because the line would mostly pass homes in existing right-of-way and no structures would be removed; and would have minimal effects on conservation efforts on USFS land, the overall impacts of the Middle Alternative on land use would be ***low-to-moderate.***

Impacts of Middle Option 3 (removing the existing Harvalum-Big Eddy line and including it on double-circuit towers with the proposed line) would have a larger initial disturbance impact than the other two options, but would affect fewer acres by combining existing facilities and requiring less new right-of-way. Though still a low-to-moderate impact, Middle Option 1 would have the most impact of the three options because it would place an additional footprint adjacent to existing lines and require a slightly larger right-of-way. Impacts from Middle Option 2 would fall between Options 1 and 3.

East Alternative

The East Alternative would follow existing BPA right-of-way for about 14 of its 28 miles. Between 258–269 acres of new right-of-way easement would be acquired (see Table 3-2): 258 acres for the option that would rebuild the existing Harvalum-Big Eddy and McNary-Ross lines with double-circuit towers (Option 3), and 2 acres for the option that would parallel that line (Option 1). Acreage for Option 2 (which is a mix of the single and double-circuit towers along existing lines) falls between the two acreages given. Even if the line paralleled the two existing lines, there is vacant easement adjacent to the existing lines, only 12.5 feet of additional right-of-way would be needed along the Harvalum-Big Eddy line, and no new right-of-way would be needed along the McNary-Ross line. The remainder of the East Alternative would require a new 150-foot wide right-of-way. Easements would also be acquired for new access roads (see Table 3-3).

As with all the action alternatives, the right-of-way for the East Alternative would occupy more acres of private land than any other land use category. The East Alternative occupy between 9 and 23 acres of state-owned land depending on whether the route would go to Substation Site 1 or 2. As with the Middle Alternative, the East Alternative would cross about 0.6 miles of Warm Springs Tribal trust land and about 12.5 feet of additional right-of-way (0.8 acres) would be required for options that parallel the existing line in this area (Options 1 and 2). In Washington, about 1 mile of Yakama Tribal trust land would be crossed where there is no existing line, requiring about 0.5 acres of new right-of-way for Options 1 and 2, and no new right-of-way for Option 3. Federal land that would be crossed includes BPA-owned land surrounding Big Eddy Substation and about 0.3 miles of USFS land. No new right-of-way would be obtained across this USFS land because the existing corridor could accommodate either a new parallel single-circuit line or a rebuild of the existing line to double-circuit.

The East Alternative crosses the National Scenic Area for 7.5 miles and would require the least amount of new right-of-way within the National Scenic Area (1-5 acres). See Chapter 7, National Scenic Area Standards for acreages of impact on the land uses within the National Scenic Area and a discussion of project consistency with National Scenic Area land use designations crossed by the East Alternative.

Agriculture

The East Alternative would impact lands classified as farmlands of statewide importance and prime farmland. The tower and roads footprints would remove about 25 acres of farmlands of statewide importance in Klickitat County, which is about 0.005 percent of land in this classification in the county, and about 8 acres in Wasco County, which is less than 0.002 percent of the land in this classification in the county. Impacts to prime farmland would be about 9 acres in Klickitat County, which is about

0.007 percent of land in this classification in the county, and about 3 acres in Wasco County, which is about 0.8 percent of land in this classification in the county.

About ~~81–83~~ 86–88 acres of rangeland would be removed from use due to tower footings and access roads, and an additional 33–67 acres of rangeland would be temporarily disturbed during project construction (see Table 3-6).

Table 3-6. Impacts on Land Use by the East Alternative

	Permanent Impacts				Temporary Impacts		
	Towers[1] (acres)	New Roads (acres)	Upgraded Existing Roads (acres)	Total Permanent Impacts per Land Use (acres)[1]	Towers[1,2] (acres)	Temporary Roads (acres)	Total Temporary Impacts per Land Use (acres)[1]
Irrigated Cropland	0.1	~~0.4~~ 0.1	~~0.3~~ 0.2	**~~0.8~~ 0.4**	0.4	~~0~~ 0.1	**~~0.4~~ 0.5**
Nonirrigated Cropland	5–6	~~12~~ 4	~~0.5~~ 3	**~~17–18~~ 12–13**	15–21	~~18~~ 19	**~~33–39~~ 34–40**
Orchards/ Vineyards	0.1–0.2	~~0.1~~ 0	0	**~~0.2–0.3~~ 0.1–0.2**	0.4–1.2	~~0~~ 6	**~~0.4–1.2~~ 6–7**
Rangeland	11–13	~~39~~ 45	~~31~~ 30	**~~81–83~~ 86–88**	33–67	0	**33–67**
Conservation/ Recreation	0.1–0.2	~~0.5~~ 0	~~1~~ 0	**~~2~~ 0.1–0.2**	0.4–1.3	0	**0.4–1.3**
Total by Type of Impact	**17–19**	**~~52~~ 49**	**33**	**~~102–104~~ 99–101**	**49–91**	**~~18~~ 24**	**~~67–108~~ 73–115**
National Scenic Area	4–7	12	20	**36–39**	13–43	~~1~~ 4	**~~14–44~~ 17–47**

[1] Impacts are presented as ranges from all possible tower options. ~~Double-circuit options would have the greatest impacts from towers.~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 3.5 acres for the East Alternative.

[2] The "Temporary Tower Impacts" column provides the total of the temporary tower construction impacts and removal of existing towers (when applicable).

The East Alternative would impact about ~~17–18~~ 12–13 acres of nonirrigated cropland for tower footings and access roads, and another ~~33–39~~ 34–40 acres would be temporarily disturbed during project construction. The small amount of irrigated cropland found along the East Alternative at line mile E23 would potentially be impacted by about ~~0.8~~ 0.4 acre of towers and access roads and an additional ~~0.4~~ 0.5 acre would be temporarily disturbed. Irrigation equipment may need reconfiguration to continue to operate under the line.

As with the Middle Alternative, the orchards crossed by the East Alternative near Big Eddy Substation would have a portion of a tower and some road within the vicinity, but no orchard trees would be removed because the line would be designed to span the orchard.

For options that would remove existing towers (the first 14 miles of line), about 3.5 acres, now used for the footprint of the existing towers, could be planted and farmed or used for grazing.

As with the Middle Alternative, the potential route adjustment at line miles ME6-8 would impact the same type of crop land use, but would have a smaller footprint impact by about 0.2 acre because the route adjustment would require one less tower.

Residences

The East Alternative would pass within 800 feet of 39–42 houses (see Appendix B). As with the Middle Alternative, most of these houses are either in Oregon or in Wishram, Washington. There are no houses within the proposed right-of-way, so none would be removed. About three–five houses would be within 300 feet of the new line, which could mean that the line would pass through parts of the property used for residential purposes. All but one of these houses has the existing Harvalum-Big Eddy line encumbering the properties, so no additional right-of-way restrictions would be imposed for the option that would rebuild the existing line as double-circuit (East Option 3) within the existing right-of-way. For options that would parallel all or portions of the existing Harvalum-Big Eddy line (East Options 1 and 2), an additional 12.5-foot wide right-of-way would impose new land use restrictions on these properties. At about line mile E27, a house within 330 feet of the proposed line would likely have residential uses impacted (no buildings, tall trees, etc.) by a new 150-foot wide right-of-way.

During construction, noise and dust could impact residents in the area to some extent, with greater impacts the closer a home is to the proposed tower or road work.

Conservation and Recreation

The East Alternative would impact about ~~2~~ 0.1–0.2 acres of USFS conservation land due to tower and access road work, with an additional 0.4–1.3 acres of temporary impacts from tower construction. The impacts would be on land already encumbered by the existing right-of-way and would not affect any special-status species or ecosystems. No recreational facilities would be affected. Dispersed recreation on this property, or elsewhere along the East Alternative (including uses on the Columbia River or areas near the Little Klickitat River) would not be impacted functionally, but those participating in those activities may be affected by the presence of the line.

The East Alternative would pass within about 0.25 mile of the Maryhill Winery and the Maryhill Museum of Art on the opposite side of SR-14 (near line mile E13), but would not cross either property and would have no permanent impact on their use. Temporary impacts would include those caused by construction activities, which would be perceptible to outdoor visitors for a short period.

Industrial

The East Alternative would cross through about 0.5 mile of the Windy Flats wind energy project where it is on DNR property. The East Alternative is located so as to avoid impacts to wind turbines. The proposed line would not preclude future wind development near the line as long as structures, including blades, would not cross into the 150-foot right-of-way. Coordination with BPA would be necessary for potential underground work within the right-of-way.

In summary, because the East Alternative would remove acreage from range and cropland, but these uses could continue; there would be little impact to residential use because the line would mostly be in existing right-of-way where it would pass homes ~~in existing right-of-way~~ and no ~~structures~~ building would be removed; there would be minimal impacts on conservation efforts on USFS land, and wind facilities would not be affected, impacts of the East Alternative on land use would be ***low-to-moderate.***

Knight Substation Options

Knight Substation Site 1

~~Although BPA needs 30 acres for Knight Substation, at~~ For Site 1, BPA would likely purchase 72 acres (about 30 percent) of a 245-acre private agricultural property. This would create an 80-acre parcel that would be owned by BPA, as 8 acres are already owned by BPA where its existing transmission lines cross the property (see Table 3.6.1). The 80 acres would encompass most development needs (substation, portions of new road, soil stockpile area, and staging areas), as well as extra purchased acreage. The extra land would be purchased to avoid land-locking the current landowner.

Table 3-6.1. Impacts on Land Use by the Knight Substation Sites

Facility	Site 1 (acres)	Site 2 (acres)
Property Purchase	80	30
Additional Permanent Impacts	6.3[1]	6.7[2]
Total Permanent Impacts[3]	**86.3**	**36.7**
Total Temporary Impacts[4]	**21**	**13**

[1] Acreage outside 80-acre parcel that would be impacted by installation of a new access road off Knight Road (4.6 acres), Klickitat County PUD electrical lines (0.15 acres), and dead-end towers for overhead ground wire (1.5 acres).
[2] Acreage outside 30-acre parcel that would be impacted by installation of a new access road off Knight Road (5 acres), Klickitat County PUD electrical lines (0.15 acres), and dead-end towers for overhead ground wire (1.5 acres).
[3] These are maximum potential permanent impacts. If some land is leased back for agricultural use, permanent impacts would be less.
[4] These are temporary impacts that occur outside the 80-acre and 30-acre parcels.

Site 1 ~~would~~ could permanently remove ~~72~~ up to 86.3 acres of land from its existing land use (mostly cropland, with a small amount of rangeland). The substation parcel would remove 80 acres of nonirrigated cropland from grain production, impacting land that is classified as prime farmland. However, BPA may lease out portions of the unused land for agricultural use. A substation access road from Knight Road would permanently remove an additional 4.6 acres of agricultural land from use (the road would impact a total of 6 acres, but 1.4 acres of it would be on the 80-acre parcel). Overhead ground wire and associated counterpoise needed on the Wautoma-Ostrander line about 1 mile out from either side of Knight Substation would require two new dead-end towers, which would permanently impact 1.5 acres – about 0.75 acre of agricultural land and 0.75 acre of rangeland.

Klickitat County PUD substation electrical service would follow about 0.5 mile of Knight Road county right-of-way from Pine Forest Road. The 30 wood poles required could permanently remove about 0.15 acre of agricultural land from production, but would likely be at the edge of fields such that no agricultural land would be impacted. As the PUD line turned west off Knight Road toward the substation sites, it would likely be buried alongside the proposed substation access road and would not impact any land beyond that described for the road.

Construction of the substation at Site 1 would temporarily impact about 21 acres of land outside the 80-acre parcel. If a 1-mile temporary access road from Hill Road is needed for substation construction on Site 1, about 6 acres of agricultural land and 2 acres of rangeland would be temporarily impacted outside the parcel. This area would be within the BPA fee-owned right-of-way of the Wautoma-Ostrander and Bonneville-Midway transmission lines that run through the area, but much of this is leased to the adjacent landowner for agriculture. The road could further impact fields by temporarily dissecting fields or cutting-off corners of fields from use. In addition, counterpoise installation on the

Wautoma-Ostrander line would temporarily impact about 9 acres of agricultural land and 4.3 acres of rangeland outside Site 1.

~~Possible roads needed to access Site 1 would be about 0.75 miles long, would further impact agricultural lands, and may dissect some fields or cut-off corners of fields from use. If the access road runs from Knight Road, it would impact DNR land leased for agricultural use.~~

Temporary construction impacts would include noise and dust during the 20 months it is expected to take for substation construction. However, Site 1 is surrounded by farmland, with no houses in the vicinity, so disturbance would be limited to drivers passing on Knight Road about 0.5 miles to the east.

Overall, impacts to Site 1 would be ***moderate.*** Assuming BPA does not lease the excess property for agricultural use, Site 1 would convert up to 86.3 acres of prime farmland to nonagricultural use. If excess property is leased back for agricultural use, about 28 acres would be permanently impacted. About 21 acres of mixed agriculture and rangeland would be temporarily impacted by the temporary road and counterpoise installation.

~~Overall, because Site 1 would convert more than 70 acres of prime farmland to a nonagricultural use and new roads would create further impacts, impacts of Site 1 would be ***moderate.***~~

Knight Substation Site 2

Site 2 would permanently remove up to 36.7 acres of land from its existing land use (mostly cropland, with a small amount of rangeland). BPA would likely purchase 30 acres (6 percent) of 544 acres of State Trust Land, removing the 30 acres from potential grain production (it is currently fallow) and impacting prime farmland. Dispersed recreation that may occur locally would also be eliminated from ~~the~~ this 30-acre area. ~~the substation would occupy~~. Placement of the substation at Site 2 may also cut off the top portion of the DNR land from practical use. An access road to the site would be from Knight Road and would permanently remove an additional 5 acres of agriculture land from use on the northern portion of DNR property.

Permanent impacts from the ground wire dead-end towers (1.5 acres) and Klickitat County PUD electrical service (0.15 acres) would be the same as describe for Site 1.

Construction of the substation at Site 2 would temporarily impact about 13 acres outside the 30-acre parcel. Temporary impacts would be due to the counterpoise installation on the Wautoma-Ostrander line as described for Site 1.

Site 2 is surrounded by farmland, although it is closer to Knight Road than Site 1, with no homes in the vicinity. On the east side of Knight Road, there are ~~20~~ 5-acre residential parcels for sale ~~being sold as residential~~; in the unlikely event that homes were built prior to a proposed substation at Site 2, construction activities would disturb residents for the 20-month construction period. Drivers on Knight Road would also be slightly impacted by construction activities.

Overall, impacts of using Site 2 would be ***moderate.*** About 36.7 ~~30~~ acres of prime farmland would be converted to a nonagricultural use and about 13 acres would be temporarily impacted.~~, and a relatively short 0.25 road would be required, it is~~ It is also possible that the property north of the substation would be difficult to continue farming and dispersed recreation would be slightly limited.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option, no impacts on land use and recreation would occur other than those already described for each action alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential land use and recreation impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.1.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on land use and recreation. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Provide a schedule of construction activities to all landowners that could be affected by construction.
- Limit construction to daylight hours, minimizing disturbance to those residents who work during the day.
- Compensate landowners for any new land rights required for right-of-way or access road easements.
- Compensate landowners for any damage to property during construction.
- Compensate landowners for reconfiguration of irrigation systems due to placement of towers or access roads.
- Restore compacted cropland soils ~~to~~ as close as possible to preconstruction conditions using tillage.
- Do not allow mixing of excavated material with topsoil outside of tower footprint on farms or croplands.
- Work with landowners to determine mitigation measures needed to maintain CRP conservation status, if needed.
- Follow applicable goals and objectives of the National Scenic Area Management Plan with guidance from the USFS and CRGC in the National Scenic Area.
- Reseed disturbed areas (see mitigation measures in Section 3.3 Vegetation).
- Implement measures to reduce the possible spread of noxious weeds (see mitigation measures in Section 3.3 Vegetation).
- Implement measures to control dust (see mitigation measures in Section 3.4 Geology and Soils)
- Implement measures to control construction noise (see mitigation measures in Section 3.11 Noise).
- Install gates, barriers, and postings ~~Minimize or eliminate public access to project facilities through postings and installation of gates and barriers~~ at appropriate access points, and at the landowner's request, to minimize or eliminate public access to project facilities.

3.1.4 Unavoidable Impacts Remaining after Mitigation

Under any of the action alternatives, portions of a new transmission line would be introduced to areas where such infrastructure does not currently exist. Existing land uses in these locations would be altered by the placement of transmission towers, access roads, and right-of-way restrictions. Construction of Knight Substation would permanently reduce the agricultural capacity of the property on which it would be located.

3.1.5 No Action Alternative

The No Action Alternative would have ***no*** impact on land use because no new transmission lines, towers, and substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.2 Visual Resources

This section describes the scenic resources within the project area and how the project alternatives could affect these resources.

3.2.1 Affected Environment

The scenic resources in the area are high quality and include the Columbia River and National Scenic Area, recreational areas and trails, historic and scenic highways, the rural pastoral landscape in the Klickitat County plateau, and views of Mount Hood and Mount Adams. The action alternatives all begin within the National Scenic Area in Oregon (see Map 3-2). The purpose of the National Scenic Area is to protect and enhance the scenic, cultural, recreational and natural resources of the Gorge while allowing compatible growth to occur in existing urban areas (USFS 2010). For that reason, development through this area is of concern to those that oversee its protection, including the CRGC and USFS.

After exiting Big Eddy Substation, each alternative travels through the National Scenic Area and then crosses the Columbia River, either near The Dalles (West Alternative) or about 6 miles to the east (Middle and East alternatives). Each alternative travels through the National Scenic Area for several more miles, climbing up and over the Columbia Hills ridgeline in Washington. The hills are marked by sculpted terrain, rock outcrops, grasses, and shrubs. Descending down the north side of the Columbia Hills, the alternatives cross a gently rolling agricultural plateau for several miles before crossing the Little Klickitat River and some forested ravines – at different points, depending on the alternative.

After crossing the Little Klickitat River, the alternatives continue north to the Knight Substation area, where the terrain becomes more variable. Just north and east of the substation sites the forested foothills of the Simcoe Mountains begin. Terrain and trees limit or block views of the project from areas farther north.

Where the alternatives traverse the Klickitat County plateau, views can be expansive and include Mount Adams to the northwest and Mount Hood to the south.

Observers of this environment include local residents and business owners, recreationists using area parks and trails, and motorists, including those traveling on the area's scenic highways. There are many parks, trails and highways in or near the project area with extensive, high-quality viewsheds (observable near and distant scenery from a specific location). (See Table 3-7 for a list of parks, trails, and highways, listed from south to north.)

Likewise, some local residents and business owners have expansive views of either the National Scenic Area, the rolling Klickitat County plateau and/or nearby peaks. Throughout the area, many residents live on large, rural properties. Some county residents live in rural unincorporated communities such as Celilo and Biggs in Oregon, and Wishram and Centerville in Washington. A few also live or own land in one of several existing and future large-lot residential subdivisions, such as River Crest, near the Little Klickitat River in Washington. Urban areas near the project are The Dalles, Oregon and Goldendale, Washington.

Table 3-7. Parks,[1] Highways and Trails in or near the Project Area

Name	Location
Oregon Recreation Areas	
Sorosis State Park	Off E. Scenic Drive in The Dalles, west of Big Eddy Substation.
Thompson State Park	North of US-30 in The Dalles, west of Big Eddy Substation.
Riverfront State Park	Along the Columbia River in The Dalles, west of Big Eddy Substation.
Seufert County State Park	Southeast of The Dalles Dam, west of Big Eddy Substation.
Celilo State Park	Along the Columbia River, east of The Dalles and Big Eddy Substation and west of Celilo Village.
Deschutes River State Park	Off of Oregon SR-206, east of Celilo Village.
Washington Recreation Areas	
Spearfish Lake/Little Spearfish Lake	Just north of the Columbia River northeast of The Dalles.
Hess Park	Northwest of The Dalles Dam, off Highway 197.
Columbia Hills State Park	Off Washington SR-14, east of Spearfish Lake. Includes Horsethief Lake and the south portion of Dalles Mountain Ranch.
Columbia Hills Natural Area Preserve	The northernmost part of the Dalles Mountain Ranch (see above).
Avery Recreation Area	Off Washington SR-14 east of Columbia Hills State Park and about 2 ½ miles west of Wishram.
Goldendale Observatory State Park	Off US-97 on a hilltop north of Goldendale.
Scenic Highways	
I-84[2]	Runs east-west along the Oregon side of the Columbia River, in the southern part of the project area.
Historic Columbia River Highway (US-30)[2]	Runs east-west on the Oregon side of the river, roughly parallel with I-84.
Columbia River Gorge Scenic Byway; Lewis and Clark Trail Highway (SR-14)[2]	Runs east-west along the Washington side of the Columbia River.
Yakama Scenic Byway; Journey Through Time Scenic Byway (US-97)	Runs north-south outside the project area to the east.
Trails[3]	
Riverfront Trail	A multi-use trail that begins at the Columbia Gorge Discovery Center in The Dalles and ends at The Dalles Dam. It lies west of the project area.
Historic Lewis and Clark Trail	The Columbia River and surrounding gorge, through which the Lewis and Clark Expedition traveled to reach the Pacific Ocean.
Historic Oregon Trail	Follows much the same route as the Historic Columbia River Highway (see above).
Klickitat Trail	A multi-use trail that runs through Swale Creek Canyon to Uecker Road west of Centerville.

[1] For descriptions of parks, see Section 3.1 Land Use and Recreation.
[2] National Scenic Area Scenic Travel Corridor.
[3] This does not include undocumented trails that may be throughout the area.

3.2.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative. The evaluation of visual impacts is generally based on methods and protocol developed by the Federal Highway Administration, in combination with elements of other visual resource assessment methods, including those of the USFS and the Bureau of Land Management. (See Appendix C for more information about impact methodology.) Please see Chapter 7 for more discussion about the proposed project's consistency with National Scenic Area guidelines for visual resources.

Common Impacts

Potential visual impacts include temporary visual changes during construction and the overall permanent visual changes caused by the presence of the towers, conductors, access roads, and substation work. Visual quality and viewer sensitivity are combined to determine visual impacts.

Construction activities would create temporary changes in scenery by introducing helicopters, trucks and heavy equipment such as cranes and bulldozers to the area. Construction activities would occur over a 20-month period, during daylight hours. Construction crews would be working in localized areas of the transmission line right-of-way and at the substations, and would be visible primarily to nearby viewers or those with a direct line-of-sight. However, soil disturbance could be visible from a distance until areas have been revegetated. Installation of towers by skycrane helicopter and stringing of the conductor by helicopter would also be visible from a greater distance. The one or two temporary staging areas that would be needed along or near the line to store materials, equipment and vehicles would be visible to those in the immediate vicinity. The staging areas would likely be an existing developed site or parking lot ranging from 5–15 acres, so no new areas would be developed. Construction activities would have a ***low-to-moderate*** temporary visual impact for any of the action alternatives depending on the location.

The permanent presence of lattice steel 500-kV towers would create an obvious human-made or industrial element to the viewscape. Where the proposed line would parallel other transmission lines, the proposed line would not be out of context. Where the line would create a new corridor, the introduction of the line would degrade the natural visual quality of the area, although transmission lines are typical in rural landscapes. Because there are few trees in the project area, foreground views of the towers would be apparent because they could not be screened by vegetation (for example, there are few ~~no~~ trees along road sides to block views of towers crossing over a road). Middle ground views would also be apparent, depending on the surrounding scenery and backdrop, but in the distance the towers could blend in as there would be no clear-cut right-of-way swath to highlight the corridor from a distance.

Because background landscape can be seen through the towers' lattice steel ~~towers have space between the members through which the background can be seen,~~ the towers would blend in with the landscape from a distance when there is ~~with~~ a backdrop of hills or vegetation. Weather conditions, such as fog and rain further obscure the ability to see the towers from a distance. The towers would be more obvious on tops of hills or ridges where they would break the skyline. The galvanized steel towers and the transmission line conductors would be treated to dull the shininess of the steel ~~would appear shiny for 2–4 years before they dull with the weather and the transmission line conductors would be treated to reduce the shininess of the metal~~. Both the proposed single and double-circuit towers would be larger than the existing transmission line structures along the project. In general, new towers would range from 50–140 feet taller than existing BPA wood poles or lattice steel towers in the area. In most cases, the use of taller double-circuit towers would include removing existing poles and towers, and would reduce the number of towers, sense of clutter, and the width of a given corridor, but would add bigger, more obvious structures.

When transmission towers exceed certain criteria, such as height or proximity to airports, the Federal Aviation Administration requires special tower lighting or markings to make them more visible to airplane and helicopter pilots to prevent accidents. The FAA has determined that some towers ~~Where any alternatives would run~~ near the Columbia Gorge Regional Airport in Dallesport and taller towers that are on either side of the Columbia River ~~where towers or conductors would exceed height restrictions, the FAA~~ would require ~~a review to determine whether towers should be marked~~ marking with lights. In addition, the conductors spanning the Columbia River would require marker balls. ~~and/or red and white paint, and whether conductor spans should have marker balls.~~ Tower lights would be white during the day and red at night; some steady-burning and some flashing. Where towers and wires require marking, their addition to the landscape would be more pronounced, both during the day and at night.

> **Defining "Sensitive Viewers"**
>
> The importance of a visual resource depends primarily on the sensitivity of the viewer, the distance of the resource from the viewer, the diversity of landscape elements and the context in which they are being viewed. Recreationists are generally highly sensitive to their surroundings, which can include both near and distant scenery, depending on landscape, elevation and vistas. Motorists can have variable sensitivity, partly because they must pay attention to the road and partly because they are moving through the resource area (vs. being stationary). However, motorists along scenic highways and National Scenic Area scenic travel corridors may have higher sensitivity to their surroundings because of their expectations.
>
> Similarly, residents can be variably sensitive, depending on the quality of views from their properties. Rural residents, for example, may have longer viewsheds, i.e., more opportunities for scenic views over fields or valleys, than those in more urban areas. At the same time these residents often plant vegetation around the perimeters of their homes to provide privacy, shade and windbreaks.
>
> Most viewers of the action alternatives would be in sparsely populated rural areas. There are only a few pockets of more urban populations. Neighborhoods close to the cores of these cities and towns would have limited or no views of the alternatives because of other buildings, fences and landscaping; dwellers on city outskirts or higher slopes may have some views of the alternatives. In general, views of the alternatives depend on the viewer's position in the landscape, and terrain, vegetation, or existing infrastructure that can obscure views.
>
> Residents and business owners within 800 feet of an alternative or who have expansive views of areas an alternative would cross would be the most sensitive viewers, because of their extended viewing of the project area and the value they may place on views from their homes and businesses.

Access roads would also create a visual impact ~~both~~ in the fore and middle ground as well as ~~and~~ in the distance, depending on terrain. ~~with new roads producing~~ New roads would produce a more evident visual change than the upgrade of existing roads. Upgrading existing roads (widening, blading, and/or gravel) would brighten the road, and would make them more visible from a distance than they may be currently. Because temporary roads would be removed from crop lands after construction, they would not create a permanent visual impact. Unlike transmission lines, which form straight lines and angles, access roads can curve and follow terrain. In flat areas, roads are not seen as well from a distance, but on steep slopes, especially where cut and fill is needed, roads would likely appear more obvious unless uneven terrain allows them to be hidden on the hillside. (See Appendix B for a map showing preliminary road and tower locations along the action alternatives.)

Project-related work at Big Eddy Substation would have ***no*** impact on visual resources, because the new equipment required would be within the existing substation yard and the area already has an industrial look.

For all action alternatives, the visual impact of maintenance activities would be limited to people seeing helicopters, trucks, and maintenance workers along rights-of-way. Maintenance activities would have ***no-to-low*** temporary impacts on views, but would have a greater affect on recreationists seeking natural landscapes away from human activity.

The visual impacts of each action alternative are discussed next. To assess these impacts, each alternative was considered in three sections: the southern section, where the transmission line would run from Big Eddy Substation and cross up and over the Columbia Hills (through the National Scenic Area); the middle section, where the line would cross the arid Washington plateau and reach the Little Klickitat River; and the northern section, where the line would run from the Little Klickitat River to the Knight Substation sites.

West Alternative

Columbia Gorge and National Scenic Area Impacts

For its first 9.6 miles, as the West Alternative travels from Big Eddy Substation, over the Columbia River and through the National Scenic Area, the line would be visible from portions of ~~eight~~ nine parks and preserves, three scenic highways/corridors and some residences in The Dalles. (See Table 3-8 and Map 3-2.) For most viewers, this section of the line would be seen in the middle or background, and would be subordinate to other elements of the landscape. In a few locations, notably just below the Big Eddy Substation in Oregon and where it crosses the northern portion of the Columbia Hills State Park and the adjacent Columbia Hills Natural Area Preserve in Washington, it would be in the foreground and/or would dominate the landscape, although the affected number of viewers would be limited.

Because the proposed line would run near the Columbia Gorge Regional Airport, several towers between line miles W0-6.5 could require lighting ~~and possibly painting~~. Marker balls would be placed on the line that spans the Columbia River between line miles W2-3. ~~Marker balls may also be placed on the line that spans Fifteenmile Creek.~~ This would heighten visibility of the towers and lines ~~during the day and at night~~.

Several houses near Fifteenmile Creek in Oregon would have fore and middle ground views of at least one tower ~~and marker balls (if needed) where the line would span the creek.~~ (See Appendix B for a map that shows house locations within about 800 feet of the proposed lines.) Also in this area, several poplar trees used as windbreak trees for an orchard would be removed, which would be noticeable to a few residents and travelers on Eightmile Road. (See Section 3.3 Vegetation, for a discussion about vegetation and a list of areas where trees would be removed.)

Views of the line from Sorosis, Thompson, Riverfront, and Seufert parks in Oregon and Hess Park in Washington would be distant and obscured by other human-made features as these parks are west of the project with existing views of The Dalles Dam and US 197. Views would be intermittent from Spearfish and Little Spearfish lakes because the terrain would block direct line-of-sight of the line. The West Alternative would not be visible from Tom McCall Preserve (Rowena Plateau), a popular scenic site west of the project area between Hood River and The Dalles, Oregon, because topography and vegetation would obscure the view or towers would be so distant they would blend in.

Table 3-8. Scenic and Populated Areas Impacted by Action Alternative[1]

	Name	West Alternative	Middle Alternative	East Alternative
OR Recreation Areas	Sorosis State Park	X		
	Thompson State Park	X		
	Riverfront State Park	X		
	Seufert County State Park	X		
	Celilo State Park		X	X
	Deschutes River State Park			X
WA Recreation Areas	Spearfish Lake/Little Spearfish Lake	X		
	Hess Park	X		
	Columbia Hills State Park	X		
	Columbia Hills Natural Area Preserve	X		
	Avery Recreation Area		X	X
	Goldendale Observatory State Park	X	X	X
Historic Highways	I-84[2]	X	X	X
	Historic Columbia River Highway (US-30)	X		
	Columbia River Gorge Scenic Byway; Lewis and Clark Trail Highway (SR-14)[2]	X	X	X
	Yakama Scenic Byway; Journey Through Time Scenic Byway (US-97)			X
Trails	Riverfront Trail	X		
	Historic Lewis and Clark Trail	X	X	X
	Historic Oregon Trail	X		
	Klickitat Trail	X		
Populated Areas	The Dalles	X		
	Celilo		X	X
	Biggs			X
	Wishram		X[3]	X[3]
	Centerville		X	X
	Goldendale	X[3]	X[3]	X[3]
	Total Houses/Businesses within 800 feet[4]	17–24	42–46[5]	39–42[5]

[1] An “X” means some viewers at these locations may see towers if not obscured by vegetation, terrain or distance.
[2] Views from rest areas are unaffected; the closest one on I-84 is 11 miles west of The Dalles; on SR-14 it is about 3 miles west of Lyle.
[3] Foreground and dominant ~~Close and direct~~ views of towers for nearest residents.
[4] Lower numbers are for double-circuit configuration; higher numbers for single-circuit.
[5] These numbers include 25 homes in Wishram.

From The Dalles, viewers would not likely see the proposed towers leaving the Big Eddy Substation area. Although two towers would break the skyline, there are many towers in this developed urban area and the towers would be distant, so views would not be noticeably altered. Although the West Alternative would cross the Columbia River where there are presently no transmission lines, the location is difficult to see from The Dalles and SR-14 due to curves in the river, terrain, or distance. Motorists on I-84 would likely see towers on the Washington side of the Columbia River as they look north, but they would not see towers on the Oregon side because they (towers) would be on a bluff above the interstate highway.

Where the West Alternative would run parallel to the Spearfish Tap 115-kV wood pole line (line mile W3.5–5), and then parallel to or replace the Chenoweth-Goldendale 115-kV wood pole line (line miles W6–22), the West Alternative's new steel towers would be noticeably taller and more industrial-looking than these existing rustic wooden structures, particularly to motorists or bicyclists travelling on SR-14 (the Columbia River Gorge Scenic Byway and Lewis and Clark Trail Highway), and to recreationists at the Dalles Mountain Ranch portion of the Columbia Hills State Park and in the Columbia Hills Natural Area Preserve. Travelers would see the line as they approached where it crosses SR-14; views of the towers would appear larger as viewers got closer until they passed underneath the line (see Figure 3-1 for existing views and simulations of the proposed towers in the view; see Map 3-4 for photo locations). Photo simulations show views about 3 to 5 years after construction. (See Appendix C for a discussion about photo simulation methodology.) View duration for motorists would be less than 1 minute given speed, terrain and curves in the road. From SR-14, two towers of the West Alternative would break the skyline to the south towards the Columbia River and four towers would break the skyline to the north as they ascend the Columbia Hills (see Appendix C for skyline assessments from SR-14). These towers would be more noticeable from a distance than ~~those~~ towers with ~~that would have~~ landscape ~~hills in the background~~ behind them.

Expansive views of the Columbia Gorge from these areas would be marred in the foreground by the steel towers (see Figures 3-2 and 3-3). Middle ground views would be less dominant, as the eye is drawn to the surrounding view of the gorge. The removal of the existing wood-pole line would help lessen the visual impact slightly if it were replaced with the single-circuit tower. The larger, more complicated double-circuit towers would have an overall greater visual impact than the single-circuit towers and would dominate the landscape, even if use of double-circuit towers allowed for the removal of the wood-pole line. The double-circuit towers would also be more visible from a distance where they climb over the Columbia Hills.

A relatively small number of trees would be removed in several isolated areas in this portion of the line. Tree removal would be noticed by people hiking in the area, but not by the general public.

Most of the access roads along this portion of the West Alternative are existing roads accessing the wood-pole line in the area. These roads would require upgrades that would make them more visible than they are presently. New roads would be needed as short spurs from the main access road to tower sites, and between line miles W1 and W4 where there are no existing transmission lines and no access road system. These areas are difficult to see from public areas.

Central Klickitat Plateau Impacts

At line mile W11, the alternative would cross the Klickitat Trail (see Figure 3-4), where the steel transmission towers would again be more visible than existing infrastructure to trail users and motorists on nearby Harms Road and the Centerville Highway. Hikers along the Klickitat Trail would see the line at the trail head and as they head west, but not after passing under the corridor. In this area, towers would be in the fore or middle ground for most viewers (hikers and motorists) and would be more visually dominant than existing infrastructure.

From here, the West Alternative would continue to follow the Chenoweth-Goldendale line north and east 8 miles across sparsely populated, rolling agricultural fields. Several homes scattered between line miles W12-13 and W17-18 would have fore and middle ground views of the line. One home is surrounded by pine trees; about 10 trees would be removed if the wood pole line was removed and the single or double-circuit line was built in its place. This tree removal would be noticeable from the local road (Harms Road), but would not change views from the home itself.

At line mile W18, where the West Alternative turns east following the existing Chenoweth-Goldendale line along the area of the Little Klickitat River, the line may cross ~~interrupt~~ in the fore or middle ground of views from ~~of~~ several residences scattered to the north of the line, and potential ~~residences where~~ 20-acre "view lots" that are for sale to the south of the line. This area has Mount Adams and Mount Hood vistas. However, because the terrain is varied and it is more heavily vegetated along the river than other areas of the project, views of the line would be location-specific. If BPA and the owners of Piper Canyon Airport ~~(line miles W19-20)~~ determined that nearby towers (along line miles W19-20) should be marked for safety, lighting ~~and/or marker balls~~ would ~~also~~ make the line more visible to some residents. Trees (ponderosa pines) would be removed in upland areas along the line in this area, which may be visible to those living in the vicinity. (See Section 3.3 Vegetation for woodland areas along the alternatives that would require tree removal.) Tree removal combined ~~Combined~~ with the installation of new steel towers, some of which could appear visually dominant, ~~this~~ would be a noticeable change of scenery for some nearby ~~existing and future~~ residential viewers (see Figure 3-5).

North Klickitat Plateau Impacts

At line mile W23, the West Alternative crosses SR-142, a popular recreation highway, and heads north to the Knight Substation area at line mile W27. Along this stretch, it passes just west of Goldendale and parallels Knight Road, which is about 0.5 mile to the east. Though sparsely populated, views from these areas and from SR-142 can be expansive and include Mount Adams to the northwest and the Columbia Hills and Mount Hood to the south. For Goldendale and other local residents with such views, portions of towers could be visible in the fore or middle ground of ~~front of~~ one or more landmarks (see Figures 3-6 and 3-7) and could be intrusive. One house is located within 800 feet of the proposed line along this stretch, and would have foreground views of the towers. From line mile W23 to the substation sites, the proposed line would be less than 1 mile to the west of land around Goldendale that is zoned for 5-acre lots. Some of these potential lots could have middle ground views of the line in front of views of Mt Adams. Because of the distance from the Goldendale Airport and the size of the towers, the FAA has determined towers in this area would not require marking. The Goldendale Observatory State Park would potentially have views of the line through this area, but the line would be about 3 miles to the west ~~of the observatory~~ so views would be distant.

Overall, the West Alternative would have ***high*** impacts to visual resources, because viewers ~~it~~ would have ~~create~~ direct foreground views of the line where it crosses Columbia Hills State Park, the Columbia Hills Natural Area Preserve, near a portion of the Little Klickitat Trail, and near several homes in the Central Klickitat Plateau area, and the line could ~~be seen~~ intermittently cross in front of mountain views ~~of Mount Adams~~ from roads and houses near the Little Klickitat River (with some tree removal) and Goldendale ~~and heading to the Knight Substation sites~~. While the West Alternative would not be visually dominant for many viewers, it would impact a number of sensitive viewers.

For the West Alternative, options that use double-circuit towers (West Options 2, 4, 5, and 6) would have higher visual impacts than the single-circuit options (West Options 1 and 3) because the larger double-circuit towers would be more noticeable and would not replace an existing line for the first 5 miles, and the towers would replace the smaller Chenoweth-Goldendale wood-pole line from line miles W6-22.

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Figures 3-1 through 3-11 are located in a separate file due to size:

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Figures 3-1 through 3-11 are located in a separate file due to size:

See: BEK_FEIS_Photo_Simulations.pdf

Middle Alternative

Columbia Gorge and National Scenic Area Impacts

For its first 11 miles, as the Middle Alternative travels from Big Eddy Substation, over the Columbia River and through the National Scenic Area, the line would be visible from portions of two parks, two scenic highways, and residences east of The Dalles and of Celilo and Wishram. (See Table 3-8 and Map 3-2.) Some viewers would have fore to middle ground views of towers ~~Views for residents~~, but in areas that already have power lines and other industrial features.

The first 9 miles of the Middle Alternative would follow or replace an existing BPA lattice-steel line (Harvalum-Big Eddy 230-kV), so the proposed line would not create a new intrusion across this landscape. However, the proposed line would increase the industrial look and sense of clutter if it were built with single-circuit towers (parallel to the existing line) or increase the scale of impact if it were built with larger double-circuit towers (to carry both the proposed and existing line). Either way, the new line would be marginally more dominant, visually, than what exists now.

In Oregon, most of the Middle Alternative would be south of the National Scenic Area boundary and would pass five houses that would have fore and middle ground views of towers. Because some towers would exceed 200 feet tall, several towers would require lighting ~~and possibly painting~~. Likewise, the wires would require marker balls where they span the Columbia River (the existing line crossing the Columbia has lights, is painted red and white, and has marker balls on the wires that span the river). ~~and could require them across Fifteenmile Creek and spans of deep ravines~~. The potential route adjustment at line miles ME6-8 would improve views for a resident who has an existing river crossing tower within about 200 feet of his/her house. The adjustment would remove the existing line and build a double-circuit line about 1,000 feet to the west.

Where the line would cross the river, the line would join or replace an existing transmission line crossing and there is an existing railroad bridge crossing to the east. The line would increase the amount of steel structures and conductors, or be bigger and more noticeable than what is there now (see Figure 3-8), but in an already disturbed area. ~~where it would cross the Columbia River. However, there is an existing transmission line crossing the river at this point as well as a railroad bridge just to the west of the crossing, so natural views are already impacted by human structures (see Figure 3-8).~~ Motorists on I-84 would likely see towers in the background on the Washington side of the Columbia River as they look north; westbound traffic would have middle to background views of the larger river crossing tower in Oregon on the bluff above I-84, but ~~they~~ because of terrain, eastbound traffic would not see towers on the Oregon side. ~~because the towers would be on a bluff above the interstate.~~ The route adjustment at line miles ME6–8 would have similar views from I-84 as the existing line route in this area and would not improve or worsen views.

Because Celilo is about a mile upstream from the point where the existing Harvalum-Big Eddy and the proposed line would cross the Columbia River, some Celilo residents and Celilo State Park visitors would possibly have middle ground to background views of the line (see Figure 3-9). From Celilo Park, four towers in Oregon and six towers in Washington would break the skyline, potentially making these towers more visible than towers that would have landscape ~~hills~~ as a backdrop (see Appendix C for a skyline assessment from Celilo Park). However, given the distance, the towers would not dominate the landscape and would only be visible ~~views would likely be vague except~~ on ~~very~~ clear days.

People at Avery Recreation Area, located about 3 miles west of the Middle Alternative, could potentially have views of the line looking across the Columbia River to Oregon. However, the line would be in the background and would not be obvious to the casual observer.

Some upper Wishram residents, who have views of the existing line, would have close, foreground ~~close~~ views of the Middle Alternative (see Appendix B). Some 25 Wishram homes, including one business, are within 800 feet of the centerline, with the closest within 71 feet (of the single-circuit option). If double-circuit towers were used, these taller towers would be dominant in this portion of the Wishram area landscape and may be more noticeable ~~distinguishable~~ from a middle ground ~~a~~ distance as well ~~than the somewhat shorter single-circuit towers~~.

Sightseers on SR-14 would pass close to towers where the highway runs under the line (see Figure 3-10) and have brief foreground and middle ground views of the line as it would ascend the Columbia Hills. This 2-mile long portion would create a new feature not already present on the steep terrain, but would not likely dominate the landscape because ~~Although~~ the line would follow a draw up the Columbia Hills. However, access roads would have to zigzag up the hill and would likely be visible from a distance. Viewers from SR-14 would see two towers of the Middle Alternative break the skyline in the background to the north as the line goes over the Columbia Hills; looking south, viewers would see six towers break the skyline in the background. Visual impacts from SR-14 would be ~~temporary and incremental~~ broken-up because of curves in the road and terrain, and would be incremental because of existing transmission lines in this area (see Figure 3-10).

Central Klickitat Plateau Impacts

The Middle Alternative would descend the Columbia Hills and share a brief stretch of right-of-way with the Big Eddy-Spring Creek 230-kV line, then turn north across rolling agricultural fields (line miles M12-13) and pass directly west of Centerville (line mile M16), introducing steel towers where none currently exist. Views for rural residents and motorists along this route segment are expansive as it is relatively flat (similar to views shown in Figure 3-4). Two houses would be within 800 feet along this portion of the Middle Alternative, with fore to middle ground views of the towers. However, most views from the outskirts of Centerville would only be slightly affected because the towers would be several miles away (in the background), ~~and~~ generally below views of Mount Adams or Mount Hood, and subordinate to other landscape elements. Likewise, the line would run at least 6 miles west (and parallel to) US-97, a scenic byway, with a minimal impact on motorists' views.

The Middle Alternative then joins the West Alternative (and existing Chenoweth-Goldendale line) at line mile M20, where it crosses the Little Klickitat River and would run past several large-acreage residential developments, including River Crest, which is partly developed. Because the alternative approaches from the south along a new right-of-way, introducing steel towers where none currently exists, it would be highly visible to local residential property owners and potentially dominate the local landscape in the fore and middle ground. These inhabitants would be highly sensitive viewers because their properties boast views of Mount Adams (see Figure 3-6) and, in some cases, Mount Hood.

North Klickitat Plateau Impacts

The visual impacts of the Middle Alternative from line miles M20–27 would be the same as the West Alternative, crossing ~~passing~~ over SR-142 to the west of Goldendale through a sparsely populated area with expansive views that include Mount Adams to the northwest and the Columbia Hills and Mount Hood to the south. For residents on the western edge of Goldendale, local residents and motorists along SR-142 ~~local residents~~ with such views, portions of towers could be visible in the fore or middle ground in front of one or more landmarks. While the towers would not be seen by many people, those who would see them would likely be highly sensitive viewers.

Overall, the Middle Alternative would have ***moderate-to-high*** impacts to visual resources; it would increase the industrial ~~human~~ element through the first 9 miles, though there is already a visual impact due to the existing line and other features; it would place towers and roads over the Columbia Hills where there are none currently, though not all towers would be seen as the line would be somewhat hidden in a ravine; ~~and~~ it would be in foreground views of two homes in the Central Klickitat Plateau area; and it would ~~be seen~~ intermittently cross in the middle and background of residential and motorists' ~~in~~ views of Mount Adams or other peaks ~~from roads and houses~~ along its route north across the plateau. ~~near the Little Klickitat River (with some tree removal) and heading to the Knight Substation sites.~~

For the Middle Alternative, options that use double-circuit towers (Middle Options 2 and 3) may have slightly less visual impact than the single-circuit option (Middle Option 1) because, although the towers would be larger and more noticeable, the double-circuit options would remove an existing lattice-steel line lessening the expanse of the visual impact.

East Alternative

Columbia Gorge and National Scenic Area Impacts

For the first 9 miles, the East Alternative would have the same visual impacts as the Middle Alternative. In this area the line would increase the industrial look and sense of clutter if it were built with single-circuit towers (parallel to the existing line) or increase the scale of impact if it were built with the larger double-circuit towers (to carry both the proposed and existing line); would pass houses in Oregon and Wishram, Washington, that would have fore and middle ground views of towers; cross the Columbia River with existing transmission line and railroad bridge crossings; and would provide temporary fore to middle ground views of the towers from I-84 and SR-14 and distant views from Celilo (see Figures 3-8, 3-9, and 3-10). The potential route adjustment at line miles ME6-8 would improve views for a resident that has an existing river crossing tower within about 200 feet of their house.

From just west of line mile E10, the East Alternative would split from the Middle Alternative and continue east along the Columbia Hills through the National Scenic Area, following the existing Harvalum-Big Eddy and McNary-Ross transmission lines (both have lattice-steel towers) until line mile E14. In this area, the East Alternative would run within view of Biggs and Deschutes River State Park in Oregon, and the Maryhill Museum of Art, Maryhill Winery and SR-14 in Washington. ~~Some towers in the area may require lighting, and wires may require marker balls for potential aircraft safety.~~ From SR-14, views would be periodic as the road is curvy, the line would be above the road, and the varied terrain would block direct continuous views of towers (see Figure 3-11). Viewers at the museum and winery would have middle ground views of the closest towers. However, views along the Columbia River and other locations would only be slightly affected because the line would have the backdrop of the hills, two transmission lines are already present, and wind turbines dominate the visible landscape just outside the National Scenic Area to the northeast. In this area, adding a single-circuit line to the existing transmission corridor (also with ~~that has two~~ lattice-steel towers) ~~lines already~~ would create a wide, industrial, and somewhat chaotic corridor. Engineers would attempt to match tower locations such that they would be next to one another, but that would not always be feasible given topography (avoiding rock outcrops or ravines). Although the double-circuit towers would be larger, ~~because they would~~ allowing ~~for the~~ incorporation of one of the existing lines, the corridor may have a cleaner look than adding single-circuit towers.

Outside the National Scenic Area boundary, the East Alternative would turn north along new right-of-way (line mile E14-16) to climb over the Columbia Hills, crossing through acres of wind turbines. Although the line and access roads would be visible and add to the industrial look of that area, motorists along both sides of the Columbia River (SR-14, US-97, and I-84) would be drawn to the presence of the much larger, white wind turbines and may not notice the transmission line.

Central Klickitat Plateau Impacts

As the East Alternative continues to head north between line miles E14-23 – running ~~3~~ 2-4 miles west of and parallel to US-97 (a scenic byway) – it would be far enough away from the highway that it would blend into the background of motorists' views. Rural residents and local roadway users closer to the alternative would be more greatly affected. Because there are no existing towers along this stretch and terrain is flatter, many ~~so most~~ towers would break the skyline. Several houses within 800 feet of the East Alternative (line mile E22) would have fore and middle ground views of the line. In some places, towers could be seen in front of views of Mount Adams (see Figure 3-6) or Mount Hood. The alternative would be somewhat visible from the eastern outskirts of Centerville (line miles E18-20) and the western outskirts of Goldendale (line miles E21-24), but would ~~be less noticeable~~ largely be subordinate because of distance. From line miles E21-24, the East Alternative would pass less than 1 mile to the west of land near Goldendale that is zoned for 5-acre lots. Some of these potential lots could have middle ground views of the line in front of views of Mt Adams. ~~There are several houses within 800 feet of the East Alternative (line mile E22) that would have fore and middle-ground views of the line.~~

The East Alternative crosses the Little Klickitat River at line mile E23, where ~~However,~~ the terrain is flatter than along other portions of the river. ~~and~~ Some trees would need to be removed away from the river's edges. Combined with new towers, this would ~~tree removal could~~ be a noticeable scenery change for sensitive viewers in scattered areas. Most would have middle or background views, but some could find the new towers visually dominant.

North Klickitat Plateau Impacts

The visual impacts of the East Alternative from line miles E24-28 would be the same as the Middle and West alternatives, passing over SR-142 ~~to the~~ west of Goldendale through a sparsely populated area with expansive views that include Mount Adams to the northwest and the Columbia Hills and Mount Hood to the south. For residents on the western edge of Goldendale, local residents and motorists along SR-142 with such views, portions of towers could be visible in the fore or middle ground of one or more landmarks. While the towers would not be seen by many people, those who might see them could be sensitive viewers.

Overall, the East Alternative would have ***moderate-to-high*** impacts to visual resources. It would increase the industrial ~~human~~ element through the first 14 miles, but it would not be out of context as it would be in a corridor with one or two existing lattice-steel lines and would ascend the Columbia Hills through wind turbine development. Through the Columbia Gorge, views of the East Alternative from parks or byways would be distant or intermittent; the line would be in fore and middle ground views from homes that have existing transmission line views ~~through the Columbia Gorge.~~ Where it heads north to the Knight Substation sites through the Central Klickitat Valley, the East Alternative would intrude on a some residents' and motorists' ~~from a few scattered houses that have~~views of Mount Adams or Mount Hood, usually in the middle ground. ~~through the Central Klickitat Valley and heading to the Knight Substation sites.~~ Generally, the East Alternative would have a lesser impact than the Middle Alternative along its southern portion (before it turns north), but about equal impact along its route where it would create new corridor through the sparsely populated Central Klickitat Valley.

For the East Alternative, options that use double-circuit towers (East Options 2 and 3) would have less visual impact than the single-circuit option (East Option 1) because, although the towers would be larger and more noticeable, the double-circuit options would remove an existing lattice-steel line, lessening the expanse of the visual impact, especially from line miles E9-14 where there are two existing lines.

Knight Substation Options

Knight Substation Sites 1 and 2 are both in agricultural fields crossed by BPA's existing North Bonneville-Midway 230-kV and Wautoma-Ostrander 500-kV steel tower transmission lines. Few residents are nearby (none within 800 feet); the closest is at the intersection of Pine Forest Road and Knight Road. The owner of property just west of Substation Site 1 has plans to build a house; and property just east of Knight Road adjacent to Site 2 has been subdivided into eight, 5-acre view lots. Panoramic vistas extend in all directions, including the Simcoe Mountains on the north, rolling terrain to the east, the Columbia Hills to the south and Mount Adams and the Cascade Range to the west.

The substation would be mostly seen by local motorists on Knight Road and by the resident north of the sites on Pine Forest Road, though views would be partially obscured by terrain. Though lights would be installed, they would be turned off except for emergencies, such as during equipment failures. Site 1 would have a lower impact than Site 2 because it is farther away from Knight Road and ~~the terrain would partially obscure views.~~ excavated soil that is stockpiled and then re-spread on 19 acres just north of the substation will further obscure views from the north by raising intervening terrain about 4 feet. ~~Property just east of Knight Road and adjacent to Site 2 has been subdivided into eight, 5-acre view lots.~~ Though no homes have been built on properties adjacent to the substation sites, a substation on Site 1 would be in the foreground of the property just west of it, although not within views of Mount Adams. Site 2 would likely be in the foreground of views toward Mount Adams from the ~~these~~ 5-acre lots on the east side of Knight Road.

The Klickitat County PUD wood-pole line that would provide electrical service to the Knight Substation would be visible to motorists driving Knight Road for the 0.5 mile stretch from Pine Forest Road south to the substation site. The presence of the line would be consistent with typical distribution lines in Klickitat County and would not appear out of place.

The addition of ground wire on the Wautoma-Ostrander line (about 1 mile to either side of the Knight Substation) could cause a slight additional visual impact for those nearby or for motorists on Knight Road. The ground wire would be much smaller in diameter than the existing conductors and be strung above the existing conductors. Once installed, the underground counterpoise would not be seen or have a visual impact.

Because of the low number of sensitive viewers nearby and some screening by topography and elevated soil after construction, ~~construction of~~ Knight Substation at Site 1 would have ***low-to-moderate*** visual impacts, whereas because it is closer to Knight Road and potential development, Site 2 would have ***moderate*** visual impacts.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option, ***no*** impacts to visual resources would occur beyond those already described for each action alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential visual impacts of the fiber optic cable Wautoma Option and the expansion at Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.2.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on visual resources. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Site all construction staging and storage areas away from locations that would be clearly visible from sensitive scenic areas, trails and scenic highways as much as practical.
- Treat galvanized steel towers and transmission line conductors to dull the shininess of the steel.
- Implement construction site maintenance and clean-up. Keep construction areas free of debris.
- Provide regular maintenance of access roads and gates within and leading to the corridor.
- Reseed disturbed areas (see mitigation measures for Section 3.3 Vegetation).
- Implement measures to reduce the possible spread of noxious weeds (see mitigation measures in Section 3.3 Vegetation).
- Implement measures to control erosion and dust (see mitigation measures in Sections 3.4 Geology and Soils, and 3.13 Air Quality).
- ~~Implement measures to control construction noise (see mitigation measures in Section 3.11 Noise).~~

3.2.4 Unavoidable Impacts Remaining after Mitigation

Even after mitigation, any action alternative would have unavoidable impacts on visual resources by permanently adding tall steel towers to landscapes that are otherwise ruggedly scenic or pastoral. Many different viewer groups, including residents, motorists and recreationists, would be affected.

3.2.5 No Action Alternative

The No Action Alternative would have no impact on visual resources because no new transmission towers or substation would be constructed. Impacts from operation and maintenance of existing towers, conductors and substations would continue unchanged.

3.3 Vegetation

This section describes vegetation resources and how the project alternatives could affect these resources.

3.3.1 Affected Environment

A variety of vegetation cover types occur in the area and are typical of those portions of the Columbia Basin Province with precipitation of about 9 to 16 inches per year (Franklin and Dryness 1988). Vegetation categories described in this section include special-status plants, grassland, shrub-steppe (including scabland and lithosols), disturbed grassland/shrub-steppe, woodlands (including riparian woodlands), cropland and weeds. Sensitive plant species with historic or suspected range in the National Scenic Area are described in Chapter 7.

Special-Status Species

Special-status species include those protected under the federal Endangered Species Act (ESA) as threatened, endangered, or proposed species; those listed by the U.S. Fish and Wildlife Service (USFWS) as candidate species or species of concern; and those listed for protection by the states of Oregon and Washington. No federally listed threatened, endangered, proposed or candidate species are known to occur in the project area (USFWS 2008, 2009). Ten state-listed species are documented as occurring within 2 miles of the proposed routes based on historical data (ORNHIC 2009; WNHP 2009c), or within 1,000–2,000 feet of the proposed corridor by current field surveys (see Table 3-9). Two of these state-listed species are also federal species of concern. These special-status species are all on the Washington portion of the project (none were documented or found in Oregon).

Four of the special status species are associated with wetlands: mousetail (*Myosurus clavicaulus*), Nuttall's quillwort (*Isoetes nuttallii*), smooth goldfields (*Lasthenia glaberrima*), and western ladies-tresses (*Spiranthes porrifolia*). All four species were found during field surveys conducted in spring 2010 in vernal pool type wetlands on the West Alternative in Washington near line mile W3. Mousetail was also found in wetlands where the West and Middle alternatives share a route near line mile WM21 and in a wetland on the Middle Alternative near line mile M11. (See Section 3.5 Water Resources and Wetlands for more discussion about wetlands.)

Four other special-status species are associated with high quality grasslands: clustered lady's-slipper (*Cypripedium fasciculatum*), Douglas' draba (*Cusickiella douglasii*), hot-rock penstemon (*Penstemon deustus* var. *variabilis*), and obscure buttercup (*Ranunculus triternatus*). These species have been mapped (ORNHIC 2007 and WNHP 2009c) and are known to occur along the West Alternative in the grasslands of the Columbia Hills State Park and Columbia Hills Natural Area Preserve. During project field surveys (spring 2010), only the obscure buttercup was found. Because of the unusual spring weather (early heat, then a late snow) it is assumed that the field surveys missed the plant flowering times of the other three special species grassland plants and their presence could not be verified. Because both the park and preserve biologists have recorded their presence, it is assumed that all four of the special-status grassland type species occur in this area.

Table 3-9. Special-Status Plants Documented along Action Alternatives

Special-Status Species	State or Federal Listings[1]	Vegetation Cover Type	Historical Occurrences within 2 Miles of Alternatives[2]	Field Verified Occurrences along Alternatives[3]
Mousetail (*Myosurus clavicaulus*)	WA (S)	Wetland	No occurrences	West, Middle
Nuttall's quillwort (*Isoetes nuttallii*)	WA (S)	Wetland	West	West
Smooth goldfields (*Lasthenia glaberrima*)	WA (E)	Wetland	No occurrences	West
Western ladies-tresses (*Spiranthes porrifolia*)	WA (S)	Wetland	West	West
Clustered lady's-slipper (*Cypripedium fasciculatum*)	WA (S), SoC	Grassland	West	Not found
Douglas' draba (*Cusickiella douglasii*)	WA (T)	Grassland	West	Not found
Hot-rock penstemon (*Penstemon deustus* var. *variabilis*)	WA (T)	Grassland	West	West
Obscure buttercup, also called Dalles Mountain buttercup (*Ranunculus triternatus*)	OR (LE)[4], WA (E), SoC	Grassland	West	West
Gooseberry-leaved alumroot (*Heuchera grossulariifolia* var. *tenuifolia*)	WA (S)	Rock Outcrops/Cliffs	No occurrences	West
Smooth desert-parsley (*Lomatium laevigatum*)	WA (T)	Rock Outcrops/Cliffs	Middle, East	Not found

[1] SoC = USFWS Species of Concern. The species is in jeopardy, but sufficient information does not exist to support listing.
E/LE = State Endangered/Listed Endangered. In danger of becoming extinct or extirpated.
T = State Threatened. Likely to become endangered.
S = State Sensitive. Vulnerable or declining and could become endangered or threatened in the state.
[2] Historical Data from ORNHIC 2007 and WNHP 2009c.
[3] Field verified occurrences include those found within 1,000–2,000 feet of the proposed corridor.
[4] Although this species is listed in both Oregon and Washington, it was only found in Washington.

Two of the special-status species along the project are associated with cliffs and rock outcrops: gooseberry-leaved alumroot (*Heuchera grossulariifolia* var. *tenuifolia*) and smooth desert-parsley (*Lomatium laevigatum*). The gooseberry-leaved alumroot was found during field surveys along the West Alternative near Swale Creek and the Klickitat Trail (line mile W11). Smooth desert-parsley has historically been located along the Middle and East alternatives near Wishram (line mile ME9), but was not found during field surveys.

The CRGNSA Management Plan protects a number of endemic and species of special interest within the National Scenic Area. Many of those species are discussed in this EIS section; a table listing all the National Scenic Area protected species is found in Appendix D, with a determination of whether the species are likely present or affected along the action alternatives.

Priority Ecosystems

Priority ecosystems are areas designated for the conservation and management of habitats, natural areas, or vegetation assemblages with unique or significant value. In Washington, priority ecosystems are those that are designated by the Washington Natural Heritage Program as high-quality or rare ecosystems based on global, national, and state data (WNHP 2007). These designations help guide general planning and conservation efforts as well as the selection of natural areas to be protected under the Natural Area Preserves Act (WNHP 2009a). Potential WNHP priority ecosystems are crossed by all three action alternatives (WNHP 2009c). Five different priority ecosystem types were found in Washington during field surveys within 1,000–2,000 feet of one or more of the project alternatives: two ecosystem types are in grasslands, two are in shrub-steppe, and one is in woodlands. These are described in the next section by vegetation type. No Oregon priority areas, as designated by the Oregon Natural Heritage Program, are crossed by the action alternatives (ONHP 2003).

Grassland

High quality grassland (also known as east-side steppe) was historically the most widespread vegetation type in the project area (Franklin and Dyrness 1988), although it is now quite rare. Grassland consists of a dominant cover of native bunchgrasses and herbaceous forbs, with a species composition similar to that of shrub-steppe communities, but with low or no shrub cover. High quality grassland is found along the West Alternative where it crosses the Columbia Hills State Park and Columbia Hills Natural~~e~~ Area Preserve (line miles W6.5-11; see Map 3-5)

In addition to the four special-status species in grassland along the West Alternative, this area also contains two WNHP priority ecosystems: bluebunch wheatgrass-Sandberg's bluegrass lithosol and Idaho fescue-houndstongue hawkweed (*Hieracium cynoglossoides*). Common native dominants in this area include squirreltail (*Elymus elymoides*), needle-and-thread (*Hesperostipa comata*), Idaho fescue (*Festuca idahoensis*), Sandberg's bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Common forbs in this area include fern leaf desert parsley (*Lomatium dissectum*), narrow leaf desert parsley (*Lomatium triternatum*), barestem desert parsley (*L. nudicale*), small-flowered woodland star (*Lithophragma parviflorum*), grass widow (*Sisyrinchium inflatum*), and several common species of pussytoes (*Arenaria spp*.), milk vetch (*Astragalus spp*.), and lupine (*Lupinus spp*.).

Cryptogamic crusts—which are composed of lichens and mosses that form a protective layer over the soil, aiding in soil stability and water infiltration—are also found.

Scabland lithosol communities (also referred to as Columbia plateau scabland shrubland [WNHP 2008]) can also occur in small patches within grassland or shrub-steppe communities (Franklin and Dryness 1973; WNHP 2008), including the grassland areas along the West Alternative. These communities have very shallow soils such that exposed rock and gravel is common, with the dominant species frequently either dwarf-shrub species or grasses. Common species include stiff sage (*Artemisia rigida*), along with many dwarf-shrub buckwheats (*Eriogonum* ssp.), balsamroot (*Balsamorhiza* ssp.), and Sandberg's bluegrass.

Shrub-Steppe

High quality shrub-steppe has historically not been as widespread as grassland in the area (Franklin and Dyrness 1988; WNHP 2008), and, like grassland, is now quite rare. Shrub-steppe shares many of the same grass and herbaceous species as grassland communities, but also has a major shrub component (Franklin and Dyrness 1988). High-quality shrub-steppe can be found along the Little Klickitat River in the West and Middle alternatives (line miles W18, W19.5, and WM21; see Map 3-5). Within these shrub-steppe areas, two WNHP priority ecosystems were identified: Douglas' buckwheat (*Eriogonum douglasii*)-Sandberg's bluegrass, and bitterbrush-Idaho fescue.

The dominant native vegetation found in this cover type includes antelope bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), and little sagebrush (*Artemisia arbuscula* ssp. *arbuscula)*. Other shrubs and dwarf shrubs present are sulfur and arrowleaf buckwheat (*Eriogonum umbellatum* and *E. compositum)* and other species of *Artemisia*. Common grasses include Idaho fescue, bluebunch wheatgrass, and Sandberg's bluegrass. Some patches of intact cryptogamic crusts were present in this cover type but are generally small.

Disturbed Grassland/Shrub-Steppe

Disturbed grassland/shrub-steppe includes areas of historic grasslands and shrub-steppe that have been disturbed over time due to grazing or other land use activities. Disturbed grasslands and shrub-steppe are discussed together since neither are high quality vegetation communities, the herbaceous components of the two communities are similar, and their historic (pre-disturbance) distributions are uncertain. Disturbed grassland/shrub-steppe is the most prevalent vegetation type along the project alternatives and is found along the project alternatives in Oregon, the Columbia Hills, the West Alternative as it runs northeast, and along the Little Klickitat River. Disturbed grassland/shrub-steppe is often interspersed with cropland and ranges from fairly intact to somewhat degraded as much of the area surveyed was lightly grazed or showed no evidence of recent grazing, and had some native species present. (See Map 3-5 for locations of disturbed grassland/shrub-steppe along the project alternatives.)

Species composition in this vegetation type includes bulbous bluegrass (*Poa bulbosa*), cheatgrass (*Bromus tectorum*), quackgrass, yarrow (*Achillea millefolium*), stork's bill (*Erodium cicutarium)*, desert parsleys (*Lomatium* spp.), yellow starthistle, and common fiddleneck (*Amsinckia menzieii*). Shrubs such as green and grey rabbitbrush (*Chrysothamnus viscidiflorus* and *C. nauseous*), or sagebrush (*Artemisia* spp.) are also present. Some patches of intact cryptogamic crusts were present in this cover type, but are generally small. This vegetation cover type is depicted as rangeland in Section 3.1 Land Use and Recreation.

Woodlands

There are small woodland or treed areas along the project; they occur primarily in the riparian zones and upland areas around rivers, creeks, and dry washes. Eighteen woodland areas were identified for all project alternatives: 11 crossed by the West Alternative, seven crossed by the Middle Alternative, and six crossed by the East Alternative. Woodland areas are found where the alternatives cross Fifteenmile Creek and orchards in Oregon, along drainages of the Columbia Hills, around a house on the West Alternative, and along the Little Klickitat River area (see Map 3-5and/or Appendix B). Trees in these areas include Oregon white oak (*Quercus garryana*), ponderosa pine (*Pinus ponderosa*), black locust (*Robinia pseudoacacia*), Hawthorn (*Crataegus phaenopyrum*), and orchard trees. Understory plants present include taller shrubs such as mixed willow (*Salix* spp.), oceanspray (*Holodiscus discolor*), mock orange (*Philadelphus lewisii*), black hawthorn (*Crataegus douglasii*), Himalayan blackberry (*Rubus armeniacus*), and snowberry (*Symphoricarpos albus*).

The woodlands with Oregon white oak or with a combination of Oregon white oak and ponderosa pine are high quality intact native communities. The Oregon white oak-ponderosa pine woodland is a WNHP priority ecosystem. This priority ecosystem is found in woodland areas on the West Alternative and where the alternatives cross the Little Klickitat River.

Cropland

Cropland is a general cover type that combines irrigated and nonirrigated agriculture, orchards, and vineyards. It is the second most prevalent vegetation type in the project area after disturbed grassland/shrub-steppe. Cropland also is discussed in Section 3.1 Land Use and Recreation.

Weeds

Undesirable plant species (weeds) are identified by the federal government as those that are "undesirable, noxious, harmful, nonnative, injurious, or poisonous, pursuant to state or federal law," and that should be managed where county or private management plans are in place, as stated in the Federal Noxious Weed Act. "Invasive species" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (E.O. 13112).

"Noxious weeds" are specifically defined in the Plant Protection Act as those plant species that can damage cultivated or natural vegetation, livestock, and other resources. Weeds can reduce crop yields and forage production, injure livestock, and displace native plant species. State and county noxious weed lists classify weeds according to the threats they pose, their distribution, and their potential for eradication or control. Generally, those species posing a higher risk but that have a lower distribution are rated higher. One hundred thirty-seven weed species are on the combined federal and county noxious weed lists for Klickitat and Wasco counties (Wasco County Weed Department 2008; Klickitat County Weed Board 2009; USDA 2010). Of these, four are listed by the U.S. Department of Agriculture (USDA), 42 by Wasco County, and 123 by Klickitat County.

The following 10 noxious weed species are found along the project alternatives: Canada thistle (*Circium* spp.), Diffuse knapweed (*Centaurea* spp.), Russian knapweed (*Centaurea* spp.), perennial pepperweed (*Lepidium latifolium*), puncturevine (*Tribulus terrestris*), rush skeleton weed (*Chondrilla juncea*), white top (*Cardaria draba*), yellow starthistle (*Centaurea solstitialis*), scotch thistle (*Onopordum acanthium L.*), and medusa head (*Taeniatherum canput-medusae*) (field survey spring 2010). All these species except medusa head, are rated Class B noxious weeds in Oregon and in Klickitat County. Medusa head is not rated in Klickitat County, but in Oregon it is a Class B noxious weed. Class B noxious weeds are designated for control in regions where they are not yet widespread, but in regions where the weeds are already abundant, control is decided at the local level, with containment as the primary goal.

The weeds along the project alternatives are primarily in disturbed shrub-steppe along the benches above the Columbia River. On the north side of the Columbia Hills, few noxious weeds are found. The West Alternative has the fewest weeds. Rush skeletonweed and diffuse knapweed are found along the West Alternative from Big Eddy Substation and through The Dalles and Dallesport areas, with skeletonweed patches continuing into the Dalles Mountain Ranch Columbia Hills State Park (line miles W0-8). Punturevine is found in the Dallesport area south of SR 14 (line miles W2.5-4).

In Oregon, the Middle and East alternatives traverse areas of skeletonweed and diffuse knapweed, with yellow starthistle in the Fifteenmile creek drainage and areas of puncturevine, whitetop, and scotch thistle. As the Middle and East alternatives cross into Washington, there is an abundance of diffuse knapweed and puncturevine, with patches of skeletonweed. On the north side of SR 14 patches of perennial pepperweed are evident. From where the East Alternative departs from the Middle Alternative and continues east (line miles E9-E14), yellow starthistle is abundant, and is one of the more prominent plant species in portions of the entire landscape.

Many other weed species, not considered noxious, are also along the alternatives, including cheatgrass, reed canarygrass (*Phalaris arundinacea*), barnyardgrass (*Echinochloa crus-galli*), and cereal rye (*Secale cereale L.*).

3.3.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Impacts to vegetation would include removal, disturbance, changes in vegetation type, and the spread of noxious weeds. Where disturbed vegetation could not be restored to its preconstruction cover type, the impact would be permanent. Where disturbed vegetation could be reestablished, impacts would be temporary.

The project would require removal of some trees within the right-of-way for the life of the line. Trees or other vegetation that can grow taller than ~~10~~ 4 feet would typically be removed from the proposed transmission line right-of-way. In addition, trees outside of the right-of way that have the potential to fall or grow close enough to the conductors to cause a flashover would be removed. Permanent tree removal would not only affect the trees, but could also change the understory vegetation, which tends to be shade tolerate species that may not survive exposure to full sun.

Actual tree removal would depend on the terrain and how far the conductor would be from the top of the tree's growth potential. In the project area, many trees are associated with rivers or creeks and are located in deeply incised channels. Trees in these areas would likely be well below the conductors and would not require removal. In addition, some of the trees in the area are older, slow-growing Oregon white oak which, depending on the situation, could be left in place where they would have little potential of growing close enough to the conductors to cause problems. Existing orchards crossed by the project would require a special-use permit to ensure that the trees would be maintained well below electrical clearances.

At tower sites and along new access roads, vegetation would be permanently removed and soils would be compacted. The impact level would depend on both the amount and quality of vegetation removed. In disturbed grassland/shrub steppe communities, some vegetation would likely return to and recover at least some of the area beneath the towers. Road beds would be graveled and would be periodically mowed if vegetation returned. In addition, habitat fragmentation could occur where new or expanded rights-of-way or access roads would cross through sensitive plant communities, particularly woodlands, special-status plant populations, or priority ecosystems that may occur over a restricted or reduced area. Fragmenting vegetation habitats can limit the spread of plant seeds and isolate plant communities.

Temporary impacts due to construction activities would include vegetation removal or trampling and soil compaction from crew activity and construction equipment. Temporary impacts would occur in construction areas surrounding new towers, including counterpoise, pulling and tensioning sites, staging areas, and along the right-of-way during tree removal. Where an existing line would be removed, tower removal would temporarily disturb that area. However, the existing tower location would either be used for the proposed tower, or could revegetate permanently.

The one or two staging areas that would be needed (to store materials, house a small office trailer, and park vehicles) would be located on already developed areas, either paved of previously graded parking lots. Vegetation impacts would be limited to possible mowing or trampling of highly disturbed grassland/shrub-steppe. The staging areas would be about 5 -15 acres and would be identified just prior to construction. There would be ***no-to-low*** impacts to vegetation due to staging areas, as the areas would either be void of vegetation or be highly disturbed, no special-status plant species would be present or affected, trees would not be removed, and, if vegetation were present, it would be allowed to reestablish or be reseeded following construction.

Maintenance activities could also create temporary impacts by trampling vegetation in work areas around towers or in the right-of-way where trees would need to be removed. In addition, construction and maintenance activities could start fires which would result in the loss of vegetation. Because of higher fuel loads created by cheatgrass and similar species, there would be a greater risk of fires igniting and spreading in disturbed grassland/shrub-steppe communities. Fire would act to further reduce the native components of the system and facilitate the spread of weeds. However, fire-control measures would be taken and the potential for fire impacts would be ***no-to-low.*** (See Section 3.3.3 Mitigation Measures.)

Although vegetation disturbed through construction or maintenance activities would be allowed to reestablish in many areas, these would be vulnerable to noxious weed infestations, and the ability for the preconstruction vegetation type to reestablish would depend on the vegetation present. Under good growing conditions, and with appropriate reseeding and noxious weed mitigation measures, grasslands and disturbed grassland/shrub-steppe ~~would have the potential to~~ could reestablish within three growing seasons (McLendon and Redente 1990; Gayaldo 1996; OEFSC 2001; Humphrey and Schupp 2002; Kulmatiski 2006; Kulmatiski et al. 2006; Link et al. 2011; Prevey et al. 2010; Roos et al. 2010), while shrub-steppe and sensitive plant species ~~w~~could take five years or longer. The loss of cryptogamic crusts could result in an increase in soil erosion and decreased soil nutrient and water retention. Reestablishment of the cryptogamic crust component in higher quality shrub-steppe is a long-term process, and can take from 7 to 100 years, depending on the complexity of the species association within a given area of cryptogamic crust (PALS 1997).

Areas disturbed would be reseeded (see Section 3.3.3 Mitigation Measures). In agricultural areas, crops could be reestablished the following growing season, but areas around tower legs would be left untilled, creating areas that could harbor weeds if not treated.

Noxious weeds and other invasive species such as cheatgrass grow quickly and thrive in disturbed areas, outcompeting native grasses, forbs and/or shrubs. Once established, weed species are hard to control. Impacts of weed infestations would be more pronounced on native plant communities than in areas that have already been disturbed. Areas would be vulnerable to noxious weeds because existing vegetation would be disturbed and soil exposed during construction, and because vehicles would drive (both during construction and maintenance activities) along access roads and potentially carry weed seeds from one area to another. ~~However~~ Although mitigation measures would be taken to lessen the risk of introducing or spreading existing noxious weeds during and after construction and throughout the life of the line; the potential for spreading weeds would be ~~***low***~~ ***moderate***. (See Section 3.3.3 Mitigation Measures.)

Proposed project work at Big Eddy Substation would occur within the existing electrical yard where no vegetation exists; work at Big Eddy Substation would have ***no*** impacts on vegetation.

West Alternative

Of the nine special-status species found along the West Alternative, eight would potentially be impacted by the West Alternative (see Table 3-10). The special-status species gooseberry-leaved alumroot was also found along the West Alternative, but would not be impacted because it is not on the proposed right-of-way and is away from potential construction zones.

About 7–10 acres (depending on the tower type used) of grassland containing the obscure buttercup would be impacted by a combination of towers and roads. In addition, about 3–4 acres of hot-rock penstemon, 2–3 acres of clustered lady's slipper, and 0.2–0.7 acre of Douglas' draba would also be impacted by tower and road placement. Although neither clustered lady's slipper nor Douglas' draba were found during field surveys, they are assumed to be present and potential impacts were determined using WNHP 2009 data.

Because special-status species are more sensitive to disturbance, especially compaction and removal of associated species, BPA assumed that even temporary construction impacts (areas around towers disturbed during construction) could create a permanent loss of these species. Therefore, all disturbance to special-status species would be considered permanent.

All four special-status species associated with wetlands found along the West Alternative would also potentially be impacted: about 0.4–0.5 acre of Nuttall's quillwort, smooth goldfields, and western ladies tresses; and 0.5–0.7 acre of mousetail. These species are all found in the same wetland areas, and the mousetail is also found in a separate location that would only be impacted if double-circuit towers were used.

Table 3-10. Permanent Impacts[1] on Special-Status Plants along the West Alternative

Vegetation Cover Type	Special-Status Species	Tower Impacts (acres)[2]	Road Impacts (acres)	Total Impacts (acres)
Grassland	**Clustered lady's slipper**	2–3	1	2–3
	Douglas' draba	0.2	0.5	0.2–0.7
	Hot-rock penstemon	0.5–1.7	2	3–4
	Obscure buttercup	2–5	5	7–10
Wetland	**Nuttall's quillwort**	0.2–0.3	0.2	0.4–0.5
	Mousetail	0.2–0.4	0.3	0.5–0.7
	Smooth goldfields	0.2–0.3	0.2	0.4–0.5
	Western ladies-tresses	0.2–0.3	0.2	0.4–0.5

[1] Construction impacts are considered permanent impacts for special-status species based on the assumption that individual plants for these species could be destroyed.

[2] Acreage ranges represent tower options – the smaller acreage is for single-circuit options, the larger acreage is for double-circuit options.

Disturbed grassland/shrub-steppe is the most abundant vegetation type crossed and affected by the West Alternative. About ~~84–101~~ 78–95 acres of disturbed grassland/shrub-steppe would be permanently impacted (removed) by tower footprints and roads. An additional ~~35–84~~ 36–85 acres would be temporarily impacted around tower sites during construction (see Table 3-11). Most conductor and fiber optic cable pulling sites would be in disturbed grassland/shrub steppe, temporarily impacting about 14 acres. Disturbed areas would be reseeded following construction. In temporarily impacted areas, this vegetation type would likely return to preconstruction coverage within three growing seasons.

The West Alternative is the only alternative that crosses high-quality grasslands. About ~~24-30~~ 20–26 acres of grassland would be permanently impacted. An additional 7–23 acres would be temporarily impacted during construction (see Table 3-11). Two conductor and fiber optic cable pulling sites would likely impact an additional 1.5 acres. The Idaho fescue-houndstongue hawkweed priority ecosystem would be impacted. Bluebunch wheatgrass-Sandberg's bluegrass lithosol would be spanned by the line and would not be impacted. Areas of cryptomgamic crusts found within the grasslands would also be permanently impacted.

Table 3-11. Impacts on Vegetation Types and Priority Ecosystems on the West Alternative

	Permanent Impacts				Temporary Impacts		
Vegetation Cover Types and Associated Priority Ecosystems[1]	Towers (acres)[2]	New Roads (acres)	Upgrading Existing Roads (acres)	Total Permanent Impacts per Cover Type (acres)	Towers (acres)[2]	Temporary Roads (acres)	Total Temporary Impacts per Cover Type (acres)
Shrub-Steppe	~~0.9–2.5~~ 1–3	~~3.9~~ 4	~~0.7~~ 0	**~~6–7~~ 5–7**	3–8	0	**3–8**
Grassland	2–8	~~11~~ 8	~~11~~ 10	**~~24–30~~ 20–26**	7–23	0	**7–23**
Idaho fescue-houndstongue hawkweed[3]	*0.3–0.6*	*0.4*	*1.7*	***2.4–2.7***	*0.8*	*~~1.80~~ 0*	***5-5.3***
Disturbed Shrub-Steppe/Grassland	10–27	~~52~~ 48	~~22~~ 20	**~~84–101~~ 78–95**	31–80	~~4~~ 5	**~~35–84~~ 36–85**
Woodland[4]	2–3	0	0	**2–3**	0	0	**0**

[1] Associated Priority Ecosystems are listed in italics beneath their associated Vegetation Cover Type in this column.

[2] Impacts for tower construction are presented in a range because they differ by tower option. ~~Single-circuit tower options have lower impacts; double-circuit tower options higher impacts,~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 1.5 acres for the West Alternative.

[3] Idaho fescue-houndstongue hawkweed values are included with grassland values, and so are not added into the totals.

[4] Impacts to woodlands are calculated based on tree removals, which are considered permanent impacts only.

Because high-quality grasslands are vulnerable to weed invasion and habitat disturbance, the likelihood is low that temporarily disturbed areas can be restored to preconstruction conditions. Disturbed areas would create opportunities for skeletonweed found in this area to spread, and care would need to be taken to prevent equipment from carrying weed seeds from other areas of the project. Noxious weed spread within high-quality grasslands would affect their integrity and the priority ecosystem that is designated for protection by the state of Washington.

Three areas of high-quality shrub-steppe found along the West Alternative would be impacted. About ~~6–7~~ 5–7 acres would be permanently removed and an additional 3–8 acres would be disturbed during construction (see Table 3-~~11~~ 13). The two WNHP priority ecosystems found in this area (Douglas' buckwheat-Sandberg's bluegrass, and bitterbrush-Idaho fescue) would not be impacted.

Because these high-quality shrub-steppe communities are relatively small and broken up by disturbed grassland/shrub-steppe—where weeds are more likely present—and because shrub-steppe communities take longer to recover, there would be a higher risk that the disturbed vegetation would not completely recover to its preconstruction state.

For options that would remove the existing Chenoweth-Goldendale line, about 1.5 acres of land (or about 0.01 acre per tower) that is currently encumbered by the wood pole line could revegetate to the surrounding vegetation type. The ability for high quality vegetation to return would be less likely or more difficult than for disturbed grassland/shrub-steppe.

Eight of the 11 woodland/tree areas along the West Alternative would be impacted by tree removal (see Table 3-12). About 93–130 trees would be removed, permanently impacting about 2–3 woodland acres, including the understory. Fewer trees would be impacted by tower options that would remove the existing wood-pole line and build a new line in its place.

In Oregon near Big Eddy Substation, a cherry orchard (Woodland 1) would be spanned and the terrain and height of the trees would likely allow the trees to remain untouched – with an agreement with the landowner to ensure the trees stay well below the conductors. However, there is a windbreak of poplar trees around the orchard where several trees on the north side may be removed, leaving a gap that could expose the orchard to wind. Trees along the Fifteenmile Creek drainage (Woodland 2) are low-growing Oregon white oaks in a ravine and would not require removal. In Washington, between line miles W3-7, trees in several woodlands near Threemile, Fivemile, and Eightmile creeks (Woodlands 3, 4, and 6) would be removed: black locust would be removed in Woodlands 3 and 4, and several Oregon white oaks would be removed in Woodland 6. Woodland 7, located in the Columbia Hills Natural~~e~~ Area Preserve, would require the removal of Oregon white oak and ponderosa pine trees that are part of a priority ecosystem. Other trees requiring removal along this alternative include some ponderosa pine growing around a house (Woodland 8), and growing in the Little Klickitat River area (Woodlands 9, 10, and 11). Although most trees along the route are associated with ravines or drainages, only the Hawthorn trees near the intermittent Threemile Creek drainage would require removal in the riparian zone; all other trees would be removed in upland areas.

Because tree removal along the West Alternative would not create a clear swath through any given wooded area, but would be at the edges of narrow or scattered treed areas, woodland habitat would be impacted but not fragmented.

Overall, because the West Alternative would impact ~~seven~~ eight special-status species, a high-quality grassland, and three high-quality shrub-steppe communities; would remove vegetation from two priority ecosystems; and impact woodland areas that are scarce in the area, the impacts of the West Alternative on vegetation would be ***high.***

Although still considered a high impact, the option that would include removal of the existing wood-pole line and use of single-circuit towers in an existing alignment (West Option 3), would have the least impact of the tower options because it would have a smaller tower footprint, would allow vegetation regeneration where the wood-pole towers are currently located, and it would require less tree removal since the right-of-way expansion would be less. The option that would use the most double-circuit towers, for about 21 miles (West Option 5), would have the greatest impact because of the larger tower footprints. The impacts of West Options 1, 2, 4, and 6 would be between the options with the least and greatest impacts.

Table 3-12. Woodland Locations and Potential Tree Removals along the Action Alternatives

Woodland Group No. (line mile)	Woodland/Tree Description	Tree Removal		
		Parallel Tower	Rebuild Tower	Access Roads
1 (W1)	Cherry orchard, poplar windbreak trees	No orchard trees; About 5 poplar windbreak trees	N/A	None
2 (W1)	Oregon white oak, big leaf maple, black locust, in Fifteenmile Creek ravine.	None - Span Ravine/Creek	N/A	None
3 (W3)	Oregon white oak and Hawthorn grove (about 30 trees, isolated woodland) in marshy Threemile Creek drainage	About 20 Hawthorn	N/A	None
4[1] (W5)	Hawthorn, Oregon white oak, Lombardi poplar in Threemile Creek draw and ridge	About 15 Hawthorn	N/A	Possible
5[1] (W7)	Oregon white oak in Fivemile Creek draw	Likely none	Likely none	None
6[1] (W7)	Oregon white oak in Eightmile Creek draw	About 10 Oregon white oak	About 10 Oregon white oak	None
7[1] (W9)	Oregon white oak grove in draw; isolated ponderosa pines	About 10 Oregon white oak in upland; about 5-10 ponderosa pine	About 10 Oregon white oak in upland; 5-10 ponderosa pine	Possible
8 (W12)	Ponderosa pine around house	None	About 20 Ponderosa pine	None
9 (W18)	Isolated ponderosa pine over a 1,000 ft length	About 10 ponderosa pine	About 10 ponderosa pine	None
10[1] (W19)	Ponderosa pine along 1,200 ft stretch of Little Klickitat River. Oregon white oak and ponderosa pine in river drainage.	About 35 ponderosa pine in upland areas	About 35 ponderosa pine in upland areas	None
11 (WM20)	Ponderosa pine woodland, about 100 trees	About 10–15 ponderosa pine	N/A	Possible
12 (ME1)	Orchard, Oregon white oak on either side of orchard	No orchard trees, about 6 Oregon white oak	No orchard trees, 6 Oregon white oak	None
13 (ME1)	Orchard	None	None	None
14 (ME1)	Oregon white oak along Fifteenmile Creek	None–Span Creek	None–Span Creek	None
15 (ME2.5)	Oregon white oak along Fifteenmile Creek	None–Span Creek	None–Span Creek	None
16 (ME3)	Oregon white oak along Fifteenmile Creek	None–Span Creek	None–Span Creek	None
17[1] (M19)	Oregon white oak, willows along Little Klickitat River, ponderosa pine upland	Span Creek–no trees About 5 ponderosa pine in upland area	N/A	None
18[1] (E22)	Oregon white oak and willows in Little Klickitat River draw, isolated ponderosa pine upland	About 5 Oregon white oak and 5 ponderosa pine in upland areas	N/A	None

[1] May contain Oregon white oak-ponderosa pine woodland WNHP priority ecosystem.

Middle Alternative

Both special-status species found along the Middle Alternative would be potentially impacted. Although smooth desert-parsley was not found during field surveys, it is assumed present and potential impacts were determined using WNHP 2009 data. About 0.7–0.9 acre of smooth-desert parsley found along the rock outcrops near the Columbia River in Washington would potentially be removed by tower and new road construction. About 0.5 acre of this smooth-desert parsley area would be impacted due to temporary construction activities, but it is assumed that the plant would not regenerate and the impact would be permanent.

About 0.2 acre of the special-status wetland species mousetail (found near the Little Klickitat River), would be removed. This species would not be expected to regenerate, and the impact would be permanent.

Disturbed grassland/shrub-steppe is the most abundant vegetation type crossed and affected by the Middle Alternative. About ~~75–77~~ 70–72 acres of disturbed grassland/shrub-steppe would be permanently impacted (removed) by tower footprints and roads. An additional ~~34–47~~ 35–49 acres would be temporarily impacted during construction (see Table 3-11). Pulling sites would likely disturb about 16 acres. Disturbed areas would be reseeded following construction. In temporarily impacted areas, this vegetation type would likely return to preconstruction coverage within three growing seasons. As most noxious weeds were found in disturbed grassland/shrub-steppe areas along the Columbia River, the potential risk for weeds to spread would be high. Mitigation measures would help prevent further infestations.

Where the Middle Alternative crosses over the Columbia Hills (between line miles M9–10.5), the disturbed grassland/shrub-steppe community is in relatively good condition with only light disturbance. In this area, impacts would be greater, as the alternative would also impact cryptomgamic crust found in this lightly disturbed area, would create a new corridor, and most access roads would be new.

For options that would remove the existing Harvalum-Big Eddy line and build double-circuit, about 2 acres of land (or about 0.06 acre per tower) that is currently encumbered by the existing line could revegetate to the surrounding vegetation type (which is mostly disturbed grassland/shrub-steppe in this area).

No high-quality grasslands would be affected by the Middle Alternative, since no grassland is present along the route.

Of the small amount of high-quality shrub-steppe found along the Middle Alternative, about 3 acres would be permanently impacted and an additional ~~0.8–7.5~~ 1–8 acres would be disturbed during construction (see Map 3-5). Small patches of cryptogamic crusts within this high-quality shrub-steppe would also be impacted. The two WNHP priority ecosystems (Douglas' buckwheat-Sandberg's bluegrass and bitterbrush-Idaho fescue) would not be impacted. Because this high-quality shrub-steppe community is small and surrounded by disturbed grassland/shrub-steppe—where weeds are more likely present—and because shrub-steppe communities take longer to recover, there would be a higher risk that the disturbed vegetation would not completely recover to its preconstruction state.

Table 3-13. Impacts on Vegetation Cover Types and Priority Ecosystems on the Middle Alternative

	Permanent Impacts				Temporary Impacts		
Vegetation Cover Types and Associated Priority Ecosystems[1]	Towers (acres)[2]	New Roads (acres)	Upgrading Existing Roads (acres)	Total Permanent Impacts per Cover Type (acres)	Towers (acres)[2]	Temporary Roads (acres)	Total Temporary Impacts per Cover Type (acres)
Shrub-Steppe	0–0.3	3	0	3	~~0.8–7.5~~ 1–8	0	~~0.8–7.5~~ 1–8
Grassland	0	0	0	0	0	0	0
Disturbed Shrub-Steppe/Grassland	10–12	~~44~~ 41	~~21~~ 19	~~75–77~~ **70–72**	31–45	~~3~~ 4	~~34–47~~ 35–49
Woodland[3]	0.5–0.7	0	0	0.5–0.7	0	0	0

[1] There were no Priority Ecosystems found on the Middle Alternative.

[2] Impacts for tower construction are presented as the range of tower options. ~~Single-circuit tower options have lower impacts; double-circuit tower options higher impacts.~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 2.0 acres for the Middle Alternative.

[3] Impacts to woodlands are calculated based on tree removals, which are considered permanent impacts only.

Three of the seven woodlands found along the Middle Alternative would be impacted (see Table 3-12). About 26 trees would be removed, impacting roughly 0.7 woodland acre, including the understory. In Oregon near Big Eddy Substation, the Middle Alternative would span an orchard (Woodland 12); the trees in the orchard would be allowed to remain (with an agreement with the landowner to ensure the trees stay well below the conductors), but several Oregon white oak trees on either side of the orchard would be removed. The alternative would then span another orchard and Fifteenmile Creek three times (Woodland 13, 14, 15, and 16). No trees in these four woodland areas would be removed because the terrain would provide enough clearance for the conductors.

Where the Middle Alternative crosses the Little Klickitat River (Woodland 17), several ponderosa pines would be removed in upland areas on the north side of the crossing. The alternative would also impact a small portion of ponderosa pine in a large woodland area (Woodland 11) to the north of the river (this woodland would also be impacted by the West Alternative).

None of the trees removed would be part of a priority ecosystem. The number of trees removed would be the same for all tower options proposed for the Middle Alternative.

In summary, the Middle Alternative would impact two special-status species and one high-quality shrub-steppe community, but would not impact high-quality grasslands or priority ecosystems, and would require only a small number of trees to be removed. Disturbed grassland/shrub-steppe that would be impacted is common in the area and would return in temporarily disturbed areas following construction. Overall impacts of the Middle Alternative on vegetation would be ***moderate***.

The three options for the Middle Alternative would have similar overall moderate impacts to vegetation. Although use of double-circuit towers in some places would have a greater footprint and would create disturbance during removal of the existing line, the existing tower footprints would be allowed to revegetate and the total footprint would be smaller by combining two lines on one tower.

East Alternative

The one special-status species, smooth desert-parsley, found along the East Alternative would potentially be impacted. As described for the Middle Alternative, smooth desert-parsley was not found during field surveys, but is assumed present and potential impacts were determined using WNHP 2009 data. About 0.7–0.9 acre of smooth-desert parsley found near the Columbia River in Washington (an area in which the Middle and East alternatives follow the same route) would potentially be removed by tower and new road construction. About 0.5 acre of this smooth-desert parsley area would be impacted due to temporary construction activities, but it is presumed that the plant would not regenerate and the impact would be permanent.

Disturbed grassland/shrub-steppe is the most abundant vegetation type crossed and affected by the East Alternative. About ~~89–92~~ 86–89 acres of disturbed grassland/shrub-steppe would be permanently removed along the East Alternative, and an additional ~~37–45~~ 39–47 acres would be temporarily disturbed during tower construction (see Table 3-14 and Map 3-5). Pulling sites would disturb about 16 acres.

For options that would remove an existing line and build the proposed line as double-circuit, about 3.5 acres (or about 0.06 acre per tower) that are currently encumbered by the existing line could revegetate to the surrounding vegetation type (which is mostly disturbed grassland/shrub-steppe in this area).

Since various weeds are found in the disturbed grassland/shrub-steppe areas along the East Alternative from Big Eddy Substation through line mile 14, there would be the potential that with disturbance these species would spread. ~~With reseeding and noxious weed mitigation measures, temporarily disturbed grassland/shrub-steppe vegetation communities would likely return within three growing seasons.~~

Table 3-14. Impacts on Vegetation Cover Types and Priority Ecosystems on the East Alternative

	Permanent Impacts				Temporary Impacts		
Vegetation Cover Types and Associated Priority Ecosystems[1]	Towers (acres)[2]	New Roads (acres)	Upgrading Existing Roads (acres)	Total Permanent Impacts per Cover Type (acres)	Towers (acres)[2]	Temporary Roads (acres)	Total Temporary Impacts per Cover Type (acres)
Shrub-Steppe	0	0	0	**0**	0	0	**0**
Grassland	0	0	0	**0**	0	0	**0**
Disturbed Shrub-Steppe/Grassland	11–14	~~41~~ 45	~~37~~ 30	**~~89–92~~ 86–89**	33–41	~~4~~ 6	**~~37–45~~ 39–47**
Woodland[3]	0.4–0.8	0	0	**0.4–0.8**	0	0	**0**

[1] There were no Priority Ecosystems found along the East Alternative.

[2] Impacts for tower construction are presented as the range of tower options. ~~Single-circuit tower options have lower impacts; double-circuit tower options higher impacts~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 3.5 acres for the East Alternative.

[3] Impacts to woodlands are calculated based on tree removals, which are considered permanent impacts only.

Since no high-quality grasslands or shrub-steppe are found along the East Alternative, these plant communities would not be impacted.

Of the six woodlands identified along the East Alternative, two would be impacted (see Table 3-12). About 16 trees would be removed, impacting roughly 0.8 acre of woodland, including the understory. In Oregon, the tree impacts would be the same as described for the Middle Alternative: conductors would span an orchard at Woodland 12 with removal of several Oregon white oak trees on either side of the orchard; and span Woodlands 13, 14, 15, and 16, which include those next to Fifteenmile Creek, with no tree removal. Where the East Alternative crosses the Little Klickitat River, some ponderosa pine in the upland area above the river and some Oregon white oak trees in an adjacent oak woodland would be removed. The oak woodland is part of a more expansive woodland following the river, and removal of trees from this woodland would contribute to some fragmentation of this wooded corridor.

In summary, although the East Alternative would potentially impact one special-status species, it would not impact high-quality grassland, high-quality shrub-steppe communities, or priority ecosystems, and would require only a small number of trees to be removed. Disturbed grassland/shrub-steppe that would be impacted is common in the area and in temporarily disturbed areas would return following construction. Therefore, overall impacts of the East Alternative on vegetation would be ***low***.

The three options for the East Alternative would have similar overall low impacts to vegetation. Although use of double-circuit towers where appropriate has a greater footprint and would create disturbance during removal of an existing line, the existing tower footprints would be allowed to revegetate and the total footprint would be smaller by combining two lines on one tower.

Knight Substation Options

Knight Substation Site 1

Knight Substation at Site 1 would permanently convert ~~10~~ 29.65 acres of nonirrigated cropland to a nonvegetated developed areas ~~substation yard at either site~~, with ~~5~~ 42.5 additional acres of mostly cropland and some range land impacted temporarily by construction activities. See Table 3.14.1.

Permanent impacts would include the removal of existing cropland vegetation for the substation, the access road from Knight Road, the footprint of the wood-pole Klickitat County PUD line to service the substation, and the footprint of the two dead-end towers that would be needed on either end of the ground wire along the Wautoma-Ostrander line.

Temporary impacts to vegetation would be due to a soil stockpile area, construction staging areas, a possible temporary access road from Hill Road, and the installation of counterpoise at each of the existing Wautoma-Ostrander towers 1 mile outside the Knight Substation site. The temporary access road would be reseeded and restored for existing cropland or rangeland use once construction of the substation was complete and a permanent access road from Knight Road was established. Disturbance areas at tower sites due to counterpoise installation would also be restored and the existing cropland or rangeland vegetation would be reestablished.

Existing vegetation on the north side of the proposed substation site would be covered with the soil excavated for the substation. The soil would be spread evenly to essentially match existing terrain contours, then spread with saved topsoil and revegetated. If the area was leased for agricultural use, it would be revegetated with crop type species; if it was left as open space, it would be reseeded with a mix of grasses and shrubs.

Staging areas would be restored and seeded and an area on the south side of the substation site would be left untouched and vegetation would be allowed to remain; these areas would not revert back to existing agricultural type vegetation species.

Table 3-14.1. Impacts on Vegetation by the Knight Substation Sites

Facility	Site 1 (acres)	Site 2 (acres)
Permanent		
Substation[1]	22	22
New Road[2]	6	5
PUD Electrical Service	0.15	0.15
Counterpoise Dead-End Towers	1.5	1.5
Total Permanent Impacts	**29.65**	**28.65**
Temporary		
Soil Stockpile area	19	N/A (soil to be hauled off-site)
Staging Area	2.5	2.5
Possible Temporary Road[3]	8 (6 agriculture, 2 range)	N/A
Counterpoise	13 (9 agriculture, 4 rangeland)	13 (9 agriculture, 4 rangeland)
Total Temporary Impacts	**42.5**	**15.5**

[1] Substation disturbance area includes the fenced electrical yard, control house, parking lot, retention pond, and the graveled buffer outside of the fence line.
[2] From Knight Road
[3] From Hill Road

There would be no impacts to grassland/shrub-steppe vegetation, special-status species, or priority ecosystems at either site. Overall impacts of Substation Site 1 on vegetation would be ***low*** because a relatively small amount of vegetation would be permanently impacted and the type of vegetation that would be impacted is abundant and common to the area. Impacts to croplands are discussed in Section 3.1 Land Use and Recreation.

Knight Substation Site 2

Knight Substation at Site 2 would permanently convert 28.65 acres of nonirrigated cropland to a nonvegetated developed area, with 15.5 additional acres of cropland impacted temporarily by construction activities. See Table 3.14.1.

Permanent impacts would be similar as those described for Site 1, although the access road from Knight Road would be shorter and would impact less land.

Temporary impacts would be due to the counterpoise installation and staging areas and would be the same as those described for Site 1.

There would be no impacts to grassland/shrub-steppe vegetation, special-status species, or priority ecosystems at either site. Overall impacts of Substation Site 2 on vegetation would be ***low*** because a relatively small amount of vegetation would be permanently impacted and the type of vegetation that would be impacted is abundant and common to the area.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on vegetation would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential vegetation impacts of the fiber optic cable

Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.3.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on noncultivated vegetation from construction and operation and maintenance of the action alternatives. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Locate towers and roads outside of priority ecosystems, high-quality vegetation communities, and areas of special-status plants as much as possible. Avoid these areas during construction (staging areas, pulling sites, etc.).
- Avoid tree removal to the extent possible.
- Cut or crush vegetation rather than blade in areas that would remain vegetated to maximize the ability of native plants to resprout.
- Work with the appropriate state agency to mitigate impacts to federal species of concern, ~~or~~ state-listed species, or protected habitats if impacts are unavoidable. Site-specific mitigation to be determined after a project decision is made and during tower location and design. Measures could include the following:
  - Ecologically optimizing siting of facilities
  - Special construction techniques to minimize soil disturbance
  - Seasonal restrictions
  - Identifying and securing replacement lands
  - Identifying appropriate seed or plant sources for revegetation
  - Monitoring and response provisions.
- Seed all disturbed areas to prevent colonization by weeds and facilitate reestablishment of the preconstruction plant community. Use native seed mixtures that consist of locally dominate native species, unless requested differently by the landowner. On CRP lands, use native seed mixtures approved by the local Farm Service Agency. ~~Use approved (local Farm Service Agency) native seed mixtures in high quality vegetation communities and a combination of native and non-native seed in disturbed vegetation communities. Include the dominant native species from the impacted community in the seed mix.~~
- Restore compacted soils if needed prior to seeding (see mitigation measures in Section 3.1 Land Use and Recreation).
- Prepare and implement an Early Detection Rapid Response Plan to control the infestation or spread of noxious weeds that would include the following measures:
  - Collaborate with the Klickitat County Weed Board or Wasco County Weed Department and landowners to determine and carry out the best control measures deemed locally effective for weed control during construction and over the life of the line.
  - Conduct invasive weed surveys prior to and following construction to determine potential weed spread and appropriate corrective actions.
  - Where possible, treat identified infestations prior to construction.

- ➢ Pressure or steam wash vehicles and other equipment that have been in weed-infested areas at established wash stations upon leaving the infested areas to prevent spreading weeds to uninfected areas during construction.
- ➢ Monitor and treat existing and new infestations during construction on a minimum annual basis and for 3 years after construction.

- ~~Conduct invasive weed surveys prior to and following construction to determine potential weed spread and appropriate corrective actions.~~
- ~~Collaborate with the Klickitat County Weed Board or Wasco County Weed Department and landowners to determine and carry out the best control measures deemed locally effective.~~
- ~~Pressure or steam wash vehicles and other equipment that have been in weed-infested areas at established wash stations upon leaving the infested areas to prevent spreading weeds to uninfected areas during construction.~~
- Equip all vehicles with basic fire-fighting equipment, including extinguishers and shovels to prevent fires that could encourage weed growth.
- Use certified weed-free mulch, if mulch is used for erosion control.

3.3.4 Unavoidable Impacts Remaining after Mitigation

Unavoidable impacts would include permanent vegetation loss in the footprint of new towers, substation, and roads as well as temporary disturbance of vegetation during construction and maintenance activities. Depending on the alternative, special-status species, priority ecosystems, and high-quality grassland or shrub-steppe communities would be impacted.

3.3.5 No Action Alternative

The No Action Alternative would have no impact on vegetation because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.4 Geology and Soils

This section describes the geology and soils found in the project area and how the proposed alternatives could affect these resources. It also discusses potential landslide risks.

3.4.1 Affected Environment

Geology

The project vicinity is predominantly volcanic rock, composed specifically of the Wanapum and Grande Ronde Basalt units of the Columbia River Basalt Group and younger basalts of the Simcoe Mountains at the project area's northern edge. The Columbia River Basalt Group consists of tens of thousands of vertical feet of basalt flows that emanated from fissures in southeastern Washington and northeastern Oregon, covering the southeastern quarter of Washington and adjacent areas in Oregon. The Grande Ronde and Wanapum Basalt flows are from 14.5 to 16.5 million years old (Walsh et al. 1987).

Overlying the basalt flows are much thinner (10- to 90-foot) accumulations of volcanic sediments, alluvial materials, and soils that were deposited on the land surface after eruptive events, including ash from the 1980 Mount St. Helens' eruption. These sediments include volcanic-rich alluvial sands, gravels, silts, and clays.

Topography consists of plateaus and gently rolling hills bordered by steeper slopes on the south (on either side of the Columbia River) and north (flanks of the Simcoe Mountains). Elevation ranges from 160 feet at normal pool elevation of Lake Celilo behind The Dalles Dam to 2,628 feet above sea level at the crest of the Columbia Hills north of the Columbia River.

Landslide Areas

All route alternatives travel through an area in Oregon, just south of the Columbia River and east of The Dalles, where Wasco County has determined there may be some risks of landslides (see Map 3-6). Risks are obviously higher on the area's steep slopes, although none of the larger landslide sites appear recent. More recent, active landslides are small and appear related to headwaters of drainages on steep slopes or failed banks of incised streams.

There are also some landslide areas present along the Columbia Hills on the Washington side of the Columbia River, including a large, potentially active landslide on the north side of Highway 14 above Wishram. Landslide risk mapping in Klickitat County was performed by Washington's Division of Geology and Earth Resources and by interpretation of aerial photographs. No landslide areas were found along the route alternatives north of the Columbia Hills, but there are steep slopes in the Little Klickitat River area.

The West Alternative crosses two possible landslide areas south of I-84 in Oregon (between line miles W1.2-1.8) and a large inactive landslide on Washington Parks and DNR lands between line miles W7.6-8.4. Small landslides may also be associated with the headwaters of drainages on the north flank of the Columbia Hills near line mile W9.5. Other steep slopes along the West Alternative can be found at line miles W0-2 on the Oregon side of the Columbia River, W5.5-10 where it would climb over the Columbia Hills, W11 and W13 on either side of Swale Creek, and W19.6-20.5 near the Little Klickitat River.

The Middle Alternative crosses many steep slopes for its first 9 miles. In addition, it crosses short segments of steep terrain much farther north between line miles M19.6-20 near the Little Klickitat River. Some areas on the steep slopes between line miles M0.5-7 along the Columbia River are identified as moderate to high landslide risk areas by Wasco County. Where the Middle Alternative parallels the existing Harvalum-Big Eddy line in Oregon, it crosses landslides not previously mapped, but recognized on aerial photographs at line miles M3.2 and M6.5-6.8 (see Map 3-6). It also crosses the edge of a large landslide on the north side of Highway 14 above Wishram in Washington (line miles M9-9.4). The Oregon landslides do not appear currently active, but the slide above Wishram has deformed Highway 14 in places, indicating that portions of it are still moving.

The East Alternative shares the same corridor as the Middle Alternative from Big Eddy Substation to about line mile E9.3 before turning east on a separate route. Like the Middle Alternative, steep slopes can be found at line miles E0.5-1.5, E2.2-6.2, E6.5, E7, and E7.8-8.6. In addition, the East Alternative crosses steep slopes between line miles E9.3-14, east of Wishram, Washington, and E14.6- E15, where it descends from the Columbia Hills. Some areas on the steep slopes between line miles E0.5-7 are identified as moderate to high landslide risk areas and include three inactive landslides. On the Washington side, there is a large and active landslide above Wishram (line miles E9-10). Where the East Alternative is in a new corridor, many actively eroding stream banks would be crossed (near line miles E10.4, E12, E12.7, and E12.8), as well as an old slide from line miles E13.6-14.7.

Seismic Risks

A detailed seismic and geologic hazard assessment was conducted for the route alternatives. Results of the assessment are summarized in the maps in Appendix J. There are no known active faults in the area. The faults displayed in Appendix J have a low-to-moderate probability of surface rupture. Unless a surface rupture is visible, efforts to locate towers to avoid potential surface rupture is not considered practical. No surface ruptures were observed at the proposed tower locations of the route alternatives. Earthquakes occurring elsewhere in the Northwest could cause ground shaking or ground failure—landslides or liquefaction (severe settling of soil) – in large landslide areas, in floodplain sediments and alluvial fill in the Swale Creek Valley, and in floodplain sediments around Fifteenmile Creek in Oregon and the Little Klickitat River in Washington.

Soils

Soils throughout the area are typically varieties of silty loams—a mix of sand, silt, and clay—or coarser variants (sandy or gravelly loams). Soils are a mixture of weathering products of the underlying materials (i.e., basalt or fluvial sediments) with substantial amounts of loess (silty or loamy material deposited by glaciers) and lesser amounts of volcanic ash. The most dominant soil is Goldendale silt loam, covering more than 2,300 acres in the project area. This soil has slow to moderate water-infiltration traits. Soil thickness varies, with thinner soils on steep slopes and exposed bedrock, and thicker soils in basins.

Many soil types in the area are either considered prime farmland or support “farmlands of statewide importance.” (See Section 3.1 Land Use and Recreation.) About half of the soils are mildly to moderately expansive (absorb water easily). Dirt roads in the Centerville and Klickitat Valley portion of the project area, with a high proportion of volcanic ash in the soil, are nearly all signed as impassible when wet. As a result of these erodible soil properties and the potential for frost action, which can cause soil softening or heaving, road construction and maintenance is challenging in some areas.

3.4.2 Environmental Consequences

Common Impacts

The project could affect soils by exposing soils to rain and wind, causing erosion; compacting soil; or by removing soils from use by either taking it off-site or covering with impervious surfaces. Landslides can affect the integrity of the towers and roads, and construction in slide areas can trigger further slides.

Construction activities would involve excavation (for tower footings, substation ground mat, equipment, and counterpoise), grading and cut-and-fill for roads, tree removal, movement of heavy equipment, and lay-down of materials. All these activities would disturb soils and remove or damage vegetative cover. The exposed soil would be vulnerable to movement off-site through water runoff, wind dispersal, or movement by gravity (soil/rocks rolling down hill). Soil compaction also contributes to erosion as rainfall is less easily absorbed (increasing runoff) and it is more difficult for plants to grow (creating areas with patchy or no vegetation coverage).

The area of soil disturbed at each tower site would be about 0.5 acre (including counterpoise installation impacts) for single-circuit towers and about 0.8 acre for double-circuit towers. Where existing lines would be removed, wood pole removal would disturb about 0.1 acre of soil and lattice steel tower removal would disturb about 0.43 acre. About 18 conductor tensioning sites would be required and would disturb about 14 acres of soil. Impacts from roads are based on an average road width of about 30 feet (smaller on straight stretches, larger at turns).

The amount of predicted soil loss is based on the disturbance area, type of underlying soil and terrain, and is calculated as “tons per year.” A ton is equivalent to 40 cubic yards of soil (4 feet by 5 feet by 2 feet). Even without building the project, soil is lost through existing conditions such as rain, wind, grazing, farming, driving, and construction. Mitigation measures such as installing silt fences during rainy periods, covering piles of soil, dust control, and reseeding disturbed areas, are essential for reducing erosion and soil loss.

Some soil would be removed from potential use, such as in localized areas around transmission tower footings, road beds, and at the new substation. The ground beneath new or improved access roads would be subject to long-term compaction. Where footings and roadways are built on expansive soil, impacts would be greater because more work (e.g., grading, graveling, more extensive foundations) would be required to ensure stability. Roads on steep slopes would be the most likely to cause erosion by removing the ground cover, compacting the soil, and potentially changing drainage patterns. Proper road design (such as gravelling surfaces, selecting appropriate road locations and grades, and installing water bars or other appropriate drainage) would be essential to help avoid long-term erosion impacts (see Section 3.4.3 Mitigation Measures).

Typical operations and maintenance would have minimal effects on soils. Annual vehicle ground inspections and vegetation maintenance activities could cause some dust, create ruts on wet roads, or disturb vegetation that could expose soil. Where temporary roads would be constructed, maintenance vehicles and equipment may need to drive through fields and could cause temporary soil erosion or compaction. BPA would mitigate impacts to restore soil function and compensate landowners for damages.

Landslides would potentially affect the integrity of towers and road stability as well as other resources in the area. Towers and roads would be generally sited to avoid possible unstable locations. Where this is unavoidable, civil engineers would walk locations to select the best tower and road locations, use appropriate design standards for the given soils of the area, and monitor the area as part of routine maintenance. If a landslide did occur within the project area, effects could include blocked roads by debris, damage or destruction of homes, disruption of water, sewer and power systems, as well as damage to habitats and land uses.

Seismic issues can also affect tower construction (i.e., siting, type of footing used). All facilities would be built to applicable seismic standards and combined wind- and ice-loading tower design criteria typically exceed earthquake-induced loads.

Specific soil erosion impacts and landslide impacts for each route alternative are discussed below.

Proposed project work at Big Eddy Substation, which would be the same for all alternatives, would occur within its existing yard. Excavation would be required for dead-end towers and electrical switching equipment and would range from minor (less than 5 feet) for burial of key lines to more extensive (up to 15 feet) for footings for the dead-end towers. About 1 acre would be disturbed for this work. Some footing excavations could require limited drilling or blasting in bedrock.

Soil at Big Eddy Substation averages about 4 feet deep. While not likely at this site, footing construction could require temporary dewatering if perched groundwater is present at the time of construction. Excavated soil would be used on site as needed and, if required, remaining soil would be transported to an appropriate certified site after being tested for contamination – particularly for hydrocarbons and polychlorinated biphenyls (PCBs). The yard is currently graveled and newly disturbed areas would be immediately re-graveled. Estimated soil loss from the site due to erosion would be about 1.30 tons per year. This is a typical low loss rate for soils of the area (Renard et al. 1997; Toy and Hadley 1987; SCS 1978). Overall, there would be ***low*** erosion impacts due to project additions at Big Eddy Substation.

West Alternative

Tower installation and construction of some ~~40~~ 36 miles of new, improved and temporary access roads for the West Alternative would disturb about ~~169-268~~ 148-240 acres of land; ~~169~~ 148 acres for West Option 1, which uses all single-circuit towers, and ~~268~~ 240 acres for West Option 5, which has the greatest use of double-circuit towers of the options. Disturbance acreages for West Options 2, 3, 4, and 6 fall between Options 1 and 5. Estimated soil loss along the West Alternative due to erosion would be about ~~28-41~~ 26-39 tons per year (see Table 3-15). This rate was determined with the use of appropriate erosion control mitigation measures (see Section 3.4.3 Mitigation Measures) and would be similar to typical erosion rates for the area. If left bare, disturbed soil would erode at a much higher rate.

The West Alternative would potentially be affected by three possible landslide areas: south of I-84 in Oregon (between line miles W1.2-1.8), a large inactive landslide on Washington Parks and DNR lands between line miles W7.6-8.4 (see Map 3-6), and small areas associated with the headwaters of drainages on the north flank of the Columbia Hills near line mile W9.5.

If a landslide were to occur at line mile W1.2 – 1.8, debris flow could potentially reach I-84 and cause damage to the highway or block traffic. A landslide in line miles W7.6-8.4 would impact habitat and sensitive species in the Columbia Hills State Park and potentially could case sedimentation in Eightmile Creek. The route also crosses steep terrain at line miles W0-2 on the Oregon side of the Columbia River, W5.5-10 where it would climb over the Columbia Hills, W11 and W13 on either side of Swale Creek, and W19.6-20.5 near the Little Klickitat River. Actual construction in landslide areas would total about ~~2.5~~ 2.5 acres (see Table 3-16). Landslide impacts through this area are unlikely because BPA's existing wood-pole transmission runs through many of these areas and has had no history of landslides and the proposed line would be build to appropriate design standards taking into account soil stability.

Overall impacts of the West Alternative on geology and soils would be ***low***. Although work could disturb up to ~~268~~ 240 acres of land, the disturbance would be spread over 27 miles and erosion rates would be similar to existing erosion rates without the project and would be controlled through mitigation. In addition, the amount of tower and road construction needed in landslide areas would be small (just over 2 acres) and appropriate engineering designs would lessen potential risk of landslides in these areas.

West Option 1 would have the least impact on soils and West Option 5 would have the greatest, although both are still considered a low impact. Impact levels for West Options 2, 3, 4, and 6 fall between Options 1 and 5.

Table 3-15. Potential Erosion (Soil Loss) Impacts[1] by Action Alternative

	Tower Construction[2] (tons/year)	Access Roads—New, Upgraded and Temporary (tons/year)	Total (tons/year)
West Alternative			
Predicted Soil Loss: Existing Conditions Without Project	9–23	~~21~~ 17	~~30–44~~ 26–40
Predicted Soil Loss: Project with Mitigation	9–22	~~19~~ 17[3]	~~28–41~~ 26–39
Middle Alternative			
Predicted Soil Loss: Existing Conditions Without Project	11–13	26	37–39
Predicted Soil Loss: Project with Mitigation	10–12	~~23~~ 24	~~33–35~~ 34–36
East Alternative			
Predicted Soil Loss: Existing Conditions Without Project	11–20	~~26~~ 28	~~37–46~~ 39–48
Predicted Soil Loss: Project with Mitigation	12–27	~~30~~ 32	~~42–57~~ 44–59

[1] Analysis of surface erosion potential from water was based on NRCS erosion coefficients for specific soil map units and slope erosion coefficients used in the Revised Universal Soil Loss Equation (RUSLE) model (Renard et al. 1997; Toy and Hadley 1987; SCS 1978). Analysis of erosion by other processes, including surface erosion by wind, erosion from mass wasting, and erosion of stream banks, was qualitative.

[2] Range of quantities reflects range of impacts that could occur from different tower options. For example, double-circuit options disturb about 20-30% more land than single-circuit options.

[3] This number reflects potential soil erosion from upgrading existing access roads as well as existing county roads. About 5 miles of county roads would be improved for the West Alternative.

Table 3-16. Landslide Areas Disturbed by Action Alternative

Alternative	Tower Construction[1] (acres)	Access Roads—New, Upgraded, and Temporary (acres)	Total (acres)
West Alternative	1.1–1.3	~~1.3~~ 1	~~2.4 2.6~~ 2.1–2.3
Middle Alternative	2.4–3.9	~~5.3~~ 6	~~7.7–9.2~~ 8.4–9.9
East Alternative	5.2–11.9	~~17.2~~ 14	~~22.4 30.1~~ 19.2–25.9

[1] Range of quantities reflects different tower options.

Middle Alternative

Installing towers and construction of about ~~37~~ 40 miles of new, improved and temporary access roads for the Middle Alternative would disturb about ~~159-179~~ 109-132 acres: ~~159~~ 109 acres for Middle Option 1, which uses all single-circuit towers, and ~~179~~ 132 acres for Middle Option 3, which has the greatest use of double-circuit towers of the options (disturbance acreages of Middle Option 2 falls between these acreages). Estimated soil loss along the Middle Alternative due to erosion would be about ~~33-35~~ 34-36 tons per year (see Table 3-15). This rate was determined with the use of appropriate erosion control mitigation measures (see Section 3.4.3 Mitigation Measures), and would be ~~similar to~~ slightly less than typical erosion rates for the area. If left bare, disturbed soil would erode at a much higher rate.

The Middle Alternative would potentially be affected by steep slopes for its first 9 miles, and steep terrain much farther north between line miles M19.6-20 near the Little Klickitat River (see Map 3-6).

Actual construction in landslide areas would total about 8-~~9~~ 10 acres (see Table 3-16), 2 of those acres would be for upgrading existing roads. Between line miles M0.5-7, tower and roads would mostly avoid the landslide areas, since much of the existing access road system along the Harvalum-Big Eddy line could be used. In addition, these landslides in Oregon do not appear to be active and the existing Harvalum-Big Eddy line and its associated access roads have been in place for over 50 years through these areas with no history of landslides. If a landslide occurred in the potential landslide area between line mile M6-7, debris could impact disturbed shrub-steppe, range land, Moody Road, and possibly a house over looking the Columbia River.

Where the Middle Alternative would cross the edge of a large landslide on the north side of Highway 14 above Wishram in Washington (line miles M9-9.4) and further north at line mile M10, towers and new roads would likely be located in these areas. Since these are steep slopes, road work would likely require cut-and-fill or benching into hillsides. While it is unlikely, if a landslide did occur above Wishram, effects could include blockage of SR-14 and other local roads, damage or destruction of homes in or near Wishram, damage to BPA's Harvalum-Big Eddy and McNary-Ross transmission lines, and disruption or damage of some basic services to area residents. However, these effects are unlikely because existing BPA transmission line through this area has no history of landslides and appropriate design standards would be used to site towers and roads in the area. A landslide at line mile M10 would impact disturbed shrub steppe habitat and could block intermittent drainages.

Overall, impacts of the Middle Alternative on geology and soils would be ***low-to-moderate***. Impacts related to erosion would be low since, although work would disturb up to ~~179~~ 132 acres of land, the disturbance would be spread over 27 miles, erosion rates would be ~~similar to~~ slightly less than existing soil erosion rates without the project, and erosion would be controlled through mitigation. Impacts related to landslide risk would be moderate because about ~~9~~ 8-10 acres in landslide areas could be disturbed, but appropriate engineering designs would lessen potential risk of landslides in these areas.

Middle Option 1 would have the least impact on soils and Middle Option 3 would have the greatest, although still considered a low-to-moderate impact. The impact level for Middle Option 2 would be in between these options. The potential route adjustment at line miles ME6-8 would lessen soil disturbance by about 0.5 acre because one less tower would be required.

East Alternative

Installing towers and construction of about ~~37~~ 38 miles of new, improved and temporary access roads for the East Alternative would disturb about ~~169-212~~ 125-136 acres: ~~169~~ 125 acres for East Option 1, which uses all single-circuit towers, and ~~212~~ 136 acres for East Option 3, which has the greatest use of double-circuit towers of the options (disturbance acreages of East Option 2 falls between these acreages). Estimated soil loss along the East Alternative due to erosion would be about ~~42–57~~ 44–59 tons per year (see Table 3-15). This rate was determined with the use of appropriate erosion control mitigation measures (see Section 3.4.3 Mitigation Measures), and would be greater than typical erosion rates for the area. If left bare, disturbed soil would erode at an even higher rate.

Because it crosses a larger stretch of steep terrain, the East Alternative would have the greatest potential impact on landslides. The East Alternative crosses steep slopes for its first 16 miles (see Map 3-6). The East Alternative would not encounter steep slopes where it would cross the Little Klickitat River as the other routes do.

Actual construction in landslide areas would total about ~~22-30~~ 19-26 acres (see Table 3-16), 9 of those acres would be for upgrading existing roads already present. Because the first 9 miles of the route is the same route as the Middle Alternative, the impacts would be the same, and the risk would be minor crossing landslide areas based on use of existing roads and history of use. Where the East Alternative would cross through an active landslide area near Wishram, and continue east crossing actively eroding stream banks, towers and roads would be built across these areas, with extensive use of the existing access road system in addition to short sections of new road. The existing line has not had any history of erosion problems associated with slides in this area. Although unlikely, impacts from a landslide along this alternative would be similar to those described above.

New line and extensive road work would be required through a possible slide area as the East Alternative heads north up steep slopes at line mile E14. A landslide at line mile E14 could impact disturb-shrub steppe habitat, range land, BPA's existing Harvalum-Big Eddy and McNary-Ross transmission lines, and SR-14.

Overall, impacts of the East Alternative on geology and soils would be ***moderate-to-high*** since work would disturb up to ~~212~~ 136 acres of land spread over 28 miles and erosion rates would be higher than existing rates without the project (though erosion would be controlled through mitigation). In addition, ~~about 30~~ up to 26 acres in landslide areas could be disturbed, though appropriate engineering designs would lessen potential risk of landslides in these areas.

Although still considered overall moderate impacts, East Option 1 would have the least impact on soils and East Option 3 would have the greatest; the impact level for East Option 2 would be between these options. The potential route adjustment at line miles ME6-8 would lessen soil disturbance by about 0.5 acre because one less tower would be required.

Knight Substation Options

Knight Substation Site 1

Knight Substation at Site 1 would permanently impact about ~~10~~ 29.65 acres of soil for construction of the substation, a new access road, dead-end towers and installation of PUD electrical service. ~~About 250,000 cubic yards of soil would be excavated to level the site and to create a 1-acre retention pond. Although the substation yard would not create an impervious surface, soil would be compacted.~~ Portions of the substation site would be covered with impervious surfaces (the control house and equipment locations). Although the yard itself would be graveled, it would be compacted and have less water absorption ability than if it remained agricultural land. Compaction would also occur around the dead-end towers and wood poles carrying PUD electric service.

Up to ~~5~~ 42.5 additional acres of soil would be temporarily disturbed during construction ~~for~~ due to a soil stockpile area, possible temporary road off Hill Road, counterpoise installation and staging areas ~~and~~

equipment. ~~The stormwater retention pond would retain water runoff, allowing slow release, which would lessen water erosion from the site. The graveled yard would lessen possible wind erosion.~~

Substation Site 1 is somewhat hilly; elevation ranges by 20 feet across the property. The substation would be terraced to accommodate the elevation. About 147,000 cubic yards of soil would likely require excavation for the substation due to the terrain and potential difficulties with wet soil depending on when construction occurs. ~~Other soil excavated would range from minor amounts (less than 5 feet) for installing a ground mat, to more extensive amounts (up to 15 feet) for footings of the dead-end towers.~~ Excavating ~~for these footings~~ could also require limited drilling or blasting in bedrock and could require temporary dewatering depending on groundwater levels at the time of construction.

Excavated soil would be placed on 19 acres to the north of the substation yard, spread evenly to match existing terrain contours, spread with saved topsoil, and revegetated with either crop species or native grasses and shrubs.

Potential erosion would be controlled through erosion control measures during construction and a stormwater retention pond at the substation would eliminate the potential for long-term erosion.

~~Once constructed, erosion at Site 1 would be at an estimated rate of 1 ton of soil per year. At Site 2, the erosion rate would be about half that – 0.5 tons of soil per year. Erosion rates differ between the two sites because Site 1 has slightly more rolling terrain. Because access to Site 1 would require a longer road than that of Site 2, soil disturbance from roads would also be greater for Site 1. Overall, soil impacts would be~~ ~~***moderate***~~ ~~for both~~ Soil impacts at Site 1 would be ***moderate*** because, while a relatively large amount of soil would be disturbed, temporarily disturbed areas would be reseeded and measures would be implemented to minimize erosion potential. There would be ***no*** landslide impacts. ~~at either site~~.

Knight Substation Site 2

Knight Substation at Site 2 would permanently impact 28.65 acres of soil due to installation of the same facilities noted for Site 1. There would be 1 acre less permanent impact because the new access road is slightly shorter. An additional 15.5 acres of soil would be impacted temporarily for counterpoise installation and staging areas; no soil stockpiling is required at Site 2. Excavation would be less than Site 1 because Site 2 is flatter than Site 1. Excavated soil would be taken to an appropriate off-site disposal site. As with Site 1, erosion would be controlled with erosion control measures and a stormwater retention pond.

Soil impacts at Site 2 would be ***low-to-moderate***, because Site 2 is slightly flatter than Site 1, the access road is slightly shorter, there is no need to stockpile and re-spread soil at Site 2, and the same erosion control measures would be implemented. There would be ***no*** landslide impacts.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option, no impacts on soils would occur beyond those already described for each route alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential soil erosion impacts of the Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.4.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on geology and soils. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Minimize the project ground disturbance footprint, particularly in sensitive areas (i.e., steep slopes and landslides areas).
- Prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) for construction activities to lessen soil erosion and improve water quality of stormwater runoff.
- For the SWPPP, use management practices contained in the Storm Water Management Manual for Eastern Washington (e.g., use silt fences, straw bales, interceptor trenches, or other perimeter sediment management devices; place them prior to the onset of the rainy season and monitor and maintain them as necessary throughout construction).
- Prepare a Fugitive Dust Control Plan to control dust.
- Water or use palliatives on exposed soil surfaces in areas disturbed during construction.
- Water, use palliatives, or cover construction materials if they are a source of blowing dust.
- Gravel access road surfaces in areas of sustained wind and potential dust erosion.
- Ensure construction vehicles travel at low speeds on access roads and at construction sites to minimize dust.
- Limit the amount of time soils are left exposed.
- Reseed disturbed areas (see mitigation measures in Section 3.3 Vegetation).
- Restore compacted soils (see mitigation measures in Section 3.1 Land Use and Recreation).
- Conduct additional site-specific evaluations in areas of potential landslides to determine degree of recent activity, likelihood of activation or reactivation, potential setbacks, and site-specific stability as appropriate.
- Design roads to limit water accumulation and erosion; install appropriate access road drainage (ditches, water bars, cross drainage, or roadside berms) to control and disperse runoff.
- Design transmission tower footings and roads for specific site conditions through detailed geologic hazard assessments, including review of geologic maps and aerial photography, surface condition assessments, and geological testing at representative sites.
- Minimize construction on steep or unstable slopes, if possible
- Relocate towers or roads located within previously unidentified active slides, bedrock hollows, or other geologic hazard areas, where possible.

3.4.4 Unavoidable Impacts Remaining after Mitigation

With any of the action alternatives, even with the implementation of mitigation measures, soil would be disturbed, some erosion would occur during construction, access roads would contribute to small amounts of long-term erosion and water diversion, soils would be removed from productive use at tower sites, roads, and Knight Substation, and project components would be exposed to some landslide risk in certain areas.

3.4.5 No Action Alternative

The No Action Alternative would have no impact on geology or soils in the project area because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.5 Water Resources and Wetlands

This section describes the rivers, streams, groundwater and wetlands found in the project area and how each of the proposed alternatives could affect these resources.

3.5.1 Affected Environment

Water Resources

Surface Water and Floodplains

Four primary stream channels drain east to west across the project area. From south to north, these stream channels are Fifteenmile Creek in Oregon, the Columbia River dividing Oregon and Washington, and Swale Creek and the Little Klickitat River in Washington (see Map 3-7).

Fifteenmile Creek southeast of The Dalles drains the area east of the city and west of the Deschutes River. It reaches the Columbia River on the east side of The Dalles at the base of the hill below Big Eddy Substation. Wasco County Geographic Information System (GIS) coverage indicates the presence of a floodplain along Fifteenmile Creek. Flood flows are expected to be from 200 cubic feet per second (cfs) to potentially over 1,000 cfs for a 100-year event, based on flows in nearby streams such as Mill Creek. In the areas crossed by the alternatives, Fifteenmile Creek is in a ravine with oak riparian trees on either side.

The **Columbia River** flows through the Columbia River Gorge. Behind The Dalles Dam, the Columbia River is a reservoir called Lake Celilo (at elevation 160 feet above mean sea level). Typical summer stream flows at The Dalles' gaging station range from 70,000-100,000 cfs with mid-spring peak flows as high as 350,000 cfs (USGS 2009). Though there is a floodplain designated along the Columbia River, the river's water level is controlled by various dams, including The Dalles Dam, and John Day Dam (east of the project alternatives). Where crossed by the alternatives, riparian vegetation along the river is mostly grasses and shrubs, with some small trees.

Swale Creek is an unmeasured, intermittent stream with discontinuous flow from mid-summer through fall. It drains the Centerville Valley on the north flank of the Columbia Hills, turning northward west of the project alternatives to flow into the Klickitat River. Throughout much of the area, Swale Creek is shallow and wide, crossing relatively flat terrain, and it often floods to some degree each winter and spring. Swale Creek has a wide 100-year floodplain, particularly between Uecker and Cameron roads. Riparian vegetation along Swale Creek is grasses and shrubs.

The **Little Klickitat River** flows at the base of the Simcoe Mountains near the project's northern margin. Mill Creek, Blockhouse Creek, and Spring Creek drain the mountains' south flank into the Little Klickitat River. Median flows in the Little Klickitat River range from 10 cfs in summer to 300 cfs in mid-winter. Peak flow at the mouth exceeded 17,000 cfs twice between 1946 and 1980, the last date for which peak flow is available (USGS 2009). The Federal Emergency Management Agency (FEMA) has established a 100-year floodplain from upstream of Goldendale (at a point just east of Highway 97) to about Olson Road to the west. In the areas crossed by the alternatives, the Little Klickitat River is in a shallow ravine with an oak and pine riparian corridor.

In addition to the Columbia River and these creeks, the alternatives cross many tributaries to these larger water bodies, including Threemile, Fivemile, and Eightmile creeks along the West Alternative, and Spring Creek along all alternatives where they head to the Knight Substation sites. These tributaries are intermittent or dry washes, only containing water seasonally or during heavy rains, with little or no flow by mid-summer.

Rivers and streams in the area have designated buffer zones. Regulating agencies establish buffers as boundaries between local waterways and existing or future development that help protect rivers and streams by filtering pollutants, providing flood control, preventing bank erosion, mitigating warming, and providing room for lateral movement of the waterway channel.

In Wasco County, stream buffers differ depending on whether the waterway is within the National Scenic Area. Within the National Scenic Area, minimum buffers are 200 feet for perennial or fish-bearing streams (some of which can be intermittent) and 50 feet for intermittent, non-fish-bearing streams (Wasco County Planning Department 2006b). Outside the National Scenic Area (where the Middle and East alternatives cross Fifteenmile Creek), the buffer for fish-bearing streams is 100 feet, but the same 50-foot buffer applies to non-fish-bearing streams (Wasco County Planning Department 2006a). Similarly, in Klickitat County, buffers range from 25-200 feet, depending on stream flow (continuous or intermittent) and the presence of fish (Klickitat County Planning Department 2004).

Water Quality

Water quality standards require regulating agencies to rank impaired water bodies and develop total maximum daily loads (TMDLs) for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. Fifteenmile Creek in Oregon has a proposed temperature TMDL pending approval by the U.S. Environmental Protection Agency (EPA). This stream is listed as impaired for sedimentation, habitat modification, and flow.

TMDLs have been established in the Columbia River for dioxin (with waste load allocations for pulp and paper mills upstream and downstream of the project) and dissolved gas (a result of dam operations on the lower river). Samples taken from the Columbia River above The Dalles Dam in the mid-‘90s found two detectable pesticides (endosulfan and DDT/DDD/DDE). Measurements for bacteria, conductivity, and turbidity have been within acceptable limits (DEQ 2009b). Riparian shading of the Columbia River does not influence thermal conditions because the river is so large.

The Little Klickitat River and its tributaries, including Swale Creek, have a temperature TMDL because mid-summer temperatures typically exceed 59 degrees Fahrenheit (°F), a critical threshold for anadromous fish (fish that spend most of their adult life in salt water and return to freshwater streams and rivers to spawn). Turbidity in the Little Klickitat River is moderate, suspended sediment concentrations are low, and dissolved oxygen concentrations are adequate.

Groundwater

Two types of aquifers occur along the project alternatives: shallow alluvial aquifers connected directly to local surface waters, and basalt aquifers with groundwater elevations that reflect levels of the Columbia and Little Klickitat rivers. Surfacing groundwater, in the form of springs and seeps, occurs where bedrock is permeable, such as in the Columbia Hills.

Groundwater is used for domestic and municipal potable water and to irrigate crops throughout the region. It provides part of the water supply for The Dalles and—from both springs and wells—all of the water supply for Goldendale. Most houses in areas beyond urban services are served by wells tapping aquifers at depths exceeding 30 feet below the ground surface in valleys, and at greater depths on ridges.

The only protected aquifer is The Dalles Critical Groundwater Area, designated by the Oregon Water Resources Department (2009b). Additional water withdrawal is restricted in the confined basalt aquifers in and around the city of The Dalles.

Wetlands

Wetlands are areas of transition between aquatic and terrestrial systems, where water is the dominant factor determining soil characteristics and vegetation species. Wetlands can be biologically productive and help maintain or improve water quality, contribute to flood control, provide wildlife habitat, and have recreational or aesthetic value.

Wetlands along the project were identified through field reconnaissance in April 2010 using the USFWS wetland classification system (Cowardin et al. 1979). If the project proceeds, wetland delineations will be conducted in locations where facilities cannot avoid impacts.

Two main wetlands categories occur along the project alternatives:

Palustrine—wetlands dominated by trees, shrubs, and persistent emergents, including mosses and lichens. Within the palustrine category, two subclasses occur: palustrine emergent, which has at least 30 percent cover of emergent herbaceous vegetation; and palustrine scrub-shrub, which has at least 30 percent cover of woody vegetation less than 20 feet tall. Both types of palustrine wetlands can be found along the transmission line alternatives (USFWS 1981). (See Map 3-7.) These palustrine wetlands are generally near rivers, streams, or creeks and are part of a larger wetland complex or are smaller wetlands in agricultural areas.

Lacustrine—large wetlands (20 acres or more) lacking trees and vegetation located in depressions or dammed river channels. Lacustrine wetlands include permanently flooded lakes and reservoirs and tend to have extensive areas of deep water (Cowardin et al. 1979). The only mapped lacustrine wetland along the alternatives is the Columbia River where it is dammed by The Dalles Dam, forming Lake Celilo.

Within these categories, wetlands can vary in quality. Relatively undisturbed wetlands along rivers and streams (such as Fifteenmile Creek in Oregon and the Little Klickitat River in Washington) contain a higher diversity of plants, thereby providing greater habitat opportunities and maximum erosion and flood control and are considered high quality wetlands. In some cases, these wetlands may have rare or special characteristics protected at federal, state (Washington “Natural Heritage Sites”), or local levels. Examples include bogs, characterized by spongy, acidic peat soil formed from decaying mosses; vernal pools, which are temporary shallow ponds on rocky outcroppings or hard-pan soil depressions; alkali wetlands; and forested wetlands. Smaller, disturbed, lesser quality wetlands can be found in active agricultural fields (such as where manure or fertilizer runoff is possible). (See tables under each alternative for the quality of individual wetlands.)

Like rivers and streams, wetlands have designated buffers—areas surrounding them that provide access to wetlands for a variety of wetland-dependent or upland wildlife species. Disturbance within these buffers can affect a wetland’s ability to provide suitable habitat for these species. Wetland buffers can be other wetlands, deep open water, or upland areas (Hruby 2004).

Buffers are determined for each wetland according to procedures outlined in the Wasco County National Scenic Area Land Use and Development Ordinance and the Klickitat County Critical Areas Ordinance. Wasco County’s maximum wetland buffer is 200 feet (Wasco County Planning Department 2006b) and Klickitat County’s maximum is 300 feet (Klickitat County Planning Department 2004).

3.5.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Water Resources

Transmission line and access road construction (digging for tower footings, blading for access roads, etc.) would cause ground disturbance that could affect surface waterways and groundwater. Water quality could be impacted if appropriate erosion control measures were not implemented and sediment from eroded soils reached water bodies. In the long term, if trees or vegetation were removed, especially in riparian areas, water quality could be impacted due to more run off (that would have been absorbed or lessened by the vegetation), or by removal of vegetation that provides shade to keep water temperatures lower.

Although each action alternative would have some towers within 50 feet of smaller, intermittent streams in the project vicinity, no towers would be built in waterways or within 50 feet of the Columbia River and other primary creeks and rivers. These larger waterways would be spanned from bank-to-bank high above water level. No new access roads would cross rivers or larger creeks, but new access roads would invariably cross intermittent tributaries or drainages. Where intermittent drainages would be crossed, culverts would be used to ensure unobstructed water passage.

No towers or new access roads would be built in floodplains. Any work within floodplains would be coordinated with regulating jurisdictions to minimize potential water flow obstructions. Generally, floodplains can be impacted if encroachments block flood flows or restrict storage of flood waters, if impermeable surfaces are created lessening water absorption into the soil, or if the grade of the floodplain is changed such that water cannot spread during high flow events. Although tower installation in a floodplain does not generally prohibit water flow (water can flow around tower legs), road construction can change the original grade and compact soil, which allows less water absorption.

There would be some groundwater impacts, although BPA would work to minimize them. Generally, groundwater can be impacted by disrupting water flow by building new roads, increasing turbidity through soil disturbing activities or drilling, and by contamination through accidental spills of hazardous materials (such as fuels, oil) or excavation of existing contaminated soils.

Erosion in areas of soil disturbance and vegetation removal could result in increased groundwater turbidity. This impact would be greatest where new access roads would be constructed. The potential for impacts would be less likely with the upgrades of existing roads. Interception of groundwater seeps in road cut banks could also alter the hydrology or water quality of adjacent wetlands and streams. However, use of erosion control measures in all areas where soils are exposed during construction is expected to minimize the transport of sediment to groundwater recharge areas, including intermittent streams.

Most refueling and equipment maintenance would be done at staging areas located at least 100 feet from streams and wetlands, with spill containment and clean-up procedures in place.

Contaminated soils and underground structures may exist along the alternative routes as remnants of earlier road, pipeline, and agricultural projects. Excavation of contaminated soils, primarily during road construction, could mobilize contaminants into a previously uncontaminated groundwater body. In addition, abandoned or orphaned wells could be disturbed, providing a direct pathway for contaminants to flow to an underlying aquifer. Existing contaminated areas, orphaned wells, and underground infrastructure would be identified and avoided prior to construction.

Where excavations require blasting into bedrock, minor amounts of nitrate residue from explosives could get into groundwater. These impacts would only temporarily affect localized areas.

Overall, there would be ***no-to-low*** impacts on groundwater for all alternatives as culverts would allow water flow; contaminated areas, abandoned wells, and underground infrastructure would be identified and avoided; and mitigation measures for erosion would be implemented.

Operations and maintenance tasks along any of the alternatives would have ***no*** impacts on water resources. Twice-yearly helicopter inspections would not disturb any ground. Maintenance vehicles used for annual ground inspections would stay on established access roads and little vegetation maintenance would be needed along any of the alternatives.

Proposed project work at Big Eddy Substation would occur within its existing yard. The closest water body is Fifteenmile Creek about a third of a mile from the substation across Fifteenmile Road. Groundwater at the substation is typically 20 to 50 feet below the surface (WRD 2009a); dewatering during excavating is unlikely to be required. Because of the distance from surface water and mitigation measures that would be taken to control erosion (see Section 3.5.3 Mitigation Measures), construction at Big Eddy Substation would have ***no-to-low*** impacts on water resources.

Wetlands

Wetlands could be impacted by fill (through tower or road placement), vegetation removal, diversion of surface water flows, and by contamination from accidental spills or oil from machinery. Removal of forested vegetation could decrease evapo-transpiration rates and increase soil and water temperatures due to lack of shading. The transmission line would span wetlands wherever possible.

Typical operations and maintenance tasks—including annual ground inspections—would have ***no*** impact on wetlands. Maintenance vehicles would stay on established access roads and little vegetation maintenance would be needed in wetland areas along any of the alternatives.

Because there are no wetlands at Big Eddy Substation, work within the substation yard would have ***no*** wetland impacts.

West Alternative

Water Resources

From south to north, the West Alternative would cross Fifteenmile Creek (line mile W0.5), the Columbia River (between line miles W2-3), and then many small drainages until traversing Swale Creek at line mile W11 and the Little Klickitat River from line miles W20-21.5. Several drainages to the Little Klickitat via Spring Creek would be crossed as all the alternatives head north to the Knight Substation Sites (line miles W23, W23.5, W24, and W26).

About nine towers along the West Alternative would be within 50 feet of intermittent streams, disturbing about 2 acres during construction (see Table 3-17). New access roads would cross ~~17~~ 12 intermittent streams, drainages or dry-washes; in addition, improvements would be made to ~~15~~ 14 existing access roads that cross such streams (see Table 3-18). Up to ~~25~~ 64 new culverts would be installed for these various crossings. Some new and improved access roads would need to be built near the Little Klickitat River's north bank between line miles W20-21. The closest portion of the road would be about 250 feet from the edge of the riparian area. With proper road design and erosion control measures used during construction, sedimentation and runoff from tower or road construction would not reach water bodies.

Table 3-17. Tower Disturbance within 50 Feet[1] of Intermittent Streams by Action Alternative

Alternative	Number of towers	Disturbance (acres)
West Alternative	9	2.0
Middle Alternative	12	2.2
East Alternative	4–5[2]	2.7–2.9

[1] For this report, impacts were analyzed within 50 feet of the centerline of streams regardless of possible buffer size. If an action alternative is selected, potential tower impacts within applicable stream buffers will be a fully assessed to help guide tower placement.
[2] Number of towers depends on which tower option is selected.

Table 3-18. Number of Streams Crossed by Access Roads by Action Alternative

Alternative	Stream[1] Crossings		Total
	New Roads	Improved Roads	
West Alternative	~~17~~ 12	~~15~~ 14	26
Middle Alternative	~~10~~ 15	~~10~~ 5	20
East Alternative	~~22~~ 11	~~8~~ 13	24

[1] Streams crossed by access roads are seasonal (intermittent) or dry-washes.

Fifteenmile Creek has a woody riparian cover in a ravine that would be well below the West Alternative line (line mile W0.5); no riparian vegetation would need to be removed. No riparian vegetation along the Columbia River would be impacted; the towers at the Columbia River crossing would be far from the edge of the river, no trees would be removed, and any riparian vegetation present would not affect the river water temperature given the expanse of the river.

Crossings of a Threemile Creek tributary (line mile W3.5) and of Threemile Creek (line mile W5.5) would require that some riparian vegetation be removed. Loss of the vegetation could affect water temperature slightly before the creek runs dry in late summer. The amount of trees removed (about 15 to 20) for each crossing is relatively small compared to the number of existing trees in the riparian area, but losing the vegetation would leave a 150-foot wide swath of exposed water.

Riparian vegetation along the incised Fivemile Creek (line mile W7) would likely be spanned and no trees would need removal. Because the heavily wooded Eightmile Creek is in a draw where the West Alternative crosses (line mile W7.5), the riparian areas (where trees are providing shade) would be spanned with no tree removal necessary. Some trees in the upland portions of the creek would be removed, but impacts to the stream would be minimal because many trees would remain in the area to provide water absorption and shading.

There are no trees at the Swale Creek crossing at line mile W11 and low-growing vegetation or shrubs within the riparian zone would not be impacted because the tower footprints would be far enough from the creek edge. Therefore, ~~so~~ no riparian vegetation would be impacted.

The West Alternative would cross intermittent tributaries to the Little Klickitat River as well as the river itself (line miles W18 - 22), but no riparian vegetation would be removed because the drainages are incised and would be well below the transmission line. However, scattered groups of trees in upland areas along the Little Klickitat River would be removed, which could potentially affect sedimentation and runoff to the river.

Overall, because the West Alternative would disturbed about 2 acres within 50 feet of intermittent streams and this amount would be spread over nine areas where erosion control measures would be used to ensure sedimentation would not reach water; most riparian areas would be left untouched with the exception of Threemile Creek, where some shade tree removal could have a small impact on water temperatures when the water level is low; and because access road crossings would be limited to intermittent streams, where culverts would be used to ensure unobstructed flows, the West Alternative would have a ***low*** impact on water resources.

The West Alternative tower options would all have similar low Impacts on water resource. However, West Option 1 would have the smallest ground disturbance and so would potentially have the least risk of erosion and possible sedimentation; West Option 5 would have the greatest ground disturbance and the greatest potential for sedimentation impacts. Ground disturbance amounts for West Options 2, 3, 4, and 6 would fall between the two other options.

The floodplains of the four main water ways crossed by the West Alternative are narrow and would be avoided. No towers or access roads would be within floodplains; therefore the West Alternative would have ***no*** impact on floodplains.

Wetlands

Potentially impacted wetland areas (and some wetland buffers) along the West Alternative are all in Klickitat County, located just north of the Columbia River and scattered along the proposed transmission line corridor from line mile W11 near Swale Creek to line mile W24 northwest of Goldendale. (See Map 3-7 and Table 3-19. Map 3-7 shows all wetlands near each alternative, of which only some could be potentially impacted by tower footings or access roads. Table 3-19 lists only wetlands and buffers that could be impacted.)

References to Wetlands

To assess potential impacts of the transmission line alternatives on specific wetlands and buffers, wetlands within 1,000-2,000 feet of the proposed rights-of-way were identified and analyzed. Each wetland is identified as WL (for wetland) and followed by a letter and number. For example, WL-W10 is Wetland 10 found along the West Alternative. WL-WME2 is Wetland 2 in the vicinity of all alternatives (West, Middle and East) where they share a common alignment. These labels, and corresponding line miles, are used in several tables in this section.

Along the West Alternative, about ~~0.8-1.2~~ 1-1.5 acres in ~~13~~ 18 different palustrine emergent or mixed palustrine emergent and scrub-shrub wetlands could be permanently impacted by fill (dirt, rock, or concrete) required for tower footings and upgrading or building new access roads (see Table 3-20). An additional 0.8-1.8 acres of wetlands could be temporarily impacted during tower construction activities.

Impacts would vary depending on wetland quality (or “functional level”). Three wetlands that could be impacted by tower footings and access road construction are high quality because of their special characteristics, with two having vernal pool features (see Table 3-19). Four wetlands could have more than 0.10 acre (an acreage threshold for requiring compensation mitigation) impacted, and three of these wetlands are considered high quality. Impacts to wetlands from the West Alternative would be ***high***.

West Option 1 would impact the least amount of wetlands, whereas Options 5 and 6 would have the highest potential impact (West Options 2, 3, and 4 would have impacts that would fall between the other options).

Table 3-19. Potentially Impacted Wetlands/Buffers along the West Alternative

Line Mile	Wetland ID	Classification	Size[1] (acres)	Type and Size (acres) of Potential Impact[2]	Functional Level[3]
W2.5[4]	WL-W10	Palustrine scrub-shrub and emergent	5	Tower (0.12–0.15), Road (0.19)	High
W3.5[4]	WL-W23	Palustrine emergent	1.9	Tower (0.12–0.14), Road (0.03)	High–vernal pool characteristics
W3.5[4]	WL-W12	Palustrine scrub-shrub and emergent	5	Tower in buffer	N/A
W10	WL-W26	Palustrine emergent	1.2	Road ~~(0.02)~~ in buffer	N/A
W10	WL-W27	Palustrine emergent	0.4	Road (0.01)	N/A
W10	WL-W28	Palustrine emergent	1.4	Tower (up to 0.01), Road (0.01)	Low
W10.5	WL-W29	Palustrine emergent	<0.1	Tower (up to 0.01), Road (0.001)	N/A
W10.5	WL-W30	Palustrine emergent	0.1	Tower (up to 0.05), Road (0.08)	Low
W12	WL-W14	Palustrine emergent	0.7	Road in buffer	N/A
W13.5	WL-W15	Palustrine emergent	~~0.5~~ 2	Road ~~(0.05)~~ in buffer	Low
W15	WL-W16	Palustrine emergent	1.4	Tower and road in buffer	N/A
W16.5	WL-W20	Palustrine scrub-shrub and emergent	~~0.3~~ 0.4	Road in buffer	Moderate
W16.5	WL-W33	Palustrine scrub-shrub and emergent	0.7	Road (~~0.11~~ 0.16)	Moderate
W18	WL-W35	Palustrine scrub-shrub and emergent	0.9	Tower (up to 0.04), Road (~~0.03~~ 0.02)	Moderate
W18.8	WL-W37	Palustrine emergent	1.5	Tower in buffer	N/A
W20.8	WL-WM2	Palustrine scrub-shrub and emergent	9.3	Tower (0.02–0.03)	High
W21.5	WL-WM4	Palustrine emergent	1.6	Tower (up to 0.15), Road (~~0.12~~ 0.53)	High–vernal pool characteristics
W24	WL-WME2	Palustrine scrub-shrub and emergent	17.6	Road (0.02)	Moderate

[1] Approximate size of wetland within 1,000-2,000 feet of proposed right-of-way.
[2] Permanent impacts. Road impacts include those from both new and improved access road construction.
[3] Functional level based on Ecology Wetland Rating Form for Eastern Washington. N/A means functional level could not be assessed.
[4] Wetlands located within the National Scenic Area.
Note: Indirect impacts to wetlands (i.e., buffer impacts) were not fully assessed in this analysis, but would be once an alignment is selected, wetland delineations are completed and buffer widths are established.

Table 3-20. Potential Wetland Impacts by Action Alternative[1]

Wetlands Type	Tower Construction (acres)		Access Road Construction[2] (acres)	
	Permanent Disturbance	Temporary Disturbance	Permanent Disturbance from New Road Construction	Permanent Disturbance from Upgrading Existing Roads
West Alternative				
Palustrine Emergent	0.1–0.4	0.4–1.1	~~0.3~~ 0	~~0~~ 0.5
Mixed Palustrine Emergent and Scrub-Shrub	0.1–0.2	0.4–0.7	0.2	0.1[3]
Total	0.2–0.6	0.8–1.8	~~0.5~~ 0.2	~~0.1~~ 0.6
Middle Alternative				
Palustrine Emergent	0.1	0.4–0.7	~~0.6~~ 0.3	~~0.3~~ 0.5
Mixed Palustrine Emergent and Scrub-Shrub	0	0–<0.1	~~<0.1~~ 0	~~0~~ <0.1
Total	0.1	0.4–0.7	~~0.6~~ 0.3	~~0.3~~ 0.5
East Alternative				
Palustrine Emergent	<0.1	0.4	~~0.2~~ 0.1	0.2
Mixed Palustrine Emergent and Scrub-Shrub	0	0	~~<0.1~~ 0	~~0~~ <0.1
Total	<0.1	0.4	~~0.2~~ 0.1	0.2

[1] Range of impacts reflects different tower options.
[2] There would be no temporary disturbance to wetlands from access road construction.
[3] For the West Alternative, this number reflects improvements to both access roads and 5 miles of county roads.

Middle Alternative

Water Resources

From south to north, the Middle Alternative would cross Fifteenmile Creek three times (once at line mile M0.5 and twice between line miles M2.5-3.2) and the Columbia River (between line miles M7-8). It would cross drainages to the Columbia River on the south side of the Columbia Hills, and drainages to Swale Creek on the north side of the hills. The Middle Alternative would then cross Swale Creek at line mile M15, more small intermittent creeks, and the Little Klickitat River just before line mile M20. As with the other alternatives, several drainages to the Little Klickitat via Spring Creek would be crossed as routes head north to the Knight Substation sites (line miles M23, M23.5, M24, and M26).

Eight to 12 towers along the Middle Alternative would be within 50 feet of intermittent streams, disturbing about 2.2 acres during construction (see Table 3-17). New access roads would cross ~~10~~ 15 intermittent streams, drainages or dry-washes; in addition, improvements would be made to ~~10~~ five existing access roads that cross streams (see Table 3-18). Up to ~~28~~ 50 new culverts would need to be installed. One existing access road would be upgraded where it runs adjacent to the stream buffers of Fifteenmile Creek south of the creek near line mile M2 (see Map B-2, which has the access road labeled as new road because of the extent of upgrades required). As with the West Alternative, some new and improved access roads would be built near the Little Klickitat River's north bank between line miles M20-21. The closest portion of the road would be about 250 feet from the edge of the riparian area. With proper road design and erosion control measures used during construction, sedimentation and runoff from tower or road construction would not reach water bodies.

Fifteenmile Creek has a woody riparian cover in a ravine that would be well below all three crossings of the Middle Alternative line (line miles M1, M2.5, and M3); no riparian vegetation would be removed. No riparian vegetation along the Columbia River would be impacted; the towers at the Columbia River crossing would be far from the edge of the river, no trees would be removed, and any riparian vegetation present would not affect the river water temperature given the expanse of the river.

There are no trees at the Swale Creek crossing at line mile M15 and low-growing vegetation or shrubs within the riparian zone would not be impacted because the tower footprints would be far enough from the creek edge. Therefore, ~~so~~ no riparian vegetation would be impacted.

Where the Middle Alternative crosses the Little Klickitat River (line mile M19.5), riparian vegetation would not be removed because the river is in a draw and the vegetation would be well below the transmission line. Some pine trees would be removed in upland areas on either side of the river, which could potentially affect sedimentation and runoff to the river.

Overall, because about 2.2 acres disturbed within 50 feet of intermittent streams would be spread over 8-12 areas where erosion control measures would be used to ensure sedimentation would not reach water; riparian areas would be left untouched; and access road crossings would be limited to intermittent streams where culverts would be used to ensure unobstructed flows, the Middle Alternative would have a ***low*** impact on water resources.

The Middle Alternative tower options would all have similar low Impacts on water resource. However, Middle Option 1 would have the smallest ground disturbance and so would potentially have the least risk of erosion and possible sedimentation, and Middle Option 3 would have the greatest ground disturbance and the greatest potential for sedimentation impacts. Ground disturbance amounts for Middle Option 2 would be between Options 1 and 3.

No towers or new access roads would be built in floodplains. ~~A~~ Where a portion of one existing access road paralleling the southeast bank of Fifteenmile Creek is within the creek's floodplain and would need to be upgraded, ~~Although the upgrade may increase~~ the compacted soil surface area could be somewhat increased. However, this would have little effect on the floodplain because the road has been in place for several decades and the upgrade would not change the grade or water storage capability of the floodplain. The Middle Alternative would have ***low*** impacts in floodplains.

Wetlands

Potentially impacted wetlands along the Middle Alternative are on either side of the Columbia River crossing, at line miles M7 and M8, and then scattered along the proposed transmission line corridor from line mile M11 at the base of the Columbia Hills to M24 northwest of Goldendale (see Map 3-7 and Table 3-21). About 1 acre in ~~nine~~ 13 different palustrine emergent or mixed palustrine emergent and scrub-shrub wetlands could be permanently impacted by installation of tower footings and upgrading or building new access roads (see Table 3-20). An additional 0.4-0.7 acre could be temporarily impacted during tower construction.

~~Six~~ Five wetlands would potentially be impacted by more than 0.10 acre (a threshold requiring compensatory mitigation). One is identified as a high-quality wetland with vernal pool characteristics;

two of the wetlands are considered low quality; and the functional levels of the other ~~three~~ two are unknown given lack of permission to enter the property. Impacts to wetlands from the Middle Alternative would be ***moderate-to-high***.

Middle Option 1 would impact the least amount of wetlands, whereas Options 2 and 3 would have the highest potential impact.

Table 3-21. Potentially Impacted Wetlands/Buffers along the Middle Alternative

Line Mile	Wetland ID	Classification	Size[1] (acres)	Type and Size (acres) of Potential Impact[2]	Functional Level[3]
M7[4]	WL-ME3	Palustrine emergent	0.5	Road in buffer	Moderate
M8[4]	WL-ME11	Palustrine emergent	4.8	Road (0.19)	Low
M8.3[4]	WL-ME13	Palustrine emergent	0.1	Road in buffer	Low
M10.~~8~~5[4]	WL-M1	Palustrine emergent	0.6	Road (0.07)	N/A
M11~~.3~~[4]	WL-M4	Palustrine emergent	0.6	Tower in buffer Road (0.07)	Low
M13.~~5~~7	WL-M5	Palustrine emergent	1.5	Road (0.15)	N/A
M14.8	WL-M9	Palustrine emergent	1.3	Road ~~(0.10)~~ in buffer	N/A
M15	WL-M12	Palustrine emergent	8.8	Tower (~~0.13~~ 0.4) Road (~~0.10~~ 0.06)	N/A
M17	WL-M13	Palustrine emergent	2.0	Road in buffer	Low
M17.5	WL-M15	Palustrine emergent	2.3	Tower in buffer	Low
M18.~~5~~3	WL-M16	Palustrine emergent	2.3	Road (0.13)	Low
M20.8	WL-WM4	Palustrine emergent	1.6	Road (0.12)	High–vernal pool characteristics
M24.3	WL-WME2	Palustrine scrub-shrub and emergent	17.6	Road (0.02)	Moderate

[1] Approximate size within 1,000–2,000 feet of proposed right-of-way.
[2] Permanent impacts. Road impacts include those from both new and improved access road construction.
[3] Functional level based on Ecology Wetland Rating Form for Eastern Washington. N/A means functional level could not be assessed.
[4] Wetlands within the National Scenic Area.

East Alternative

Water Resources

From south to north, the East Alternative would cross Fifteenmile Creek three times (once at line mile E0.5 and twice between line miles E2.5-3.2) and the Columbia River (between line miles E7-8). It would cross drainages to the Columbia River on the south side of the Columbia Hills, and drainages to Swale Creek on the north side of the hills. The East Alternative would then cross Swale Creek at line mile E18.5, more small intermittent creeks, and the Little Klickitat River at line mile E23. As with the other alternatives, several drainages to the Little Klickitat via Spring Creek would be crossed as routes head north to the Knight Substation sites (line miles E24.5, E25, M25.5, E27.5).

Four to five towers along the East Alternative would be within 50 feet of intermittent streams, disturbing about 2.7-2.9 acres during construction (see Table 3-17). New access roads would cross ~~22~~ 11 intermittent streams, drainages or dry-washes; in addition, improvements would be made to ~~eight~~ 13 existing access roads that cross streams (see Table 3-18). Up to ~~30~~ 62 new culverts would be installed. One existing access road would be upgraded where it would run next to the stream buffers of Fifteenmile Creek (south of the creek near line mile E2). With proper erosion control measures used during construction, sedimentation and runoff from tower or road construction would not reach water bodies.

Fifteenmile Creek has a woody riparian cover in a ravine that would be well below all three creek crossings of the East Alternative (line miles E1, E2.5, and E3); no riparian vegetation would be removed. No riparian vegetation along the Columbia River would be impacted; the towers at the Columbia River crossing would be far from the edge of the river, no trees would be removed, and any riparian vegetation present would not affect the river water temperature given the expanse of the river.

There are no trees at the Swale Creek crossing at line mile E19 and low-growing vegetation or shrubs within the riparian zone would not be impacted because the tower footprints would be far enough from the creek edge. Therefore, ~~so~~ no riparian vegetation would be impacted.

Where the East Alternative would cross the Little Klickitat River (line mile E23), riparian vegetation would not be removed because the river is in a draw and the vegetation would be well below the transmission line. Some trees would be removed in upland areas on either side of the river, which could potentially affect sedimentation and runoff to the river.

Overall, because the total 2.7-2.9 acres disturbed within 50 feet of intermittent streams would be spread over four to five areas with erosion control measures used to ensure sedimentation would not reach water; riparian areas would be left untouched; and access road crossings would be limited to intermittent streams where culverts would be used to ensure unobstructed flows, East Alternative would have a ***low*** impact on water resources.

The East Alternative tower options would all have similar low Impacts on water resource. However, East Option 1 would have the smallest ground disturbance and so would potentially have the least risk of erosion and possible sedimentation, and East Option 3 would have the greatest ground disturbance and the greatest potential for sedimentation impacts. Ground disturbance amounts for East Option 2 would be between Options 1 and 3.

No towers or new access roads would be built in floodplains. As with the Middle Alternative, a portion of the existing access road paralleling the southeast bank of Fifteenmile Creek is within the creek's floodplain and would be upgraded. This upgrade would have little effect on the floodplain because the road has been in place for several decades and, although the upgrade may further compact a small area of the surface, it would not change the grade of the floodplain or the water storage capability. The East Alternative would have ***low*** impacts in floodplains.

Wetlands

Potentially impacted wetlands along the East Alternative are on either side of the Columbia River crossing, at line miles E7 and E8, and then much farther north along the alternative's proposed route between line miles E18 (southeast of Centerville) and E26 (northwest of Goldendale). (See Map 3-7 and Table 3-22.)

About ~~0.5~~ 0.4 acre in ~~five~~ nine different palustrine emergent and mixed palustrine emergent and scrub-shrub wetlands could be permanently impacted by installation of tower footings and upgrading or building new access roads—the least wetland disturbance of all alternatives (see Table 3-20). An additional 0.4 acre could be temporarily impacted during tower construction.

Two wetlands would potentially be impacted by more than 0.10 acre (a threshold for requiring compensation mitigation). ~~One of those~~ Both wetlands ~~is~~ are identified as a low quality wetlands.~~; the functional level of the other wetland is unknown given lack of permission to enter the property.~~ Impacts to wetlands from the East Alternative would be ***low-to-moderate***.

The East Alternative tower options would all have the same potential impacts on wetlands.

Table 3-22. Potentially Impacted Wetlands/Buffers along the East Alternative

Line Mile	Wetland ID	Classification	Size[1] (acres)	Type and Size (acres) of Potential Impact[2]	Functional Level[3]
E7[4]	WL-ME3	Palustrine emergent	0.5	Road in buffer	Moderate
E8[4]	WL-ME11	Palustrine emergent	4.8	Road (~~0.19~~ 0.25)	Low
E8~~.3~~[4]	WL-ME13	Palustrine emergent	0.1	Road in buffer	Low
E18	WL-E4	Palustrine emergent	4.5	Tower (0.02), road (0.15)	Low
E19	WL-E7	Palustrine emergent	5.3	Road ~~(0.24)~~ in buffer	N/A
~~E20.8~~ E21	WL-E9	Palustrine emergent	1.0	Tower, road in buffer	N/A
E22.3	WL-E11	Palustrine emergent	1.7	Tower (0.02)	Low
E22.3	WL-E12	Palustrine emergent	1.0	Road in buffer	Low
E25.5	WL-WME2	Palustrine scrub-shrub and emergent	17.6	Road (~~0.02~~ 0.08)	Moderate

[1] Approximate size within 1,000–2,000 feet of proposed right-of-way.
[2] Permanent impacts. Road impacts include those from both new and improved access road construction.
[3] Functional level based on Ecology Wetland Rating Form for Eastern Washington. N/A means functional level could not be assessed.
[4] Wetlands within the National Scenic Area.

Knight Substation Options

The closest water body to the Knight Substation sites is the intermittent Spring Creek located about 1 mile to the south. A mapped drainage to Blockhouse Creek runs through Site 1, but no sign of the drainage was found during field surveys. Because there are no water bodies in the vicinity of the substation sites, there are no designated floodplains. In addition, construction of the substation access road and installation of counterpoise and dead-end towers on either side of the substation, as well as potential construction of a temporary access road for Site 1, would not affect water bodies. The back-up generator would have a double-walled secondary containment system made of steel with alarm systems if oil reaches the secondary vessel. Because water bodies are far from the sites and the terrain is relatively flat, with implementation of appropriate erosion control measures, construction at either site would result in ***no*** impacts on surface water.

Groundwater at both sites is about 20 to 50 feet below the surface and likely limited. Dewatering during excavating is unlikely to be required. Substation construction would result in ***no-to-low*** impacts on groundwater.

There are no wetland areas on or near either Site 1~~. A potential palustrine emergent wetland near~~ or Site 2.~~ would not be impacted by substation or road construction.~~ There would be ***no*** wetland impacts.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on water resources and wetlands would occur beyond those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential water resource and wetland impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.5.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on water resources. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Minimize the project ground disturbance footprint, particularly in sensitive areas such as stream crossings and wetlands, and stream and wetland buffers.
- Develop and implement a Spill Prevention, Control and Countermeasure Plan to minimize the potential for spills of hazardous material, including provisions for storage of hazardous materials and refueling of construction equipment outside of riparian zones, spill containment and recovery plan, and notification and activation protocols.
- Prepare and implement a SWPPP (see mitigation measures in Section 3.4 Geology and Soils) to improve water quality of stormwater runoff.
- Prepare to manage dewatering, including proper disposal of drilling fluids and mud away from wetlands or surface waters.
- Prepare for management of excess concrete.
- Remove and dispose of sediment properly, away from wetlands or surface waters.
- Install culverts for access roads in the dry season or during low-flow conditions if possible to minimize sediment delivery to streams.
- Limit tracking of soil onto paved roads by gravelling road approaches, washing vehicle wheels, and cleaning mud and dirt from paved roads to reduce sediment delivery to roadside ditches and nearby streams.
- Avoid use of heavy equipment and vegetation removal in wetlands and wetland buffer zones to avoid soil compaction, destruction of live plants, and potential alteration of surface water patterns. Use track equipment or matting, if appropriate.
- Avoid placing staging areas in wetlands or stream buffers.
- Avoid placing new access roads through wetland complexes around the Columbia River, Fifteenmile Creek, Little Klickitat River, Spring Creek, Swale Creek, and Blockhouse Creek to minimize the potential for altering surface water patterns and isolating connected wetlands.
- Obtain all appropriate permits with approved wetland delineations and compensatory mitigation plans prior to construction as needed.
- Use high-visibility fencing around wetland buffer zones to avoid inadvertent activity (e.g., parking and driving) in wetlands or buffers or streams.
- Reseed disturbed areas (see mitigation measures in Section 3.3 Vegetation).

3.5.4 Unavoidable Impacts Remaining after Mitigation

Potential Impacts to water resources should be avoided by mitigation measures, though some slight sedimentation could occur to water bodies and ground water and adjustment of surface water flows due to project construction and access roads. Some portions of wetlands would likely be filled, though project design would attempt to avoid wetlands if possible.

3.5.5 No Action Alternative

The No Action Alternative would have no impact on water resources because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.6 Wildlife

This section describes wildlife resources and how the project alternatives could affect these resources. Related vegetation and wetlands information can be found in Sections 3.1 Land Use and Recreation, 3.3 Vegetation, and 3.5 Water Resources and Wetlands.

3.6.1 Affected Environment

The proposed project would cross lands that provide habitat to a wide variety of wildlife. In addition to more common wildlife species, several species known to occur or that could potentially occur in the vicinity have special federal or state status.

Special-Status Species

Special-status species include those protected under the federal Endangered Species Act (ESA) as threatened, endangered, or proposed species; those listed by the U.S. Fish and Wildlife Service (USFWS) as candidate species or species of concern; and those listed for protection by the states of Oregon and Washington.

One species federally listed as threatened and one species listed as a candidate for listing are found in Klickitat County, Washington, but are not likely to occur along any of the action alternatives. The Mardon skipper butterfly (*Polites mardon*) is federally listed as threatened. Habitat for the Mardon skipper consists of native prairie vegetation including Idaho fescue (*Festuca idahoensis*) and blue violet (*Viola* spp.), which can occur in glacial outwash prairies and openings and ridgetops in ponderosa pine (*Pinus ponderosa*) woodlands (Larson 1995). The closest known location is in ponderosa pine woodlands in the Cascade Mountains about 21 miles north of the project.

The Oregon spotted frog (*Rana pretiosa*) is a candidate species. There are only three documented populations of the Oregon spotted frog in Washington, two of which are in Klickitat County about 18 miles northwest of the project in the easternmost extent of its historic range (Larsen 1997).

Thirty-four other special-status species categorized as federal species of concern or state-listed species have the potential to occur in the project area, many of which could occur in two or more habitats (ORNHIC 2007; ODFW 2009; WDFW 2009a). See Table 3-23 for a list of those species according to the habitat(s) they occupy. Fourteen of these are likely to be in the project area according to state databases or field observations. Appendix D contains a USFS list of sensitive species that may occur in the National Scenic Area or on USFS land crossed by the Middle and East alternatives.

~~The USFS protects sensitive invertebrate species on USFS lands crossed by the Middle and East alternatives (see Appendix D for a list of these species). These sensitive invertebrate species require habitat with some kind of water source (cold springs, streams) or moist conifer forest; this type of habitat is not found along the Middle or East alternatives where they cross USFS land, so these species are not present. The USFS land in this area is not covered by the Northwest Forest Plan, so USFS Survey and Manage species requirements are not applicable to these lands.~~

Table 3-23. Special-Status Species Documented[1] or with Potential to Exist along the Action Alternatives

Common Name[2] *Latin Name*	Habitat Type	Found in Project Vicinity[1]	Alternative Location (state)	Oregon State Status	Washington State Status	Federal Status[3]
Croplands (Agricultural Fields)						
Golden eagle ***Aquila chrysaetos***	Breeding, foraging	Yes	Middle (WA), East (OR, WA)	None	Sensitive	None
Prairie falcon ***Falco mexicanus***	Breeding, foraging	No		None	Monitor	None
Peregrine falcon ***Falco peregrines***	Breeding, foraging	No		Sensitive-vulnerable	Candidate	Species of concern (delisted, monitor)
Burrowing owl ***Athene cunicularis***	Breeding, foraging	No		Sensitive-critical	Candidate	Species of concern
Long-billed curlew ***Numenius americanus***	Foraging	Yes	Middle, East (WA)	Sensitive-vulnerable	Monitor	None
Ferruginous hawk ***Buteo regalis***	Breeding, foraging	No	West, Middle, East (OR, WA)	Sensitive-Critical	Threatened	Species of Concern
Grassland/Shrub-Steppe						
Sharptail snake ***Contia tenuis***	Breeding, foraging	No		None	Candidate	Species of concern
Burrowing owl ***Athene cunicularis***	Breeding, foraging	No		Sensitive-critical	Candidate	Species of concern
Loggerhead shrike ***Lanius ludovicianus***	Breeding, foraging	No		Vulnerable	Candidate	Species of concern
Long-billed curlew ***Numenius americanus***	Foraging	Yes	West (WA)	Sensitive-vulnerable	Monitor	None
White-tailed jackrabbit ***Lepus townsendii***	Breeding, foraging	No		None	Candidate	None
Black-tailed jackrabbit ***Lepus californicus***	Breeding, foraging	No		None	Candidate	None
Black-tailed deer ***Odocoileus hemionus columbianus***	Foraging	Yes	West (WA)	None	Priority	None
Mule deer ***Odocoileus hemionus hemionus***	Foraging	Yes	West (WA)	None	Priority	None
Golden eagle ***Aquila chrysaetos***	Breeding, foraging	Yes	West (WA)	None	Sensitive	None
Prairie falcon ***Falco mexicanus***	Breeding, foraging	Yes	West, Middle (WA)	None	Monitor	None
Peregrine falcon ***Falco peregrines***	Breeding, foraging	Yes	West (WA)	Sensitive-vulnerable	Candidate	Species of concern (delisted, monitor)

Common Name[2] ***Latin Name***	**Habitat Type**	**Found in Project Vicinity[1]**	**Alternative Location (state)**	**Oregon State Status**	**Washington State Status**	**Federal Status[3]**
Ferruginous hawk ***Buteo regalis***	Breeding, foraging	No	West, Middle, East (OR, WA)	Sensitive-Critical	Threatened	Species of concern
Woodlands (Oregon White Oak Woodland/Oregon White Oak-Ponderosa Pine)						
Western gray squirrel ***Sciurus griseus***	Breeding, foraging	Yes	West, Middle (WA)	None	Threatened	Species of concern
Black-tailed deer ***Odocoileus hemionus columbianus***	Wintering	Yes	West (WA), Middle/East (OR)	None	Priority	None
Mule deer ***Odocoileus hemionus hemionus***	Wintering	Yes	West (WA), Middle/East (OR)	None	Priority	None
Lewis' woodpecker ***Melanerpes lewis***	Breeding, foraging	Yes	West (WA)	Sensitive-critical	Candidate	Species of concern
Olive-sided flycatcher ***Contopus cooperi***	Breeding, foraging	No		Sensitive-vulnerable	None	Species of concern
Long-eared myotis ***Myotis evotis***	Breeding, foraging	No		None	Monitor	Species of concern
Wild turkey ***Melanerpes gallopavo***	Breeding, foraging	Yes	West (WA), Middle/East (OR)	None	Priority	None
Sharptail snake ***Contia tenuis***	Breeding, foraging	No		None	Candidate	Species of concern
Silver-haired bat ***Lasionycterius noctivagans***	Breeding, foraging	No		Sensitive-vulnerable	None	Species of concern
California mountain kingsnake ***Lampropeltis zonata***	Breeding, foraging	No		Sensitive-vulnerable	Candidate	None
Wetlands						
Oregon spotted frog ***Rana pertiosa***	Breeding, foraging	No		Sensitive-critical	Endangered	Candidate
Northern leopard frog ***Rana pipens***	Breeding, foraging	No		Sensitive-critical	Endangered	None
Western toad ***Anaxyrus boreas***	Breeding, foraging	No		Sensitive-vulnerable	Endangered	Species of concern
Western painted turtle ***Chrysemys picta bellii***	Breeding, foraging	No		Sensitive-critical	None	None
Western pond turtle ***Actinemys marmorata***	Breeding, foraging	Yes	West (WA)	Sensitive-critical	Endangered	Species of concern
Pallid bat ***Antrozous pallidus***	Breeding, foraging	No		Sensitive-vulnerable	Monitor	Species of concern

Common Name[2] *Latin Name*	Habitat Type	Found in Project Vicinity[1]	Alternative Location (state)	Oregon State Status	Washington State Status	Federal Status[3]
Townsend's big-eared bat ***Corynorhinus townsendii***	Foraging	No		Sensitive-critical	Candidate	Species of concern
Long-eared myotis ***Myotis evotis***	Breeding, foraging	No		None	Monitor	Species of concern
Long-legged myotis ***Myotis volans***	Breeding, foraging	No		Sensitive-vulnerable	Monitor	Species of concern
Small-footed myotis ***Myotis ciliolabrum***	Breeding, foraging	No		None	Monitor	Species of concern
Yuma myotis ***Myotis yumanensis***	Breeding, foraging	No		None	None	Species of concern
Riparian Areas						
Mountain quail ***Oreortyx pictus***	Breeding, foraging	Yes	East (WA)	None	Priority	Species of concern
Black-tailed deer ***Odocoileus hemionus columbianus***	Wintering	Yes	West (WA), Middle/East (OR)	None	Priority	None
Mule deer ***Odocoileus hemionus hemionus***	Wintering	Yes	West (WA), Middle/East (OR)	None	Priority	None
Rock Outcrops						
Sagebrush lizard ***Sceloporus graciosus***	Breeding, foraging	Yes	East (WA)	Sensitive-vulnerable	Candidate	Species of concern
Cliffs						
Golden eagle ***Aquila chrysaetos***	Breeding, foraging	Yes	East (OR, WA)	None	Sensitive	None
Prairie falcon ***Falco mexicanus***	Breeding, foraging	Yes	East (OR, WA)	None	Monitor	None
Peregrine falcon ***Falco peregrines***	Breeding, foraging	Yes	West, Middle, East (OR, WA)	Sensitive-vulnerable	Candidate	Species of concern (delisted, monitor)
Pallid bat ***Antrozous pallidus***	Breeding, foraging	No		Sensitive-vulnerable	Monitor	Species of concern
Spotted bat ***Euderma maculatum***	Breeding, foraging	No		Sensitive-vulnerable	Monitor	Species of concern
Small-footed myotis ***Myotis ciliolabrum***	Breeding, foraging	No		None	Monitor	Species of concern
Long-legged myotis ***Myotis volans***	Breeding, foraging	No		Sensitive-vulnerable	Monitor	Species of concern
Yuma myotis ***Myotis yumanensis***	Breeding, foraging	No		None	None	Species of concern

Common Name[2] *Latin Name*	Habitat Type	Found in Project Vicinity[1]	Alternative Location (state)	Oregon State Status	Washington State Status	Federal Status[3]
Open Water						
Bald eagle ***Haliaeetus leucocephalus***	Foraging	Yes	West (OR), Middle/East (OR, WA)	Threatened	Sensitive	Species of concern (delisted, monitor)
American white pelican ***Pelecanus erythrorhynchos***	Foraging	Yes	West (OR), Middle/East (OR, WA)	Sensitive-vulnerable	Endangered	None

[1] Documented occurrences of species either come from state database information (see sources below) or BPA field surveys in 2009 and 2010.

[2] Some species are listed more than once if they occur in more than one habitat.

[3] Species of Concern is a designation given by the USFWS. No threatened, endangered, or candidate species under the Endangered Species Act are likely to occur in the project area.

Sources: Oregon Department of Fish and Wildlife 2009; Oregon Natural Heritage Information Center 2007; Washington Department of Fish and Wildlife 2009; Washington Department of Fish and Wildlife 2010a.

The project area is in the Pacific Flyway. In addition to ESA and state regulations, the Migratory Bird Treaty Act and CRGNSA Management Plan also provide protection for birds. Most native bird species are protected under the Migratory Bird Treaty Act, which prohibits taking, killing, or possessing protected birds and their eggs and nests. The CRGNSA Management Plan protects a number of endemic species and species of special interest within the National Scenic Area. Many of those species are discussed in this EIS section; a table listing all of those protected species is found in Appendix D, with a determination of whether the species are likely present or could be affected along the action alternatives.

Habitats and Associated Wildlife Species

A variety of habitats occur across the project area: grassland/shrub-steppe, woodlands, riparian areas and wetlands, rock outcrops and cliffs, and cropland. Within these habitats, the states of Oregon and Washington have designated habitats for protection. In Oregon, "strategy" habitats are those habitats that have experienced a high degree of historic loss since 1850 and meet a number of other risk criteria (ODFW 2006). The proposed action alternatives would cross three of the six Oregon habitat categories (OAR 635-415-0025); Categories 2, 4, and 6. Category 2 habitat is "essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage". Category 4 habitat is "important habitat for fish and wildlife species." Category 6 habitat is "habitat that has low potential to become essential or important habitat for fish and wildlife". In the project vicinity, wetlands would be considered Category 2 habitat, disturbed grassland/shrub-steppe Category 4 habitat, and cropland or small areas of trees Category 6 habitat (see Appendix D for a complete list of ODFW habitat categories).

~~Seven strategy habitats are crossed by the action alternatives including riparian habitats, sagebrush steppe and shrublands, wetlands, and rock habitats (ODFW 2006).~~

In Washington, priority habitats are those habitat types "with unique or significant value to a diverse assemblage of species," and that are used in guiding conservation and management priorities (WDFW 2008, 2010b). Five priority habitats were identified along the action alternatives using the

Washington database and field observations: eastside steppe (grassland), shrub-steppe, Oregon white oak woodland, cliffs, riparian zones, and freshwater wetlands.

Wildlife species may be associated with a specific habitat or may use several habitats; wildlife species are discussed according to the habitat(s) they occupy.

Grassland/Shrub-Steppe

Native shrub-steppe and eastside steppe (grassland) are two WDFW priority habitats found in limited qualities along the action alternatives. High quality native grasslands occur for about 3 miles between line miles W7 and W10 in the Columbia Hills State Park and Columbia Hills Natural Area Preserve. Small areas of native shrub-steppe are found near the Little Klickitat River at line miles W18, W19.5 and WM21. For more information about the vegetation found in these habitats, see Section 3.3 Vegetation.

Much of the shrub-steppe and grassland habitat has been disturbed by agricultural practices and is dominated or co-dominated by nonnative species or more disturbance-tolerant species. These disturbed grassland/shrub-steppe habitats can be found along the length of the action alternatives and at Substation Site 2, and are often interspersed with cropland (see Map 3-5).

Nine special-status species could reside and/or forage in both the high quality and the disturbed grassland/shrub-steppe habitats (see Table 3-23). Special-status species were observed during field surveys in several areas of grassland/shrub-steppe along the West Alternative in Washington, including long-billed curlew, black-tailed deer, mule deer, prairie falcon, and a juvenile golden eagle. The prairie falcon was the only special-status species observed during field surveys along the Middle Alternative in the disturbed grassland/shrub-steppe habitat just north of line mile M13. No special-status species were found in surveys of disturbed grassland/shrub-steppe habitat along the East Alternative. The ferruginous hawk could occur in this habitat, but is rare and has not been observed.

Although still considered disturbed grassland/shrub-steppe due to grazing, areas of dense good quality sagebrush habitat were found in Oregon along north-facing slopes of Fifteenmile Creek and the Columbia River. These communities could provide habitat for breeding pairs of state-listed species such as loggerhead shrike and black-tailed jack rabbit, as well as wintering habitat for mule deer and black-tailed deer.

Common species associated with high quality native grasslands and shrub-steppe include northern harrier (*Circus cyaneus*), Swainson's hawk (*Buteo swainsoni*), western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), and many other passerine bird species that rely on this habitat type for breeding and foraging. The lack of active or intensive farming practices in the high quality habitats allows species to breed and nest without disturbance.

Common species associated with both disturbed and native grassland/shrub-steppe include mammals such as coyote (*Canis latrans*) and various species of rodents, reptiles such as western rattlesnake (*Crotalus viridis*) and western fence lizard (*Sceloporus occidentalis*), and birds such as red-tailed hawk (*Buteo jamaicensis*) and northern flicker (*Colpates auratus*). This habitat type is also important for a variety of passerines and game birds such as Mountain quail (*Oreotryx pictus)*, California quail (*Callipepla californica*), and ring-necked pheasant (*Phasianus colchicus*).

Woodlands

Extensive woodlands are scarce along the action alternatives, however, the alternatives cross, in total, 18 woodland areas (see Table 3-12 and Map 3-5 in Section 3.3 Vegetation). These woodlands are mostly associated with riparian habitat and are found along Fifteenmile Creek in Oregon, on the West Alternative along drainages of the Columbia Hills and through the Columbia Hills State Park and the

Columbia Hills Natural Area Preserve, and where the alternatives cross or parallel the Little Klickitat River.

All the woodlands support wildlife species, but woodlands that are considered priority habitat may be the only place some special-status species are found. Oregon white oak woodlands greater than 5 acres are WDFW priority habitats that occur within the transition zone between conifers and grassland/shrub-steppe along the action alternatives. The Oregon white oak-ponderosa pine designation includes pure Oregon white oak stands or oak-conifer associations (usually with ponderosa pine in the project area), with oak trees having 25 percent of the canopy cover, or 50 percent if overall canopy cover is less than 25 percent (Larson and Morgan 1998). Seven of the woodland areas crossed are priority woodland habitat. The West Alternative crosses these priority habitats along the Columbia Hills between line miles W5-7 (Woodlands 4, 5, 6, and 7) and near the Little Klickitat River at line mile W19 (Woodland 10); the Middle and East alternatives cross these priority habitats near the Little Klickitat River at line miles M19 (Woodland 17) and E22 (Woodland 18).

In addition, a number of widely dispersed stands of ponderosa pine also occur in the more upland portions of the area at line miles W12, W18, and WM20 (Woodlands 8, 9, and 11).

The woodlands have the potential to support 10 special-status wildlife species (see Table 3-23). Five special-status woodland species were found during field surveys, including wild turkey, wintering mule and black-tailed deer along the action alternatives, as well as western gray squirrel and Lewis' woodpecker along the West Alternative. Multiple sightings and potential nesting platforms for western gray squirrel were observed in the Oregon white oak and ponderosa pine woodland where the West Alternative follows the Little Klickitat River (line miles W18-20, Woodland 9 and 10). Additional special-status species likely to occur in these woodlands include olive-sided flycatcher, long-eared myotis, wild turkey, sharptail snake, silver-haired bat, the California mountain kingsnake and black-tailed deer, and mule deer.

Common wildlife species that can also be found in these woodlands include mammals such as western skink (*Eumeces skiltonianus*), raccoon (*Procyon lotor*), and small rodents such as deer mouse (*Peromyscus maniculatus*); reptiles such as southern alligator lizard (*Elgaria multicarinata*); and birds such as Cooper's hawk (*Accipiter cooperii*), barn owl (*Tyto alba*), downy woodpecker (*Picoides pubsecens*), ash-throated flycatcher (*Myiarchus cinerascens)*, and red-tailed hawk (*Buteo jamaicensis*). For example, red-tailed hawks were found nesting just south of Woodland 17 along the Middle Alternative. Unoccupied raptor nests were observed in riparian trees near Fivemile Creek at line mile W7 (Woodland 5) and near Fifteenmile Creek at line mile M1 (Woodland 14). An active long-eared owl (*Asio otus*) nest was also observed in the Oregon white oak between line miles W7-8 (Woodland 6).

Riparian and Wetland Habitats

Riparian habitats are vegetation areas that rely on the presence of surface water. They can be found along rivers, creeks, and dry washes. Riparian habitats include the wooded areas along rivers and creeks (see woodlands discussion), Swale Creek (which is not wooded where the alternatives cross), and the vegetated areas along wetlands.

The shrubs and trees of riparian woodlands and scrub-shrub wetlands provide suitable breeding habitat and migration and dispersal corridors for many bird and mammal species, including three special-status species: mule deer, black-tailed deer, and mountain quail.

Common species that use these areas for nesting and/or foraging include birds such as the red-winged blackbird *(Agelaius phoeniceus*), red-tailed hawk, American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), and song sparrow (*Melospiza melodia*); and mammals such as the raccoon. Also, an inactive raptor nest was observed in the riparian corridor along Fifteenmile Creek, and mountain quail have also been documented near the East Alternative by Swale Creek and one of its tributaries (line mile E19) (WDFW 2009b).

The Swale Creek area along the West Alternative (line mile W11) was observed to have a particularly diverse concentration of paired shorebirds, waterfowl, passerines, raptors, and game birds. Species observed during the field surveys in this area include paired long-billed curlews, a flock of mountain quail, a bald eagle that flew over the area, an active great horned owl nest with fledglings, an active ruffed grouse (*Bonasa umbellus*) nest, and several unoccupied songbird nests likely leftover from last year's nesting season.

Wetlands occur along perennial and seasonal streams and drainages; they can form naturally or be created by humans (e.g., stock ponds). These habitats are important foraging and breeding habitats for a variety of common amphibians, shorebirds, and waterfowl.

About 63 wetlands are found along the West Alternative, creating about 69 acres of wetland habitat within 1,000–2,000 feet of the West Alternative. About 41 wetlands are found along the Middle Alternative, creating about 104 acres of wetland habitat within 500–1,000 feet of the Middle Alternative. About 37 wetlands are found along the East Alternative, creating about 72 acres of wetland habitat within 500–1,000 feet of the East Alternative. (See Map 3-7 and Section 3.5 Water Resources and Wetlands for more details about wetlands).

Seasonal wetlands and ponds as well as pools and backwater areas along creeks that have emergent vegetation and areas of standing water most of the year provide suitable breeding habitat for amphibians and turtles, including five special-status species: Oregon spotted frog (*Rana pertiosa),* Northern leopard frog (*Rana pipens),* western toad (*Anaxyrus boreas),* Western toad (*Anaxyrus boreas),* and western pond turtle (*Actinemys marmorata)* (see Table 3-23). These wetland areas could also provide foraging habitat for six special-status bat species: Pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), Long-eared myotis (*Myotis evotis*), Long-legged myotis (*Myotis volans*), Small-footed myotis (*Myotis ciliolabrum*), and Yuma myotis (*Myotis yumanensis*). The western pond turtle was found in a wetland along the West Alternative near line mile W3.

Open Water

The action alternatives cross Fifteenmile Creek, the Columbia River, Swale Creek, and the Little Klickitat River. These water sources could be used by various species of waterfowl and raptors as foraging habitat. Also, waterfowl and shorebirds are known to concentrate at Spearfish Lake and Horsethief Lake, which are less than 1 mile from the West Alternative. The Columbia River in particular provides suitable foraging habitat for such special-status bird species as the bald eagle and American white pelican, and common species such as osprey (*Pandion haliaetus*) and double-crested cormorant (*Phalacrocorax auritus*). The bald eagle and white pelican were both observed along the Columbia River along the action alternatives (see Table 3-23).

Rock Outcrops and Cliffs

There are small, isolated patches of rock outcrops scattered throughout the project area among the agricultural fields north of the Columbia Hills or co-occurring with cliff habitat (see Map 3-5). A large concentration of high quality rock outcrops interspersed with grassland/shrub-steppe and sandy soils occurs along the Columbia River between line miles W2–3, W4–5, near W8 and W11, and between line miles ME7–9, E9-14. Rock outcrops provide potential habitat for sagebrush lizard (*Sceloporus graciosus*), a federal species of concern, and common reptiles such as gopher snake (*Pituophis catenifer catenifer*) and western fence lizard (*Sceloporus occidentalus*). Sagebrush lizard was not found during field surveys on rock outcrops in the project area, though it has been found historically along the East Alternative in Washington.

Cliffs are a WDFW priority habitat and provide suitable raptor nesting locations along ledges and bat roosting sites in cracks and crevices. Eight special-status species of raptors and bats could reside in these habitats along the proposed routes; golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), peregrine falcon (*Falco peregrines*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), small-footed myotis (*Myotis ciliolabrum*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*) (see Table 3-23).

Peregrine falcon was the only special-status raptor species observed along the West Alternative in the cliff habitat along the Columbia River in both Oregon and Washington, and a peregrine falcon nest has been documented along the cliffs on the south bank of the Columbia River north of the Middle and East alternatives (ORNHIC 2009).

Three falcon eyries (nest sites) were observed near the Middle and East alternatives' Columbia River crossing: two were observed on the Oregon side of the crossing (line mile ME7) and one was observed on the Washington side (ME8). It was difficult to get a view into these eyries, so species occupancy and activity are unknown. An unknown, unoccupied raptor nest was observed along the cliff line just south of the Middle and East alternatives on the Washington side. A known golden eagle nest was observed just south of the East Alternative near line mile E12 (WDFW 2009b). This nest is unoccupied. Also south of the East Alternative, there is a known prairie falcon eyrie near line mile E12 (WDFW 2009b). The status of this nest is unknown.

Common species using these cliffs include the common raven (*Corvus corax*), American crow (*Corvus brachyrhynchos*), Swainson's hawk (*Buteo swainsoni*), violet-green swallow (*Tachycineta thalassina*), northern rough-winged swallow (*Stelgidopteryx serripennis*), cliff swallow (*Petrochelidon pyrrhonota*), and yellow-bellied marmot (*Marmota flaviventris*).

Cropland

Cultivated fields and farmsteads are widespread in the area and provide foraging or nesting and roosting habitat for many birds and bats. Farm buildings and trees in farmsteads and along field edges also provide potential nesting and roosting sites for six special-status bird species (golden eagle, prairie falcon, peregrine falcon, ferruginous hawk, burrowing owl, long-billed curlew) and common species such as owls, hawks, and bats. Cultivated fields provide foraging habitat for horned lark, mountain quail, and others.

No burrowing owl burrows were found during field surveys; however there is some suitable burrowing owl habitat along field margins and fence rows. Isolated stands of trees were often observed to be used as nesting sites throughout the project area. Several nests were observed in these isolated trees, including raptor nests at line mile M16, a long-eared owl nest just east of the East Alternative near line mile E16, an active raven's nest between line miles WM20-21, two active red-tailed hawk nests near line miles WM20, WM22-23 and E24 and an active great horned owl nest near line miles WM24-25 (E26), and unoccupied remnant raptor nests at line miles W13, WM21, and between line miles WM25 (E26) and the end of the transmission line routes.

The long-billed curlew was found in cultivated fields near the Middle and East alternatives in Washington and golden eagle was found in cultivated fields along the Middle and East alternatives in Oregon and along the East Alternative in Washington.

3.6.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

None of the action alternatives would impact federal threatened or endangered wildlife species. Other species, including federal species of concern and state-listed species could be impacted through construction disturbance, habitat loss, collisions with lines, and to a lesser extent maintenance activities.

New tower footings and access roadbeds would permanently alter current wildlife breeding, roosting, nesting, and foraging sites in all habitats. The loss of trees, shrubs, groundcover, woody debris, and soil or rock could result in habitat losses for mammals, reptiles, birds, and invertebrates. The loss of these resources could also decrease prey populations and other food such as acorns and seeds. Conversely, new towers could provide new or additional roosts for raptors, which would benefit raptor populations, but may adversely affect small mammal, lizard and snake populations due to the increased predation. Impacts would affect both special-status and common species. However, the permanent loss of habitats of special-status species would be a greater impact than the loss of habitats for common species because of the sensitive species' limited distribution and number. Similarly, loss of habitat~~s~~ would be a greater impact on raptors and migratory birds because of their relative rarity and vulnerability to habitat loss and climate change. ~~federal protection laws; and the~~ The loss of WDFW or ODWF priority habitats would be a greater impact than the loss of other habitats.

Construction disturbances could result in temporary displacement and elevated stress levels for most types of wildlife species in or near the construction area. Disturbances could include noise from heavy equipment, helicopters, blasting, explosive fittings, vehicles, and humans. Most invertebrates, reptiles, and amphibians, including those in wetland areas, in woodlands, in grassland/shrub-steppe, and on rock outcrops, would not typically move great distances to avoid construction activities. These species would experience increased stress where the nearby noise and human disturbance could disrupt foraging, breeding, and other normal activities. Furthermore, these species would likely suffer disproportionate impacts from habitat loss and physical destruction since they are relatively immobile. For more mobile species, displacement both within and near construction sites would occur but would be temporary. In both cases, the impact level would increase if the increased stress or the displacement occurs during the breeding season and results in decreased reproductive capacity or the abandonment and loss of a nest or young, or if the displacement becomes permanent due to habitat alteration.

On cliffs or rock outcrops, lizards and snakes would likely move during construction. However, blasting or drilling in these areas would increase potential direct impacts to reptiles in the vicinity. After construction activities end, reptiles would return.

Noise from maintenance activities would be infrequent and brief, consisting primarily of one to two maintenance vehicles with workers inspecting the area, or transmission line and tower inspections by helicopter. Because of the dry climate and the few trees that would pose a potential threat to the line, there would be little vegetation maintenance needed. Maintenance vehicles would use established access roads; however, if work is required within the right-of-way, habitat in these areas could be trampled. If towers were located in wetlands such that maintenance workers would have to traverse the wetland, wetland species could be impacted. Typical operations and maintenance impacts on wildlife would be much less than impacts that would occur during construction and would be brief and minimally invasive; overall operation and maintenance impacts on wildlife would be ***low*** for the action alternatives.

Electrocution of birds is not an issue with high-voltage transmission lines, even for birds with the largest wingspans. Electrocution is a factor considered in line design: the "physical separation between energized and/or grounded structures, conductors, hardware, or equipment that can be bridged by birds to complete a circuit" (APLIC 2006). Electrocution is more commonly a problem with lower voltage distribution lines that have conductors generally spaced 2 to 6 feet apart. The conductor-to-conductor spacing for the proposed lattice-steel tower would be at least 23 feet.

However, birds can collide with conductors or ground wires. The frequency of bird collisions with transmission lines depends on line placements and configurations and the numbers and species of birds present (Hunting 2002). Installing lines in areas of high bird use or migration is the biggest factor in avian collisions. Transmission lines with a flat configuration (the conductors are on the same horizontal plane) are easier for birds to avoid, while lines that have the conductors stacked (the same vertical plane) can create a fence effect and are harder for birds to avoid. This fence effect can also be created by locating lines next to each other. However, the conductors of 500-kV transmission lines are relatively large and more visible to birds and they fly higher to avoid them. The smaller ground wire strung at the top of the tower is often the wire that birds run into.

Most collisions with power lines occur during flights in areas used daily by a relatively large number of birds. The risk of collisions with power lines also increases when birds are migrating in groups at night or in low visibility conditions such as fog. Waterfowl, shorebirds, and other waterbirds such as egrets and cranes appear to be more susceptible to collision where lines span river valleys, wetland areas, and lakes, or where lines are between waterfowl feeding and roosting areas (McNeil et al. 1985). Important factors in determining the risk of collisions for a bird species include body size, maneuverability, age of the bird, and the height at which the bird flies (Crowder and Rhodes 1999). Mountain quail, pheasant, and other low-flying birds do not typically fly high enough to collide with conductors. Raptors and passerines appear to be more susceptible in upland habitats (Hunting 2002). Also, because the project area is within the Pacific Flyway, migrating birds could collide with the lines. Although bats can be susceptible near wind turbines, bats do not tend to collide with transmission lines because the lines are stationary.

Bird diverters would be installed on overhead ground wires spanning open water or other areas of high bird use to avert possible collisions.

Previous studies have found that electromagnetic fields (EMF) associated with transmission lines do not cause any adverse health, behavioral, or productivity effects in animals, including both wildlife and livestock (Exponent 2009). Some limited research has suggested possible effects of low frequency EMF on biological mechanisms involved in the navigation abilities of honeybees, birds, and bats. For example, some studies report that honeybees and some bird species have the ability to detect EMF and use magnetic navigation. In addition, some recent experiments have reported findings that suggest magnetic field exposure might affect these magnetic navigation systems in both birds and bees (Gill 2007, Hsu et al. 2007). However, there is no conclusive evidence that quantifies these effects, or determines if such effects are found in high-voltage transmission line environments.

Construction, operation, and maintenance of Big Eddy Substation would have ***no*** impact on wildlife, since the Big Eddy Substation yard where upgrade work would occur is highly disturbed (gravel with no vegetation), and contains no wildlife habitat. In addition, the existing substation facility has been in place and operating for many years, so species in the surrounding area are accustomed to construction, operations and maintenance activities.

West Alternative

As described in Section 3.3 Vegetation, about 6–7 acres of high quality shrub-steppe (along the Little Klickitat River) and 24–30 acres of high quality grasslands (through the Columbia Hills State Park and Columbia Hills Natural Area Preserve ~~areas~~) would be removed from use for towers and access roads on the West Alternative. The lower acreage would be removed if the line is built using single-circuit towers, and the higher acreage would be removed if the line is built using double-circuit towers (larger footprint) for the length of the Chenoweth-Goldendale line. Temporary tower construction activities would affect an additional 3–8 acres of shrub steppe and 7–23 acres of grassland.

The alternative crosses through the middle of the grassland habitat, and would impact those species that use the habitat by removing and fragmenting the habitat. Because grassland habitat could continue to thrive under the transmission line between towers, the lines would not fragment habitat as much as a new access road might. However, even fragmentation from new access roads would be relatively minimal because access roads use would be infrequent and access roads are relatively narrow, so wildlife species could traverse these areas with little impact. Wildlife species in this area, including the long-billed curlew, golden eagle, peregrine falcon, black-tailed deer, and mule deer would be disturbed if construction occurred during nesting or breeding season. Species that forage in the area would likely migrate to less disturbed grassland areas within Columbia Hills State Park or the Columbia Hills Natural Area Preserve.

Since the West Alternative crosses the edges of the high quality shrub-steppe, it would not contribute to habitat fragmentation in these areas, but would lessen the overall size of the habitat. Species that use these areas would likely migrate to more contiguous shrub-steppe habitat areas.

Disturbed grassland/shrub-steppe is the most common habitat in the project area and could accommodate species that would be displaced by the West Alternative. If construction occurs during nesting, impacts could lead to displacement or physical disturbance and the loss of a nest or young.

Where the West Alternative crosses woodland areas, the right-of-way would not require a cleared swath through woodlands, because either the woodlands are not dense or intact, or because they are within ravines that would be spanned. About 2–3 acres of woodland (trees and undergrowth) would be removed over eight different woodland areas. Tree removal would involve a few select trees on the fringes of the woodland habitats. Some Oregon white oaks would be removed in the Eightmile Creek draw within the Columbia Hills State Park, which is potential western gray squirrel habitat. However, this woodland area is small and it is unlikely that it provides enough contiguous habitat for the squirrel. Farther north, on the Columbia Hills Natural Area Preserve ~~DNR nature preserve~~, the alternative would cross the eastern edge of oak habitat, but tree removal would be limited to taller ponderosa pines on the high sides of the ravines, and would not substantially impact the habitat. More extensive western gray squirrel habitat is located around the Little Klickitat River, but the West Alternative would pass to the south of this habitat, and tree removal required in this area would be at the fringes of the habitat. Although treed areas are relatively rare in this area and provide essential habitat for many species, species that nest or live in these wooded areas would be less impacted by the limited amount of habitat removal than they would be by disturbance to the surrounding habitat during construction (especially if construction occurred during the nesting or breeding seasons).

Although there is about 69 acres of wetland habitat within 1,000–2,000 feet of the West Alternative, potential impacts to wetlands would be limited to a loss of about 0.5 acre spread over 11 wetlands (see Section 3.5 Water Resources and Wetlands), with an additional 2 acres disrupted during construction. Some of these are considered high quality wetlands that provide good habitat. Impacts on these wetlands would in turn impact species in the wetlands. For less mobile species (amphibians, turtles, and invertebrate species), physical disturbance could result in death of individuals or destruction of eggs.

More mobile species (birds, deer, or bats) that use the wetlands for foraging would not be directly harmed. In the long-term, all wetland species would be impacted somewhat because the wetland habitat would be reduced.

Wetland birds could be injured or killed if they collide with overhead ground wires. The largest concentration of wetland birds are expected to congregate in wetlands associated with open water (the Columbia River, the Little Klickitat River, Swale Creek) and other wetlands near line mile WM24.

Impacts on open water species would be limited to birds, as the project would not impact water habitat. Bald eagle and white pelicans seen in the area, as well as migratory birds, water birds, and raptors foraging in these areas could be injured or killed if they collide with overhead ground wires. Potential areas where water birds or foraging raptors could collide with lines include the crossings of the Columbia River, Swale Creek and Little Klickitat River as well as near line mile W3 where birds are likely to fly between Spearfish Lake and Horsethief Lake. Options with double-circuit towers would have more conductors and the conductors would be stacked creating more of a fence effect, making it harder for the birds to navigate. However, the use of bird diverters on overhead ground wires would lessen possible collisions.

Construction noise could also disturb nesting. Construction during nesting could lead to displacement or physical disturbance and the loss of a nest or young. Construction at other times of year would lead to temporary displacement from the area and a temporary shift in foraging areas.

Towers and new access roads could be placed on about 4.5 acres of rock outcrops or cliff habitat, which would create an additional 4 acres of temporary impacts. This acreage would be spread between the Oregon and Washington sides of the Columbia River. Sagebrush lizard, peregrine falcon and possible bat habitat could be impacted. Along cliffs, the West Alternative could create an increased risk of bird collisions with transmission lines. Bird diverters would be placed on overhead ground wires to avert collisions.

Noise during construction could impact peregrine falcon nesting in cliff habitat along the West Alternative as well as possible bat usage.

About 11–13 acres of cropland foraging habitat would be lost due to the placement of towers and access roads and an additional 11–17 acres would be temporarily impacted by construction activities (see Section 3.1 Land Use and Recreation). Since no burrowing owl burrows were found during field surveys, it is unlikely that the owl would be impacted. However, there is some suitable burrowing owl habitat along field margins and fence rows that would be taken up by towers and access roads. Cropland is habitat that is used with the seasons, more when fields are planted and growing than when being tilled. It is not considered high quality habitat and it is abundant along the West Alternative.

Of the three ODFW habitat categories crossed, only Categories 4 and 6 would be impacted. See Appendix D for acreages of ODFW habitat categories impacted by the West Alternative, as well as a list of potential impacts to sensitive species of the National Scenic Area.

Overall, the West Alternative would impact some of the most high quality habitat in the project area (grasslands, shrub-steppe, woodlands, rock and cliff, and wetlands). The transmission line would often cross over the habitat or remove vegetation on the fringes of the habitat. Though some habitat would be removed, the habitat spanned would be available to special status and other wildlife species. Slight impacts would be likely to the western gray squirrel, to amphibians, turtles, and invertebrate species associated with wetlands, the sage lizard and to other common species of birds and wildlife. Impacts would be greater if construction occurred during the nesting or breeding season. Impacts of the West Alternative on wildlife would be ***moderate-to-high*** because special priority habitats, status species and other wildlife would be affected.

The option that would include removal of the existing Chenoweth-Goldendale line and building single-circuit towers in an existing alignment (West Option 3), would have the least impact of the tower options because it would have a smaller tower footprint, would allow habitat regeneration where the wood-pole towers are currently located, and it would require less tree removal since the right-of-way expansion would be less. The option that would use the most double-circuit towers (for about 21 miles, West Option 5), would have the greatest impact because of the larger tower footprints. The impacts of West Options 1, 2, 4, and 6 would be between these options.

Middle Alternative

The Middle Alternative would not impact native high quality grassland habitat because this habitat is not found along the route.

The Middle Alternative would affect about a 1-mile long patch of high quality shrub-steppe habitat along the Little Klickitat River at line mile M21 (same area impacted by the West Alternative). About 3 acres of this native habitat would be removed for towers and access roads (see Section 3.3 Vegetation). Additional areas of impact would occur for temporary construction activities and would affect 0.8−3.0 acres. Although this high quality habitat would be affected, the area affected is at the fringe of the habitat, an existing line and access road run through it, and species using this habitat would likely migrate deeper into more contiguous shrub-steppe areas.

As with all the action alternatives, disturbed grassland/shrub-steppe habitat common in the area would be impacted. Towers and access roads would occupy about 75–77 acres of possible foraging and nesting habitat and an additional 34–47 acres would be temporarily impacted by construction activities. Prairie falcon seen at line mile M13 would likely move to other habitat in the area during construction activities.

The Middle Alternative would impact about 0.7 acres of woodland habitat (trees and understory vegetation). This includes removal of some Oregon white oak trees flanking an orchard near Big Eddy Substation, some ponderosa pine trees above the riparian zone where the line would cross the Little Klickitat River, and additional pines at the edge of a larger woodland (also on the West Alternative) along the river (see Section 3.3 Vegetation). None of these woodlands provide priority habitat, but species using these areas could be affected by losing habitat and construction activities. In areas where black-tailed deer and mule deer wintering habitat was found (Oregon side M2–4), about 6 trees would be removed next to an orchard. The ponderosa pines removed near the Little Klickitat River are next to western gray squirrel habitat.

Although there are about 69 acres of wetland habitat within 1,000–2,000 feet of the Middle Alternative, potential impacts to wetlands would be limited to a loss of about 0.5 acre spread over 11 wetlands (see Section 3.5 Water Resources and Wetlands), with and additional 2 acres temporarily disrupted during construction. One of these wetlands (line mile M20.8; also crossed by the West Alternative) is considered a high quality wetland providing good habitat. Impacts on this wetland would in-turn impact species in the wetlands. For less mobile species (amphibians, turtles, and invertebrate species), physical disturbance could result in death of individuals or destruction of eggs. More mobile species (birds, deer, or bats) that use the wetlands for foraging would not be harmed directly.

Wetland birds could collide with overhead ground wires. The largest concentration of wetland birds are expected to congregate in wetlands associated with open water (Fifteenmile Creek, Columbia River, the Little Klickitat River, Swale Creek) and other wetlands near line mile WM24. In addition, wetland bird species in wetlands occurring between line miles M9.5–20, and from M22–27 would be exposed to a new transmission line where there are no lines now.

Impacts on open water species would be limited to birds, as the project would not impact water habitat. Bald eagle and white pelicans seen in the area, as well as migratory birds, water birds, and raptors foraging in these areas could be injured or killed if they collide with over-head ground wires. Potential areas where water birds or foraging raptors could collide with lines include the crossings of Fifteenmile Creek, the Columbia River, Swale Creek and the Little Klickitat River. In areas where there are options for double-circuit or single-circuit towers, it is unknown which options would create greater obstacles for birds and have a greater potential for collision. With single-circuit parallel options there would be two sets of towers in the corridor; with double-circuit options all the conductors would be placed on the same towers. The use of bird diverts on overhead ground wires would lessen possible collisions for any option.

Construction noise could also disturb nesting. Construction during nesting could lead to displacement or physical disturbance and the loss of a nest or young.

Although the Middle Alternative crosses some rock outcrops and cliff habitat near the Columbia River crossing, towers and access roads would not likely be placed in these habitats so no acreage would be disturbed. In these areas, as with the crossing of open water habitat, there is increased risk of bird collisions. However, raptors using the cliff habitat are not as likely to collide with lines as are the waterfowl associated with open water habitats.

About 25–27 acres of cropland foraging habitat would be lost due to the placement of towers and access roads, and an additional 22–27 acres would be temporarily impacted by construction activities (see Section 3.1 Land Use and Recreation). The known golden eagle breeding and foraging habitats at line mile M6 are relatively far from the line route and would not be impacted by habitat loss. However, they could be disturbed by noise if construction occurred during nesting season. The long-billed curlew sighted at line miles M13 and M15 would likely move to other cropland areas during construction activities and would not be impacted because this type of habitat is plentiful in the area. Though no burrowing owl burrows were found during field surveys, there is some suitable burrowing owl habitat along field margins and fence rows that would be taken up by towers and access roads. However, the habitat removed would be a small proportion of the total amount of affected croplands. Losses of croplands would have little effect on cropland species due to the small amount of land removed and the relatively low-quality foraging habitat provided.

Of the three ODFW habitat categories crossed, only Categories 4 and 6 would be impacted. See Appendix D for acreages of ODFW habitat categories impacted by the Middle Alternative, as well as a list of potential impacts to sensitive species of the National Scenic Area or on USFS land crossed by the Middle Alternative.

Since the Middle Alternative would mostly impact common habitat that is abundant in the area, would barely impact high-quality habitats (the fringe of one shrub-steppe area, but no grasslands or rock and cliff), would only slightly impact woodlands and wetlands, and would have few potential impacts to special–status species (amphibians, turtles associated with wetlands, bald eagle, white pelican, and mule and black-tailed deer), impacts of the Middle Alternative on wildlife would be ***low-to-moderate***.

The single and double-circuit tower options for the Middle Alternative would have similar impacts to wildlife.

East Alternative

The East Alternative would not impact native high-quality grassland or shrub-steppe habitat because this habitat is not found along the route.

As with all the action alternatives, the commonly found disturbed grassland/shrub-steppe habitat would be affected by the East Alternative. Towers and access roads would occupy about 89–92 acres of possible foraging and nesting habitat, and an additional 37–45 acres would be temporarily affected from construction activities. This habitat is used by common species such as coyote, rattlesnake, lizards, and birds. Tower and road footprints would remove only a small amount of the total habitat in the area and would not fragment this habitat because these species could navigate between the towers and across the right-of-way.

Wildlife species associated with woodlands—including those along riparian corridors—would experience isolated disturbances as trees and ground cover are removed. About 16 trees could be removed from two woodlands areas (see Section 3.3 Vegetation) over about 0.4–0.8 acre. This includes six Oregon white oak trees flanking an orchard (as for the Middle Alternative), and five ponderosa pine and five Oregon white oak trees in the upland area above the Little Klickitat River. The ponderosa pine and Oregon white oaks could potentially be considered priority habitat, but it is likely too isolated from the larger woodland area to provide western gray squirrel habitat. Although upland from the river's edge, these trees are part of a thin riparian woodland that follows the river and removal of trees from this woodland would have a slight contribution to fragmenting the river corridor, impacting species that would use this area as refuge near the water.

Of the 72 acres of wetland habitat within 1,000–2,000 feet of the East Alternative, potential impacts to wetlands would be limited to a loss of about 0.3 acre spread over 5 wetlands (see Section 3.5 Water Resources and Wetlands). The five wetlands potentially impacted are low quality and are of limited habitat value. Wetland birds could be impacted by colliding with overhead ground wires. As with the other alternatives, the largest concentration of wetland birds are expected to congregate in wetlands associated with open water (Fifteenmile Creek, Columbia River, the Little Klickitat River, Swale Creek) and other wetlands near line mile E25 (WM24). In addition, wetland bird species in wetlands occurring between line miles E15–E28 would be exposed to a new transmission line where there are no lines now.

As with the Middle Alternative, year round open water habitats crossed by the East Alternative include Fifteenmile Creek, and the Columbia and Little Klickitat rivers. Special-status species, as well as other common waterfowl species that use this habitat, would primarily experience impacts from the risk of transmission line collisions.

The East Alternative crosses cliff habitat at the Columbia River crossing, and passes near this habitat as it climbs the Columbia Hills, but no acreage would be impacted by towers or access roads. In these areas, as with the crossing of open water habitat, there is increased risk of bird collisions. However, raptors using the cliff habitat are not as likely to collide with lines as the waterfowl associated with open water habitats. Prairie falcon, golden eagle, and peregrine flacon are known to nest in these cliffs, and though they would not likely be impacted by the line itself because there are existing lines in the area, noise from construction would impact breeding or nesting if it occurred during that season.

About 18–21 acres of cropland foraging habitat would be lost due to the placement of towers and access roads, and an additional 30–37 acres would be temporarily impacted by construction activities (see Section 3.1 Land Use and Recreation). The known golden eagle breeding and foraging habitats at line miles E6 and E18-19 are relatively far from the line route and would not be impacted by habitat loss. However, they could be disturbed by noise if construction occurred during nesting season. The long-billed curlew sighted at line mile E18 would likely move to other cropland areas during construction activities and would not be impacted because there this type of habitat is plentiful in the area. Though no burrowing owl burrows were found during field surveys, there is some suitable burrowing owl habitat along field margins and fence rows that would be removed for towers and access roads. However, the amount of habitat removed would be small when compared to that available in the area.

Loss of cropland habitat would have little effect on cropland species because the amount is small, and it is of low quality for foraging species.

Of the three ODFW habitat categories crossed, only Categories 4 and 6 would be impacted. See Appendix D for acreages of ODFW habitat categories impacted by the East Alternative, as well as a list of potential impacts to sensitive species of the National Scenic Area or on USFS land crossed by the East Alternative.

Since the East Alternative would mostly impact common habitat that is abundant in the area, would not impact high-quality habitats (grasslands, shrub-steppe, or rock and cliff), would only slightly impact woodlands and wetlands, and would have few potential impacts to special–status species (golden eagle, prairie falcon, peregrine falcon, bald eagle, white pelican, and mule and black-tailed deer), impacts of the East Alternative on wildlife would be ***low-to-moderate***.

The single and double-circuit tower options for the East Alternative would have similar impacts to wildlife.

Knight Substation Options

Construction of Knight Substation at Site 1 or Site 2 (including access and electrical service needed for the substation) would remove about 30 ~~10~~ acres of cropland habitat from use. (Site 2 is fallow cropland.) In addition, about 43 acres (for Site 1) and 16 acres (for Site 2) of cropland habitat would be temporarily impacted due to the potential temporary access road to Substation Site 1 from Hill Road, the counterpoise needed along the Wautoma-Ostrander line, and potential temporary access for counterpoise installation.

Because no special-status species, nests, or burrowing owl burrows were found at either substation site, they would not likely be impacted. Because both sites are a small area relative to the total amount of the habitat type present in the area, and because this habitat provides relatively low quality habitat to special-status and other common species, impacts to wildlife from Knight Substation would be ***low*** at either substation site.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on wildlife would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential wildlife impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.6.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on wildlife. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Minimize the project ground disturbance footprint, particularly in special-status areas such as priority ecosystems, which can include riparian areas, wetlands, and grassland/shrub-steppe.
- Avoid tree removal to the extent possible.
- In locations where nests for special-status species have been identified, determine construction schedules through consultation with WDFW or Oregon Department of Fish and

Wildlife to avoid breeding season disturbance. The following mitigation schedules will be ~~considered~~ implemented where possible:

- Peregrine falcon—avoid construction activities within 0.25 mile of any active nests during the breeding season (~~March 15~~ February 1 through July 15 ~~August 31~~ or until young have fledged).
- Prairie falcon—avoid construction activities within 0.25 mile of any active nests during the breeding season (March 1 through July 30 or until young have fledged).
- ~~Prairie falcon~~ Bald eagle and golden eagle—avoid construction activities within 0.25 mile of active nests during the breeding season ~~(February 15 through July 15)~~ (January 1 through August 31 or until young have fledged).
- Western gray squirrel—avoid construction activities within 400 feet of all nest trees during the breeding season (March 1 through August 31). Avoid blasting within 0.25 mile of nest trees during this same period. Protect all western gray squirrel nests and nest trees. Maintain a 50-foot no-cut buffer around each nest tree.

- Install bird diverters on overhead ground wires in high risk areas (over river and stream crossings and near wetlands).
- Prepare and implement a SWPPP and a Spill Prevention and Contingency Plan (see mitigation measures for Sections 3.4 Geology and Soils and 3.5 Water Resources and Wetlands) to protect wetland habitats.
- Reseed disturbed areas (see mitigation measures for Section 3.3 Vegetation).
- Prepare for fire control (see mitigation measures for Section 3.3 Vegetation) to protect habitats.
- Work with the appropriate state agencies to mitigate impacts to federal species of concern, state-listed species, or protected habitats if impacts are unavoidable (see mitigation measures for Section 3.3 Vegetation).

3.6.4 Unavoidable Impacts Remaining after Mitigation

Construction of towers, substations, access roads, and other associated facilities would affect local wildlife populations through temporary displacement of individuals or groups and permanent loss of wildlife habitat. An incremental increase in avian collisions with transmission lines may occur at river crossings, and in areas of high concentrations of waterfowl and other birds.

3.6.5 No Action Alternative

The No Action Alternative would have no impact on wildlife because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.7 Fish

This section describes fish resources and how the project alternatives could affect these resources. Related vegetation and water resources information can be found in Sections 3.3 Vegetation and 3.5 Water Resources and Wetlands.

3.7.1 Affected Environment

The action alternatives cross four fish-bearing rivers or streams: Fifteenmile Creek in Oregon, the Columbia River in Oregon and Washington, and the Little Klickitat River and Swale Creek in Washington (see Map 3-7). Other streams in the project area are intermittent and may be fish-bearing seasonally; however, no fish have been documented in these streams.

Some of the fish-bearing streams have the potential to provide habitat for special status species (species with federal or state protections) and other common fish species such as redband rainbow trout, mountain whitefish, walleye, and smallmouth bass. This section describes the fish-bearing streams and the possible fish present. See Table 3-24 for a list of the special-status fish species present in the streams crossed.

The CRGNSA Management Plan protects a number of endemic species and species of special interest within the National Scenic Area. Many of those species are discussed in this EIS section; a table listing all the National Scenic Area protected species is found in Appendix D, with a determination of whether the species are likely present or affected along the action alternatives.

Fifteenmile Creek. Fifteenmile Creek in Oregon is a tributary to the Columbia River and is designated as critical habitat for one steelhead distinct population segment (DPS) where the action alternatives cross it. The West Alternative crosses Fifteenmile Creek at line mile W0.5, and the Middle and East alternatives cross it three times at line miles ME0.5, ME2.5, and ME3.25. Chinook salmon and steelhead are found in this portion of Fifteenmile Creek (StreamNet 2009). Coho salmon appear to be restricted from migrating to this area by Cushing Falls, also known as Seufert's Falls, at about river mile 0.5. Riparian vegetation along the creek where the alternatives cross is plentiful, with substantial amounts of Oregon white oak and other deciduous trees and shrubs, which provide shade, cover, and large woody debris recruitment.

Columbia River. Behind The Dalles Dam, the Columbia River is a reservoir called Lake Celilo. This reach of the Columbia River is a migration corridor for fish moving to and from upriver spawning areas (StreamNet 2009; WDFW 2009), and is designated as critical habitat for several species of federally protected salmonids, including four salmon evolutionarily significant units (ESUs), three steelhead DPSs, and one bull trout DPS. Coho salmon use the Columbia River as a migration corridor as well (there is some uncertainty as to whether the Coho Lower Columbia River ESU occurs past Hood River). Pacific lamprey, river lamprey, leopard dace, and mountain sucker are all state-listed candidate or sensitive species that occur in the Columbia River. Each action alternative would cross the Columbia River (line miles W2–3 and ME7–8).

Table 3-24. Fish-Bearing Streams Crossed by the Action Alternatives

River/Stream	Special Status Fish Species Present	Protected Fish Unit or Segment[1]	Alternative
Columbia River (OR/WA)	Chinook Salmon (*Oncorhynchus tshawytscha*)	Upper Columbia River spring-run ESU[1] (E[1])	West, Middle, East
		Snake River spring/summer-run ESU (T[1])	West, Middle, East
		Snake River fall-run ESU (T)	West, Middle, East
	Sockeye Salmon (*Oncorhynchus nerka*)	Snake River ESU (E)	West, Middle, East
	Steelhead (*Oncorhynchus mykiss*)	Middle Columbia River DPS[1] (T)	West, Middle, East
		Snake River Basin DPS (T)	West, Middle, East
		Upper Columbia River DPS (T)	West, Middle, East
	Bull Trout (*Salvelinus confluentus*)	Columbia River DPS (T)	West, Middle, East
	Coho Salmon (*Oncorhynchus kisutch*)	Lower Columbia River ESU[2] (T)	West, Middle, East
	Pacific lamprey (*Lampetra tridentata*)	None	West, Middle, East
	River lamprey (*Lampetra ayresi*)	None	West, Middle, East
	Leopard dace (*Rhinichthys falcatus*)	None	West, Middle, East
	Mountain sucker (*Catostomus platyrhynchus*)	None	West, Middle, East
Fifteen Mile Creek (OR)	Steelhead (*Oncorhynchus mykiss*)	Middle Columbia River DPS (T)	West, Middle, East
	Chinook Salmon (*Oncorhynchus tshawytscha*)	None	West, Middle, East
Swale Creek (WA)	Steelhead (*Oncorhynchus mykiss*)	Middle Columbia River DPS (T)	West
Little Klickitat River (WA)	Steelhead (*Oncorhynchus mykiss*)	Middle Columbia River DPS (T)	West, Middle, East

[1] Federally protected species designated as threatened (T) or endangered (E) under the ESA. Unit refers to evolutionarily significant units (ESU), and segment refers to distinct population segments (DPS).

[2] There is some uncertainty as to whether the Coho lower Columbia River ESU occurs past Hood River; ORNHIC and StreamNet data show coho upstream of the John Day River, but no ESU has been designated.

Swale Creek. Swale Creek is an ephemeral stream with isolated pools of water present year round. During the summer, streamflow typically diminishes to less than 0.5 cfs, and temperatures may exceed 70˚F, effectively reducing the available habitat and precluding migration of juvenile salmonids through the area. Adult steelhead are found in Swale Creek to a point about 0.5 mile downstream of the intersection with the West Alternative (WDFW 2009), which is part of the creek designated as steelhead critical habitat. Juvenile steelhead could occur in this area, but would likely move out of the system before streamflows decline in summer months. Riparian vegetation where the West Alternative crosses Swale Creek includes deciduous trees, shrubs, grasses, and forbs. This riparian area provides shade and woody debris.

Neither the Middle nor East alternatives cross critical habitat for steelhead in Swale Creek. These two alternatives cross Swale Creek at different points, but in both locations the channel is shallow and does not appear to contain suitable habitat for steelhead. In addition, the riparian vegetation at these crossings is limited to small shrubs and agricultural crops, which do not contribute much value to fish habitat in Swale Creek.

Swale Creek is in Water Resource Inventory Area (WRIA) 30 in Klickitat County. Swale Creek discharges into the Klickitat River at river mile 17.2.

Little Klickitat River. The portion of the Little Klickitat River crossed by the action alternatives is designated as critical habitat for the Middle Columbia River steelhead DPS. The action alternatives cross the river at different locations; near line miles W19.5, M20, and E23. Chinook and coho salmon occur in the lower 0.25 mile of the Little Klickitat River, but this is about 5 miles downstream (or west) of the West Alternative (WDFW 2009). Riparian vegetation is Oregon white oak and other deciduous trees and shrubs as well as ponderosa pine.

The Little Klickitat River is in Water Resource Inventory Area (WRIA) 30 in Klickitat County and is a tributary to the Klickitat River. The Little Klickitat River is 303(d) listed under the Clean Water Act as a Category 5 water for exceedence of water temperature criteria (Ecology 2009a) (see Chapter 5 for more information about the Clean Water Act).

3.7.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Fish would be impacted if the water quality and habitat in which they live were changed. Impacts could be due to erosion, pollution, stream alterations, and riparian vegetation removal. Erosion could occur as a result of rain runoff from ground disturbed by construction activities, which could transport loose sediment to surface waters and subsequently increase turbidity and sedimentation of the river or stream bottom. Pollution could result from accidental oil or gas spills from construction vehicles. Removing riparian vegetation would remove the benefits it provides for fish, such as providing shade and decreasing water temperatures, filtering water and reducing turbidity and contaminants, increasing habitat complexity through large woody debris input to the stream, and helping stabilize the stream banks and controlling erosion.

None of the action alternatives would directly alter fish habitat or require culverts in fish-bearing streams. All tree removal would be upland from fish-bearing stream edges and would not impact shading on fish habitat ~~water surfaces~~.

Tower and road construction could result in erosion. Whether sediments reach fish habitat would be a function of the amount of soil disturbed, the terrain, how close construction sites are to water bodies and drainages, and mitigation measures used to limit off-site soil movement.

Some impacts on fish and fish habitat could result from new access roads that would cross smaller, intermittent streams, some of which could support fish seasonally, but most of which are dry for most of the year (based on stream typing from Washington's Interim Water Typing System [WAC 222-16-031]). None of these seasonal streams support sensitive fish species. Culverts needed within these intermittent streams would be designed (sized appropriately) and installed to ensure unobstructed water passage to minimize potential downstream effects to fish.

Detonating explosives adjacent to fish habitat could cause disturbance, injury, or mortality to fish, or salmonid eggs. To avoid impacts on fish, blasting should be avoided within 200 feet of fish-bearing streams.

Even low concentrations of petroleum entering streams can have toxic effects to fish and other aquatic organisms. BPA would require that stored fuel and vehicle refueling be done away from streams and drainages (see Section 3.7.3 Mitigation Measures). Other than unanticipated spills near water bodies, ***no*** impacts would occur on aquatic organisms from petroleum products.

Operations and line maintenance could require the periodic removal of tree saplings and possible herbicide use for saplings and noxious weeds, but only in upland areas. Herbicides may be toxic to fish and other aquatic organisms, depending on type used and concentration, should they enter streams (Tu et al. 2001). They can also reduce stream primary production by killing aquatic plants. Generally impacts on streams occur from overspray or drift (aerial applications) and additionally from leaching through soils into groundwater or by surface/subsurface runoff. BPA would use an integrated vegetation management strategy (BPA 2000a) to control vegetation along the transmission line corridor that may involve a number of different methods, including manual (hand-pulling, clippers, chainsaws), mechanical (rollerchoppers, brush-hogs), biological (insects or fungus for attacking noxious weeds), and the application of herbicides. If used, herbicide application would be limited to hand spraying at least 100 feet from all fish-bearing stream channels and only EPA-approved herbicides that are non-toxic to aquatic resources would be used (see Section 3.7.3 Mitigation Measures). Overall, there would be ***no-to-low*** potential operation and maintenance impacts on fish.

Big Eddy Substation is about 0.5 mile west of Fifteenmile Creek and about 1 mile south of the Columbia River. Because of the distance and limited construction area within the existing fenced electrical yard, Big Eddy Substation upgrades would have ***no*** impacts on fish or fish habitat.

West Alternative

The West Alternative would place about ~~25~~ 64 new culverts in dry washes or seasonal, non–fish-bearing tributary streams (see Section 3.5 Water Resources and Wetlands). With proper sizing and erosion control measures, sedimentation would be limited and water flow would be maintained such that there would be no impacts on possible downstream fish-bearing streams.

The West Alternative would cross four fish-bearing streams, but towers would be placed well away from the water's edge (see Table 3-25), no culverts would be required, and no riparian trees would be removed. Of the four fish-bearing streams crossed, Fifteenmile Creek, the Columbia River, and the Little Klickitat River have special-status fish species present in the areas of the river crossings. Any construction work would be well away from these streams and there would be ***no*** impacts on these special-status fish. Overall, there would be ***no-to-low*** potential impacts on fish from the West Alternative.

Table 3-25. Approximate Tower Distances from Intersections with Fish-Bearing Streams

Stream Name	Alternative	Approximate Distance in feet from North (N)[1] and South (S)[1] Sides of the Stream
Fifteen Mile Creek	West	1015 (N) and 1424 (S)
Fifteen Mile Creek	Middle, East (1st crossing)	1015 (N) and 692 (S)
Fifteen Mile Creek	Middle, East (2nd crossing)	1250 (N) and 926 (S)
Fifteen Mile Creek	Middle, East (3rd crossing)	1279 (N) and 680 (S)
Columbia River	West	300 (N) and 800 (S)
Columbia River	Middle, East	475 (N) and 926 (S)
Swale Creek	West	700 (N) and 400 (S)
Swale Creek	Middle	900 (N) and 500 (S)
Swale Creek	East	700 (N) and 100 (S)
Little Klickitat River	West	323 (N) and 526 (S)
Little Klickitat River	Middle	366 (N) and 850 (S)
Little Klickitat River	East	558 (N) and 879 (S)

[1] N = north; S = south

Middle Alternative

The Middle Alternative would place about ~~28~~ 50 new culverts in dry washes or seasonal, non–fish-bearing tributary streams (see Section 3.5 Water Resources and Wetlands). With proper sizing and erosion control measures, sedimentation would be limited and water flow would be maintained so there would be no impacts on possible downstream fish-bearing streams.

The Middle Alternative would cross the four fish-bearing streams, but towers would be placed well away from the water's edge (see Table 3-25), no culverts would be required, and no riparian trees would be removed. Of the four fish-bearing streams crossed, Fifteenmile Creek, the Columbia River, and the Little Klickitat River have special-status fish species present in the areas of the river crossings. An existing BPA access road along Fifteenmile Creek would require upgrading; to ensure sediment would not reach the creek, mitigation measures would be required. Other construction work would be well away from these streams and there would be ***no*** impacts on special-status fish present in these water bodies. Overall, there would be ***no-to-low*** potential impacts on fish due to the Middle Alternative.

East Alternative

The East Alternative would place about ~~30~~ 62 new culverts in dry washes or seasonal, non–fish-bearing tributary streams (see Section 3.5 Water Resources and Wetlands). With proper sizing and erosion control measures, sedimentation would be limited and water flow would be maintained so there would be ***no*** impacts on possible downstream fish-bearing streams.

As with the other alternatives, the East Alternative would cross the four fish-bearing streams, but towers would be placed well away from the water's edge (see Table 3-25), no culverts would be required on these streams, and no riparian trees would be removed. Of the four fish-bearing streams crossed, Fifteenmile Creek, the Columbia River, and the Little Klickitat River have special-status fish species present in the areas of the river crossings. As with the Middle Alternative, an existing BPA access road along Fifteenmile Creek would require upgrading; to ensure sediment would not reach the creek mitigation measures would be required. Other construction work would be well away from these streams and there would be ***no*** impacts on special-status fish present in these water bodies. Overall, there would be ***no-to-low*** potential impacts on fish due to the East Alternative.

Knight Substation Options

No fish-bearing streams are located in the vicinity of Knight Substation Sites 1 and 2 or along the proposed substation access road or where counterpoise would be installed. The closest water body to the Knight Substation sites is the intermittent Spring Creek about 1 mile to the south. A mapped drainage to Blockhouse Creek runs through Site 1, but no sign of the drainage was found during field surveys and ~~although a dry wash that is a tributary to Blockhouse Creek is located nearby. Blockhouse Creek is about 4 miles and 1 mile downstream of the Sites 1 and 2, respectively, and~~ no fish occur in Blockhouse Creek in the vicinity of the confluence with the dry wash.

Because water bodies are far from the sites and the terrain is relatively flat, with implementation of appropriate erosion control measures, construction work at the Knight Substation sites or along the Wautoma-Ostrander line would have ***no*** impact on fish or fish habitat.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on fish would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential fish impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.7.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on fish. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Minimize the project ground disturbance footprint, reseed disturbed areas, and install culverts during the dry season (see mitigation measures for Section 3.3 Vegetation and 3.5 Water Resources and Wetlands) to limit sedimentation affecting fish habitat.
- Prepare and implement a SWPPP and a Spill Prevention and Contingency Plan (see mitigation measures for Section 3.4 Geology and Soils and 3.5 Water Resources and Wetlands) to protect fish habitats.
- Avoid blasting within 200 feet of fish-bearing streams.

3.7.4 Unavoidable Impacts Remaining after Mitigation

No unavoidable impacts on fish or fish habitat have been identified associated with any of the alternatives.

3.7.5 No Action Alternative

The No Action Alternative would have no impact on fish because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.8 Cultural Resources

This section describes the cultural resources in and near the proposed project and how the project alternatives could affect these resources.

3.8.1 Affected Environment

Cultural resources are nonrenewable resources associated with human occupation or activity related to history, architecture, archaeology, engineering, and culture. Historic properties are a subset of cultural resources that are eligible for inclusion in the National Register of Historic Places (NRHP). They are defined as any district, site, building, structure, artifact, ruin, object, work of art, or natural feature important in human history at the national, state, or local level. Historic properties include both historic and pre-contact resources. Pre-contact resources are those that date to before direct or indirect contact between Euro-Americans and Native Americans.

Although the Action Alternatives vary slightly in length and location, they share several cultural resource elements. Each alternative begins in Oregon on an upland east of The Dalles, crosses the Columbia River, climbs over the Columbia Hills, and then extends across an arid plain in Washington (Washington Plateau). The Oregon portion of each alternative is small compared with the portion in Washington.

The probability of encountering cultural resources along any of the alternatives varies by the landforms crossed (resources are more common in flat areas and areas near water sources). Existing or potential cultural resources are not likely equally distributed on all alternatives because of specific landforms and water sources nearby. For example, relatively flat land next to a river with historic fish runs, or near a natural travel corridor where historic Indian place names are found, would have a greater likelihood of pre-contact cultural resources than a steep slope and upland away from the river. Sites next to the river are more likely to represent pre-contact villages and intense fishing activity, while uplands are more likely to represent pre-contact, scattered plant-gathering and hunting areas and temporary campsites. Post-contact sites are also more likely along the river and could include fishing and settlement sites, while those in the uplands are more likely to be associated with farming.

Known existing pre-contact and historic sites, buildings and structures were researched in the area. ~~Accessible areas of each alternative were also walked to determine if any obvious sites or potential sites were along the alternatives. However, many areas were inaccessible. Total recorded and new sites within 1 mile of each alternative are in Table 3-26.~~ An initial pedestrian inventory was conducted along each alternative to identify cultural resources in the vicinity. Although a majority of each alternative was surveyed, several areas were not surveyed due to lack of landowner permission-to-enter-property, as well as an incomplete identification of potential access roads. Additional pedestrian inventories are being conducted to assess 100 percent of the proposed project area along with any access roads and staging areas prior to implementation.

Although less than 100 percent of each alternative was inventoried prior to publication of the EIS, the inventory was sufficient to determine the relative effect of each potential alterative under consideration. Total recorded and new sites within 1 mile of each alternative are in Table 3-26.

Table 3-26. Identified Cultural Resource Sites by Action Alternative

Cultural Resource Sites	West Alternative	Middle Alternative	East Alternative
Existing Sites	143	123	113
New Sites	14	~~10~~ 15	~~10~~ 16
Total	157	~~133~~ 138	~~123~~ 129

Note: About 62 percent of the West Alternative, 52 percent of the Middle Alternative, and ~~58~~ 71 percent of the East Alternative were inventoried for cultural resources ~~(i.e., where BPA obtained landowner permission to conduct fieldwork~~).

BPA has asked potentially affected Tribes to identify concerns about properties of religious and cultural significance (locations that may not contain cultural materials, but have cultural importance for their association with cultural traditions) within the project area.

In addition, many of BPA's existing lines in the project vicinity could be considered for eligibility for the NRHP because of their age and because they are part of BPA's master transmission grid (though many have been substantially altered over the years). Big Eddy Substation could be eligible for inclusion in the NRHP as part of an historic district.

The Columbia River and the Columbia River Gorge

The southern portion of the project area lies in a well-documented ethnohistoric region along the Columbia River between The Dalles to the west and the former Celilo Falls to the east (Murdock 1980). The Columbia River's once-prominent features in this area—including rapids, eddies and waterfalls—provided an excellent fishery and terraces along the river afforded a place for people to fish, live and trade. The area's oldest pre-contact fishery site, dating back nearly 10,000 years, was found at Fivemile Rapids (now inundated) near The Dalles (Caldwell 1956).

Native inhabitants of this area lived in villages on both sides of the river. Although many of these sites were inundated by Lake Celilo after construction of The Dalles Dam, the surrounding areas were traditionally used by local peoples for subsistence activities and cultural practices (Spier and Sapir 1930). Populations of specific villages would ebb and flow seasonally, as residents moved between winter and summer dwellings and traveled inland in search of roots and other plant materials, and as inland tribes came to fish and trade. The result was fluctuating groups of various Native American bands that interacted closely throughout the year and across the landscape (Boyd and Hajda 1987; Wernz et. al. 2003; Biddle 1926).

About 200 years ago, Europeans and Euro-Americans began to arrive. The earliest documented Euro-Americans to travel through the area were members of the Lewis and Clark Expedition in 1805. The journals of the Lewis and Clark expedition demonstrate that the expedition camped in three locations along the river in the project vicinity. These campsites were likely inundated following completion of The Dalles Dam. Many settlers followed, especially as the Oregon Trail—which transects the area—became established. Construction of railroads and other infrastructure, planting of fruit orchards and cultivated crops, and ranching heavily impacted native subsistence and trade networks (Schalk 1980).

In 1855, both the Warm Springs Reservation and Yakama Reservation were created and Tribes were forced to move from their traditional territories. Oregon Tribes in the area eventually became part of the Confederated Tribes of the Warm Springs Reservation. In Washington, the local Wishram Tribe eventually joined more than a dozen others to become the Confederated Tribes and Bands of the Yakama Nation.

By 1861, The Dalles-Celilo region was "thickly settled (by Euro-Americans) along Threemile, Fivemile, Eightmile and Fifteenmile creeks" in Oregon (L. Carter. 1861). By the early 1900s, railroad-building crew camps and settlements were appearing along both sides of the river, including the current location of Wishram. The region also had military importance as a strategic river-access control point; Fort Dalles was established there around 1850 to protect residents.

Pre-Contact and Historic Sites

Many sites and site types are present within or near the project alternatives. These sites include pre-contact villages, camps, fishing stations, rock images (petroglyphs and pictographs), burial areas, rock cairns and alignments, pre-contact lithic scatters, historic rock alignments, and historic trash scatters.

Most previously recorded sites are close to the Columbia River. Relative locations of the previously recorded sites reflect the cultural significance of Celilo Falls and the surrounding area, the Columbia River, the Columbia River Gorge and other water bodies.

The Celilo Bridge, located just east of the Middle and East alternatives' Columbia River crossings, was built in 1912 and was the only river crossing between Portland and Pasco, Washington. The bridge is historically significant due to its engineering and importance in developing the railroad system in the Pacific Northwest. The Maryhill Museum of Fine Art, located about one-third southeast of the East Alternative (line mile E14),was likely placed on the NRHP due to its architectural significance.

Sites also include properties of religious and cultural significance to Indian Tribes. These sites may possibly include pre-contact site as well as sites that have been historically used by Tribal members. Locations that have known Indian place names can also be considered culturally significant sites because the place names act as connections between Tribal peoples and the landscape.

The Homesteads of the Dalles Mountain Ranch Historic District consists of approximately 2,450 acres located on the southern slope of the Columbia Hills on property belonging to the Washington State Parks and Recreation Commission. This historic district consists of remnants of historic ranches from the late 19th and early 20th centuries. The historic district is eligible under criterion A of the NRHP (36 CFR 60), due to its association with events and patterns important in our history, specifically homesteading and ranching.

Columbia Hills State Park which includes the previously mentioned Dalles Mountain Ranch as well as the Horsethief Lake area, is within the viewshed of at least one of the alternatives. Numerous cultural sites are within the park boundary as well as the surrounding area.

Oregon and Washington Uplands

Fewer sites are found in the upland portion of the action alternatives. However, this may be somewhat skewed by the lesser amount of past investigations to identify sites in this area relative to the Columbia River Gorge. Pre-contact cultural resource sites on the Oregon and Washington uplands show evidence of procurement of upland resources and, in some cases, religious or spiritual activities. All sites reflect seasonal activities. Sites include pre-contact lithic scatters, rock cairns and rock alignments, rock images (pictographs and petroglyphs), and camp sites.

Historical sites within the upland areas reflect homesteading, agricultural-, and transportation-related themes and include historic railroads, farmsteads, trash scatters, and a hydroelectric facility.

BPA transmission facilities that were constructed prior to 1974 are potentially historically significant. The entire Big Eddy Substation facility is likely eligible for inclusion in the NRHP as part of an historic district, however, the 500-kV yard affected by the project is newer. The transmission lines that would be affected by the project that were built prior to 1974 include the Chenoweth-Goldendale 115-kV line, Harvalum-Big Eddy 230-kV line, McNary-Ross 345-kV line, and North Bonneville-Midway 230-kV line. The Wautoma-Ostrander 500-kV line was built at a later date and is not historically significant.

3.8.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Because the project transects areas significant to Columbia River Tribes and because the general area has a rich history, there is the potential for disturbing known cultural sites. Project construction (towers, counterpoise installation, pulling and tensioning sites, access roads) could also damage or destroy unidentified cultural resources. Besides direct physical impacts, the proposed project could introduce visual elements that alter the character or setting of sensitive cultural and spiritual resource sites. Increased access to cultural resources due to project construction, operation, and maintenance could increase vandalism and looting.

In addition, if existing substations, transmission lines and towers eligible for listing on the NRHP are replaced as part of the project, there could be an adverse effect due to the historic nature of some of BPA's infrastructure. ~~However, proposed work at Big Eddy Substation would occur within the existing, disturbed electrical yard and would have no adverse impact to the substation's eligibility for the NRHP.~~ Although the entire Big Eddy Substation facility is likely eligible for inclusion in the NRHP as part of an historic district, the 500-kV yard where the additions would take place is newer and additional electrical equipment would not affect eligibility of the district as a whole. Because work at the substation would occur within the existing electrical yard and control house, a previously disturbed area, there would be ***no*** impact on cultural resources.

Work at Knight Substation would involve line adjustments to the North Bonneville-Midway line where it would loop into the proposed substation. Impacts to the North Bonneville-Midway line would be ***low***, because the portion of the line that would be reconfigured is small (two towers) relative to the entire length of the line.

BPA attempts to avoid known sites whenever possible and uses trained cultural resource monitors on large-scale projects to ensure unidentified sites are not inadvertently impacted. Sites have been and would continue to be identified by using a variety of methods, including archaeology, oral history, and history. Archaeological sites would be delineated both by surface observations and subsurface testing before construction to avoid physically impacting sites during construction. Appropriate mitigation procedures would be in place to stop construction activities and determine protective measures (e.g., avoidance) if artifacts are found (see Section 3.8.3 Mitigation Measures). Impacts should not occur to unknown sites with these procedures in place.

Operation and maintenance of the proposed transmission line and substation would not impact cultural resources. Towers and access roads would be sited to avoid sensitive areas, so maintenance of towers or access roads would not affect known resources. Vegetation within the right-of-way is sparse, so it is not expected that any ground-disturbing mechanical vegetation clearing would be required. If any maintenance activities need to occur outside of tower locations or off access roads, a review of sensitive areas would be required to avoid impacting resources.

West Alternative

Because the Action Alternatives could have both physical and visual impacts on cultural resources, resources are discussed in two ways: those that could be located within 1 mile of each alternative and those that could be located in the right-of-way.

The West Alternative would pass within 1 mile of 157 separate cultural resource sites (see Table 3-26). Of these, 143 sites were previously recorded and 14 were recorded during the cultural resources survey for the alternative. These sites include the following types of pre-contact sites: cairns, isolated artifacts and scatters of artifacts, camps, village sites, burial locations, and rock images (pictographs and petroglyphs). They also include the following types of historic sites: rock alignments, trails, roads, refuse scatters, shack locations, a fishwheel location, and a hydroelectric facility. Most of these sites are far enough away from the right-of-way to avoid being disturbed physically.

The alternative would be near Columbia Hills State Park, and some new towers could be visible from this area. The alternative also crosses through Homesteads of the Dalles Mountain Ranch Historic District. Although a BPA transmission line currently traverses the historic district, the line consists of wood pole structures rather than the highly visible, new steel towers that would be necessary for the current project.

Eleven sites are within the West Alternative's potential right-of-way. These sites include scattered and isolated pre-contact artifacts, a pre-contact rock alignment, a pre-contact cairn, and an historic rock alignment.

The West Alternative would avoid all but one of the larger sites and all burial areas. Surveys completed before construction would help further identify sites that may be impacted if they could not be avoided. However, the West Alternative crosses or spans landforms and water bodies where there is a probability of encountering unknown resources during construction. Overall, the West Alternative's potential to impact cultural resources would be ***moderate***.

For options that would remove the existing Chenoweth-Goldendale line, impacts to the existing historic value of the transmission line would be ***high*** due to the large portion of the line removed relative to its entire length.

Middle Alternative

The Middle Alternative would pass within 1 mile of ~~133~~ 138 cultural resource sites (see Table 3-26). Of those, 123 were previously recorded and ~~10~~ 15 ~~were~~ have been recorded during ~~a recent cultural resources survey~~ the ongoing cultural resources inventory. These sites mainly consist of pictographs and petroglyphs, burial locations, scatters of lithic artifacts and isolated pre-contact artifacts, pre-contact and historic rock alignments and cairns, an historic fishwheel location, and historic trash dumps. Other sites consist of historic fence jacks and a pre-contact lithic quarry. These sites are far enough ~~away~~ from the right-of-way to avoid being disturbed physically.

~~Nine~~ Fourteen of the sites are within the Middle Alternative's potential right-of-way. These sites include ~~three~~ four scatters of historic artifacts, two pre-contact isolated artifacts, two pre-contact rock alignments, an historic railroad grade, a site containing historic and pre-contact artifacts, an historic rock alignment, and a large site consisting of pre-contact artifacts, pictographs, and burial sites. The Middle Alternative crosses over an Oregon Trail segment at two places due to a 90-degree bend where the line crosses the Columbia River. The trail route was not identified during fieldwork but has been identified from historical sources.

The most significant cultural site along the Middle Alternative's proposed right-of-way is separated by a vertical distance that would make it unlikely to be impacted by the line. Other sites within the right-of-way would be avoided during construction. While the Middle Alternative crosses or spans some landforms and water bodies where there is a probability of encountering unknown resources during construction, overall its potential to impact cultural resources would be ***low.***

For options that would include the removal of about 9 miles of the Harvalum-Big Eddy line, impacts on the existing historic value of the transmission line would be impacted due to the portion of the line removed relative to its entire length. Overall impacts on historic transmission line infrastructure would be ***moderate***.

East Alternative

The East Alternative would pass within 1 mile of ~~123~~ 129 cultural resource sites (see Table 3-26). Of those, 113 were previously recorded and ~~10~~ 16 ~~were~~ have been recorded during the ~~recent~~ ongoing cultural resources ~~survey~~ inventory. Sites mainly consist of pictographs and petroglyphs, burial locations, scatters of lithic artifacts and isolated pre-contact artifacts, pre-contact and historic rock alignments and cairns, an historic fishwheel location, and historic trash dumps. Other sites include historic fence jacks and a pre-contact lithic quarry.

~~Ten~~ Sixteen sites are within the East Alternative's potential right-of-way or routes of proposed access roads. These ~~sites~~ include ~~two~~ four scatters of historic artifacts, two sites containing pre-contact and historic artifacts, two pre-contact rock alignments, an historic railroad grade, pre-contact lithic artifact scatters, a pre-contact burial, an historic rock alignment, and a large site ~~consisting of~~ containing pre-contact artifacts, pictographs, and burial sites. Like the Middle Alternative, the East Alternative crosses over an Oregon Trail segment at two points. The trail route was not identified during fieldwork but has been identified from historical sources. The East Alternative straddles both identified segments and there would be no physical impact to either segment.

The most significant cultural site along the East Alternative's proposed right-of-way is separated by a vertical distance that would make it unlikely to be impacted by the line. Other sites within the right-of-way would be avoided during construction. However, the East Alternative crosses or spans some landforms and water bodies where there is a probability of encountering unknown resources during construction. Overall, the East Alternative's potential to impact cultural resources would be ***low.***

However, options that would include the removal of about 9 miles of the Harvalum-Big Eddy Line would have the same impacts on this line as described for the Middle Alternative. In addition, options for the East Alternative that include the removal of the McNary-Ross transmission line would impact that line. However, the McNary-Ross line is relatively long and the removal of 5 miles of the line would have a minimal impact on the historic significance of the line. Overall impacts on historic transmission line infrastructure would be ***moderate***.

~~*Big Eddy Substation*~~

~~Although the overall Big Eddy Substation is likely eligible for inclusion in the National Register of Historic Places as part of an historic district, the 500-kV yard where the additions would take place is newer and additional electrical equipment would not affect eligibility of the district as a whole. Because work at the substation would occur within the existing electrical yard and control house, a previously disturbed area, there would be ***no*** impact on cultural resources.~~

Knight Substation Options

There are no known cultural resource sites near either proposed Knight Substation sites or along the proposed substation access road or Wautoma-Ostrander counterpoise work. However, only limited cultural resource surveys have been conducted in the vicinity of either location in the past. BPA recently conducted limited archaeological testing of portions of Site 1; no cultural resources were identified.

Because the substation sites are ~~would be~~ located where there is a low likelihood of cultural resources, there would be ***no-to-low*** potential impact**.**

The Wautoma-Ostrander line, which would require overhead groundwire and counterpoise on either side of the Knight Substation, is not considered historically significant so changes would not have an impact.

If an unknown site is discovered during construction, work would be stopped and mitigation measures implemented.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on cultural resources would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential cultural resource impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.8.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts by the Action Alternatives on cultural resources. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Locate transmission line towers and access roads to avoid cultural resources, where possible.
- Use existing access roads where possible to limit possibility of new disturbances.
- Consult with the Washington DAHP or Oregon State Historic Preservation Office (SHPO), as applicable, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Nation, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation, state agencies (if sites found on state lands), and the USFS (if sites found on USFS land or within the National Scenic Area) regarding NRHP eligibility of cultural resources.
- Develop an Inadvertent Discovery Plan that details crew member responsibilities for reporting in the event of a discovery during construction. This plan should include directives to stop work immediately and notify local law enforcement officials (if appropriate), appropriate BPA personnel, Tribes, USFS (if appropriate) and the Washington DAHP or Oregon SHPO if cultural resources are discovered.
- Ensure cultural resource monitors are present during construction in the area of known cultural resources to monitor sites during excavation and to prevent unauthorized collection of cultural materials.
- Prepare a mitigation plan to protect sites if final placement of project elements results in unavoidable adverse impacts to a significant cultural resource.

3.8.4 Unavoidable Impacts Remaining after Mitigation

Some effects of the project may not be physical or direct in nature. The new transmission line could impact the viewshed of nearby sites or culturally significant areas. While these effects could be partially mitigated by various construction methods, including double-circuiting, they cannot be eliminated completely. BPA is still conducting studies and consulting with appropriate entities identify resources and the effects that could result from each alternative.

3.8.5 No Action Alternative

The No Action Alternative would have no impact on cultural resources in the project area because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.9 Socioeconomics

This section describes social, economic, and public facility resources and how the project alternatives could affect these resources.

3.9.1 Affected Environment

Population

The proposed project area is located in Wasco and Klickitat counties. All action alternatives originate near The Dalles, which is the county seat for Wasco County and the largest city in the area with a population of about 13,447 (City-Data 2007). All action alternatives end at Knight Substation about 4 miles from Goldendale, Washington, which has a population of about 3,742 (City-Data 2009). The Middle and East alternatives also come close to the residential communities of Wishram and Centerville, Washington, with respective populations of about 324 and 120 (U.S. Census Bureau 2000a).

The population densities for both Klickitat and Wasco counties as of 2007 were both about 10 people per square mile (City-Data 2007a), which is low compared to more populated areas of western Oregon and Washington. The 2007 population estimate for Klickitat County was 20,377, an increase of 6.3 percent from 2000, which is less than the overall state increase of 11.1 percent (U.S. Census Bureau 2007a). The 2007 estimated county population for Wasco County was 23,593, a decrease of 0.8 percent from 2000, which is less than the overall state average population increase of 7.8 percent (U.S. Census Bureau 2007b). As of 2007, Klickitat County had a more rural population than Wasco County. In Klickitat County, 59 percent of people lived in rural settings compared to 34 percent in Wasco County (City-Data 2007).

Minority and Low Income Populations

Federal agencies are required to consider impacts on minority and low-income populations (see Section 5.19 Environmental Justice ~~Chapter 5 Consultation, Review, and Permit Requirements~~). Demographic data at the county level is further partitioned into ~~section~~ census tracts and then block groups, which are defined with local input and are designed to represent relatively homogenous neighborhoods. The action alternatives cross four census tracts and four or five block groups, depending on the alternative (see Map K-1 in Appendix K). The proportions of minority populations in Klickitat and Wasco counties are similar to those in Washington and Oregon as a whole (see Table K-1 in Appendix K) (U.S. Census Bureau 2000a, 2000d). Minority populations (including Hispanic) are proportionately lower ~~Minority populations~~ in three of the five ~~census survey areas~~ block groups intersected by the action alternatives ~~are lower~~ than in the county and state ~~averages~~. The remaining two block groups, crossed by all action alternatives, have higher proportions of a minority group than at the county or state level. Census tract 9502, block group 1 is in the central portion of the project area in Washington ~~in Oregon (crossed by all action alternatives)~~ and has higher proportions of people of American Indian descent (9.5 percent) than ~~the average~~ in the combined populations of Klickitat and Wasco counties (3.7 percent) ~~Klickitat County~~ or Washington state (1.6 percent). ~~Minority~~ Census tract 9707, block group 1 is located ~~populations~~ in the southern corner ~~portion~~ of the project area in Oregon and contains Big Eddy Substation. It ~~(crossed briefly by all action alternatives) have~~ has a higher proportion of people of Hispanic descent at 15.5 percent than both ~~Klickitat~~ Wasco County (9.3 percent) and the state of Oregon (8.0 percent) ~~Washington~~. ~~However, in all of these cases, minority populations make up no more than 17 percent of the total population in the block group~~.

Klickitat County residents with income levels reported below the poverty level in 2000 accounted for about 4 percent of the population, compared to a Washington state average of about 7 percent. Wasco County residents with income levels reported below the poverty level accounted for about 3 percent of the population, compared to an Oregon state average of 8 percent. In the combined populations of Klickitat and Wasco counties, ~~project area~~, populations below the poverty level (3.4 percent) were ~~higher~~ lower than both ~~county~~ state averages (U.S. Census Bureau 2000a, 2000b, and 2000c). ~~The proportion of the populations with an income below the poverty level was less than 20 percent.~~

Local Economy

Agriculture is a dominant force in the local economy for both Wasco and Klickitat counties, generating about $90 million in commodity value in Wasco County and about $57 million in Klickitat County in 2007 (NASS 2007). Lumber production; health care; manufacturing; professional, technical, and scientific services; arts, entertainment, and recreation; electrical power generation; mining, accommodation and food services; and retail also play major roles in the local economy, with retail generating the greatest revenue listed at about $382 million for Wasco County and $66 million for Klickitat County (U.S. Census Bureau 2007a, 2007b). For instance, Impact Analysis for Planning (IMPLAN)[4] estimates that 88 percent of purchases from the "other nonresidential construction" sector are supplied by sources in Klickitat and Wasco counties, and 12 percent are imported from other counties. Formerly, aluminum production was economically important, but a global price drop in aluminum forced several local smelters to close. Another important element of the local economy comes from tourism. Recreation resources supporting tourism are discussed in greater detail in Section 3.1 Land Use and Recreation.

Real estate has been experiencing some recent changes, particularly in the northern portion of the area along the Middle and West alternatives, and near Knight Substation Sites 1 and 2, where parcels are being sold as 20-acre rural residential lots, many with a view of Mt. Adams. While this area remains mostly undeveloped, home sites are currently for sale, and the number of residences may increase over the next several years.

Wind energy is rapidly developing within the region and contributes to the local economy through lease payments to landowners, jobs associated with each wind energy facility, and tax payments to the county and state. Klickitat County has designated an area that includes most of the project area as part of its Energy Overlay Zone, which promotes construction of wind power generation and associated transmission infrastructure. Several wind farms have been built near the action alternatives and several others are planned. The largest wind power project in the area is Windy Flats, which will eventually include up to 95 wind turbines and is crossed by the East Alternative (line mile E15–16) (Hardke 2009). The Windy Flats Westerly Expansion Area is in the southern portion of the project area abutting the Columbia Hills between the West and Middle alternatives. This area is proposed for wind farm expansion in the near future (Hardke 2009).

Taxes

The retail sales tax is Washington's principal single source of tax revenue. Together with the related use tax, over $5.8 billion in state revenue was realized during fiscal year 2002, the latest information available. This represented nearly 50 percent of state taxes deposited in the general fund during that

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[4] IMPLAN is an input-output model commonly used in this type of application. The IMPLAN system adjusts national level data to fit the economic composition and estimated trade balance of a chosen region and can be used to construct county models. The multipliers used in this analysis are based on IMPLAN data for Klickitat and Wasco counties (Minnesota IMPLAN Group 2007).

year (Washington State Department of Revenue, October 2003). The state use tax rate is 6.5 percent and the use tax rate for unincorporated portions of Klickitat County is 0.5 percent, for a total use tax rate of 7 percent (Washington Department of Revenue 2010). Federal agencies such as BPA are exempt from paying sales tax on goods purchased in Washington for in-state use. However, goods purchased by BPA outside of Washington for use in Washington are subject to the state use tax, which has the same local rates as the sales tax. Oregon has no sales or use tax.

Property taxes help support local government services such as police, fire and schools, and are levied on real property (land and improvements) unless either the land or improvements are tax exempt. The local property tax, which varies by local taxing district, is assessed at a rate around $3 per thousand dollars of evaluation. BPA, a federal agency, is exempt from this tax on land that it owns in fee (RCW 84.36.010).

Employment

In 2000, the unemployment rates in Klickitat and Wasco counties were 6.3 and 4.8 percent, respectively (U.S. Census Bureau 2000b, 2000c; City-Data 2007). With the recent national economic recession, unemployment rates for both counties have increased to about 9 and 10 percent, respectively, in 2009 (U.S. Census Bureau 2009). These are similar to the 2009 unemployment rates in their respective states, with Washington at about 9 percent, and Oregon at about 12 percent.

Per capita income is a widely accepted statistical indicator of the economic well being of an area. The per capita income for the project area was lower than both the state and national averages in 2000. The national per capita income for the United States was $21,587. The per capita incomes for the state of Washington and Klickitat County for the same year were $22,973 and $16,502, respectively. The per capita incomes for Oregon and Wasco County were $20,940 and $17,195, respectively (U.S. Census Bureau 2000b, 2000c).

The three sectors employing the most people in both counties in 2000 were the agriculture, forestry, fishing and hunting, and mining sector; the retail sector; and the manufacturing sector. The sector accounting for the most employment in Klickitat County was the agriculture, forestry, fishing and hunting, and mining sector at about 13 percent, while in Wasco County the top sector was retail trade at about 16 percent (U.S. Census Bureau 2000c).

State Trust Lands

Several parcels of publically owned property along the action alternatives are Washington State Trust Lands (State Trust Lands) managed by DNR. State Trust Lands are held in trust by the state and leased to private farmers either on a cash rent or sharecrop basis (McKay 2010), or to a wind developer (i.e., Windy Flats). Of the State Trust Lands crossed, the West Alternative crosses range land and the East Alternative crosses wind development land that may also be used for range land. All action alternatives cross DNR-leased crop land if the routes head to Substation Site 2. Cash rents for agricultural land range from $30 to $40 per acre, per year (acre·year). Sharecrop returns to DNR range from 30 to 35 percent of the crop, which results in $10 to $70 per acre·year, while rangelands lease at about $2/acre·year. Wind development is a much higher rate. The primary beneficiaries of State Trust Lands are public schools (kindergarten through 12th grade), which receive over 78 percent of the funds. In 2009, over 5.6 million acres were in State Trust Lands, and provided over $192 million in state revenues (DNR 2010). The West and East alternatives cross State Trust Land; all action alternatives cross a portion of a State Trust Land heading to Substation Site 2; Substation Site 2 is on State Trust Lands (see Map 3-1).

Community Values

The local area has a strong farming tradition, with many rural communities linked closely with agriculture, and fourth and fifth generation farms and ranches operating. Residents strongly identify with this tradition and with the social values and culture with which it is associated. The Dalles, where all action alternatives begin, was once crossed by the Oregon Trail and has been an economic hub in the Pacific Northwest, linking major transportation routes within the region. It is viewed as offering a more rural way of life, but with easy access to Portland (City of The Dalles 2009a). East of The Dalles, the Middle and East alternatives come close to the rural center of Wishram (line miles ME9). The Middle Alternative then splits north to cross the Garner Family Trust (line miles M12–14), a fifth generation farm representative of other homesteads in the Centerville Valley. It then continues north near the rural community of Centerville, Washington, located between the Middle and East alternatives near line miles M16 and E19. The community consists of mostly single-family residences, agricultural-related commercial and industrial development, and a school. Near line mile WM20, both the West and Middle alternatives pass the Divers Ranch, a fourth-generation cattle ranch also representative of other multi-generational holdings in the area. The West and Middle alternatives cross the Old Settler Road and a Divers family burial site (Divers 2009).

High-quality environmental, recreational, and historical resources are also well represented in the area. Residential use, recreation, research, and environmental and historical preservation are important activities occurring in many specially designated places in the area. All action alternatives cross the Columbia River and the Lewis and Clark Historic Trail, run through the National Scenic Area, and cross over the Columbia Hills. The West Alternative runs for about 2 miles through both the Columbia Hills State Park and Columbia Hills Natural Area Preserve, across the Klickitat Trail, and then north to follow about 2 miles of the Little Klickitat River. The Middle Alternative also runs along the Little Klickitat River for about 1 mile, and, along with the East Alternative, crosses portions of the Oregon Trail.

Construction of weekend or retirement homes, and wind farm development have brought some change to local communities recently.

Some members of the community welcome a new transmission line as step to increased energy development, while others do not want such growth or intrusion. Few landowners (private or public) want a transmission line to cross their property, and sentiments range from “build public facilities on public lands” to “don’t impact public lands that protect species and benefit all citizens of the state.”

Housing and Lodging

In 2007, there were 9,180 housing units in Klickitat County, of which about 11 percent were vacant (U.S. Census Bureau 2007a). In comparison, there were 10,733 housing units available in Wasco County, of which about 16 percent were vacant (U.S. Census Bureau 2007b). The combined vacancy rate in the local area in 2007 was about 14 percent. Vacancy rates from 5 to 7 percent are typically considered low, 7 to 10 percent are considered moderate, and a vacancy rate of 10 percent or higher is typically considered high. Therefore, this is higher than the national vacancy rate of owner-occupied housing of about 2 to 3 percent and the national rental vacancy rate of 8 to 10 percent (CalculatedRisk 2009).

There are 19 hotels or motels with over 900 rooms in the local area. The hotels and motels are primarily in The Dalles and Goldendale. Occupancy rates are as high as 100 percent in the summer and as low as 30 percent in the winter. There are also many campgrounds within about 20 miles of the project, although many are closed during winter. RV hookups are available at Celilo Park (about 8 sites with RV hookups); Maryhill State Park, Goldendale, Washington (more than 50 RV sites); Rufus RV Park in Rufus, Oregon (58 RV sites); Sherman County RV park in Moro, Oregon (33 RV sites); and Sunset RV Park (12 RV sites), Cottonwood RV Park (about 35 RV sites), and Peach Beach Campark (82 RV sites) in Goldendale, Washington.

Public Services

Hospitals and Schools

There are three hospitals in the project vicinity. Klickitat Valley Hospital in Goldendale serves all of central and eastern Klickitat County. Skyline Hospital in White Salmon serves western Klickitat and eastern Skamania Counties. The Mid-Columbia Medical Center in The Dalles serves northern Wasco County and southern Klickitat County.

There are 32 schools, both public and private, in the area: 20 schools in Klickitat County and 12 in Wasco County. About 7,000 students are enrolled (Schooltree 2009).

Law Enforcement and Fire Protection

The Klickitat County Sheriff Department provides law enforcement to all of unincorporated Klickitat County and the Goldendale Police Department provides enforcement in Goldendale.

The Wasco County Sheriff's office provides law enforcement to all of Wasco County except for The Dalles. The City of The Dalles Police Department provides law enforcement for The Dalles incorporated area.

Washington and Oregon state patrols provide patrol officers on the state highways in the area.

The local area is a high fire danger zone, a result of the seasonally hot and dry climate, urban/wildland interface, and abundant available fuels. Both Wasco and Klickitat counties have community wildfire protection plans (Klickitat and Skamania County Steering Committee 2006; Hubert 2005). Fire protection is provided primarily through 27 fire districts, including 16 in Klickitat County (Alderdale, Appleton, Bickleton, Centerville, Dallesport, Glenwood, Goldendale, High Prairie, Husum/Cherry Lane, Klickitat, Lyle, Roosevelt, Trout Lake, Underwood, White Salmon, and Wishram), and 11 in Wasco County (Mosier, The Dalles, Dufur, Tygh Valley, Pine Grove, Juniper Flats, Maupin, Columbia Rural, Sportsman Park, Pine Hollow, and Shaniko). Additional fire suppression agencies that provide service include DNR, the NPS, the USFS, the Goldendale volunteer fire department, and The Dalles fire department. In the event of major fires, all fire protection providers provide cooperative fire-fighting support.

Airports

There are multiple airports in Klickitat and Wasco counties. The Columbia Gorge Regional Airport west of U.S. 197 near Dallesport, and the Goldendale Airport near Goldendale are publically owned facilities operated by WSDOT (see Map 3-1). Piper Canyon Airport near line mile WM19.5 and Warwick Airport between the West and Middle alternatives at about line miles W11 and M14 are small, private airports.

Transmission Lines

Several BPA transmission lines cross the project area (see Chapter 2). Klickitat County PUD (Public Utility District) provides electrical service in Klickitat County, and Northern Wasco County PUD and Wasco Electric Cooperative provide service in Wasco County.

3.9.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Environmental Justice Considerations

In the project area, some populations have higher proportions of minority groups than in the county and/or state as a whole. The Council on Environmental Quality (CEQ), in its guidance for implementing Executive Order 12898 (see Section 4.21), defines a minority population as either (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. The~~se~~ proportion~~s~~ of minority populations in the study area is ~~are still much~~ lower than half of the population. Therefore, the project would not result in any ~~minority populations being~~ disproportionate effects ~~ly affected compared~~ to minority populations. ~~other races or ethnicities~~.

Low income populations ~~also~~ occur at ~~higher~~ lower percentages in the ~~project~~ combined populations of Klickitat and Wasco counties ~~area~~ than in Washington and Oregon ~~the county~~. ~~Again, however,~~ These percentages are low relative to the total population. ~~and do the~~ The project would not result in disproportionate effects to low income populations. ~~There would be no disproportionate environmental impacts from any of the action alternatives.~~

Community Values

The proposed project would impact private farms, ranches, and residences and potentially recreational use lands. The potential routes would not result in the loss of large amounts of land from any single property or change the social capacity of any communities in the area. However, the proposed project has created some conflict about energy development and whose lands should be impacted, concerns about property values, and could potentially create a sense of loss of the agrarian, cultural, and natural resource aesthetic in the area. (For additional impact analysis on these issues, see Sections 3.1 Land Use and Recreation, 3.2 Visual Resources, 3.3 Vegetation, 3.6 Wildlife, and 3.8 Cultural Resources).

Population, Housing, and Lodging

The project would not result in any permanent population increase or the construction of new housing. Project -related demand for lodging would be temporary due to the presence of construction workers in the area, but no additional employees would be needed for operations. With more than 900 hotel rooms in the area, and an average annual occupancy rate of about 75 percent, there are typically 225 available rooms at any given time. With a maximum construction workforce of about 100, with fewer workers at various times over about a 20-month construction period, existing hotels have adequate capacity. Existing campgrounds and RV parks would also be an option for construction workers to the extent that space is available. Construction workers' need for lodging would have a ***low*** temporary impact on the population and housing for all action alternatives.

Taxes

The proposed project would result in an estimated $30 to $40 million in purchases of construction materials for use in Washington, with nearly all purchases originating out-of-state. The state use tax rate is 6.5 percent and the use tax rate for unincorporated portions of Klickitat County is 0.5 percent, for a total use tax rate of 7 percent (Washington Department of Revenue 2010). Assuming the proposed project construction results in out-of-state materials purchases totaling $30 million, use tax revenues of $1.95 million and $150,000 would accrue to Washington and Klickitat County, respectively.

The proposed project could result in the purchase and removal from the Klickitat County property tax rolls of 72 acres of private nonirrigated farmland for use as a substation. Nonirrigated cropland in Klickitat County is assessed for property taxes at about $230 per acre and generates about $2 per acre in property tax annually (McBride pers. comm. 2010). The proposed land purchase would reduce Klickitat County property tax revenue by about $142 annually.

The proposed project would remove no land from property tax rolls in Wasco County, Oregon.

Employment

The action alternatives would have a temporary, ***low*** positive impact on employment and most sectors of the local economy during project construction through the hiring of local construction workers; local procurement of supplies and equipment such as gravel and fuel for vehicles, equipment rentals, staging area rentals, and other incidental materials and supplies; and food, lodging and other expenditures by workers. These direct expenditures would generate economic activity in other parts of the economy through what is known as the multiplier effect, with direct spending generating indirect and induced economic impacts. Indirect impacts consist of spending on goods and services by industries that produce the items purchased as part of the project. Induced impacts include expenditures made by workers' households involved either directly or indirectly in the construction process.

BPA would hire a contractor to build the line, and a combination of contractors and BPA staff would be responsible for engineering design, land acquisition, surveys, environmental analysis and monitoring, and obtaining construction materials, including the transmission towers. These expenditures would likely not be made locally.

Based on estimates from the IMPLAN[5] model, the project would result in about 70 temporary direct, indirect, and induced jobs (Minnesota IMPLAN Group 2007). The direct employment impact would be about 50 jobs, which could fluctuate throughout the construction period. The indirect employment impact would be about 10 jobs, and the induced employment impact would be about 15 jobs. Indirect impacts could result from purchases made by businesses that are directly affected by the project, including those supplying goods related to engineering, automotive repairs, wholesale trade, and truck transport. Induced impacts would result from purchases made by people who spend income received as a result of the project and would be dispersed among more than 100 sectors. Thirty to 80 percent of these jobs would likely be filled by local workers. The remaining workers would be expected to temporarily relocate from outside the area. Construction workers would be separated into different crews stationed at various locations along the transmission line right-of-way. These individuals would purchase meals and other items locally and likely seek temporary accommodations in local hotels, RV parks, or apartment and rental houses.

[5] IMPLAN is an input-output model commonly used in this type of application. The IMPLAN system adjusts national level data to fit the economic composition and estimated trade balance of a chosen region and can be used to construct county models for any region in the United States. The multipliers used in this analysis are based on IMPLAN data for Klickitat and Wasco counties.

Agriculture

Individual farms and related businesses in the agricultural sector could experience long-term lost revenue and income through the conversion of farmland to transmission line rights-of-way or access roads, the amount of which varies slightly among the different action alternatives. Average annual per-acre crop production values for the area were estimated at $205 for nonirrigated (grain) crops, $308 for irrigated (grain) crops, $550 for alfalfa, and $30 for rangeland based on information obtained from the Klickitat County Assessor's Office (McBride 2010). In addition, there could be a permanent increase in pest-control costs if aerial spraying is disrupted by transmission lines, and a possible temporary cost associated with the reconfiguration of irrigation equipment to accommodate transmission towers and access roads. One-time compensation payments to landowners would be made for easements and reconfiguration of irrigation equipment, if needed. Farms could also experience temporary losses of crops or forage during construction. Landowners would be compensated at market value for any reduced yield of crops and forage caused by construction activities for that season.

IMPLAN was used to estimate both the direct effects of the project on farms as well as the total effects on the economies of Klickitat and Wasco counties. Total effects from displacing or idling farmlands could include reduced output by grain elevators; feedlots; food processors, wholesalers, and retailers; and other sectors. Impacts are given for each action alternative. Estimated economic losses include both permanent and temporary agricultural output (revenue from products) and labor income.

State Trust Lands

State Trust Lands would experience small losses of revenue through the conversion of farmland to transmission line towers or tower access roads. Although each action alternative would affect State Trust Lands slightly differently, the amount of DNR revenue lost to towers and tower access roads would be negligible, ranging from $0 per year (Middle Alternative with approach to Knight Substation Site 1) to $12 per year (West Alternative with approach to Knight Substation Site 2), based on cash rents for the land. ~~If any of the alternatives connect to Substation Site 2 is selected, they for all three action alternatives would impact additional State Trust Lands by about $210 per year.~~ The amount of revenue impact of any of the alternatives would be small compared to 2009 revenues from State Trust Lands of about $192 million (DNR 2010). Therefore, permanent impacts would be ***low*** for all action alternatives. (See the Knight Substation Options section for a discussion of potential losses to State Trust Lands from Knight Substation sites 1 and 2 and ~~associated~~ substation access roads). Crops lost to temporary construction activity would result in at most $273 annually during construction for the action alternatives. This amount would be compensated, resulting in ***no*** financial impacts to DNR from construction activities. If any of the land is held in CRP, federal payments made to the state would be affected if all or a portion of the land had to be taken out of CRP. Placement of transmission lines would not necessarily affect CRP status and no loss in value from construction activities would be expected for CRP land. Because the East Alternative would be routed to avoid conflicts with existing wind turbines already developed on DNR State Trust Land, there would be no additional wind development revenue loss expected.

General Property Impacts and Compensation

BPA would need to acquire new right-of-way and access road easements across both private and public properties in varying amounts for each action alternative to enable the construction and maintenance of the proposed transmission line (see Section 3.1 Land Use and Recreation for acreages). BPA would pay market value to nonfederal landowners, as established through the appraisal process, for any new land rights required for this project.

Where the right-of-way would cross over a property, the impact would vary depending on the placement of the right-of-way in relation to a property's size, shape, and the location of existing improvements. A right-of-way could diminish the utility of a portion of property if the line effectively severs this area from the remaining property (called "severance damage"). The appraisal process takes all factors affecting value into consideration—including those mentioned above, as well as any other elements unique to the property—in determining property value, including the loss in value within the easement area, as well as outside the easement area in cases of severance. The appraisals may reference studies conducted on similar properties to support their conclusions. The strength of any appraisal depends on the individual analysis of the property, using neighborhood-specific market data in order to determine market value.

The easements required may encumber the right-of-way area with land use limitations. Each transmission line easement would specify the present and future right to clear the right-of-way and to keep the same clear of all trees, whether natural or cultivated, and all structure supported crops, other structures, trees, brush, vegetation, fire and electrical hazards. Non-structure supported agricultural crops less than 10 feet tall could be grown. Specific agreements with landowners would be required in order to vary from these limitations.

Where BPA needs to acquire easements on roads that already exist and the landowner is the only other user, market compensation is generally 50 percent of full fee value. If other landowners share the access road, compensation is usually something less than 50 percent. For fully improved roads, the appraiser may prepare a cost analysis to identify the value of the access road easement. If BPA acquires an easement for the right to construct a new access road and the landowner has equal benefit and need of the access road, market compensation is generally 50 percent of full fee value; if the landowner has little or no use for the new access road, market compensation for the easement is generally close to full fee value.

As a government agency, BPA has the power of eminent domain, or the power to condemn land rights needed to support its projects. If, after good faith negotiations, BPA and a landowner are not able to agree on terms of a purchase, BPA would ask the U.S. Department of Justice to begin condemnation proceedings in the U.S. District Court on its behalf. As part of these proceedings, BPA would pay just compensation in the form of fair market value for the land that is condemned, with this value determined through appraisals and considering all other relevant factors. A landowner may request that the condemnation process be used if they do not want to negotiate.

Property Value Impacts

The proposed transmission line is not expected to have long-term impacts on property values in the area. Whenever land uses change, the concern is often raised about the effect the change may have on property values nearby. Zoning is the primary means by which most local governments protect property values. By allowing some uses and disallowing others, or permitting them only as conditional uses, conflicting uses are avoided. Some residents consider transmission lines to be an incompatible use adjacent to residential areas. Nonetheless, the presence of transmission lines in residential areas is fairly common.

The question of whether nearby transmission lines can affect residential property values has been studied many times in the United States and Canada over the last 20 years or so, with mixed results. In the 1990s, BPA contributed to the research when it looked at the sale of 296 pairs of residential properties in the Portland/ Vancouver metropolitan area of Oregon and Washington and in King County, Washington. The study evaluated properties adjoining 16 BPA high-voltage transmission lines (subjects) and compared them with similar property sales located away from transmission lines (comps). All of the sales were in 1990 and 1991 and adjustments were made for time and other factors. Study results showed that the subjects in King County were worth about 1 percent less than their matched comps, while the Portland/Vancouver subjects were worth almost 1.5 percent more (Cowger et al. 1996).

BPA updated this study in 2000 using 1994-95 sales data. The sales of 260 pairs of residential properties in the King County and Portland/Vancouver metropolitan area were reviewed. The residential sales analysis identified a small but negative impact of from 0 to 2 percent for those properties adjacent to the transmission lines as compared to those where no transmission lines were present. Although this study identified a negative effect, the results are similar to the earlier study and the differences are relatively small (Bottemiller et al. 2000). Other studies include "High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrances Effects," by James A. Chalmers and Frank A. Voorvaart, published in The Appraisal Journal, summer 2009. The most recently published BPA article titled, "Further Analysis of Transmission Line Impact on Residential Property Values," by Marvin L. Wolverton, PhD, MAI, and Steven C. Bottemiller, MAI, provides references to other studies conducted independent of BPA's influence. This article was published in The Appraisal Journal, July 2003.

In addition, a 2010 study which involved several hundred sales of rural land in various locations across central Wisconsin indicated that property located within 0.25 mile of a high-voltage transmission line may be diminished in value by 1.11 to 2.44 percent (Jackson 2010). The study, however, acknowledged the fact that the difference was not statistically significant. In addition to the functional characteristics of the property (i.e., percentage of wooded acres, open acres, and wetland acres) used in the sale analysis, the study also considered the placement of the easement across the tract. Four location categories were used: middle, edge, clipping and diagonal. The results indicated that property sales diminished by 3.8 percent for the middle pattern and 2.1 percent for the diagonal pattern. No diminished property value was observed for either the edge or clipping pattern sales.

Studies of impacts during periods of physical change, such as new transmission line construction or structural rebuilds, generally have revealed greater short-term than long-term impacts. However, most studies have concluded that other factors, such as general location, size of property, improvements, condition, amenities, and supply and demand factors in a specific market area are far more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

Whether a transmission line introduces a negative visual impact on property owners depends on the placement of a line and its proximity, as well as each individual landowner's perception of what is visually acceptable or unacceptable. (Potential visual impacts are evaluated in Section 3.2 Visual Resources).

The new transmission line would cross over or near some current and potentially future residential areas (see Section 3.1 Land Use and Recreation). Some ***low*** temporary negative impacts on property values (and salability) might occur on an individual basis as a result of the new transmission line for these and potentially for nearby properties along all action alternatives. However, these impacts would be highly variable, individualized, and unpredictable. Constructing the transmission line is not expected to cause long-term negative impacts on property values along the proposed routes or in the general vicinity. Non-project impacts, along with other general market factors, are already reflected in the market value of properties in the area. These conditions are not expected to change appreciably.

Public Services

The project would have ***no*** impacts on hospitals, schools, and law enforcement because the project would not cause an increase in the permanent population. Project construction and maintenance activities have the potential to introduce a fire risk in a high-fire danger zone, primarily dry grassland

and agricultural fields that are susceptible to wildfire and sparsely populated. Representatives from the Centerville Fire Department with jurisdiction over portions of the project area have stated that alternatives that are easier to access and less rugged terrain would be preferable. Lack of roads and steep terrain increases the difficulty of accessing and fighting fires. Best management practices would be followed by construction and maintenance workers to reduce the risk of fires. ***Low*** permanent impacts on local or regional fire fighting services would be expected for all action alternatives.

The proximity of the rights-of-way to airports could have impacts on airport operations and aircraft flight patterns. If a decision is made to build the project, BPA would work with WDOT and the FAA to coordinate construction and design to minimize impacts and ensure aircraft safety. (See Section 3.1 Land Use and Recreation for details on impacts and mitigation for each alternative).

Operations and Maintenance

Helicopter inspection of the line would occur twice a year, and vehicle ground inspections annually. Maintenance vehicles would use access roads where established and maintenance workers would walk through agricultural fields when able to avoid damage to crops. If work is required on towers located within fields, vehicles and equipment would need to drive through fields and they could cause damage to crops, vegetation, and other property. BPA would mitigate impacts to compensate landowners and restore land use function (see Mitigation Measures in this section and in Section 3.1 Land Use and Recreation). Maintenance work could present a low fire risk for all action alternatives (see Public Services subsection). Other than potential low impacts to fire fighting services, operations and maintenance would have ***no*** impacts on socioeconomics resources for any of the action alternatives.

Project construction would occur within the existing Big Eddy Substation footprint and would have ***no*** impact on socioeconomic resources.

West Alternative

Most agricultural economic impacts along the West Alternative would occur in rangelands and nonirrigated cropland (see Section 3.1 Land Use and Recreation). The maximum yearly permanent reduction in direct agricultural output would be about $5,845, of which about $631 would be labor income (see Table 3-27). Associated with these losses would be indirect reductions in earnings by other sectors associated with agriculture, totaling about $9,580 in yearly output for Klickitat and Wasco counties, $1,615 of which would be labor income. Temporary reductions in output and labor income due to construction activities would be similar. In 2007, grain farming and cattle ranching and farming accounted for an estimated $50 million in economic output in Klickitat and Wasco counties, so permanent displacements and temporary disruptions in farm production resulting from the proposed project would each amount to less than 0.02 percent of the direct output of these two crop types (Minnesota IMPLAN Group 2008). Relative impacts on the labor income earned in the two-county region would be comparably small. Because of this small impact and with mitigation payments to landowners, the project would have ***low*** permanent and temporary impacts on the local and regional economy.

Table 3-27. Reductions in Output[1] and Labor Income[2] Resulting from Farmland Displacement and Disturbance along the Action Alternatives

	Permanent Reductions (yearly)[3]				Temporary Reductions[3]			
	Direct Effect[4]		Total Effect[5]		Direct Effect[4]		Total Effect[5]	
	Output	Labor Income	Output	Labor Income	Output	Labor Income	Output	Labor Income
West Alternative	$5,845	$631	$9,580	$1,615	$6,215	$634	$9,757	$1,600
Middle Alternative	$8,280	$835	$12,237	$1,996	$7,380	$714	$10,491	$1,674
East Alternative	$7,380	$785	$11,303	$1,893	$9,775	$877	$13,957	$2,143

[1] Output is the value of the farm product (in this case, nonirrigated grain, irrigated alfalfa, and/or animal product).
[2] Labor income is the ***portion of output*** earned by farmers and farm workers.
[3] Permanent losses are earnings that would no longer occur on an annual basis. Temporary losses are those that only occur during the period of construction. Temporary direct effects would be reimbursable.
[4] Direct Effects are changes in crop and livestock production and the associated labor income that could result from the proposed project.
[5] Total Effect is the sum of the direct effects (see footnote 4), the indirect effects (i.e., changes in purchases from other sectors by the affected business), and the induced effects (i.e., changes in personal consumption purchases from other sectors by affected farmers and farm workers).
Note: Estimates are based on potential maximum losses from the range of tower options available for each alternative.
Sources: McBride 2010; Minnesota IMPLAN Group 2007

The West Alternative tower option that would include permanently removing the Chenoweth-Goldendale line (line miles W6–22) could affect Klickitat County PUD. The PUD uses this line as a back-up power source ~~to Goldendale Substation~~ when other lines are down for maintenance. Other means for back-up would need to be found as needed. Impacts would be ***moderate***.

Middle Alternative

Similar to the West Alternative, most agricultural economic impacts along the Middle Alternative would occur in rangelands and nonirrigated croplands, although relatively more cropland would be impacted, including some irrigated alfalfa. The maximum yearly permanent reduction in direct agricultural output would be about $8,280, of which about $835 would be labor income (see Table 3-27). Associated with these losses are indirect reductions in earnings by other sectors associated with agriculture, totaling about $12,237 in yearly output for Klickitat and Wasco counties, $1,996 of which would be labor income. Temporary reductions in output and labor income due to construction activities would be slightly lower. Based on county earnings for 2007 (see West Alternative discussion), permanent displacements and temporary disruptions in farm production resulting from the proposed project would each amount to closer to 0.02 percent of the direct output of the affected agricultural products (Minnesota IMPLAN Group 2008). Relative impacts on the labor income earned in the two-county region would be comparably small. Because of this small impact and with mitigation payments to landowners, the project would have ***low*** permanent and temporary impacts on the local and regional economy.

The Middle Alternative has a tower option that would include removing portions of the existing Harvalum-Big Eddy Line and rebuilding the line on double-circuit towers to carry both the existing and proposed line in areas where they would share right-of-way. The Harvalum-Big Eddy Line would be temporarily taken out of service for removal and rebuild. Construction would have to be timed such that electric loads were relatively light on the existing line and could be redirected to other transmission lines in the area so as to not disrupt transmission service. There would be ***no*** impacts to service with proper scheduling.

East Alternative

As for the other action alternatives, most agricultural economic impacts along the East Alternative would occur in rangelands and nonirrigated croplands, although relatively more cropland would be impacted than along the West Alternative, including some irrigated alfalfa. The maximum yearly permanent reduction in direct agricultural output would be about $7,380, of which about $785 would be labor income (see Table 3-27). Associated with these losses are indirect reductions in earnings by other sectors associated with agriculture, totaling at most $11,303 in yearly output for Klickitat and Wasco counties, $1,893 of which would be labor income. Temporary reductions in output and labor income due to construction activities would be slightly higher. Based on county earnings for 2007 (see West Alternative discussion), permanent displacements and temporary disruptions in farm production resulting from the proposed project would each amount to closer to 0.02 percent of the direct output of the affected agricultural products (Minnesota IMPLAN Group 2008). Relative impacts on the labor income earned in the two-county region would be comparably small. Because of this small impact and with mitigation payments to landowners, the project would have ***low*** permanent and temporary impacts on the local and regional economy.

The East Alternative has a tower option that would include removing portions of the existing Harvalum-Big Eddy Line and portions of the existing McNary-Ross Line in areas where the proposed line and the existing lines share a right-of-way. The lines would be rebuilt on double-circuit towers to carry both the existing and proposed line. The Harvalum-Big Eddy and the McNary-Ross lines would have to be taken out of service during removal and rebuild. Construction would have to be timed such that electric loads were relatively light on the existing lines and could be redirected to other transmission lines in the area so as to not disrupt transmission service. There would be ***no*** impacts to service with proper scheduling.

Knight Substation Options

Knight Substation Site 1

Substation Site 1 is privately owned property. Locating Knight Substation at Site 1 could permanently remove 80 acres of nonirrigated cropland from production (see discussion in Section 3.1 Land Use and Recreation). This would result in a total reduction in economic output of about ~~$20,984~~ $22,491/year for Klickitat and Wasco counties, and a reduction in total labor income of about ~~$2,937~~ $3,148/year (see Table 3-28). The direct effects to the individual landowner would be slightly smaller. However, the landowner would be compensated by purchase of the property by BPA, and 50–70 acres could potentially be leased out for cultivation at some point in the future. Placing this privately-owned land into federal ownership would also remove it from the county tax base, for a loss of about $142 annually to the county in property taxes. The proposed access road to Site 1 across DNR property could have about a $322/year impact on DNR State Trust Lands. These losses altogether would be considered a permanent ***low*** impact.

Table 3-28. Reductions in Output[1] and Labor Income[2] from Farmland Displacement and Disturbance at Knight Substation

	Direct Effect[3]		Total Effect[4]	
	Output	Labor Income	Output	Labor Income
Knight Substation Site 1	~~$16,394~~ $17,571	~~$1,261~~ $1,351	~~$20,984~~ $22,491	~~$2,937~~ $3,148
Knight Substation Site 2	~~$6,156~~ $6,598	~~$473~~ $507	~~$7,880~~ $8,446	~~$1,103~~ $1,182

[1] Output is the value of the farm product (in this case, nonirrigated grain).
[2] Labor income is the ***portion of output*** earned by farmers and farm workers.
[3] Direct Effects are changes in grain production and the associated labor income that could result from the proposed project.
[4] Total Effect is the sum of the direct effects (see footnote 3 above), the indirect effects (i.e., changes in purchases from other sectors by the affected business), and the induced effects (i.e., changes in personal consumption purchases from other sectors by affected farmers and farm workers).
Note: Estimates are based on potential maximum losses from the range of tower options available for each alternative.
Sources: McBride 2010; Minnesota IMPLAN Group 2007

Knight Substation Site 2

Substation Site 2 is DNR State Trust Land leased for crop production. The substation and substation access road would permanently remove about ~~30~~ 35 acres of nonirrigated cropland from a 544-acre property owned by DNR. This would result in a total permanent reduction in regional economic output of about ~~$7,880~~ $8,446/year for Klickitat and Wasco counties, and a reduction in total labor income of about ~~$1,103~~ $1,182/year (see Table 3-28). Direct effects, which would impact DNR lessees or sharecroppers as well as DNR, would be slightly less. Lessees and sharecroppers would not be compensated for these losses. Revenues to DNR would be reduced by about ~~$900–2,100~~ $2,451 per year, about a thousandth of a percent of the revenues in 2009 from State Trust Lands. DNR would be compensated by purchase of the land rights, and since the state does not pay property tax, this would have ***no*** impact on the county tax base. Given the relatively small reductions in revenue and economic output, the permanent conversion of nonirrigated cropland to a transmission facility would result in a ***low*** permanent impact on the local economy as well as on State Trust Lands.

At either Site 1 or 2, installation of the overhead ground wire and counterpoise along the Wautoma-Ostrander line would cause temporary impacts to cropland during construction. In areas where BPA owns the right-of-way in fee, BPA would compensate lessees for crop damage. Where the right-of-way is an easement across DNR land, the lessee would be compensated for crop loss if any occurred.

Construction of Knight Substation at either Site 1 or 2 would require both the existing Wautoma-Ostrander and the North Bonneville-Midway lines to briefly be taken out of service as they would be looped into the substation. Construction would have to be timed such that electric loads were relatively light on the existing lines and could be redirected to other transmission lines in the area so as to not disrupt transmission service. There would be ***no*** impacts on service with proper scheduling.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on socioeconomics would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential socioeconomic impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.9.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on socioeconomic resources. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Compensate landowners at market value for any new land rights for right-of-way or access road easements.
- Compensate landowners for damage to property or crops during construction or operation and maintenance activities, as appropriate.
- Compensate landowners for irrigation systems that must be reconfigured to accommodate new transmission infrastructure.
- Consult with the NRCS and the Farm Service Agency to mitigate impacts to CRP land to maintain existing CRP status of lands and federal payments to landowners, where practicable.
- Prepare for fire management (see mitigation measures in Section 3.3 Vegetation).

3.9.4 Unavoidable Impacts Remaining after Mitigation

The project would permanently remove some areas from agricultural production, and environmental and recreational resources. Modest economic benefits could include increased employment in the area, local purchase of goods and services, and increased service capacity on the BPA transmission grid.

3.9.5 No Action Alternative

With the No Action Alternative, the positive economic impact due to construction expenditures would not occur. The low impacts to agricultural output and the county tax base would also not occur.

In addition, with the No Action Alternative, BPA would be unable to provide the full amount of firm transmission service that has been requested. Congestion on the existing lines moving power east to west through the area would limit the ability to transfer additional power through the Columbia River Gorge and could make it more difficult for existing or new generation facilities (including wind facilities) to sell their power. Some or all of those who have requested firm transmission service would need to accept other types of transmission service from BPA, pursue transmission service on other lines (if any capacity is available), or fund their own high-voltage lines and substations. For any firm transmission service requested for new generation, the lack of additional firm transmission capacity under the No Action Alternative also could lead some developers to ultimately modify or even cancel their projects if alternative transmission service could not be found.

3.10 Transportation

This section discusses transportation issues related to the project. For additional discussion of project access roads and scenic byways, see Sections 3.1 Land Use and Recreation and 3.2 Visual Resources.

3.10.1 Affected Environment

The transportation system in the project area includes highways and roads, railroads, airports, and the Columbia River.

Most of the roads in the project area are rural county roads (see Map 3-1). Direct road access to the immediate project vicinity is primarily provided by Klickitat and Wasco county roads and existing BPA access roads, although some access may come more directly off SR-14 (Washington). Regional highway access to the area is provided by I-5, I-90, I-84, US-197, US-97, and US-395. Highways and local roads are mostly two lanes in the vicinity, except I-84/US-30, which is a four-lane divided highway. The average daily traffic volumes of these major access highways are shown in Table 3-29.

Many of the Klickitat County roads were developed as "Farm to Market" roads with minimal or no supporting structural material and are impassable or seasonally restricted during winter months. These roads would likely require upgrades prior to construction due to the heavy loads and relatively high number of trips that would occur during construction activities. In addition, roads could require restoration following construction. County road upgrades would be within the existing road bed or disturbed area.

Table 3-29. Average Daily Traffic for Primary Roads in the Project Area

Road	Average Daily Traffic (vehicles/day)
SR-142	990
SR-14	4,300
US-97	5,000
US-197	8,400
I-84	15,500

Source: WSDOT 2009a; ODOT 2009

Railroads in the area include the Burlington Northern Santa Fe Railway and the Union Pacific Railroad. These railroads parallel both sides of the Columbia River through the area. Amtrak's Empire Builder train travels through the Columbia Gorge on the north side of the Columbia River as it travels to and from Chicago, Illinois. The railroad tracks used by these railroads are crossed by all action alternatives (see Map 3-1).

Federal Aviation Administration (FAA)-certified aviation facilities in the project area include two public airports—The Columbia Gorge Regional/The Dalles Municipal (hereafter referred to as The Columbia Gorge Regional) and Goldendale airports, and two private airports, Piper Canyon and Warwick (see Map 3-1), as well as a small private airstrip at line mile E22. There are also various other private airstrips primarily used for agricultural operations in the area.

The Columbia River is used to transport grain and other commodities produced in the region.

3.10.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Impacts to transportation would include increased traffic and possible delays along transportation corridors due to construction activities, improvements to small segments of county roads, development of BPA access roads, and affects on air traffic safety.

Intermittent disruptions to traffic flow on roads would occur during the 20-month construction period. During construction, light and heavy vehicles would access the corridor, and equipment and components would be transported to the project site via semi-trucks. Staging areas would be set up along or near the corridor for construction crews to store materials and trucks. A relatively low increase in daily traffic volume on highways would occur, with a maximum of 16 vehicles per day to deliver materials and equipment to construction sites. The addition of the construction traffic to the main roads in the area would result in a small change to existing volume to capacity ratios.

Construction vehicles could interrupt or slow traffic for brief periods of time as they enter or exit access roads, due to blasting near a road (to protect cars from flying debris), or while the conductor is being strung across the roadway by helicopter. A traffic control plan would be developed for submittal to the appropriate highway departments. Crossings of railroads would be timed to avoid interrupting train service; appropriate coordination and crossing permits would be obtained from the affected railroad. BPA would coordinate with ship traffic control for stringing the conductor across the Columbia River.

Trucks carrying heavy construction materials and equipment could damage existing roadways. All loads transported on state and county roads would be within legal size and load limits, or have valid oversize and/or weight permits. Any damage to existing roads would be repaired following construction. Project vehicles could track dust, soils and other materials from construction sites onto public roads. Erosion control measures would include stabilization of construction entrances and exits to prevent sediments from being transported onto adjacent roadways.

Overall impacts to transportation from construction would be ~~***low***~~ ***moderate*** because increased traffic on roads would be short-term and roads can absorb the relatively small increase in vehicle use; time needed for conductor stringing over, highways, railroads, and the Columbia River would be brief and scheduled to create minimal or no delays; and, although local roads may be damaged during construction, measures would be taken to repair damage ~~to existing roads~~ and prevent erosion onto adjacent roadways.

Operation and maintenance traffic over the life of the line would be only a few maintenance vehicles once a year, and helicopters twice a year, which would create ***no*** impact on transportation.

Development of access roads would include upgrading existing BPA access roads, upgrading existing county roads, building new access roads, and constructing and removing temporary access roads to tower sites within agricultural fields. Improvements to existing roads could involve clearing brush, grading and laying down gravel, widening roads, smoothing-out curves, and adding culverts, ditches, rolling-dips and/or water bars. Specific miles of access roads required are discussed for each alternative. Road-related impacts to other resources such as land use, visual resources, vegetation, wildlife, fish, soils, water resources, and cultural resources are discussed in the resource specific sections elsewhere in this EIS. See Section 3.1 Land Use and Recreation for a discussion about possible unauthorized access and use of BPA roads.

Where transmission lines run near airports and where towers and/or wires are above a certain height, airplane safety must be determine by the FAA. The FAA requires that designs be submitted for approval if a proposed structure or conductor/ground-wire is 200 feet or more above the ground or water, or if any part of the proposed transmission line is within a prescribed distance of a public airport (Melzer 2010a). Structures that the FAA deems as obstructions to aircraft may be made safe by marking with special lighting, paint, and/or marker balls, as directed by the FAA. Possible marking requirements could include 36-inch marker balls along the uppermost wire of a transmission line, ~~red and white paint on a tower~~, white/red strobe lines placed at the top of a structure, and red steadily burning lights halfway up a tower (Melzer 2010a,b). For all route alternatives, towers in the vicinity of the Columbia Gorge Regional Airport would need review by the FAA. Towers proposed near the Goldendale airport have already been reviewed and cleared by the FAA (FAA 2010a–d). The Warwick Airport would not be impacted by any route alternative. There would be impacts on the Piper Canyon Airport by the West and Middle alternatives, as discussed for each alternative; however, since this airport is not regulated by the FAA, structure marking would not be determined by the FAA. For more details on FAA requirements pertaining to airport size and proximity to the project, see the Transportation section in Chapter 5. For a description of tower lighting, see Section 2.3.2.

Construction work at Big Eddy Substation may disrupt traffic on Columbia View Drive and Fifteenmile Road as equipment and trucks enter or exit the substation. However, the substation work at Big Eddy would be minimal, and disruptions would be brief. Impacts to transportation would be ***low***.

West Alternative

The West Alternative would require about ~~21~~ 19 miles of new access road, ~~11~~ 10 miles of existing road upgrades, and 3 miles of temporary roads.~~, and 5 miles of county road upgrades. The county roads that would require upgrades include Ahola Ridge Road (from Horseshoe Bend Road south to Finn Ridge Road), Finn Ridge Road (from Harms Road to Ahola Ridge Road), and Palomino Drive (from Horseshoe Bend Road north).~~ In addition, the following county roads would likely require improvements for project construction vehicles: Dalles Mountain, Oak Creek, Harms, Randall, Niva, Finn Ridge, Ahola, Anderson, Horseshoe Bend, Olson, Esteb, Knight, Fish Hatchery, Butts, and Centerville Highway.

See Table 2-3 and Map 3-1.

The West Alternative passes within 3 miles of the Columbia Gorge Regional Airport. A number of towers and wires would be reviewed by the FAA and possibly marked for aircraft safety; these are primarily in the Columbia Gorge. About 11 towers within the first 5 miles from Big Eddy Substation would exceed 220 feet and would be reviewed by the FAA to determine the need for lighting. In addition, wires on towers between line miles W1–11 (though the Columbia Gorge) and at W19 (Little Klickitat River crossing) would need review for marker balls because they span deep ravines and the wire would be over 200 feet from the ground or water. As with all the route alternatives, the towers on either side of the Columbia River would require lighting and the topmost wire that would cross the river would require marker balls.~~; and lights that would point to the wires would be needed on the towers.~~

The West Alternative would pass about 600 feet to the south of the Piper Canyon Airport, paralleling the airstrip for about 2,000 feet. Although the FAA doesn't regulate obstructions to private-use airports, the owner of the airport would be consulted by BPA, and lighting or marking would be considered for aircraft safety and the security of the line.

The West Alternative would require the most new access roads of the route alternatives, and would pass relatively close to two airports, and although airport impacts would be mitigated with appropriate tower and line marking, the line would create some risk to air traffic safety. Therefore, overall impacts to the West Alternative on transportation would be considered ***low-to-moderate***.

West Option 1 would have the least potential risk impact on air traffic because the single-circuit towers would be shorter and fewer towers would have to be marked. Options 2 thru 6 would have similar tower marking requirements and therefore similar potential impacts.

Middle Alternative

The Middle Alternative would require about ~~19~~ 20 miles of new access road, ~~15~~ 13 miles of existing road upgrades, and ~~3~~ 7 miles of temporary roads. ~~No county roads would require upgrades.~~ In addition, the following county roads would likely require improvements for project construction vehicles: Dalles Mountain, Woods, Olson, Finn Ridge, Anderson, Horseshoe Bend, Esteb, Knight, Fish Hatchery, Butts, and Centerville Highway.

Some of the towers along the Middle Alternative ~~would have about 5 towers~~ that would exceed 200 feet ~~and that would be~~ have been reviewed by the FAA ~~and possibly marked~~ for aircraft safety. These towers would be where the line would cross Fifteenmile Creek and the Columbia River. Two towers on ~~and~~ steep terrain heading north over the Columbia Hills have not yet been reviewed. In addition, ~~numerous~~ wires between line miles M1–9 ~~11~~ have been reviewed by the FAA to determine the need for marker balls because they span deep ravines and they would be over 200 feet from the ground or water. Additional areas between line miles M9-11 (over the ~~though the~~ Columbia Hills ~~Gorge~~) and at M19 (Little Klickitat River crossing) ~~would be~~ have not yet been reviewed.~~ for marker balls because they span deep ravines and they would be over 200 feet from the ground or water.~~

As with all the route alternatives, the towers on either side of the Columbia River would require lighting~~;~~ and the topmost wires that would cross the river would require marker balls. Additional marking for aircraft safety may also be required for two towers and some wires spanning ravines as the line climbs the Columbia Hills, as well as at the Little Klickitat River crossing.

Given that mitigation measures should be able to minimize impacts on airport operations and aircraft safety, the permanent transportation impacts on air transportation would be ***low*** for the Middle Alternative.

Middle Option 1 would have the least potential risk of impact on air traffic because the single-circuit towers would be shorter and fewer towers would be marked. Options 2 and 3 would have similar tower marking requirements and therefore similar potential impacts.

East Alternative

The East Alternative would require about 16 miles of new access road, ~~16~~ 13 miles of existing road upgrades, and ~~5~~ 9 miles of temporary roads. ~~No county roads would require upgrades.~~ In addition, the following county roads would likely require improvements for project construction vehicles: Dalles Mountain, Oak Creek, Harms, Randall, Niva, Finn Ridge, Aloha, Anderson, Horseshoe Bend, Olson, Esteb, Knight, Fish Hatchery, Butts, and Centerville Highway.

Towers along the East Alternative ~~would have about 8 towers~~ that would exceed 200 feet ~~and that would be~~ have been reviewed by the FAA ~~and possibly marked for aircraft safety.~~ These towers would be located where the line would cross Fifteenmile Creek, the Columbia River, and rolling terrain along the Columbia Hills. In addition, numerous wires between line miles E1–15 (through the Columbia Gorge) ~~would need~~ have been reviewed for marker balls as they span deep ravines. It has been determined that only ~~As with all the route alternatives,~~ the towers on either side of the Columbia River would require lighting; the topmost wire that would cross the river would require marker balls; and lights that would point to the wires would be needed on the towers.

The East Alternative would pass just west of a small private airstrip at line mile E22. The transmission line could affect how the airstrip could be used, because the line would run perpendicular to the end of the runway. BPA is in discussions with the airstrip owner to determine ways to lessen impacts to airstrip use.

Given that mitigation measures should be able to minimize impacts on airport operations and aircraft safety, but could impact use of a private airstrip, the permanent transportation impacts on air transportation would be ***low-to-moderate*** for the East Alternative.

East Option 1 would have the least potential risk impact on air traffic as the single-circuit towers would be shorter and fewer towers would have to be marked. Options 2 and 3 would have similar tower marking requirements and therefore similar potential impacts.

Knight Substation Options

Construction at Substation Site 1 ~~would~~ may require temporary road access~~, likely off~~ from Hill Road from the west along BPA's Wautoma-Ostrander and North Bonneville-Midway transmission line rights-of-way.~~, Butts Road from the south, or from Pine Forest Road from the north.~~ ~~These county roads~~ Hill Road would ~~likely~~ require upgrading to accommodate the equipment loads for the substation. Construction traffic would be noticed mostly on Knight Road, but would be dispersed along Butts Road and Hill Road.~~one of the roads mentioned above.~~ Permanent access to Site 1 for operations would ~~likely~~ be from Knight Road and would run along the north side of the DNR property boundary, then south into the east side of the substation (see Chapter 2 and Map 2-2).

Substation Site 2 would be accessed directly from Knight Road to the east as described above for permanent access to Site 1. Construction traffic would be noticed on Knight Road with potential short-term delays as trucks and equipment enter or exit the site.

Knight Substation would be remotely controlled, with personnel visiting periodically, so traffic due to substation operations and maintenance would be minimal.

Depending on the season of construction, a temporary access road may need to be built along the line to install the ground wire and counterpoise. All work would be within the existing BPA right-of-way, which, in this area, is owned in fee by BPA except for the portion that crosses DNR land.

Overall substation impacts to transportation would be ***low***, because traffic disruptions would be minimal both during construction and substation operations and maintenance.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on transportation would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential transportation impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.10.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts on transportation. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Coordinate with Klickitat County roads department for upgrades of county roads.
- Coordinate routing and scheduling of construction traffic with state and county road staff, Columbia River operators, and railroad operators.
- Employ traffic control flaggers and post signs warning of construction activity and merging traffic, when necessary for short interruptions of traffic.
- Conduct regular maintenance on access roads and gates within and leading to the corridor.
- Prepare and implement a SWPPP (see mitigation measures in Section 3.4 Geology and Soils) to prevent sediments from being transported onto adjacent roadways.
- Limit tracking of soil onto paved roads (see mitigation measures in Section 3.4 Geology and Soils).
- Design roads to limit erosion (see mitigation measures in Section 3.4 Geology and Soils).
- Restore public roadways to preconstruction conditions upon completion of project construction activities.
- Coordinate with the WSDOT Aviation Division and comply with FAA regulations for marking or lighting (including painting and/or lighting towers and installing marker balls on overhead ground wires in specific locations).
- Consult with the owner of Piper Canyon Airport to ensure aircraft safety at Piper Canyon Airport.

3.10.4 Unavoidable Impacts Remaining after Mitigation

During construction, unavoidable transportation impacts would consist of minor delays and interruptions to local traffic.

3.10.5 No Action Alternative

The No Action Alternative would have no impact on transportation because no new transmission lines, towers, or substations would be constructed. Existing transportation resources would remain the same, and impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.11 Noise

This section describes noise that may be created by the construction, operation and maintenance of the proposed project.

3.11.1 Affected Environment

Noise is commonly defined as unwanted sound that disrupts normal human activities or diminishes the quality of the human environment. Transient noise sources, such as passing aircraft or motor vehicles, produce noise usually of short duration. Stationary sources such as a power lines, transformers or substations can emit noise over a longer period. Ambient noise is all noise generated in the vicinity of a site by typical noise sources such as traffic, neighboring businesses or industries and weather (wind or rain). Ambient noise level is a typical mix of noise from near and distant sources.

Noise is usually measured in decibels on the A-weighted scale (dBA), which corresponds to how humans hear sound. Table 3-30 shows typical noise levels for common sources expressed in dBA. Noise exposure depends on how much time an individual spends near the source.

Table 3-30. Common Noise Levels

Noise Source or Effect	Sound Level (dBA[1])
Rock-and-roll band	110
Truck at 50 feet (15.2 meters)	80
Gas lawnmower at 100 feet (30 meters)	70
Normal conversation indoors	60
Moderate rainfall on foliage	50
Refrigerator	40
Bedroom at night	25

[1] Decibels (A-weighted)
Source: DOE 1986

Along the action alternatives, existing noise levels vary with proximity to existing transmission lines, traffic (particularly near highways), agricultural activities, aircraft and wind levels (which can sometimes be high in the Columbia River Gorge). While each alternative crosses or parallels busy highways in the southern portion of the project area, most of the land crossed is agricultural along with some recreational land. Ambient noise levels can be intermittently high next to highways and consistently moderate to high during sustained winds in the Columbia River Gorge, but generally low elsewhere.

Transmission line noise is associated with corona. Corona is the partial electrical breakdown of the insulating properties of air around the conductors of a transmission line. Corona-generated noise is usually heard as a hissing or crackling sound accompanied by a hum under certain conditions.

The conductors of high-voltage transmission lines are designed to be corona-free under ideal conditions. Noise from transmission lines generally occurs only when conductors are wet during foul weather (periods of rain, fog, snow, or icing). Based on several years' meteorological records from Moro, Oregon, and Kennewick, Washington, foul weather conditions occur infrequently (less than 1 percent of the time) in the project area (NOAA 2010). However, for a few months after construction, residual grease or oil can cause water to bead up on the surface of conductors, producing temporarily higher levels of audible noise. Also, during fair weather, insects and dust on conductors can serve as occasional corona sources.

Substations also generate noise, which comes mostly from transformer equipment that creates a 120-Hz (less than 50 dBA) hum. Circuit breakers also create noise when opening or closing, but those activities are rare.

The EPA has established a guideline of 55 dBA for an average day-night noise level (L_{dn}) and 45 dBA for night-time noise levels (between 10 p.m. and 7 a.m.) in outdoor areas (EPA 1978). The state of Washington has similar guidelines of maximum permissible noise levels of 60 dBA (L_{dn}) and 50 dBA (night-time) to intrude into residential property (Washington State 1975). These levels apply to transmission lines that operate continuously. BPA has established a transmission-line design criterion for corona-generated noise (L_{50}, foul weather) of 50 dBA at the edge of the right-of-way (DOE 2006). Likewise, BPA's design criterion for substation noise is 50 dBA at a substation property line. Besides meeting Washington's guidelines, these criteria have been interpreted by the state of Oregon and BPA to meet Oregon Noise Control Regulations (Perry 1982).

3.11.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

Construction Noise

Construction of the transmission line and Knight Substation would generate temporary noise that could affect nearby residences, business owners and recreationists. Although daytime construction activities are excluded from noise regulations and line construction activities would be temporary, BPA did evaluate these noise impacts. The project would be built primarily using conventional construction equipment. Table 3-31 summarizes maximum noise levels (from 50 feet away) produced by such equipment. Construction activities that would create noise include access road grading, excavation for tower footings, assembling and lifting towers into place, helicopter assistance during tower installation and stringing of conductors, blasting in bedrock (when needed), and use of implosive fittings for conductor splicing.

When determining noise levels, an equivalent sound level (L_{eq}) is generally accepted as the average sound level. The overall noise caused by conventional construction equipment is estimated to be 89 dBA L_{eq} at 50 feet, dissipating with distance. Table 3-32 shows estimated construction noise levels at various distances from a construction site.

Table 3-31. Construction Equipment Noise Levels

Type of Equipment	Maximum dBA[1] at 50 Feet
Road Grader	85
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Crane	85
Combined Equipment	89

[1] Decibels (A-weighted)
Source: Thalheimer 1996

A helicopter may be used to assist with tower installation. A loaded cargo helicopter flying 250 feet away produces roughly 95 dBA, which is the same amount of noise produced by a diesel locomotive 100 feet away (Helicopter Association International 1993). If a helicopter is used, towers would be preassembled at one or more central staging areas and then transferred by helicopter to tower sites. The helicopter would hover at central staging areas for two to five minutes per tower as it picked up each tower section, and would then hover at each tower site for two to 10 minutes during a one-hour period while the tower sections are placed on the foundation. Assuming helicopters were used to erect about 130 towers, between 10 and 30 hours of hover time would be required, spread over several weeks along the transmission line route.

Table 3-32. Construction Equipment Noise Levels by Distance

Distance from Construction Site (feet)	Hourly L_{eq} (dBA[1])
50	89
100	83 (similar to truck at 50 feet)
200	77
400	71 (similar to gas lawnmower at 100 feet)
800	65
1,600	59 (similar to indoor conversation)

[1] Decibels (A-weighted)
Assumptions: Equipment used was one each – grader, bulldozer, heavy truck, backhoe, pneumatic tools, concrete pump, crane. Reference noise level of 89 dBA (L_{eq}). Distance for the reference noise level: 50 feet. Noise attenuation rate: 6 dBA/doubling of distance. This calculation does not include the effects, if any, of local shielding or atmospheric attenuation.

Blasting could be required in rocky areas where conventional excavation of tower footings would not be practical. Where blasting might occur, the explosion would produce a short noise like a thunderclap that could be audible for half a mile or more. Implosive fittings could also be used to connect conductors together. Implosive fittings make a sound like a shotgun. The fittings would be required about every 3 miles. On single-circuit towers, the conductor would require nine fittings per splice location; for double-circuit towers, 18 fittings would be required. These disturbances would be short-lived and infrequent.

Noise generated by construction activity at Big Eddy Substation would occur for all alternatives and could have a ***moderate*** temporary noise impact on a few nearby residents. If bedrock blasting is required, this could be a ***high*** temporary noise impact on a few residents, and a lesser temporary impact on residents and visitors within a mile or two of the substation.

Noise from Big Eddy Substation's existing equipment (primarily transformers) and nearby transmission lines would remain the primary source of environmental noise at the site even if the proposed project was built and operating. Additions at Big Eddy Substation would have ***no*** permanent noise impacts.

Additional noise impacts are discussed under each alternative later in this section.

Transmission Line Operations and Maintenance Noise

Maximum potential corona noise levels for the action alternatives are estimated to range from 40 to 49 dBA at the edge of the right-of-way during foul weather (L_{50}). This level is comparable to, or less, than those from existing 500-kV lines in Oregon and Washington (see Appendix E). The highest levels would generally occur where the new 500-kV circuit is at the minimum distance of 75 feet from the right-of-way edge. Noise from new conductors would be less than existing transmission lines in some places because BPA designs new lines to minimize potential corona.

The highest potential noise level of 49 dBA during foul weather would meet BPA's design criterion and Oregon and Washington regulations. This would be well below the 55 dBA level that can interfere with speech outdoors and would not intrude on indoor noise levels (EPA 1974). During the area's fair weather, which helps minimize the occurrence of corona, noise levels at the edge of the right-of-way would not exceed 29 dBA and would likely be masked by ambient noise. For all action alternatives, there would be ***low*** noise impact from operations. The only exception would be potentially higher noise impacts on one home in Wishram that, depending on tower configuration, could be as close as 71 feet to the centerline of the Middle or East alternatives.

Occasional maintenance activities would generate temporary noise sources. Each tower and line would be inspected by field crews at least once annually. In addition, twice a year a helicopter would patrol the transmission line corridor to look for any problems. If repairs are needed, field vehicles would be dispatched to access trouble spots. For all action alternatives, line maintenance would have temporary ***low*** noise impacts.

West Alternative

Ten houses would be within 500 feet of the West Alternative, depending on the line configuration. Four homes would be within 300 feet, the closest about 200 feet from the centerline (see Table 3-33; also Appendix B for a map showing house locations). Homes along the route are scattered throughout the project area, including two just north of Big Eddy Substation in Oregon and nine in rural Klickitat County (near line miles W12-13, 17, 18, 21, and 25). Construction could have temporary ***moderate-to-high*** noise impacts for these residents.

Table 3-33. Houses/Businesses near the Action Alternatives

	Single Circuit			Double Circuit[1]		
Primary Configuration	West Alternative	Middle Alternative	East Alternative	West Alternative	Middle Alternative	East Alternative
Houses/Businesses < 300 ft	4	3	3	4	5	5
Houses/Businesses < 500 ft	10	12	12	10	11	10
Range of Distances from Centerline, feet	203–486	71–425	71–484	203–486	191–495	191–495

[1] Double circuit counts include houses from single-circuit segments E-4, E-27 and M-5, where no double circuit is planned. (See Figure 1 in Appendix E for information on segments.)

Middle Alternative

Eleven to 12 homes and businesses (one business total) would be within 500 feet of the proposed Middle Alternative, depending on line configuration. Three to five of those would be within 300 feet (see Table 3-33). The homes along the route include five between Big Eddy Substation and the Columbia River crossing (near line miles M3 and M7), and three in Wishram (one of the Wishram residences is within 71 feet of the centerline of the proposed single-circuit right-of-way). The others are farther north near line miles M17, 20, and 25 in rural Klickitat County. For these residents, construction could have temporary ***moderate-to-high*** noise impacts.

East Alternative

Ten to 12 homes and businesses (three businesses total) would be within 500 feet of the East Alternative depending on line configuration. Three to five of those would be within 300 feet, depending on configuration (see Table 3-33). Along the first 9 miles, the East Alternative would affect the same Oregon and Washington homes as the Middle Alternative. In addition, it would run close to a cluster of homes and businesses near line mile E22 and a home near line mile E27, west of Goldendale. Construction could have temporary ***moderate-to-high*** noise impacts on these residents.

Knight Substation Options

Because there are no residences within 800 feet of Knight Substation Sites 1 and 2, construction activities would have temporary ***low-to-moderate*** noise impacts. If bedrock blasting is required, this could have a temporary ***moderate*** noise impact on residents within a mile or two of the substation site.

Substation operations noise is mainly made by equipment like transformers, reactors and other wire-wound equipment, which can produce a hum. No transformer would be installed at Knight Substation. Any equipment installed would be required to meet BPA's noise level criterion of 50 dBA at the edge of the property. This would ensure that all applicable federal, state, and local noise regulations are met. On rare occasions, if the local electrical service is down, a back-up generator would be used to power equipment within the substation. Generator noise would be temporary but could be noticeable depending on weather conditions. The substation would create ***no-to-low*** permanent noise impacts.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on noise would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential noise impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.11.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse noise impacts by the action alternatives. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Ensure standard sound-control devices, including mufflers, are on all construction equipment and vehicles.
- Limit construction activities to daytime hours.
- Notify landowners located along the corridor prior to construction activities, including blasting.

3.11.4 Unavoidable Impacts Remaining after Mitigation

Temporary noise impacts would occur during construction. Some corona noise may also be heard along the line (but not from homes), especially in wet or foggy weather.

3.11.5 No Action Alternative

Under the No Action Alternative, current noise levels at the edges of existing rights-of-way would continue to range from ambient to 48 dBA. The existing McNary–Ross 345-kV and parallel Big Eddy–Harvalum 230-kV lines currently produce the highest noise levels when corona is present.

3.12 Public Health and Safety

This section describes public health and safety issues associated with the proposed project, including electric and magnetic field levels.

3.12.1 Affected Environment

Throughout the local area, existing transmission facilities provide electricity for heating, lighting and other services essential for the health and safety of residents, farmers and business owners. If not constructed and operated properly, however, transmission facilities could pose risks to area dwellers and visitors – including fire or electric shock hazards or interference with aircraft safety. Transmission facilities meet safety requirements to prevent or reduce these risks. These include maintaining proper clearances between power lines and the ground, roadways and treetops; preventing ~~accidental~~ unsafe use of rights-of-way; and minimizing EMF as much as ~~possible~~ practical. (Airport locations/impacts and FAA tower marking requirements are discussed in Sections 3.1 Land Use and Recreation, and 3.2 Visual Resources.)

Electric and Magnetic Fields

Transmission lines, like all electric devices, produce EMF. Current, the flow of electric charge in a wire, produces the magnetic field. Voltage, the force that drives the current, is the source of the electric field. The strength of EMF depends on the design of an electrical line and distance from it. EMF is found around any electrical wiring, including household wiring, and electrical appliances and equipment.

Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m). Throughout a home, the average electric field strength from wiring and appliances is typically less than 0.01 kV/m. Electric-field levels in public buildings such as shops, offices, and malls are comparable with residential levels. Outdoor electric fields in publicly accessible places can vary widely from less than .01 kV/m to 12 kV/m; the higher fields are present only in limited areas along high-voltage transmission line rights-of-way (see Appendix E). Electric field strength is reduced by intervening objects such as walls and vegetation.

The International Committee on Electromagnetic Safety (ICES) has established public exposure guidelines of 5 kV/m for electric fields, except on power line rights-of-way where the limit is 10 kV/m. However, there are no national guidelines or standards for electric fields from transmission lines, and the state of Washington has no electric field limit. Oregon's Facility Siting Council has established a limit of 9 kV/m within the right-of-way (no edge of right-of-way limit). BPA has guidelines for its transmission lines and designs new transmission lines to meet its electric-field guideline of 9 kV/m maximum on the right-of-way, ~~and~~ 5 kV/m maximum at the edge of the right-of-way, 5 kV/m for road crossings, and 2.5–3.5 kV/m in parking lots.

Magnetic fields are measured in units of gauss (G) or milligauss (mG). Average magnetic field strength in most homes (away from electrical appliances and wiring) is typically less than 2 mG. However, appliances carrying high current or with high-torque motors, such as microwave ovens, vacuum cleaners or hair dryers ~~electric shavers~~, may generate fields of tens or hundreds of milligauss directly around them (see Table 3-34). Office workers operating electric equipment and machine workers are exposed to similar or higher magnetic fields. ~~fluctuating magnetic fields, while equipment or machine workers or those working for electric utilities are generally exposed to slightly higher level fields.~~ Outdoor magnetic fields in publicly accessible places can range from less than a few milligauss to 300 mG or more, depending on proximity to power lines and their voltage (see Appendix E).

Like electric fields, magnetic fields fall off with distance from the source. Unlike electric fields, however, magnetic field strength is not reduced by intervening objects such as walls. Consequently, while appliances can produce the highest localized magnetic fields, power lines serving neighborhoods and distribution lines and transformers serving individual homes or businesses can be ~~are a~~ common sources of longer-term magnetic field exposure.

Table 3-34. Typical Magnetic Field Levels

Appliance[1]	Magnetic Field Range (mG)[~~1~~2]
Can Opener	40–300
Vacuum Cleaner	20–200
Microwave Oven	1–200
~~**Electric Shaver**~~	~~0–100~~
Hairdryer	0.1–70
Power Drill	20–40
Television	0–20
Computer Monitor	2–6

[1] Applies to plug-in devices.

[~~1~~2] At a distance of 1 foot.

Source: NIEHS 2002

There are no national guidelines or standards for magnetic fields, and Oregon, Washington and BPA do not have magnetic field limits for transmission lines. Guidelines that do exist for public and occupational magnetic-field exposures are based on demonstrated responses to short-term exposures and include appropriate safety factors. For example, ICES has established public exposure guidelines of 9,040 mG for magnetic fields (ICES 2002).

Some studies have been conducted on longer-term exposure, but have been inconclusive (see Appendix F).

3.12.2 Environmental Consequences

General impacts that would occur for all action alternatives are discussed below, followed by impacts unique to each alternative.

Common Impacts

General Safety Issues

During construction of towers and installation of conductors and ground wires, heavy equipment, cranes, helicopters, fuels, and blasting materials would be used. These could pose risks of fire and injury. In addition, there are potential safety issues to the public from more traffic on highways and roads in the area during construction. By following all on-site safety requirements and mitigation practices, however, these risks would be minimized for workers and the public. The public would not be allowed in construction areas and would not be at risk of injury. Typical safety standards, such as using flaggers, and properly handling fuels or other hazardous materials, would reduce potential impacts.

Paint from surfaces coated prior to 1978, such as on existing river crossing towers, would be assumed to contain lead and/or other heavy metals unless laboratory analysis proves otherwise. A lead abatement plan would be implemented that would cover removal and disposal of any paint chips in accordance with all federal, state and local environmental and safety standards.

Construction of the action alternative would pose ***low*** general safety impacts.

During operations and maintenance of the line, there could be additional risks for fire or injuries as workers, vehicles and helicopters travel along the corridor to perform required tasks. Historically, however, on existing lines these activities have posed ***no-to-low*** safety impacts.

Electric and Magnetic Fields

The possible effects of EMF on people near a transmission line right-of-way fall into two categories: short-term electric field effects that can cause shocks, and possible long-term health effects associated with magnetic fields. Each is discussed in this section.

Electric Fields

Power lines, like electrical wiring, can cause serious electric shocks if certain precautions are not taken. All BPA lines are designed and built to meet the National Electrical Safety Code. The NESC specifies the minimum allowable distance between conductors and the ground or other objects. These requirements determine the edge of the right-of-way and the height of the line, that is, the closest point that houses, other buildings, and vehicles are allowed to the line. These clearances are specified to prevent harmful shocks to workers and the public. The electric field analysis for the three transmission line alternatives is discussed in more detail in Appendix E.

BPA also does not permit any uses within rights-of-way that are unsafe or might interfere with constructing, operating, or maintaining the transmission facilities. These restrictions are part of the legal rights BPA acquires for its transmission line easements.

However, people working or living near transmission lines must also take certain precautions. For example, it is important never to bring conductive materials – including TV antennas, irrigation pipes or water streams from an irrigation sprinkler – too close to the conductors. Also, vehicles should not be refueled under or near the conductors. BPA provides a free booklet that describes safety precautions for people who live or work near transmission lines (see Appendix A).

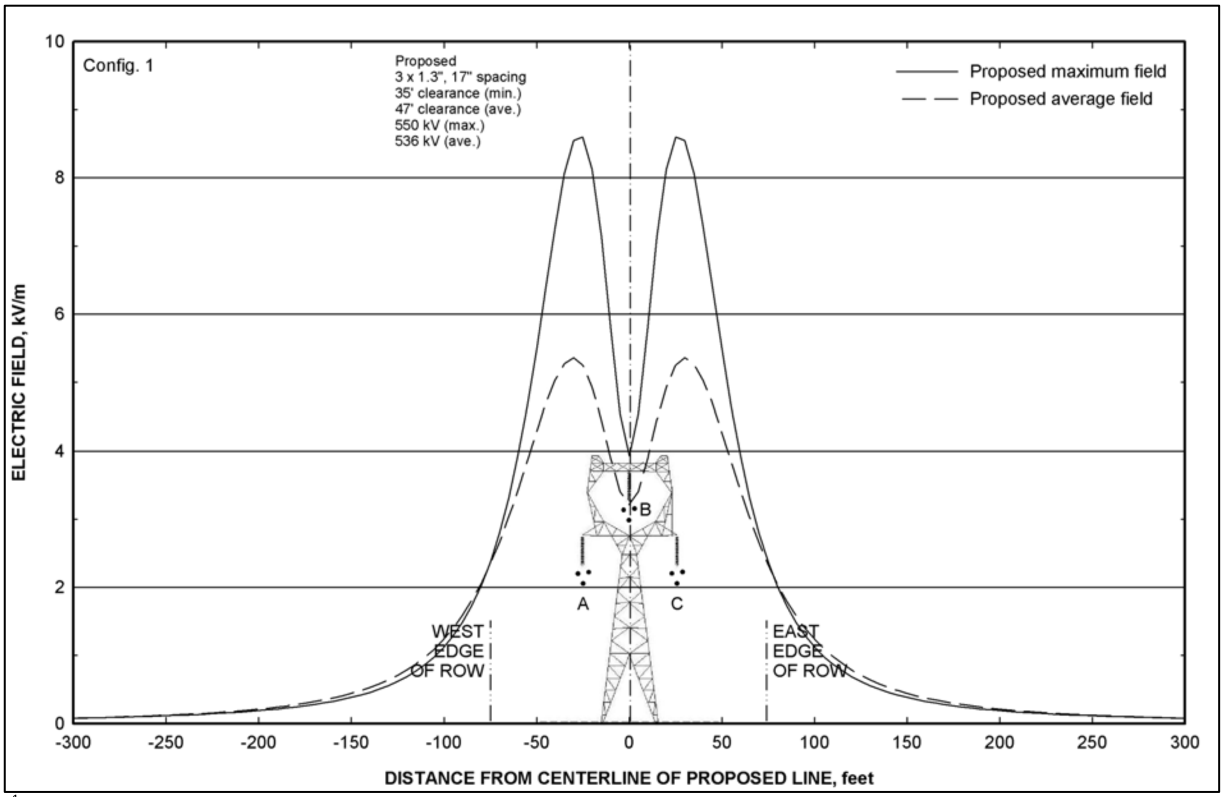
Besides serious shocks, transmission lines can also cause nuisance shocks when a grounded person touches an ungrounded object under or near a line or when an ungrounded person touches a grounded object. BPA takes additional precautions to prevent nuisance shocks. Fences and other metal structures on and near the right-of-way would be grounded during construction. After construction, BPA would respond to any complaints and install or repair grounding as needed. (Nuisance shocks from mobile objects that cannot be grounded permanently are minimized by conductor clearance codes and design practices, such as BPA's electric field requirements ~~5 kV/m electric field requirement for road crossings~~.)

The calculated maximum electric field expected on the rights-of-way of the action alternatives (where conductors are closest to the ground) would range from 7.0 to 8.8 kV/m, depending on the tower option and line configuration. This is below Oregon's limit for peak electric fields of 9 kV/m. For average conductor heights, peak fields would range from 4.2 to 5.8 kV/m. Peak values would be present only directly under the conductors and are based on the assumption of maximum current and voltage. (See Figure 3-12 for a visual example of maximum and average electric fields around one tower configuration.) These calculated peaks are rarely reached under real-life conditions, because actual line height is generally above the minimum value used in the computer model, actual voltage is generally below the maximum value used in the model, and vegetation within and near the edge of the right-of-way tends to shield the electric field at ground level.

Both maximum and average values expected at the edge of the right-of-way would range from less than 0.1 to 2.4 kV/m, well under BPA's guidelines of 5 kV/m. These electric field levels would be comparable to or less than those from existing 500-kV lines in the area and elsewhere.

For all action alternatives, shock risks for nearby residents and passers-by would be minimal. There would be ~~no-to-low~~ low electric field impacts. Electric fields would remain the same at Big Eddy Substation; facilities added to accommodate any alternative would not incrementally increase electric fields already present.

Figure 3-12. Electric Fields around Single-Circuit Configuration 1[1]



[1] Maximum field is computed using maximum voltage at minimum conductor clearance. Average field is computed using maximum voltage at average clearance. Electric field examples for all single- and double-circuit tower configurations can be found in Appendix E.

[2] ROW is an acronym for right-of-way.

Magnetic Fields

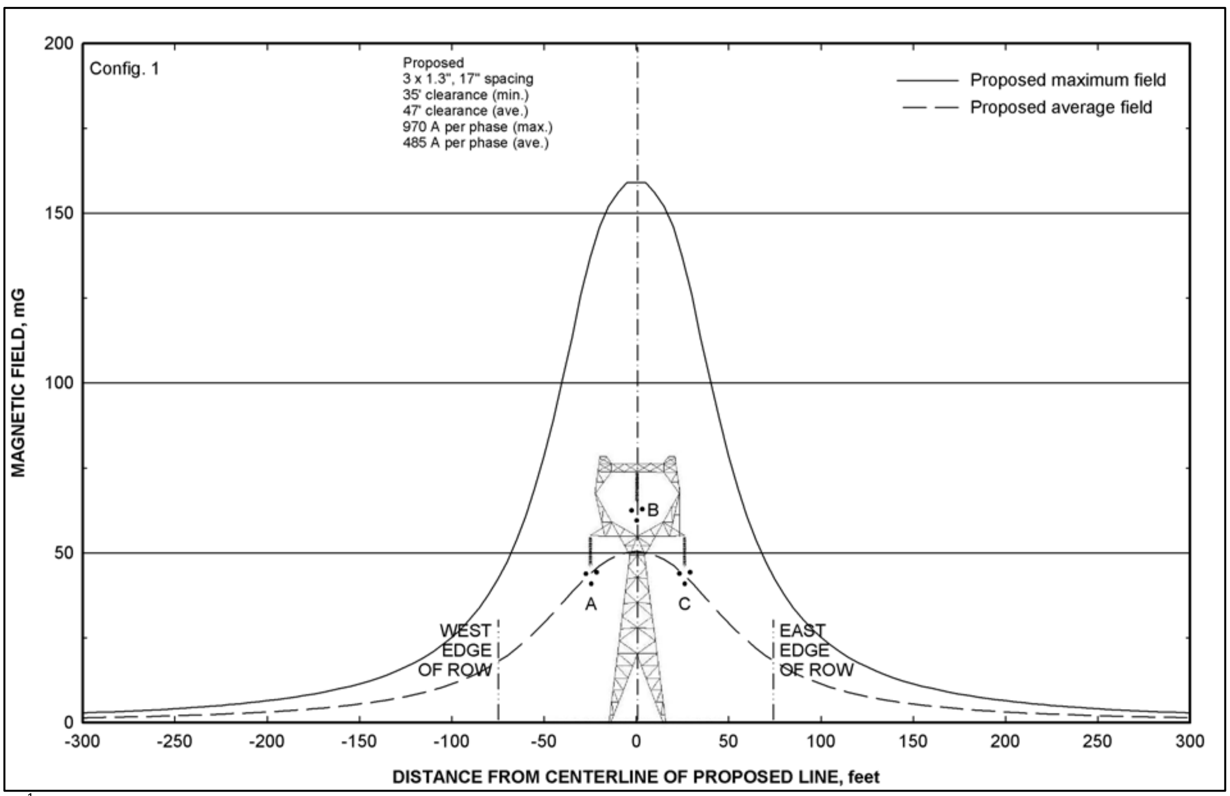
Although there have been decades of research, whether there are long-term health effects associated with transmission line fields remains inconclusive. Magnetic fields are most in question as possible sources of long-term effects, although studies sometimes lump both electric and magnetic fields together. In recent years, considerable research on possible biological effects of EMF has been conducted. A review of these studies and their implications for health-related effects is provided in Appendix F.

In summary, scientific reviews of EMF health effects research have found there is insufficient evidence to conclude that EMF exposures lead to long-term health effects, such as adult cancer, or adverse effects on reproduction, pregnancy, or growth and development of an embryo. However, uncertainties remain about possible links between childhood leukemia and childhood magnetic field exposures at levels greater than 4 mG. There are also suggestions that short-term exposures to magnetic fields greater than 16 mG may be related to an increased risk of miscarriage. Animal and cellular studies provide little support for the idea that any statistical associations reflect a causal relationship, i.e., that magnetic-field exposure increases the risk of childhood cancer or miscarriage.

An increase in public exposure to magnetic fields could occur if the proposed project results in field level increases and if residences or other structures draw people to these areas. The predicted field levels discussed in this section are only indicators of how the proposed project may affect the magnetic-field environment. They are not measures of risk or impacts on health.

Maximum magnetic fields expected for the action alternatives would range from 60 to 219 mG for the different tower and conductor configurations; average peak fields range from 17 to 65 mG. Maximum magnetic fields occur on rights-of-way directly under power lines where conductors are closest to the ground. At the edge of rights-of-way, peak magnetic fields would range from less than 1 to 82 mG, and average fields from less than 1 to 31 mG. (See Figure 3-13 for a visual example of maximum and average magnetic fields for one tower configuration.)

Figure 3-13. Magnetic Fields for Single-Circuit Configuration 1[1]



[1] Maximum field is computed using maximum possible current at minimum conductor clearance. Average field is computed using average current at average clearance. Magnetic field examples of all single- and double-circuit tower configurations can be found in Appendix E.

Actual day-to-day magnetic-field levels would be lower. They would vary as currents change daily and seasonally, and as clearances change with ambient temperature.

Beyond the edge of rights-of-way, magnetic fields fall off rapidly. For example, at a distance of 200 feet from centerline, a single-circuit transmission line with maximum current would produce a peak field of 6 mG and average field of about 2 mG. For a double-circuit tower with split-phase (or phase-optimization) configuration, the maximum and average fields would be less than 2 mG. This means that beyond a few hundred feet, transmission line magnetic fields approach common indoor ambient levels.

These calculations take into consideration that portions of the action alternatives would share rights-of-way with existing lines, or in some cases could replace those lines. In other words, they represent the total projected magnetic fields along the rights-of-way, ~~but~~ not net gains or losses in fields. Because of the way new transmission lines are designed (discussed later in this section), magnetic fields in certain locations could end up lower that what currently exists.

Magnetic fields would remain unchanged at Big Eddy Substation. Beyond the perimeter of the substation yard, magnetic fields would continue to be determined by fields from transmission lines entering the substation. The addition of a new 500-kV line would not incrementally increase fields.

Potential magnetic field impacts on residents living closest to the action alternatives are discussed under each alternative later in this section. For all action alternatives, motorists passing near or under the line would be exposed only briefly to magnetic fields, which would be required to meet BPA standards at street crossings. Cars also provide a shielding effect.

Implanted Medical Devices

Because EMF from various sources (including automobile ignitions, appliances and possibly transmission lines) can interfere with implanted cardiac pacemakers, manufacturers are now designing devices to be immune from such interference. However, research has found these efforts only partly successful and a few models of older pacemakers still in use could be affected by EMF from transmission lines. (There are also many models of pacemakers not affected by fields larger than those found under transmission lines.)

Because of the known potential for interference with pacemakers, EMF field limits for pacemaker wearers have been established by the American Conference of Governmental Industrial Hygienists (ACGIH). It recommends that, if unsure about their pacemakers, wearers of these and similar medical-assist devices should limit their exposure to electric fields of 1 kV/m or less and to magnetic fields of 1,000 mG or less (ACGIH 2008). For additional discussion about interference with implanted devices, see Appendix E.

Electric fields from the proposed 500-kV line would generally meet ACGIH standards at the edge of rights-of-way and beyond. Still, wearers of pacemakers and similar medical-assist devices are discouraged from unshielded right-of-way use. (A passenger in an automobile under the line would be shielded from the electric field.) Magnetic fields would be well below ACGIH limits.

Electromagnetic Interference

If corona is present at the surface of transmission line conductors, it can sometimes cause interference with broadcast radio and television signals close to the right-of-way. This affects only conventional broadcast radio and television receivers operating at lower frequencies (AM radio and TV channels 2-6). Satellite and cable TV systems are not affected, nor are FM radio signals.

The bundle of three conductors used for each phase of the proposed 500-kV line would minimize corona generation and should keep radio and television interference levels at acceptable levels. If complaints arise, measures would be taken under BPA's mitigation program to restore reception to the same or better quality.

Magnetic fields from transmission and distribution facilities can also interfere with other electronic equipment, such as distorting images on older TVs and computer monitors with cathode ray tubes.

While unlikely to occur at the magnetic field levels found near the proposed line, such interference is easily remedied by shielding the affected device or moving it to another location. Contemporary display devices using flat-panel technologies, such as liquid-crystal or plasma displays, are not affected.

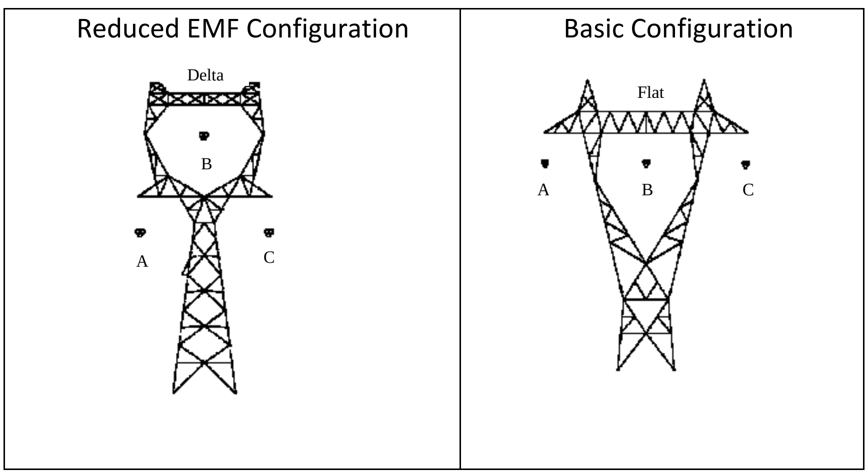
With the exception of one home that could be located very close to the Middle or East alternatives (discussed under those alternatives), none of the alternatives is anticipated to create electromagnetic interference in nearby homes.

Designing Lines to Reduce EMF

When BPA builds new high-voltage 500-kV transmission lines, the agency designs them using “EMF-mitigation” techniques to keep EMF exposure as low as reasonably achievable while maintaining system reliability.

For example, BPA uses “delta configuration” tower designs for single-circuit lines, where the three phase conductor bundles (called A, B, and C) are positioned in a triangular shape (two on the bottom, one on top) (see Figure 3-14). This configuration provides for more EMF cancellation effects than the more traditional “flat configuration,” where the three phase conductor bundles are arranged horizontally and all are at the same height above ground.

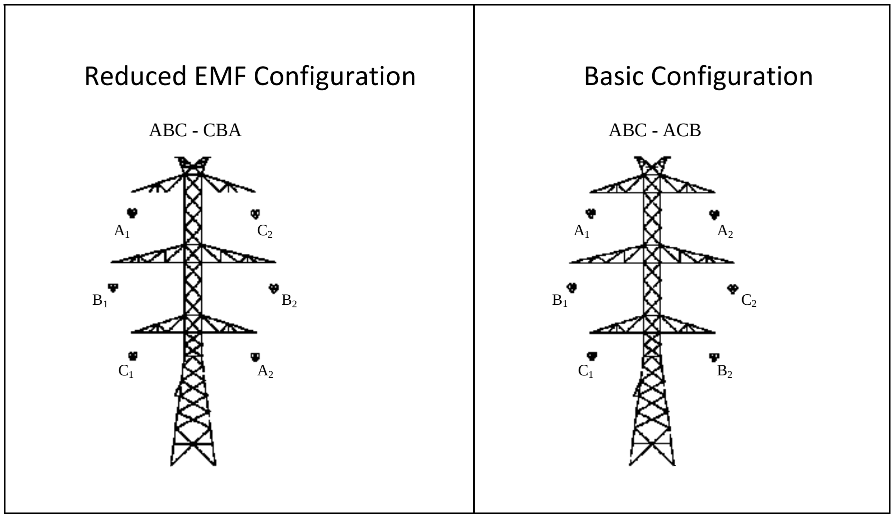
Figure 3-14. Single-Circuit Tower Design to Mitigate EMF



For double-circuit lines (two transmission line circuits on the same tower; six phase conductor bundles instead of three), BPA uses a “phase-optimization” approach to minimize EMF levels, when feasible. Generally, three phase conductor bundles of one line circuit are placed vertically on the left side of the tower while the three phase conductor bundles of the other circuit are placed vertically on the right side (see Figure 3-15).

Such phasing arrangements result in some EMF cancellation, with actual ~~offset rates~~ reduction depending on the power flow (direction) and magnitude (kilovolts) of the transmission line circuits.

Figure 3-15. Double-Circuit Tower Design to Mitigate EMF



West Alternative

For the West Alternative, the transmission line would travel through a sparsely populated area where existing lines are of lower voltage, very distant or absent. Therefore the magnetic fields near the proposed line ~~local houses~~ would generally increase from existing levels to the ranges of levels discussed in this section. The amount of increase at local houses would depend on distance from the proposed line and whether other lines are present.

For the 10 homes closest to (within ~~300~~ 500 feet of) the West Alternative, average magnetic fields would range from 0.1 to 3.5 mG, depending on whether single- or double-circuit towers are used (see Table 3-35). Maximum magnetic fields would range from 0.2 to 7 mG. These magnetic field levels are comparable to typical ambient levels and would be far less than those encountered near common household appliances or directly under the line.

Table 3-35. Magnetic Field Levels at Houses/Business near the Action Alternatives

	Single Circuit			Double Circuit[1]		
Primary Configuration	West Alternative	Middle Alternative	East Alternative	West Alternative	Middle Alternative	East Alternative
Houses/Businesses < 300 ft	4	3	3	4	5	5
Houses/Businesses < 500 ft	10	12	12	10	11	10
Range of Distances from Centerline, ft	203–486	71–425	71–484	203–486	191–495	191–495
Range of Avg. Magnetic Field, mG	0.5–3.1	0.7–22.3	0.5–22.3	0.1–3.5	0.1–1.8	0.3–1.8
Range of Max. Magnetic Field, mG	1.1–6.2	1.4–45	1.1–45	0.2–7	0.2–4.5	0.7–4.6

[1] Double-circuit counts include houses from single-circuit segments E4, E27 and M5, where no double-circuit is planned. See Figure 1 in Appendix E for more information on segments.

Middle Alternative

For the 11 to 12 homes and businesses closest to the Middle Alternative, average magnetic fields would range from 0.1 to 22.3 mG, depending on whether single- or double-circuit towers are used (see Table 3-35). Maximum magnetic fields would range from 0.2 to 45 mG. (The highest potential fields would exist near the Wishram residence closest to the proposed single-circuit line.) For all but the closest home, these magnetic field levels are comparable to ambient levels.

For the closest Wishram home, magnetic fields could be elevated over ambient levels, although the maximum level of 45 mG is below international guidelines (800–9,000 mG). If double-circuit towers were used in this area (proposed and existing lines were placed on the same towers), field levels at this home would be substantially lower (4.5 mG vs. 45 mG) because towers would be farther from the house and the conductors would be closer together, lessening overall field strengths. For this alternative, in all locations where the proposed line would parallel existing lines, magnetic field levels would be below existing levels if double-circuit towers were used.

East Alternative

For the 10 to 12 homes and businesses closest to the East Alternative, average magnetic fields would range from 0.3 to 22.3 mG, depending on whether single- or double-circuit towers are used (see Table 3-35). Maximum magnetic fields would range from 0.7 to 45 mG. (The highest potential fields would exist near the one closest Wishram residence.) For all but the closest home, these magnetic field levels are comparable to ambient levels.

As with the Middle Alternative, magnetic fields could be elevated over ambient levels for the closest Wishram home, but the maximum level of 45 mG would be below international guidelines. If double-circuit towers are used in this area, magnetic fields would be below ambient levels at this house. As with the Middle Alternative, in all locations where the proposed line would parallel existing lines, magnetic field levels would be below existing levels if double-circuit towers were used.

Knight Substation Options

Only authorized personnel would be allowed in the fenced substation yard. General EMF at the perimeter of the Knight Substation yard, regardless of location, would reflect fields generated by the new 500-kV line. The magnitudes and impacts would be similar to those for the transmission lines alone. Within a few hundred feet, these fields would dissipate to ambient levels. Since there are no residences near either substation site, there would be ***no*** EMF impacts.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option, no impacts to public health and safety would occur beyond those already described for each action alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential public health and safety impacts of the fiber optic cable Wautoma Option and the expansion at Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.12.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse impacts by the action alternatives on public health and safety. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Notify landowners located along the corridor prior to construction activities, including blasting.
- If blasting is required, take appropriate safety measures and follow all state and local codes and regulations. Lock up or remove all explosives from work sites at the end of the workday.
- Hold crew safety meetings at the start of each construction workday to review potential safety issues.
- Prepare and implement a Spill Prevention, Control and Countermeasure Plan (see mitigation measures in Section 3.5 Water Resources and Wetlands) to manage hazardous materials and respond to emergency situations.
- Prepare and maintain an on-site safety plan in compliance with state requirements.
- Prepare for fire control (see mitigation measures in Section 3.3 Vegetation).
- Fuel all highway-authorized vehicles off-site to minimize the risk of fire. Fueling of construction equipment that is transported to the site via truck and is not highway authorized will be done in accordance with regulated construction practices and state and local laws. Helicopters will be fueled and housed at local airfields or at staging areas.
- Secure the site at the end of each workday to protect equipment and the general public.
- Ensure that BPA contractors flying helicopters prioritize public safety during flights. For example, establish flight paths to avoid populated areas or schools (Helicopter Association International 1993).
- Implement appropriate airport safety measures (see mitigation measures in Section 3.1 Land Use and Recreation).
- Clear vegetation according to BPA standards to avoid contact with transmission lines prior to project construction and throughout the life of the line.
- Prepare and implement a lead abatement plan that would cover removal and disposal of any contaminated paint chips in accordance with applicable federal, state and local environmental and safety standards.
- Report possible hazardous materials, toxic substances, or petroleum products discovered along the transmission line route that would pose an immediate threat to human health or the environment, including large dump sites, drums of unknown substances, suspicious odors, stained soil, etc.).
- Adhere to appropriate specifications for grounding fences and other objects on and near existing and proposed rights-of-way.
- Construct and operate the new transmission line according to the NESC.
- Restore reception quality if radio or television interference occurs as a result of constructing the transmission line so that reception is as good as or better than before the interference.

3.12.4 Unavoidable Impacts Remaining after Mitigation

Once built, the proposed line could also cause accidental injury from electric shock if someone were to bring conductive material too close to the lines within the right-of-way. Electric fields on the right-of-way also have the potential to interfere with implanted cardiac pacemakers worn by persons walking (or otherwise not shielded) under the line.

EMF levels directly under the lines and in the rights-of-way could be higher than ambient levels, but would meet all applicable regulations and standards and would dissipate rapidly beyond the transmission line right-of-way. Fields could increase at homes within several hundred feet of the line (10 to 12 homes) for certain tower options.

3.12.5 No Action Alternative

The No Action Alternative would have no impact on public health and safety because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.13 Air Quality

3.13.1 Affected Environment

There are no major industrial facilities along the action alternatives or substation sites and no significant existing air quality problems in these portions of Wasco and Klickitat counties. Local air pollutant emissions are limited mainly to windblown dust from agricultural operations and tailpipe emissions from traffic along state highways and local roads. The nearest air quality monitoring station is in The Dalles. The area has been designated as having attainment status.

The Department of Environmental Quality Eastern Regional Office in Bend, Oregon regulates air quality in Wasco County. Air quality in Klickitat County is regulated by the Washington Department of Ecology Central Regional Office, in Yakima County by the Yakima Regional Clean Air Agency, and in Benton County by the Benton Clean Air Agency.

Based on available data from the monitoring station in The Dalles, Oregon Department of Environmental Quality (DEQ), and Ecology acknowledge that air quality along the action alternatives complies with all regulatory limits for ambient air concentrations. Yakima and Benton counties had no air quality concerns about the proposed project.

Air quality has a direct effect on visibility. Section 106 of the Clean Air Act and its amendments require that air quality be preserved, protected, and enhanced in any specific area of national or regional natural, recreational, scenic or historic value. Congress designated 156 national parks and wilderness areas as "mandatory federal Class 1 areas" where visibility is especially important (Ecology 2010). Washington has eight Class 1 areas, totaling more than 3.3 million acres. In these areas, there are restrictions on the use of the land and resources in order to avoid damaging visibility, plants, and other resources. There are no Class I areas in the project area.

3.13.2 Environmental Consequences

Common Impacts

Construction

Construction and vegetation removal activities would affect air quality. Heavy equipment creates dust and emits pollutants. The primary type of air pollution created during construction would be particulate matter, including fugitive dust from disturbed soils becoming airborne, and combustion pollutants from equipment exhaust.

Several construction crews (foundation crews, assembly crews, wire stringing crews and framing crews) would most likely be working simultaneously on separate sections of the line. This type of transmission line construction crew (up to 100 workers) could construct about 10 miles of line in 4 months. Construction equipment would consist of about 20 vehicles (pickups, vans), three bucket trucks, one conductor reel machine, two small cranes (20 to 30 ton) and one large crane (90 ton), three large excavators (bulldozers, backhoes), road construction equipment (dump trucks, rollers, road bladers), one line tensioner, 1 puller, 1 reel trailer and two helicopters (small helicopter and skycrane). One construction crew would work on Big Eddy Substation and construct Knight Substation. Construction of the Knight Substation would occur over about a 20-month period.

Construction activities that could create dust include road building and grading, on-site travel on unpaved surfaces, work area clearing and preparation, and soil disturbing operations. Wind erosion of disturbed areas would also contribute to fugitive dust. Air quality impacts are expected to be short term, and mitigation measures would be implemented to minimize impacts.

Soils in the area are mostly fine-grained, wind-blown silt and clayey silt soils (loess). Several other soil types are either very rocky, or are very thin over bedrock. Proposed construction would take place over 20 months. Gravel would be used as surface material on unpaved access roads to minimize particulate matter from being released into the air.

Tree removal, as well as the potential removal of existing towers, would create fugitive dust. Most of the vegetation is cultivated croplands, grasslands and rangelands; additional clearing of tall-growing vegetation within the right-of-way would be minimal. Erosion control measures and reseeding would be used on disturbed areas.

Clearing of tall brush and low-growing trees and vegetation can produce debris that would need to be disposed of by lop and scatter, chipping, wood waste recycling, or removal to land fill. No burning would occur.

Heavy equipment and vehicles, including those with diesel internal combustion engines, would emit pollutants such as carbon monoxide, carbon dioxide, sulfur oxides, PM-2.5, oxides of nitrogen, volatile organic hydrocarbons, aldehydes, and polycyclic aromatic hydrocarbons. All equipment is required to have acceptable air filtration systems.

The amount of pollutants emitted from construction vehicles and equipment would be relatively small and comparable to current conditions with the operation of agricultural equipment in the project vicinity. Such short-term emissions from construction sites are exempt from air quality permitting requirements.

Air quality impacts from construction of the proposed project would be ***no-to-low*** for all alternatives.

Operation and Maintenance

Operation and maintenance vehicles would mainly use access roads with native or rocked surfaces, causing fugitive dust to be stirred up. Quantities of potential emissions would be very small, temporary, and localized.

The transmission lines themselves would cause limited air emissions. The high electric field strength of transmission lines causes a breakdown of air at the surface of the conductors called corona. Corona has a popping sound that is most easily heard during rainstorms. When corona occurs, small amounts of ozone and nitrogen oxides are released in such small quantities that they are generally too small to be measured or to have any significant effect on humans, plants, or animals (see Sections 3.11 Noise and 3.12 Public Health and Safety for more detailed information).

There would be ***no-to-low*** impacts on air quality during operation and maintenance of the proposed project**.**

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no impacts on air quality would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential air quality impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.13.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate adverse air quality impacts. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Prepare and implement a SWPPP (see mitigation measures in Section 3.4 Geology and Soils) to limit erosion and dust generation.
- Prepare a Fugitive Dust Control Plan to control windblown dust (see mitigation measures in Section 3.4 Geology and Soils).
- Reseed disturbed areas (see mitigation measures in Section 3.3 Vegetation) to prevent dust from erosion.
- Shut down idling construction equipment, if feasible.
- Ensure all vehicles are in compliance with applicable federal and state air quality regulations for tailpipe emissions. Certification that vehicles meet applicable regulations will be provided by contractors to BPA in writing.
- Maintain and certify in writing that all construction equipment is in proper working condition according to manufacturer's specifications.
- Obtain rock and concrete from sources with appropriate environmental permits.

3.13.4 Unavoidable Impacts Remaining after Mitigation

Unavoidable impacts on air quality would include fugitive dust and vehicle emissions.

3.13.5 No Action Alternative

The No Action Alternative would have no impact on air quality because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.14 Greenhouse Gases

3.14.1 Affected Environment

Greenhouse gases (GHG) are chemical compounds found in the earth's atmosphere that absorb and trap infrared radiation, or heat, re-radiated from the surface of the earth. The trapping and build-up of heat in the atmosphere increases the earth's temperature, warming the planet and creating a greenhouse-like effect (EIA 2009b). Anthropogenic activities (caused or produced by humans) are increasing atmospheric concentrations to levels that could increase the earth's temperature up to 7.2 degrees F by the end of the twenty-first century (EPA 2010b).

The principal greenhouse gases emitted into the atmosphere through human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_20), and fluorinated gases (EPA 2010b). Of these four gases, CO_2 is the major greenhouse gas emitted (EPA 2010b; Houghton 2010). For example, carbon dioxide emissions from the combustion of coal, oil, and gas constitute 81 percent of all U.S. greenhouse gas emissions (EIA 2009a). Carbon dioxide enters the atmosphere primarily through the burning of fossil fuels such as coal, natural gas and oil, and wood products; as a result of land use changes; and the manufacturing of cement. Prior to the industrial revolution, concentrations were roughly stable at 280 parts per million (ppm), but have increased 36 percent to 379 ppm in 2005, all of which is attributed to human activities (Intergovernmental Panel on Climate Change [IPCC] 2007).

Of the remaining three principal greenhouse gases, methane is emitted during the production and transport of fossil fuels, through intensive animal farming, and by the decay of organic waste in landfills. Methane concentrations have increased 148 percent above pre-industrial levels (EPA 2010b). Nitrous oxide is emitted during agricultural and industrial activities, and during the combustion of fossil fuels and solid waste. Nitrous oxide atmospheric levels have increased 18 percent since the beginning of industrial activities (EPA 2010b, 2010). Fluorinated gases, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), are synthetic compounds emitted through industrial processes and now are being used to replace ozone-depleting compounds such as chlorofluorocarbons in insulating foams, refrigeration, and air conditioning. Although they are emitted in small quantities, these gases have the ability to trap more heat than CO_2 and are considered high global-warming potential gases. Atmospheric concentrations of fluorinated gases have been increasing over the last two decades and are expected to continue to increase (EPA 2010b).

The Clean Air Act is a federal law that establishes regulations to control emissions from large generation sources such as power plants. The EPA has issued a Final Mandatory Reporting of Greenhouse Gases Rule that requires reporting of greenhouse gas emissions from large sources. Under the rule, suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of greenhouse gases, are required to submit annual reports to the EPA (EPA 2010a). Executive Orders 13423 and 13514 require federal agencies to measure, manage, and reduce greenhouse gas emissions by agency-defined target amounts and dates. In the state of Washington, Executive Orders 07-02 and 09-05 direct state agencies to work with western states and Canadian provinces to develop a regional emissions reduction program designed to reduce greenhouse gas emissions to 1990 levels by 2020 (Ecology 2010). In the state of Oregon, House Bill 3543 from 2007 (codified at Oregon Revised Statutes [ORS] 468A.205), directs state and local governments, businesses, nonprofit organizations and individual residents to reduce greenhouse gas emissions in Oregon; by 2010, arrest growth of greenhouse gas emissions; by 2020 begin to reduce greenhouse gas levels to 10 percent below 1990 levels; and by 2050 achieve greenhouse gas levels at least 75 percent below 1990 levels (Oregon Global Warming Commission 2010).

Global atmospheric greenhouse gas concentrations are a product of emissions and removal over time. Soils store carbon in the form of decomposing plant materials and constitute the largest carbon reservoir on land. Through the process of photosynthesis, atmospheric carbon is also captured and stored as biomass in vegetation, especially forests. To better understand the relevance tree removal may have on the environment, one must first consider the carbon cycle. The carbon cycle consists of two phases: gaseous carbon (i.e., carbon dioxide) and solid carbon (i.e., sugars). Photosynthesis is the process plants such as trees use to sequester carbon dioxide from the air and subsequently manufacture solid, organic mass (i.e., sugars). Consequently, as trees grow and increase in mass, carbon is removed from the atmosphere. Inversely, as trees decay or are burned, carbon is emitted into the atmosphere.

Based on the carbon cycle, it is reasonable to conceptualize trees as merely a temporary carbon reservoir. In a natural environment, a tree seed would grow (sequester carbon), the tree would die and decay (release gaseous carbon), and subsequently a new tree would presumably grow in its place. Such a cyclical pattern can be visualized by a sine wave graph. Essentially, the quantity of carbon stored in solid, organic mass is dependent on the current phase of the carbon cycle. Peak solid carbon storage occurs when a tree is fully mature, and minimum solid carbon storage occurs immediately after the tree has decomposed or burned. Alternatively, minimum solid carbon storage may occur when a forested area is permanently converted to a non-forested area, such as grasslands.

Stored carbon can be released back into the atmosphere when biomass is burned (ESA 2008). In addition, CO_2, N_20, and CH_4 emissions increase in areas where soil disturbance occurs (Kessavalou et al. 1998). Models predict atmospheric concentrations of all greenhouse gases are to increase over the next century, but the extent and rate of change is difficult to predict, especially on a global scale.

3.14.2 Environmental Consequences

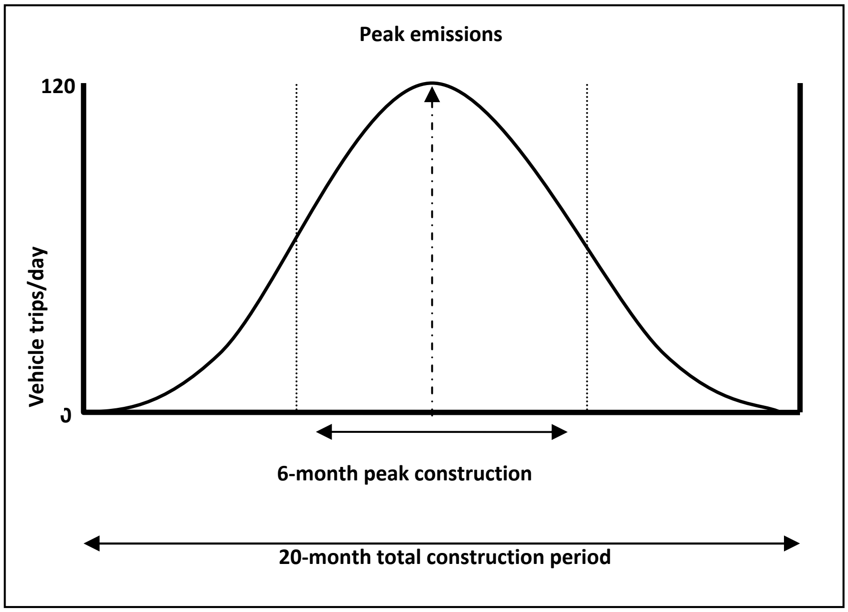
Common Impacts

Potential impacts related to greenhouse gases would generally be the same under all action alternatives. Implementation of any of the action alternatives would contribute to greenhouse gas concentrations in several different ways. Carbon dioxide, methane, and nitrous oxide emission levels would incrementally increase as vegetation and soils are removed and/or disturbed during construction of the transmission line (Kessavalou et al. 1998) and through the operation of construction-related vehicles during the construction period. Emissions would also occur during operation and maintenance of the transmission line.

Emissions from construction, operations, and maintenance-related vehicles on and off the project right-of-way also would impact atmospheric greenhouse gas concentrations incrementally because construction equipment and vehicles would be fueled by gasoline and diesel combustion motors.

Greenhouse gas emissions were estimated for all action alternatives based on the approximate number of vehicles to be used during project construction and the approximate distance those vehicles would travel during the construction period. For the proposed project, an estimated 16 vehicle round trips per day would occur during the peak construction period for all action alternatives. (Construction would take about 20 months, with peak construction activity occurring during a 6-month period see Figure 3-16.) During the 6-month peak construction period, road and tower pad construction usually takes about 3-5 months including close-out repairs of any roads damaged during construction. Non-peak construction activities would include acquisition of easements, work to connect the new line and other existing lines into the substations, and tower site restoration work (see Chapter 2 Proposed Action Alternatives for the proposed construction schedule).

Figure 3-16. Project Construction Schedule with Peak Emissions



To provide a conservative analysis and ensure that the proposed project's potential contributions to greenhouse gas concentrations are adequately considered, greenhouse gas emissions were calculated for the 6-month peak construction period using the estimate of 16 vehicle round trips per day. A round trip on the proposed project was considered to be from The Dalles to Knight Substation and back to The Dalles (about 80 miles). The greenhouse gas emission estimates are, therefore, artificially high to ensure that potential greenhouse gas emissions are fully described.

Figure 3-16 displays the estimated greenhouse gas emissions for the 6-month peak construction period. While all emissions of greenhouse gases are significant in that they contribute to global greenhouse gas concentrations and climate change, the total CO_2 emissions from the proposed project would be very low compared to emissions from other contributors. To provide context for these emission rates, EPA's mandatory reporting threshold for annual CO_2 emissions is 25,000 metric tons of $C0_{2e}$. This threshold is roughly the amount of CO_2 generated by 4,336 passenger vehicles per year. This threshold requires federal reporting of greenhouse gas emissions, but does not require any other action (EPA 40 Code of Federal Regulations [CFR] Parts 86, 87, 89 et al.).

As shown in Table 3-36, construction would result in an estimated 409 metric tons of CO_2 emissions, and an estimated 409 metric tons of CO_{2e} emissions per year. The project's estimated CO_{2e} emissions translate roughly to the annual CO_2 emissions of 78 passenger vehicles. This emission rate is about 61 times lower than what is required to trigger EPA emissions reporting. Given this extremely low amount of contribution, the project's impact on greenhouse gas concentrations during construction would be ***low***.

Table 3-36. Estimated Greenhouse Gas Emissions from the Action Alternatives

Estimated GHG Emissions of the Action Alternatives per Year	CO_2 Emissions in Metric Tons per Year	CH_4 (CO_2e[1] Emissions in Metric Tons per Year)	N_2O (CO_2e Emissions in Metric Tons per Year)	Total CO_2e Emissions in Metric Tons per Year
From Construction	409	0.03	0.4	**409**
From Operation and Maintenance	0.7	0.001	0.03	0.7

[1] CH_4 and N_2O emissions have been converted into units of CO_{2e} equivalent using the IPCC global warming potential (GWP) factors of 21 GWP for CH_4 and 310 GWP for N_2O.

Note: See Appendix G for calculations used in determining emissions.

During operation and maintenance of the transmission line, a helicopter would be used twice a year for aerial inspections and about 1 vehicle would travel round trip per year. Emergency trips were estimated at about 2 each year. The helicopter and vehicles would most likely access the transmission line corridor from The Dalles. A round trip would be from The Dalles to the project and back again, a flying distance of about 60 miles and a driving distance of about 80 miles. All full-grown trees would already have been removed during construction, but tree saplings would be removed during regular maintenance for the life of the line.

Table 3-36 displays the estimated annual greenhouse gas emissions that would be expected during operation and maintenance of the transmission line. As shown in this table, operation and maintenance would result in about 0.7 metric tons of CO_{2e} emissions per year, which translate to the annual CO_2 emissions of less than 0.1 passenger vehicle. This emission rate is about 0.003 percent of the rate required to trigger EPA emissions reporting.

Though recognized as a contribution to overall green house gas emissions, measurement of emissions from soil disturbance is difficult. However, research has shown that emissions as a result of soil disturbance are short-lived and return to background levels within several hours (Kessavalou et al. 1998). Based on the conservative methodology used to estimate vehicle emissions, the emissions related to soil disruption and annual vegetation decay are accounted for in the overall construction emission rates. Carbon that would be stored in removed vegetation would be offset in time by the growth and accumulation of carbon in soils and new vegetation.

Some trees would be removed as part of the proposed project and soil disturbance would occur. The West Alternative could remove about 93 to 130 trees, the Middle Alternative could remove about 14 to 26 trees and the East Alternative could remove about 16 trees.

The nature of tree removal is to permanently convert land (i.e., proposed BPA right of way) to a non-forested area. Therefore, this action can be characterized as permanently maintaining the proposed BPA right-of-way at the minimum level of solid carbon storage. It is the objective of this analysis to fully account for this loss of potential solid carbon storage in the context of GHG emissions.

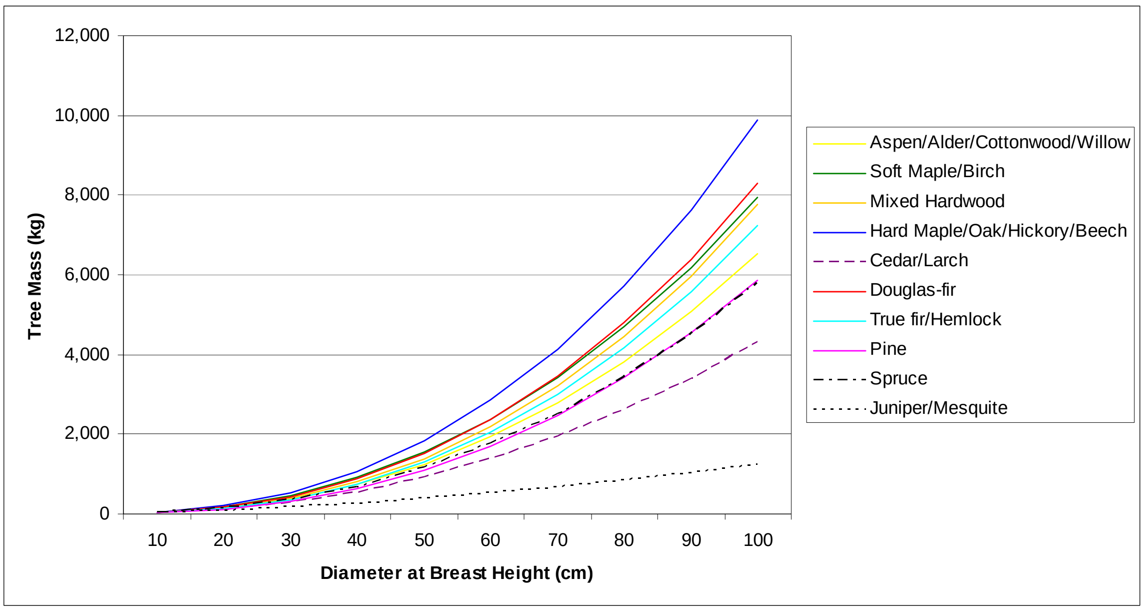
The GHG emissions from tree removal can be broken down further into three segments: the carbon that has potential to be released from the existing trees, the loss of future carbon sequestration that would have occurred if each tree continued to grow, and the energy consumed while removing the trees from the soil. The intention of this analysis was to quantify the maximum potential of GHG emissions associated with the tree removal. Within subsequent qualitative analysis, this conservative estimation can serve as a baseline to compare with other GHG emitting processes.

The estimation of the amount of carbon that may be released after harvesting a tree requires some assumptions:

- the average moisture content of a green tree assumed to be 30 percent (Simpson 1993); about 30 percent of a trees biomass is below ground (IPCC 2006);
- about 50 percent of a tree's dry-mass is comprised of carbon (IPCC 2006);
- 100 percent of the carbon will eventually be oxidized into carbon dioxide and emitted into the atmosphere; and,
- based on Figure 3-17, an average tree with a dbh of 50 to 60 cm contains about 2,000 kg of above ground biomass.

In summary, the removal of a 50 to 60-cm-dbh tree would emit about 3.3 metric tons- carbon dioxide equivalent (CO_2e) per tree.

Figure 3-17. Estimated Total Above Ground Biomass for Typical Trees in the United States



Source: Jenkins et al. 2004

Tree growth and future carbon sequestration rates are highly variable and depend on several factors including the species of tree, age of tree, climate, forest density, and soil conditions. As an alternative to estimating tree growth rates, a simple method to estimate the loss of future carbon sequestration is via mass balance. As stated above, the average current above ground mass for the trees to be removed is about 2,000 kg. Using Figure 3-17, the average, fully mature tree would not likely exceed 10,000 kg of above ground mass. Again, assuming that the average moisture content of a green tree is 30 percent, about 30 percent of a tree's biomass is below ground, and 50 percent of a tree's dry-mass is comprised of carbon, about 13 metric tons-CO_2e per tree could have been sequestered.

Removal and disposal of each tree is an energy-consuming process that results in GHG emissions via fuel combustion. This component of GHG emissions, however, was accounted for above in terms of transmission line construction.

The net carbon footprint associated with tree removal on the action alternatives will vary from 266 metric tons-CO_2e on the East Alternative to 2162 metric tons-CO_2e on the West Alternative (see Table 3-37).

Table 3-37. Net Carbon Footprint Associated with the Removal of Trees by Action Alternative

	Carbon Released from Harvesting Trees (metric tons-CO_2e)	Loss of Future Carbon Sequestration (metric tons-CO_2e)	Total (metric tons-CO_2e)
West Alternative	430	1,690	2,122
Middle Alternative	86	338	424
East Alternative	53	208	261

Note: See Appendix G for assumptions used in determining emissions.

Given this extremely low amount of contribution, the project's impact on greenhouse gas concentrations during operation and maintenance would be **low**.

Fiber Optic Cable ~~Options~~ and Wautoma Substation

For the fiber optic cable Loop Back Option , no greenhouse gas impacts would occur other than those already described for each alternative because this option would place the fiber optic cable on the same towers as the proposed transmission line. Potential greenhouse gas impacts of the fiber optic cable Wautoma Option and the expansion of BPA's Wautoma Substation are described in Section 3.15 Fiber Optic Cable ~~Options~~ and Wautoma Substation.

3.14.3 Mitigation Measures

The following mitigation measures have been identified to reduce or eliminate greenhouse gas emissions. All mitigation measures would be implemented prior to, during, or immediately after construction of the project unless otherwise noted.

- Implement vehicle idling and equipment emissions measures (see mitigation measures in Section 3.13 Air Quality).
- Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions.
- Locate all staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites.
- Locate staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance where practicable.
- Use the proper size of equipment for the job.
- Use alternative fuels for generators at construction sites such as propane or solar, or use electrical power where practicable.
- Reduce electricity use in the construction office by using compact fluorescent bulbs, and powering off computers every night.
- ~~Submit a plan for approval to~~ Recycle or salvage non-hazardous construction and demolition debris to the maximum extent practicable.
- Submit a plan for approval to dispose of wood poles locally where practicable.
- Use locally sourced rock for road construction, if possible.

3.14.4 Unavoidable Impacts Remaining after Mitigation

Unavoidable impacts would include slight increases in greenhouse gas releases.

3.14.5 No Action Alternative

The No Action Alternative would have no greenhouse gases impacts because no new transmission lines, towers, or substations would be constructed. Impacts from operation and maintenance of existing lines and substations would continue unchanged.

3.15 Fiber Optic Cable and Wautoma Substation

As part of the proposed project, BPA is proposing to string new fiber optic cable to ~~enhance~~ provide communications to Knight Substation from other ~~and among~~ BPA substations in the area. All action alternatives would require installation of this fiber optic cable. Two options have been identified for routing the proposed cable – a Loop Back Option and a Wautoma Option (see Map 3-8 and Chapter 2 for a description of the options). In addition, the project would require equipment installation at BPA's existing Wautoma Substation to provide system voltage support for the addition of the proposed Big Eddy- Knight transmission line and Knight Substation (see Map 3-8 and Chapter 2 for a description of the Wautoma Substation addition).

Because these components of the project are in a different geographic location from the proposed Big Eddy-Knight transmission line and Knight Substation, this section discusses the affected environment and how resources could be impacted by the fiber optic cable options and work at Wautoma Substation. ~~This section summarizes these options (see Chapter 2 for more detailed descriptions) and discusses the affected environment for each option and how resources would be impacted by each option (see Map 3-8).~~

~~3.15.1 Summary of Options~~

~~*Loop Back Option*~~

~~In this option, the fiber optic cable would be strung on the new towers from BPA's Big Eddy Substation north to Knight Substation, then the cable would loop back on the same towers to Big Eddy Substation. The affected environment for this option would be the same as discussed for the transmission line alternatives in this chapter.~~

~~*Wautoma Option*~~

~~For this option, the fiber optic cable would also be strung on the new towers from BPA's Big Eddy Substation north to Knight Substation, but would then continue northeast for 72 miles and carried on the existing towers that support BPA's Wautoma-Ostrander transmission line. The cable would cross Klickitat and Yakima counties and the Yakama Indian Reservation, ending at BPA's existing Wautoma Substation in northwest Benton County, Washington. Every 3 to 5 miles a splice box would be installed and a reeling site established to string and put tension on the cable. About 16 splice boxes would be placed on the transmission towers or in the ground next to the towers. At each site, about 0.25 acre of ground in line with the conductors within the existing right-of-way would be temporarily disturbed by a reeling truck and tensioning equipment.~~

~~Equipment used along the route would be primarily standard utility equipment, such as bucket trucks, light duty trucks, cranes, four-wheel drive pickup trucks, a line truck with pulling and tensioning reel, helicopter, and all-terrain vehicles. Use of helicopters and/or loud equipment would be minimized before 8 a.m. or after dusk to avoid noise that would disturb landowners. All equipment would stay within the right-of-way and use existing access roads. There would be no staging areas.~~

~~Because the fiber optic cable under this option would be installed on existing towers, cable installation would be expected to proceed relatively quickly. Typically, fiber optic crews can install about 5 to 10 miles of cable per week, depending on terrain. Installation of the cable under the Wautoma Option would be expected to take from 2 to 4 months, with most installation activities at a given location along the line completed in about a day.~~

~~Some work would also take place at local substations. Outside the yard at each of the Knight and Wautoma substations, two concrete vault boxes (4 feet x 4 feet x 4 feet) would be installed. Other fiber optic equipment needed as part of the communications network would also be installed within existing substation yards.~~

3.15.1 Affected Environment

Loop Back Option

The affected environment would be the same as discussed for the action alternatives earlier in this chapter.

Wautoma Option

The affected environment for the portion of the Wautoma Option that would be strung along the proposed Big Eddy-Knight transmission line would be the same as discussed for the action alternatives. The portion of the Wautoma Option that would run from Knight Substation to Wautoma Substation would be strung along the existing Wautoma-Ostrander transmission line that is located entirely in Washington (18.3 miles in Klickitat County, 51.3 miles in Yakima County and 2.0 miles in Benton County). ~~and a~~ About half of the project crosses the Yakama Indian Reservation. The land crossed is mostly privately owned with some areas farmed. The rest of the line passes over some federal (Bureau of Land Management [BLM]) and state (DNR and Parks) land, including Brooks Memorial State Park. Generally, the route is sparsely populated.

The existing Wautoma-Ostrander transmission line crosses mostly shrublands and grasslands. Soils consist primarily of different types of silty loams. The existing line crosses the following streams and creeks: Butler Creek, Cozy Nook Creek, Dry Creek, East Prong Little Klickitat River, Granger Drain, Jenkins Creek, Kusshi Creek, Logy Creek, Satus Creek, Shinando Creek, Toppenish Creek, West Prong Little Klickitat River, and the Yakima River. A list of fish-bearing streams can be found in Table 3-38.

There are no threatened or endangered species along this portion of the existing transmission line. The Washington state database has identified priority habitats occurring in the project area: shrub-steppe and riparian zones. Priority habitats are those habitat types "with unique or significant value to a diverse assemblage of species" and that are used in guiding conservation and management priorities (WDFW 2008, 2010b). Special-status wildlife species in the project vicinity include wild turkey (*Melegris gallopavo*), mule and black-tailed deer (*Odocoileus hemionus*), and Western gray squirrel (*Sciurus griseus*), a Washington state-listed threatened species. Townsend's ground squirrel was noted in several areas near the existing corridor. Great blue heron rookeries and a bald eagle nest were found along the Yakima River. The existing transmission line passes 0.5 mile from a spotted owl management circle near Satus Pass.

In addition to various county and other rural roads in the vicinity, the Wautoma Option crosses SR-97 and I-82. The historic Northern Pacific Railroad grade also passes under the existing Wautoma-Ostrander line.

Table 3-38. Fish-Bearing Streams Crossed by the Wautoma Option

Stream/ Creek Name	Fish Species Present										
	Bull Trout	Coho Salmon	Eastern Brook Trout	Rain-bow Trout	Steel-head Trout	Chinook Salmon	Large-mouth Bass	Small-mouth Bass	Mountain Whitefish	Walleye	Brown Trout
Butler Creek	X										
Dry Creek	X	X	X	X	X						
East Prong Little Klickitat River	X										
Kusshi Creek		X		X	X						
Logy Creek		X	X	X	X	X					
North Fork Dry Creek					X						
Satus Creek		X	X	X	X						
Shinando Creek				X							
Toppenish Creek		X	X	X	X	X	X	X			
West Prong Little Klickitat River	X			X	X						
Yakima River	X	X		X	X	X	X	X	X	X	X

Wautoma Substation

Wautoma Substation is in Benton County about 24 miles northwest of Benton City, Washington. Topography in the area consists of some rolling hills directly north of the substation. The surrounding area is dry, with no wetlands evident and with grassland species as the primary vegetation. On the northern side of the substation, the property is owned by DNR and leased out. The southern side of the substation is privately owned grassland with a home just over 1 mile away. The Wautoma Substation expansion would occur within BPA property on the southeast side of the existing electrical yard. The 0.6-acre location of the proposed expansion is on disturbed, relatively even ground, is sparsely vegetated with grassland species, and with a transmission line access road running through it. There are no federally threatened or endangered species or other special-status species on the property or in the vicinity of the substation. One state-listed plant species of concern, Columbia Milk Vetch, (*Astragalus columianus*), was observed in 2002 in an area about 1000 feet north of the substation. A Ferruginous hawk nest was observed in 2007 about 4 miles to the east, and another was observed in 2003 about 4 miles to the southwest. In 2002, burrowing owls were observed in an area near the substation. There was also a prairie falcon nest observed in 1993 about 3 miles south of the substation. There are no known cultural resources on the property.

3.15.2 Environmental Consequences

Loop Back Option

In the Loop Back Option, the cable would be strung on the proposed new transmission towers. There would be no new impacts beyond those already discussed for the action alternatives in this chapter.

Wautoma Option

For the Wautoma Option, there would be no permanent land use or landownership impacts, including on members of the Yakama Nation, since the cable would be strung on an existing transmission line and no new easements would be needed. Temporary land use impacts would occur from installation of the cable on or under the existing towers. Impacts would be limited to splice box locations and related pulling and tensioning sites. These activities could cause soil compaction and damage to some crops. Landowners would be compensated for any crop loss resulting from fiber installation, and soils would be tilled as needed to restore soil function. Land use impacts would be ***low****.*

Construction activities would create some temporary visual and noise impacts for nearby private landowners, as well as recreationists in the state park area. Because these impacts would be temporary (depending on terrain, a crew can install 5–10 miles of fiber in a week) and would occur in a relatively isolated area, impacts would be ***low***.

There would also be ***no-to-low*** impacts on vegetation, because vegetation that would be disturbed would be next to existing towers legs and the vegetation has been previously disturbed and is not comprised of trees or special status species.

Temporary impacts to soils would occur, primarily soil compaction at pulling and tensioning sites. Erosion could occur where there would be digging required for the buried splice boxes. However, with mitigation, there would be ***no-to-low*** soil impacts.

Existing streams, rivers and wetlands crossed by the existing Wautoma-Ostrander line would be avoided, and there would be ***no*** impacts.

Stringing the fiber optic cable is not expected to have any impacts on federal threatened or endangered wildlife species because they are not present along the existing transmission line. Other species, including state-list species, could be impacted by construction activities or collisions with lines. Fiber optic cable installation would cause temporary wildlife displacement in some areas. Temporary displacement caused by construction activities would have a ***low*** impact on wildlife species in grassland/shrub-steppe habitats. Impacts could be ***moderate*** if construction took place during breeding or nesting seasons for western gray squirrel and migratory birds. For these and other species for which displacement does not adversely affect the breeding season, construction impacts would be ***low***.

Most collisions with power lines occur during flights in areas used daily by a relatively large number of birds. Waterfowl, shorebirds, and other waterbirds such as egrets and cranes appear to be more susceptible to collision where lines span river valleys, wetland areas, and lakes. Important factors in determining the risk of collisions for a bird species include body size, maneuverability, age of the bird, and the height at which the bird flies (Crowder and Rhodes 1999). Although bats can be susceptible near wind turbines, bats do not tend to collide with transmission lines that are stationary.

The main areas of concern for the Wautoma Option would be the fiber optic cable crossing over the Yakima River. Bird diverters hung on fiber optic cables help birds avoid collisions. Bird diverters would be installed on the fiber optic cable spanning open water or other areas of high bird use to reduce possible collisions.

The likelihood of affecting cultural resources is ***low*** because new ground disturbance would be minimal, and the fiber optic cable would be constructed on an existing transmission line that may have already impacted visual resources, including traditional cultural properties. BPA is surveying the areas that might be impacted for preexisting cultural sites to ascertain any areas that might be especially sensitive where construction activities may be modified or curtailed. In addition, BPA has consulted with the Washington Department of Archaeology and Historic Preservation as well as the Confederated Tribes and Bands of the Yakama Nation Tribal Historic Preservation Officer and representatives from the Confederated Bands and Tribes of the Yakama Nation Cultural Resources Program.

Project construction would occur within the existing right-of-way and landowners would be compensated for any damage to crops as a result of construction. With mitigation, there ~~and~~ would be ~~have~~ ***no*** impact on socioeconomic resources.

BPA would use standard utility vehicles and existing access roads to access the Wautoma-Ostrander line right-of-way for installation of the fiber optic cable, so there would be ***no*** transportation-related impacts. The use of vehicles and equipment to install the cable would have ***low-to-moderate*** temporary noise impacts during the brief installation period at any one location.

There would be ***no*** impact on public health and safety, air quality or greenhouse gases.

Wautoma Substation

There would be no land use impacts as a result of additions to the Wautoma Substation because the project would take place on BPA-~~owned property within an existing substation yard.~~ fee-owned property. Physical impacts to the existing substation layout includes the extension of the perimeter fence to house the reactor bank and re-routing the transmission line access road.

Construction activities from vehicles, workers, and equipment would create some temporary visual, air quality (from dust), noise, and transportation impacts, but because these impacts would be temporary (about 4 to 5 months) and in an isolated area, impacts would be ***low***.

There would also be ***no-to-low*** impacts on vegetation, because the vegetation that would be disturbed would be next to an existing access road, has been previously disturbed, and has no trees or special-status plant species.

Temporary impacts on soils would occur, primarily soil compaction, but overall, there would be ***no-to-low*** soil impacts since most of the area has been previously disturbed from an existing access road and previous substation construction activities, and the construction area is relatively flat and would not be prone to soil erosion or runoff.

The project area has no water bodies so there would be no impacts on wetlands, streams, or fish.

No documented occurrences of special-status fish or wildlife species were identified within the project area, and habitat for federally listed species does not exist in the proposed area, so there would be no impacts to any listed species. Other wildlife species would experience ***no-to-low*** impacts given the small area impacted and because of the lack of good quality habitat in the impacted area.

BPA would survey the areas that would be impacted for cultural resources prior to any new construction. In addition, BPA has consulted with the Washington Department of Archaeology and Historic Preservation, the Confederated Tribes and Bands of the Yakama Nation Tribal Historic

Preservation Officer and representatives from the Confederated Bands and Tribes of the Yakama Nation Cultural Resources Program.

There would be ***no*** impact on socioeconomic resources, public health and safety, or greenhouse gases.

3.15.3 Mitigation Measures

In general, all applicable mitigation measures identified for each resource earlier in this chapter would be taken to reduce or eliminate adverse impacts by fiber optic cable installation.

3.15.4 Unavoidable Impacts Remaining after Mitigation

Even with mitigation, there would be some temporary construction impacts, but there would be no unavoidable permanent impacts.

3.15.5 No Action Alternative

The No Action Alternative would have no impact on resources because no new fiber optic cable would be strung on new or existing towers. Impacts from operation and maintenance of existing towers, conductors, and substations would continue unchanged.

3.16 Intentional Destructive Acts

Intentional destructive acts, that is, acts of sabotage, terrorism, vandalism, and theft, sometimes occur at power utility facilities. Vandalism and thefts are most common, especially of metal and other materials that can be sold. BPA has seen a significant increase in metal theft from its facilities over the past few years when the price of metal is high on the salvage market. There were more than 50 burglaries at BPA substations in 2006 alone. The conservative estimate of damages for these crimes is $150,000, but the actual amount is likely much higher since this number does not factor in all the labor-related costs associated with repairing the damage.

The impacts from vandalism and theft, though expensive, do not generally cause a disruption of service to the area. Stealing equipment from electrical substations, however, can be extremely dangerous. In fact, nationwide, many would-be thieves have been electrocuted while attempting to steal equipment from energized facilities. On Oct. 11, 2006, a man in La Center, Washington, was electrocuted while apparently attempting to steal copper from an electrical substation.

Federal and other utilities use physical deterrents such as fencing, cameras, warning signs, rewards, etc., to help deter theft, vandalism and unauthorized access to facilities. In addition, through its Crime Witness Program, BPA offers up to $25,000 for information that leads to the arrest and conviction of individuals committing crimes against BPA facilities. Anyone having such information can call BPA’s Crime Witness Hotline at (800) 437-2744. The line is confidential, and rewards are issued in such a way that the caller’s identity remains confidential.

Acts of sabotage or terrorism on electrical facilities in the Pacific Northwest are rare, though some have occurred. These acts generally focused on attempts to destroy large transmission line steel towers. For example, in 1999, a large transmission line steel tower in Bend, Oregon, was toppled.

Depending on the size and voltage of the line, destroying towers or other equipment could cause electrical service to be disrupted to utility customers and end-users. The effects of these acts would be as varied as those from the occasional sudden storm, accident or blackout, and would depend on the particular configuration of the transmission system in the area. While in some situations these acts would have no noticeable effect on electrical service, in other situations, service could be disrupted in the local area, or if the damaged equipment was part of the main transmission system, a much larger area could be left without power.

When a loss of electricity occurs, all services provided by electrical energy cease. Illumination is lost. Lighting used by residential, commercial, industrial and municipal customers for safe locomotion and security is affected. Residential consumers lose heat. Electricity for cooking and refrigeration is also lost, so residential, commercial, and industrial customers cannot prepare or preserve food and perishables. Residential, commercial, and industrial customers experience comfort/safety and temperature impacts, increases in smoke and pollen, and changes in humidity, due to loss of ventilation. Mechanical drives stop, causing impacts as elevators, food preparation machines, and appliances for cleaning, hygiene, and grooming are unavailable to residential customers. Commercial and industrial customers also lose service for elevators, food preparation, cleaning, office equipment, heavy equipment, and fuel pumps, unless they have heavy-duty backup generators.

In addition, roadways experience gridlock where traffic signals fail to operate. Mass transit that depends on electricity, such as light rail systems, can be impacted. Sewage transportation and treatment can be disrupted.

Overhead transmission conductors and the towers that carry them are mostly on unfenced utility rights-of-way. The conductors use the air as insulation. The towers and tension between conductors make sure they are high enough above ground to meet safety standards. Towers are constructed on footings in the ground and are difficult to dislodge.

While the likelihood for sabotage or terrorist acts on the proposed project is difficult to predict given the characteristics of the project, it is unlikely that such acts would occur. If such an act did occur, the problem area would be isolated quickly and electricity rerouted as much as possible to keep the system functioning. The Department of Energy, public and private utilities, and energy resource developers use security measures to help prevent such acts and to respond quickly if human or natural disasters occur.

3.17 Irreversible or Irretrievable Commitment of Resources

Irreversible commitments of resources occur when a nonrenewable resource such as minerals or petroleum-based fuels is used for the construction or operation of a proposed project. Irretrievable commitments of resources cause the lost production or use of renewable resources such as timber or rangeland.

The proposed project would consume aluminum, steel, other metals, wood, gravel, sand, plastics, and various forms of petroleum products in the construction of the transmission line, substation and development and improvement of access roads. Most of these materials are not renewable and could potentially be irreversible commitments of resources if not recycled (metals and glass) or reused (sand and gravel) at the end of the life of the project. The amount of land taken out of production for Knight Substation would also be irreversible.

Irretrievable commitments include small amounts of land lost to grazing and crop production. These commitments are irretrievable rather than irreversible because management direction could change and allow these uses in the future.

3.18 Relationship Between Short-Term Uses of the Environment and Long-Term Productivity

The proposed action alternatives would not pose impacts that would significantly alter the long-term productivity of the affected environment. Within the project area, soils and vegetation that were disturbed in the 1950s and 1970s during construction of the existing transmission lines have largely recovered. While there is never complete recovery, long-term productivity of the affected environment has not been significantly altered because revegetation of the area’s predominant grasslands and crop production continues. Similar impacts followed by recovery of productivity would occur for the proposed transmission line.

Chapter 4
Cumulative Impacts

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act require the assessment of cumulative impacts in the decision-making process for proposed federal projects. Cumulative impacts are defined 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" (40 CFR 1508.7). As stated in the CEQ handbook, "Considering Cumulative Effects under the National Environmental Policy Act" (CEQ 1997), cumulative impacts should be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects that are truly meaningful.

This chapter provides an analysis of potential cumulative impacts related to the Proposed Action. The analysis of cumulative impacts was accomplished using four steps summarized below. The first three steps are addressed in Section 4.1, and the fourth step is addressed in Section 4.2.

Step 1 — Identify Potentially Affected Resources

In this step, each resource that could be cumulatively affected by the Proposed Action, in combination with other actions, was identified.

Step 2 — Establish Boundaries

In order to identify the past, present, and reasonably foreseeable actions to consider in the cumulative impact analysis, specific spatial (i.e., location) and temporal (i.e., time) boundaries were identified for each affected resource.

Step 3 — Identify Potentially Cumulative Actions

In this step, other past, present, and reasonably foreseeable future actions to be included in the impact analysis for each specific affected resource were identified. These actions fall within the spatial and temporal boundaries established in Step 2.

Step 4 — Analyze Cumulative Impacts

This final step involves the analysis of the impacts of the actions identified in Step 3 in addition to the impacts of the Proposed Action. This analysis identifies the total cumulative impact related to each resource.

4.1 Affected Resources, Resource Boundaries, and Cumulative Actions

In considering the resources that could be cumulatively affected by the Proposed Action and other actions (Step 1), BPA determined that the same resources described in the affected resource sections in Chapter 3 of this EIS should be considered in the cumulative analysis. For each resource, BPA then established reasonable boundaries for the consideration of other past, present, and reasonably foreseeable future actions (Step 2). These boundaries are in terms of where the other actions are located (i.e., spatial boundaries), and when in time these actions took place or will take place (i.e., temporal boundaries). Accordingly, for each resource, the spatial boundary is the area where other past, present, and reasonably future actions have, are, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the Proposed Action. The temporal boundary describes how far into the past, and forward into the future, other actions should be considered in the cumulative impact analysis. Appropriate spatial and temporal boundaries may vary for each resource.

The determination of what past, present, and reasonably foreseeable future actions to consider in the cumulative impact analysis is based on the resources being affected. Guidance on determining what actions to consider in the cumulative impact analysis comes from a variety of sources, including the CEQ Cumulative Effects Handbook referenced above.

For past projects, CEQ has issued a guidance memo entitled "Guidance on Consideration of Past Actions in Cumulative Effects Analysis." This document states that consideration of past actions is only necessary in so far as it informs agency decision-making. Typically the only types of past actions considered are those that continue to have present effects on the affected resources. This present effect will dictate how far in the past actions are considered, and the impacts of these past actions are largely captured in the discussion of the affected environment chapter for each resource. The guidance states that "[a]gencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions." Agencies are allowed to aggregate the effects of past actions without "delving into the historical details of individual past actions."

Present actions are those that are currently occurring and also result in impacts to the same resources as would be affected by the Proposed Action. Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resource as the Proposed Action. The determination of what future actions should be considered requires a level of certainty that they will occur. This level of certainty is typically met by the completion of a permit application, approved proposals or planning documents, or other similar evidence.

Determining how far into the future to consider other cumulative actions is informed by the duration of the impact of the Proposed Action. For the purposes of this EIS, the future actions being considered are those that could occur over the life of a transmission line, which is about 50 years. However, though a 50-year time frame was examined, only those actions that are reasonably foreseeable were considered (see Table 4-1 for a summary of actions).

Table 4-1. Catalogue of Past, Present, and Reasonably Foreseeable Future Actions by Affected Resource

Affected Resource	Spatial Boundary	Temporal Boundary	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Land Use and Recreation	Approximately 20 to 30 miles from the proposed project, focused mainly on Klickitat and Wasco counties in and adjacent to the project area, including areas of the Columbia River Gorge National Scenic Area	Based on planning timeframes of the affected counties and through the life of the project.	Construction/operation of The Dalles Dam; agricultural activities; highway and railroad construction; construction and operation of existing BPA transmission lines and Big Eddy Substation; Scenic Act designation; wind energy development; commercial and residential development; and airport construction and operation.	Agricultural activities and other ongoing land uses and practices; residential and commercial development; existing wind energy facilities; and airport operation.	Ongoing agricultural activities and other land uses; airport operation; Knight Substation expansion; residential and commercial development; pipeline construction; and development of wind energy and other power generation facilities and transmission infrastructure.
Transportation	Affected roads in Klickitat and Wasco counties	Based on construction period for roads in project vicinity; life of the project for access issues.	Construction and operation of The Dalles Dam; agricultural activities; highway and railroad construction; construction and operation of existing BPA transmission lines and Big Eddy Substation; wind energy development; commercial and residential development; airport construction and operation.	Agricultural activities; residential and commercial development; highway improvements; existing wind energy facilities; airport operation.	Ongoing agricultural activities; airport operation; residential and commercial development; highway improvements; pipeline construction; and development of wind energy and other power generation facilities and transmission infrastructure.
Visual Resources	Based on a viewshed analysis conducted for the EIS (See Section 3.2 Visual Resources and Appendix C)	Back to the period of large scale agricultural conversion and Scenic Area designation, and through the life of the line (about 50 years).	Residential and commercial development; road and railway construction; transmission construction and operation; construction and operation of wind energy and the Goldendale power plant; The Dalles Dam construction; airport construction and operation.	Residential and commercial construction, sand and gravel operations, dam and power plant operations; existing wind energy facilities; and airport operation.	Residential and commercial development; sand and gravel operations; dam operation; power plant operation; marine terminal; expansion of Knight Substation and transmission line construction and operation; development of wind energy facilities and power transmission infrastructure; and airport operation.

Affected Resource	Spatial Boundary	Temporal Boundary	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Vegetation	Approximately 20 to 30 miles from the proposed project, focused mainly on Klickitat and Wasco counties near the project corridor (the proposed rights-of-way and new access roads).	Back to the period of large scale agricultural conversion and Scenic Area designation, and through the life of the project (though most cumulative impacts occurring up to 3 years past construction while species re-establish).	Agricultural activities; residential and commercial development; road and railway construction; wind project development; conservation and park designations.	Agricultural activities; commercial and residential development; roadway construction and maintenance; and maintenance and operation of existing wind energy facilities.	Same as present actions; and expansion of Knight Substation and transmission infrastructure.
Geology and Soils	Approximately 20 to 30 miles from the proposed project, focused mainly on Klickitat and Wasco counties near the project corridor (the proposed rights-of-way and new access roads for the action alternatives).	Back to the period of large scale agricultural conversion through the life of the project (though most cumulative impacts occurring in first year past construction).	Agricultural activities; road and railroad construction; commercial and residential development.	Agricultural activities; residential development; and maintenance of roads and existing wind energy facilities.	Same as present actions; and expansion of Knight Substation and transmission infrastructure.
Water Resources and Wetlands	Approximately 20 to 30 miles from the proposed project. Includes the Swale Creek, Little Klickitat River, Five Mile Creek, Three Mile Creek, and Eight Mile Creek drainages west of US-97. No water or wetland impacts expected to occur in Oregon.	Back to the period of large scale agricultural conversion through the life of the project.	Agricultural activities; road construction and maintenance; residential and commercial development; wind energy development and operation; park designation and conservation lands; stream restoration projects; transmission line construction.	Same as past actions	Same as past actions and expansion of Knight Substation and transmission infrastructure.

Affected Resource	Spatial Boundary	Temporal Boundary	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Wildlife	Approximately 20 to 30 miles from the proposed project, focused mainly on Klickitat and Wasco counties near the project corridor (the proposed rights-of-way and new access roads for the action alternatives).	Back to the period of large scale agricultural conversion through the life of the project.	Agricultural activities; road construction/maintenance; residential and commercial development; wind energy facility development; conservation and restoration projects; and hunting and fishing.	Same as past actions	Same as past actions; and expansion of Knight Substation and transmission infrastructure.
Fish	Approximately 20 to 30 miles from the proposed project.includes the Swale Creek, Little Klickitat River, Five Mile Creek, Three Mile Creek, and Eight Mile Creek drainages west of US-97. No water or wetland impacts expected to occur in Oregon.	Back to the period of large scale agricultural conversion through the life of the project.	Agricultural activities; road construction and maintenance; residential and commercial development; wind energy development and operation; park designation and conservation lands; stream restoration projects; transmission line construction.	Same as past actions	Same as past actions and expansion of Knight Substation and transmission infrastructure.
Cultural Resources	Based on a Viewshed analysis conducted for the EIS (See Section 3.2 Visual Resources and Appendix C)	Back to the period of large scale agricultural conversion through the life of the project.	Residential and commercial development; road and railway construction; transmission construction and operation; construction and operation of wind energy and the Goldendale power plant; The Dalles Dam construction; airport construction and operation.	Residential and commercial construction, sand and gravel operations, dam and power plant operations; existing wind energy facilities; and airport operation.	Residential/commercial development; sand/gravel operations; dam operation; power plant operation; marine terminal; expansion of Knight Substation and transmission line construction/operation; development of wind energy facilities and power transmission infrastructure; airport operation.

Affected Resource	Spatial Boundary	Temporal Boundary	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Socioeconomics	Wasco and Klickitat counties	Back to the period of large scale agricultural conversion through 1 year following completion of construction; for WDNR lands crossed by the proposed line, potentially longer-term effects on revenues for state trust beneficiaries.	Agricultural activities; highway/railroad construction; construction/operation of existing BPA transmission lines; commercial/residential development; road/railroad construction/maintenance; airport construction/operation; Scenic Area designation and tourism development; and wind energy facility development/operation.	Same as past actions; and new wind energy facility development	Same as present actions; power generation facilities and transmission infrastructure; marine terminal; pipeline construction; and expansion of Knight Substation and transmission infrastructure
Noise	Wasco and Klickitat counties, including areas of the Columbia River Gorge National Scenic Area	Back to the period of large scale agricultural conversion through the life of the project.	Road and railroad construction and maintenance; agricultural activities; residential and commercial development; wind energy development; airport construction and use; construction and operation of The Dalles Dam and BPA transmission lines.	Same as past actions	Same as past actions
Public Health and Safety	Wasco and Klickitat counties	Back to the period of large scale agricultural conversion through the life of the project.	Agricultural activities, burning of wood/ yard debris; residential/commercial development; road and railway construction/maintenance; transmission construction/operation; construction/operation of wind energy and the Goldendale power plant; The Dalles Dam construction; and airport construction.	Same as past actions	Same as past actions

Affected Resource	Spatial Boundary	Temporal Boundary	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Air Quality	Approximately 20 to 30 miles from the proposed project, focused mainly on Wasco and Klickitat counties, including areas of the Columbia River Gorge National Scenic Area	Back to the period of large scale agricultural conversion through the construction of the project.	Agricultural activities, burning of wood/yard debris; residential and commercial development; road and railway construction and maintenance; transmission construction/operation; construction and operation of wind energy and the Goldendale power plant; The Dalles Dam construction; and airport construction.	Agricultural activities, burning of wood/yard debris; residential and commercial development; road and railway construction and maintenance; construction/operation of wind energy and the Goldendale power plant	Same as present actions; and construction of new wind and other energy development.
Greenhouse Gases	Given the nature and extent of greenhouse gas emissions the appropriate boundary is global.	Greenhouse gases have been, and will continue accumulating in the atmosphere. The distant past through the life of the project.	Burning of fossil fuels and wood products; land clearing, agriculture and development.	Burning of fossil fuels and wood products; land clearing, agriculture and development; carbon sequestration initiatives; international efforts such as the Kyoto Treaty.	Burning of fossil fuels and wood products; land clearing, agriculture and development; carbon sequestration initiatives; international efforts such as the Kyoto Treaty.

[1] Past actions described are those past actions continuing to have present effects. Otherwise, they would not contribute to the cumulative impact of the Proposed Action when considering past, present and reasonably foreseeable future actions.

Some actions listed in Table 4-1 are further explained below.

Past and Present Actions

- Construction and operation of The Dalles Dam—while construction of the dam is a past action, operation of the dam would be considered present and reasonably foreseeable actions.
- Agricultural use—much of the land in the project area has been converted from native grasslands and shrub-steppe to agriculture and pasture. This conversion has all but ceased, as more land is subdivided for residential development.
- Commercial and residential development—Commercial and residential development would be considered present and reasonably foreseeable actions as well as past actions. There is active land subdividing and residential construction in the northern area of the transmission construction portion of the Proposed Action. Most of the lots being sold are marketed as having views of Mount Adams. There is some commercial development occurring in The Dalles, Oregon.
- Road and railroad construction—Construction of local and state highways (e.g., I-84, US 97, and SR 14) and the railroads bisected native grasslands, shrub-steppe habitat, riparian areas, and agricultural lands. Additional construction and maintenance of the road system would be considered present and reasonably foreseeable actions. One rail system has been removed creating the Klickitat Trail; however, there is still active railroad use along the Columbia River.
- Transmission line construction—would be considered present and reasonably foreseeable actions as well as past actions. There are a number of BPA and non-BPA transmission and distribution lines throughout the project area. Upon completion and future expansion of Knight Substation, additional transmission would be constructed.
- Wind Energy Development—Numerous wind projects have been or are being built in the general project vicinity in the last decade, with much of this development occurring in the last few years. Because of the strong wind resource associated with the Columbia River Gorge, past and present wind development in this area tends to be clustered in southern Klickitat County, Washington and northern Sherman and Gilliam counties in Oregon. Two of the closest existing wind projects to the proposed Big Eddy-Knight Transmission Project are the Windy Point Wind Energy Project, a 137-megawatt (MW) wind project with ~~52~~ 62 wind turbines, and the Windy Flats Wind Project, a 262-MW wind project with 114 wind turbines. These two wind projects were ~~was~~ developed about 6 miles to the south and southeast of Goldendale, Washington. Table 4-2 identifies the existing and operating wind projects in the general project vicinity, and Table 4-3 identifies those wind projects currently under construction in the general project vicinity.
- Airport Construction and Operation—two airports are in the general project area. One is located in Dallesport (Columbia Gorge Regional Airport, serving The Dalles), and the other is near the proposed location of Knight Substation.

Table 4-2. Existing and Operating Wind Projects in the General Project Vicinity

Name	Megawatts (MW)	Location
Arlington Wind Phase 1	103	Gilliam County, OR
Big Horn Phase 1	200	Klickitat County, WA
Big Horn Phase 2	50	Klickitat County, WA
Biglow Canyon Wind Phase 1	126	Gilliam County, OR
Biglow Canyon Wind Phase 2	149	Gilliam County, OR
Biglow Canyon Wind Phase 3	175	Gilliam County, OR
Condon Wind	50	Gilliam County, OR
Goodnoe Hills	96	Klickitat County, WA
Harvest Wind	100	Klickitat County, WA
Hay Canyon	100	Sherman County, OR
Juniper Canyon 1	150	Klickitat County, WA
Klondike I	24	Gilliam County, OR
Klondike II	76	Gilliam County, OR
Klondike III	300	Gilliam County, OR
Leaning Juniper I	100	Gilliam County, OR
Leaning Juniper II	200	Gilliam County, OR
Linden Wind	50	Klickitat County, WA
PaTu (Oregon Trail Wind)	10	Sherman County, OR
Pebble Springs	100	Gilliam County, OR
Star Point[1]	100	Sherman County, OR
Tuolumne Wind	137	Klickitat County, WA
Wheat Field	97	Gilliam County, OR
White Creek Wind	205	Klickitat County, WA
Willow Creek Wind	72	Gilliam County, OR
Windy Flats	262	Klickitat County, WA
Windy Point I	113	Klickitat County, WA
TOTAL MWs	**3145**	

[1]Firm transmission service requests associated with this existing wind project would be accommodated by the proposed Big Eddy-Knight Transmission Project if this transmission project were constructed.

Table 4-3. Under Construction Wind Projects in the General Project Vicinity

Name	Megawatts (MW)	Location
Eight Mile Canyon	78	Gilliam County, OR
Golden Hills I	200	Sherman County, OR
Goodnoe Hills Phase 2	56	Klickitat County, WA
Miller Ranch Wind[1]	98	Klickitat County, WA
Shepherds Flat North	265	Gilliam County, OR
Shepherds Flat Central	290	Gilliam & Morrow Counties, OR
Shepherds Flat South	290	Gilliam & Morrow Counties, OR
Windy Flats West	100	Klickitat County, WA
TOTAL MWs	**1377**	

[1]Firm transmission service requests associated with this under construction wind project would be accommodated by the proposed Big Eddy-Knight Transmission Project if this transmission project were constructed.

Reasonably Foreseeable Future Actions:

- Knight Substation Expansion—although the project description proposes a specific size for Knight Substation, the substation is being designed to accommodate possible future expansion as energy requests warrant the need. BPA would purchase sufficient land to allow for expansion as part of possible future projects. Although the expansion would likely involve additional transmission construction, the locations of those projects are unknown as the energy development has not yet occurred.
- New wind energy projects and transmission infrastructure—in the general project vicinity, there are a number of potential wind projects that have been already permitted by state or local siting authorities but are not yet under construction or that have been formally proposed for development ~~in Klickitat and Wasco counties~~. ~~Many of the proposed projects in Klickitat County would be southeast of Goldendale. These projects include: Juniper Canyon, Windy Flats, Linden Ranch, Windtricity, Imrie Wind, and Windy Point II. Other projects proposed in Klickitat County include the Miller North Wind Project and the School Section Wind Project. In addition, the Summit Ridge Wind project has been proposed for an area east of Dufur, Oregon.~~ As with the currently existing and under construction wind projects, these reasonably foreseeable future wind projects tend to be concentrated in southern Klickitat County, Washington and northern Sherman and Gilliam counties in Oregon. For already permitted projects, information such as the number and size of turbines, likely turbine locations, size and locations of transmission collector facilities, and miles and locations of access roads is generally available through the issued siting certificates and other local and state approval documents. For those wind projects that are only in the proposal stage, often very little is known other than general lease boundaries for the wind project area and preliminary information concerning potential turbine strings, possible access routes, and other potential project facilities. Table 4-4 identifies reasonably foreseeable proposed wind projects in the general project vicinity.

Table 4-4. Reasonably Foreseeable Wind Projects in the General Project Vicinity

Name	Megawatts (MW)	Location
Golden Hills 2	300	Sherman County, OR
Golden Hills 3	200	Sherman County, OR
Golden Hills Addn.	300	Sherman County, OR
Harris Canyon Wind	40	Sherman County, OR
Harvest Wind 2	200	Klickitat County, WA
Juniper Canyon 2	100	Klickitat County, WA
Juniper Canyon 2 (Lund)	60	Klickitat County, WA
Klickitat East PH 1	200	Klickitat County, WA
Klickitat East PH 2	200	Klickitat County, WA
Klickitat East PH 3[1]	200	Klickitat County, WA
Klickitat East PH 4[1]	200	Klickitat County, WA
Summit Ridge Wind	201	Wasco County, OR
Miller Ranch North	122	Klickitat County, WA
Montague I	200	Gilliam County, OR
Montague II	200	Gilliam County, OR
Nook 1	450	Gilliam County, OR
Nook 2[1]	250	Gilliam County, OR
Nook 3[1]	250	Gilliam County, OR
Sand Ridge II Part 1	250	Klickitat County, WA
Sand Ridge II Part 2	350	Klickitat County, WA
Sand Ridge II Part 3[1]	200	Klickitat County, WA
Shepherds Flat 4	100	Gilliam & Morrow Counties, OR
Shepherds Flat 5	488	Gilliam & Morrow Counties, OR
Thresher 1	241.5	Sherman County, OR
Thresher 2	110	Sherman County, OR
Whistling Ridge	70	Skamania County, WA
TOTAL MWs	**5482.5**	

[1]Firm transmission service requests associated with these proposed wind projects would be accommodated by the proposed Big Eddy-Knight Transmission Project if this transmission project were constructed.

- Natural gas pipeline construction—The Blue Ridge gas line is proposed to traverse Klickitat County as it would transport natural gas to Olympia and Seattle, Washington. A second pipeline project—the Palomar Pipeline— is proposed for southern Wasco County.
- Marine terminal in The Dalles—The Port of The Dalles is planning to develop a marine terminal, which will include cargo cranes and docks. This facility will allow for cruise ship and other watercraft access and options for shipping cargo.

- Commercial and residential development—Land is currently being subdivided and developed for residential use in the northern portion of the project area. In addition, commercial development has been proposed in or near the project area. The Sundoon Destination Resort is proposed for Klickitat County east of Dallesport. It would include a golf course and 400 visitor units. There is also a proposal to develop a business park at the Columbia Gorge Regional Airport in Dallesport.

4.2 Cumulative Impacts Analysis

This section provides the analysis of cumulative impacts when potential impacts from the proposed project are combined with past, present, and reasonably foreseeable actions listed in Table 4-1 and described in Section 4.1 Affected Resources, Resource Boundaries, and Cumulative Actions. The following analysis describes these potential cumulative impacts, in the order that the affected resources are presented in Chapter 3 of this EIS. For some resources, cumulative impacts would be approximately the same across all action alternatives. For other resources, cumulative impacts would vary by alternative. For these resources, general cumulative impacts are discussed first, followed by discussions of cumulative impacts specific to each alternative.

Land Use and Recreation

Land use in the project vicinity has incrementally changed due to cumulative past and present development, and this trend would be expected to continue with the cumulative future development identified in Section 4.1 Affected Resources, Resource Boundaries, and Cumulative Actions. Past and present actions have cumulatively established the current land use patterns in Wasco and Klickitat counties. These actions have introduced predominantly agricultural (mainly crops and livestock grazing) and rural residential uses throughout the area, with commercial and residential uses along the Columbia River. More recently, there has been a trend to converting agricultural land over to large-lot residential uses in some areas, for example near the Little Klickitat River. Assuming this trend continues, this land conversion could cumulatively reduce the amount of land used for agricultural purposes, although this reduction likely would be considered negligible given the extremely small portion of total agricultural lands in the general area that would be converted.

Land use in the area also has been cumulatively affected by development of transportation and utility infrastructure throughout the area. Washington DNR, in particular, has expressed concern over the cumulative impact of past, present, and reasonably foreseeable future infrastructure development on state trust lands that it manages or owns (see Appendix I for more information on Washington DNR lands in the project area). In addition to numerous roads, railroads pipelines, and transmission lines that are present in the area, development of wind energy projects has occurred and is expected to continue~~.~~ (see Tables 4-2 through 4-4) ~~identifies the many wind projects that have been permitted, or are in the process of seeking permits, in the general project vicinity~~. These wind projects tend to be located in open areas, such as agricultural lands and undeveloped areas, where a good wind resource is present. Construction of these wind projects can involve temporary land use disturbance from the installation of wind facilities and temporary interruption of agricultural activities in areas where these facilities are being installed. In general, because developers of wind projects are required through their siting permits and land agreements to restore all temporarily disturbed areas to their original condition following construction, the temporary impact on agriculture from development of wind facilities would not cumulatively affect these land uses in the area. However, the wind turbines, transmission lines, substations, and roads that would be in place for these facilities would result in the permanent conversion of thousands of acres of mainly agricultural land to an energy production use. While agricultural uses could largely continue in areas around individual wind project components, this conversion to wind generation facilities is a significant cumulative change in land use in the project vicinity.

~~Table 4-2. Permitted and Permit-Pending Wind Projects in Southern Klickitat and Northern Wasco Counties.~~

~~Name~~	~~Megawatts (MW)~~	~~Status~~
~~Big Horn~~	~~250 MW~~	~~Permitted and constructed~~
~~Harvest Wind~~	~~100 MW~~	~~Permitted and constructed~~
~~Hoctor Ridge~~	~~60 MW~~	~~Permitted and some constructed~~
~~Imrie EOZ (formerly Goodnoe II)~~	~~34 MW~~	~~Permitted~~
~~Juniper Canyon (Phase 1)~~	~~151.2 MW~~	~~Permitted~~
~~Juniper Canyon (Phase 2)~~	~~98.8 MW~~	~~Permit pending~~
~~Linden Ranch Wind Farm~~	~~58 MW~~	~~Permitted and some constructed~~
~~Miller North~~	~~150 MW~~	~~Permits pending~~
~~Miller Ranch Wind Farm~~	~~98 MW~~	~~Permitted and some constructed~~
~~School Section~~	~~20 MW~~	~~Permits pending~~
~~White Creek~~	~~206 MW~~	~~Permitted and constructed~~
~~Windtricity (Imrie CUP)~~	~~100 MW~~	~~Permitted and some constructed~~
~~Windtricity (Mariah)~~	~~12 MW~~	~~Permitted~~
~~Windy Flats 190 MW Permitted and constructed~~	~~190 MW~~	~~Permitted and constructed~~
~~Windy Flats West~~	~~67 MW~~	~~Pending~~
~~Windy Point I~~	~~242.50 MW~~	~~Permitted and some constructed~~
~~Windy Point II~~	~~130 MW~~	~~Permitted and some constructed~~
~~Summit Ridge (Wasco Co)~~	~~200 MW~~	~~Project order issued~~

Regardless of the alternative selected, BPA would obtain transmission easements for operation of the proposed project on private lands, and would obtain right-of-way grants to cross federal and state lands. In addition, existing land use or ownership would not be expected to significantly change along the transmission line right-of-way as a result of the proposed project. However, the project would add to the on-going development of utility-related land uses in the project vicinity. The areas occupied by the proposed transmission towers, access roads, and other facilities would not be available for agricultural or other uses during the life of the line, and these facilities could affect the ability of landowners to further develop these portions of their properties for other uses in the future. The proposed project thus would contribute incrementally, though in a relatively minor way, to potential cumulative land use impacts in the area.

As discussed in Section 3.1 Land Use and Recreation of this EIS, there are several recreational areas in the vicinity of the proposed project. While some past and present actions have increased recreational access and opportunities in the vicinity, some actions such as the introduction of human uses and development in otherwise natural areas and viewsheds may be viewed as having diminished the recreational experience for some recreational users. Past and reasonably foreseeable future wind development could contribute to the cumulative negative effect on recreational use through the introduction of additional evidence of human occupation in the area. Cumulative development may also adversely affect hunting by occupying areas and restricting access for hunting and temporarily disturbing wildlife during construction. The presence of the proposed project would add incrementally to these impacts. The proposed project thus would contribute incrementally, though in a relatively minor way, to potential cumulative impacts on recreational uses in the area.

Visual Resources

Past and present development and activities have cumulatively changed the visual landscape in the immediate project vicinity by introducing manmade features and altering natural forms. These features include more urbanized uses along the Columbia River, rural residential uses scattered throughout the project vicinity, and project area roads and utility infrastructure. Areas cleared for agriculture also have changed the visual quality in some areas within the project vicinity, and wind turbines have significantly changed the visual landscape in some area. Reasonably foreseeable future actions involving development would be expected to continue this trend.

As discussed in Chapter 3, each action alternative passes through the Columbia River Gorge National Scenic Area to varying degrees. The discussion of cumulative visual impacts by alternative that follows identifies these impacts within the National Scenic Area as well as outside the National Scenic Area. The National Scenic Area analysis is based on views from identified areas within the Gorge that are affected by the action alternatives and the additional actions affecting visual resources that can be seen from the same area. Maps associated with these areas are displayed in Appendix C.

West Alternative

About 10 miles of the West Alterative is within the boundaries of the National Scenic Area. The views from the Columbia River (see Map C-1) and I-84 (see Map C-2) provide the most comprehensive area where cumulative impacts could occur considering the West Alternative and other actions. Not all cumulative actions impacting visual resources from these two areas would likely be seen at the same time, but traveling along these areas would result in more prolonged impacts to visual resources. In addition to the West Alternative, other actions cumulatively impacting visual resources would include The Dalles Dam and transmission lines (primarily those crossing the Columbia River and on the north side of the river); The Dalles; I-84 construction; Columbia Gorge Regional Airport, including air traffic and proposed business park; the future marine terminal; and commercial and residential development along the river, such as Sundoon Destination Resort proposed for Klickitat County east of Dallesport.

As the alternative exits the National Scenic Area, it enters primarily agricultural areas in Klickitat County. Other activities that could occur along, or within view of the alternative primarily include agricultural activities and residential development. As increased subdivision and residential development occurs along the northern portion of the alternative, the new construction would cumulatively reduce the nature of the agricultural landscape and possibly interfere with some views of Mount Adams. In addition, wind farms along the high ridge to the south could be visible, further cumulatively altering the scenic value.

The visual presence of the proposed transmission line would contribute incrementally to the adverse cumulative impact to visual resources in the area. The extent of this contribution would depend on how portions of the proposed line in this area would be constructed. A new single-circuit line would introduce new towers and cleared right-of-way to the visual landscape, while replacing an existing line with a double-circuit configuration (to accommodate both the existing and proposed lines) would avoid additional right-of-of way but the new towers may be more visible than the existing towers.

Middle Alternative

About 6 miles of the Middle Alternative fall within the National Scenic Area. ~~Initially only 1 mile is within the National Scenic Area.~~ The southern portion of this alternative would not be visible from the Columbia River, I-84, Wishram, Rowena Plateau, or State Highway 14. As the alternative turns north to cross the Columbia River and cross the National Scenic Area, it becomes visible to those viewsheds listed above except Rowena Plateau. In terms of other cumulative actions that can be seen from the same locations, it is possible that the Summit Ridge Wind Project in northern Wasco County could be seen, along with wind projects in southern Klickitat County including Windy Point I and II, Windy Flats, and Linden Ranch. In addition, those activities described in the West Alternative could further cumulatively impact visual resources in terms of the duration of impact as one travels through the area.

Cumulative impacts as those described in the West Alternative. However, because the visual impact of the Middle Alternative would be somewhat less than the West Alternatives (see Section 3.2 Visual Resources), the Middle Alternative would contribute incrementally less to cumulative impacts compared to the other alternatives.~~for the non-scenic area would be generally similar under this alternative. However, cumulative impacts may be greater at certain locations along this alternative due to the contribution of present and future wind development and developed human uses in other areas (i.e., Goldendale Power Plant) given the proximity of this alternative to those developments.~~

East Alternative

Based on the siting of the East Alternative and its general proximity to the Middle Alternative, the cumulative impacts to visual resources generally would be the same as those described for the other alternatives. ~~Middle Alternative.~~ However, because the visual impact of the East Alternative would be somewhat less than the West and Middle alternatives (see Section 3.2 Visual Resources), the East Alternative would contribute incrementally less to cumulative impacts compared to the other alternatives.

Vegetation

Past and present actions have resulted in extensive cumulative changes to vegetative communities within the project area. Native vegetative communities in the general vicinity have been substantially altered by agricultural conversion, ranching, residential and commercial uses, road construction, and construction of the various utility infrastructure. These actions have resulted in the cumulative removal and permanent conversion of vegetation communities.

The past actions, such as agriculture, livestock grazing, and conservation efforts, which have generally cumulatively defined the vegetation in the areas for each of the action alternatives, are expected to largely continue into the future. In addition, past, present and future residential development in the northern sections of each alternative will continue to result in the cumulative clearing of native vegetation and the potential introduction or spread of noxious weeds.

West Alternative

The West Alternative has the highest impact on native vegetation because it traverses the least amount of cultivated cropland. Other actions contributing to cumulative impacts include residential development along the northern portion of the alternative that may including native vegetation clearing and the potential introduction and spread of noxious weeds. If this development resulted in additional tree removal along the Little Klickitat River, it could further contribute to cumulative vegetation impacts. In addition, the West Alternative is sited through the Columbia Hills State Park and Natural~~e~~ Area Preserve. Although efforts are underway to conduct conservation and restoration activities to improve the conditions of native vegetation in this area, these activities could not be conducted in the transmission line right-of-way. This alternative thus would contribute incrementally to the adverse cumulative impact to vegetation in the area.

Local populations of state-listed sensitive plant species such as mousetail, western ladies-tresses, hot-rock penstemon and other species were identified along the West Alternative and could be adversely affected by construction of the project. However, the proposed project, in combination with other cumulative projects, likely would not cumulatively affect any particular species to the point where it would become more imperiled or contribute to the need for listing under the Endangered Species Act because surrounding populations still exist. In addition, many existing populations in the ROW would still be viable in the future, although possibly reduced in size.

Past and present activities, such as ranching, agriculture, and road construction, have resulted in the substantial introduction and spread of noxious weeds in the project corridor and general vicinity. The spread of noxious weeds will continue as a result of ongoing and reasonably foreseeable actions and construction of the proposed project would contribute to this cumulative impact. Operation and maintenance activities also have the potential to contribute to this cumulative impact. The potential contribution of the proposed project would, however, be minimized by project-related mitigation measures designed to minimize the acres of new noxious weed infestations and minimize the contribution to cumulative effects of noxious weed colonization in the project area. The proposed project thus would contribute incrementally, though in a relatively minor way, to potential cumulative noxious weed impacts.

Middle Alternative

Past, present, and future actions with the potential to have cumulative impacts with the Middle Alternative include past and present agricultural, livestock, and road use, as well as the construction and proposed construction of wind projects in the area (Windy Flats and Windy Flats West) will result in the removal of additional native vegetation and increased risk of invasive species infestations and spread. Similar to the West Alternative, some trees may be removed in areas also experiencing residential development, which could further impact vegetation. However, cumulative impacts to vegetation would primarily be restricted to disturbed grassland/shrub steppe areas under this alternative.

Local populations of state-listed sensitive species (mousetail and smooth desert-parsley) were found in the Middle Alternative and could be adversely affected by construction of the project. However, as for the West Alternative, the proposed project, in combination with other cumulative projects, likely would not cumulatively affect any particular species to the point where it would become more imperiled or contribute to the need for listing under the Endangered Species Act because surrounding populations still exist and existing populations in the ROW would still be viable but potentially reduced in the future.

Potential cumulative impacts related to noxious weeds would largely be the same as described for the West Alternative. The proposed project thus would contribute incrementally and minimally ~~though in a relatively minor way~~, to potential cumulative vegetation impacts in the area.

East Alternative

Cumulative impacts under this alternative would be similar to those described for the Middle Alternative.

Geology and Soils

Past and present actions have cumulatively affected geology and soil resources in the proposed project area and resulted in soil disturbance, compaction, and erosion. Present and ongoing activities include primarily agricultural land uses, road construction and maintenance, transmission lines, and wind energy development. These actions are likely to continue to occur into the future and also include the potential expansion of Knight Substation.

Cumulative impacts, as they relate to soil compaction and erosion, would vary depending on location. In some areas, compaction would be remedied by farming practices, as construction-related impacts are eliminated during the following growing season. In other areas, erosion could increase, especially in terms of wind blown erosion, depending on the type of agricultural practices that are implemented (e.g., full till or no till). Current and future road construction and maintenance would also contribute to soil erosion and compaction, though affected areas would be limited. However, new road construction combined with agricultural practices could increase soil erosion during precipitation events if soil from fields travels into ditches.

Past, present, and future actions can also contribute to cumulative landslide risk by placing development on unstable slopes without taking adequate slope stabilization measures, and by increasing downslope risks from landslides. BPA is coordinating with state geologists to identify known and potential landslide risks in the vicinity of the proposed project. BPA would work to site its proposed facilities away from known landslide areas where possible, and to design any facilities in landslide areas that cannot be avoided to minimize the potential for exposing these facilities to landslides or increasing landslide risk.

The proposed project would result in minor alterations to topography within the project corridor, from grading and construction of towers and roads. These effects would be localized and limited to the construction footprint of the transmission line. Additionally, soil erosion from the proposed project would largely be mitigated by implementation of BMPs during and following construction. The proposed project thus would contribute incrementally, though in a relatively minor way, to cumulative impacts related to geology and soils.

Water Resources and Wetlands

Cumulative impacts to wetlands and water resources in the project vicinity are primarily a result of past and present land development, agricultural and livestock runoff, hydropower development, and road construction and maintenance. These impacts have been occurring since the area was settled and likely have changed in terms of rate and type of input (e.g., increased fertilizer as they were developed). All individual wetlands identified in Chapter 3 as being impacted by this alternative would also be impacted by similar agricultural and road actions. Near Little Klickitat River, additional runoff- related impacts could occur as a result of residential development. The development and maintenance of wind projects could further cumulatively reduce water quality in certain area creeks such as Swale Creek adding to the overall impact. However, these projects likely have stormwater runoff plans and mitigation in place to reduce their overall impacts. Although measures would be taken to avoid or minimize impacts to water resources and wetlands from the proposed project where possible, the project would contribute incrementally, though in a relatively minor way, to cumulative impacts to water resources and wetlands.

Wildlife

Past and present development and other activities have had a cumulative adverse impact on wildlife species and their habitat in the project vicinity. The clearing and conversion of land for urban development, home sites, utility infrastructure, and other uses since the 19th century has resulted in the cumulative loss of wildlife habitat. Agricultural operations have resulted in disturbed grasslands and cropland dominating the area. Existing roads in the project vicinity have led to increased disturbance from human activity, increased landscape fragmentation and the presence of wildlife travel barriers, lost habitat, and spread of noxious weeds. This habitat loss and modification has resulted in the displacement of wildlife species. Wildlife species also have been directly affected by hunting and trapping activities, as well as incidental harm and killing from other human activities in the area. Reasonably foreseeable future actions involving development would be expected to incrementally add to these cumulative impacts. Cumulative impacts to wildlife were analyzed in terms of disturbance and direct mortality as well as habitat disturbance, modification, or destruction.

West Alternative

Development of this alternative would not substantially contribute to cumulative impacts related to wildlife disturbance and habitat in the project vicinity. The portion that extends from Big Eddy Substation to the Columbia River is highly developed, much of the habitat has already been modified, and wildlife species have acclimated to the high levels of disturbance from The Dalles and the construction and operation of The Dalles Dam. Most cumulative actions and impacts to wildlife and wildlife habitat in the Klickitat County portion of the National Scenic Area are related to recreational uses such as hiking and conservation, restoration, and research. This is particularly true for the portion of the alternative that traverses the Columbia Hills State Park and Natural Area Preserve.

As this alternative exits the National Scenic Area, it crosses more active agricultural and livestock grazing areas. Farming and ranching activities, and road maintenance including regarding unpaved roads, result in noise and disturbance that, when combined with transmission line construction activities, increase the level and duration of the disturbance, potentially causing longer periods of project area avoidance. Depending on the timing of the disturbances (i.e., mating and breeding periods), some species could fail to reproduce during that season. Hunting also likely occurs in this portion of the project area increasing disturbance and potential mortality at specific times throughout the year. Additional impacts to wildlife would stem from residential construction in the northern portion of the project area. As additional habitat is converted to houses and roads, wildlife impacts will increase. More common species could benefit in the long term as residential development could result in supplemental food sources during food-limited periods such as winter. However, the presence of dogs and other pets may increase wildlife disturbance and mortality.

To the extent that this alternative would remove trees and occupy areas that could otherwise be used by wildlife, this alternative would contribute incrementally, though in a relatively minor way, to the cumulative impact on wildlife habitat.

Local populations of state-listed sensitive species such as burrowing owls, ferruginous hawks, Western gray squirrel, Lewis' woodpecker, various native frog species and other species could be disproportionately affected by the cumulative impacts of the proposed project and other cumulative actions, due to their limited numbers and range. However, the proposed project, in combination with other cumulative projects, likely would not cumulatively affect any particular species to the point where it would become more imperiled or contribute to the need for listing under the Endangered Species Act because surrounding habitats and populations still exist. Furthermore, the proposed project would likely have very little contribution to any cumulative impact to these species since the ROW could still be utilized as habitat by many of the species.

As described in Chapter 3, transmission lines may pose a risk to some migratory birds ~~(including local raptors)~~ because of collision-related mortality. There are a number of other transmission and distribution lines that could cumulatively impact migratory birds in the area. ~~In addition, w~~Wind turbines present a ~~similar~~ higher risk in terms of potential collisions. A recent analysis prepared by West, Inc. projected that about 16,750 birds/year (excluding raptors) would be killed cumulatively for wind farms throughout the region. For raptors, this number would be about 516 per year. Some species of birds (e.g., snow geese) migrate at higher altitudes and are not likely to be impacted. However, others make more frequent stopovers and migrate at lower altitudes. Passerines and upland games birds had the largest portion of mortality at 67.1 percent and 12.6 percent, respectively (Johnson and Erickson 2010). The study area considered was the Columbia Basin Plateau, a region much larger than Klickitat and Wasco counties, though a larger portion of the wind projects in the study area is in Klickitat County. There are some indications that recent bird mortality figures may be higher than those described in the West analysis.

This alternative thus would contribute incrementally to the adverse cumulative impact to migratory birds in the area. There also is the potential for increased cumulative impacts on bat species from the presence of the wind farms, although the proposed project would not be expected to contribute to these cumulative impacts since there would be no impacts to bat species from the proposed project (see Chapter 3).

Middle Alternative

Cumulative impacts from the Middle Alternative are similar to those described in the West Alternative; however, there are several differences. More of the Middle Alternative extends through agricultural areas (as it includes areas in Oregon) and it does not extend through the Columbia Hills State Park and Natural Area Preserve. In addition, the Middle Alternative travels through the area of the proposed Windy Flats West wind project in Klickitat County. Much of the habitat in this area will be fragmented with roads and turbines and the wildlife will experience large disturbances as a result of the construction of the wind project.

East Alternative

The cumulative impact analysis of the East Alternative is similar to the Middle Alternative. The only difference is that the East Alternative traverses the Windy Flats wind project, which has already been constructed.

Fish

Past and present actions that have cumulatively affected fish include agricultural practices and other human development that have resulted in the loss of streamside riparian cover, the loss of large woody debris sources, and the addition of sediment. In addition, development of the hydroelectric system in the Columbia River has adversely affected both downstream and upstream survival of fish. Harvest of these fish resources, in both the Columbia River and its tributaries and the ocean, has further impacted these resources. In recent years these conditions have all been improving with better passage conditions and directed harvest management.

As described in Chapter 3, there are no-to-low impacts to fish or fish habitat as a result of any of the action alternatives. The project's contribution to cumulative impacts to fish would be largely indirect and based on decreased water quality in fish-bearing streams. Therefore, the proposed project, regardless of action alternative, would not be expected to contribute in a measurable way to cumulative impacts to fish.

Cultural Resources

Cultural resources in the project vicinity have been and are being cumulatively affected because of past, present, and current development and activities. These cumulative impacts include disturbance of cultural sites, reduction of the cultural integrity of certain sites, and removal of cultural artifacts. Past actions that have affected cultural resources in the project vicinity include construction and operation of the hydro facilities, agricultural activities, highway and railroad construction, construction and operation of the existing BPA transmission lines in the area, and commercial and residential development. Present and ongoing activities in the immediate project vicinity include agricultural activities and existing wind energy facilities. Placement of wind turbines within the viewshed of Historic Properties of Cultural and Religious Significance may negatively affect the use of these areas by local area tribes. Continued conversion of native vegetation to cropland lessens the amount of lands available to tribes for native plant gathering.

During construction of the proposed project, there is also the potential for undiscovered archaeological resources to be impacted. Implementation of mitigation measures as described in Section 3.8 Cultural Resources of this EIS would lessen or avoid the potential for impacts to archaeological resources. However, the project may still contribute incrementally to the adverse cumulative impact to cultural resources in the area.

Socioeconomics

Past and present actions have set the baseline for socioeconomics within the counties where the proposed transmission line would be sited. The proposed project, in combination with past, present, and reasonably foreseeable future projects, could cumulatively affect the area's population, housing, and employment.

As described in Chapter 3, the alternatives are not likely to result in changes in population or the need for permanent housing. There may be some low impacts related to the need for temporary lodging for construction workers. However, when this lodging need is combined with those from ongoing and future construction-related activities, the impact to lodging may be moderate-to-high. Construction workers for wind and natural gas development will also require temporary housing, though many workers may be hired from the local area similar to those for the alternatives considered. Based on the analysis in Chapter 3, the area currently has an average occupancy rate of 75 percent. These additional construction activities could further increase the area occupancy rate, when combined with transmission construction activities depending on the timing of construction. In addition, depending on when the new marine terminal is constructed, it could require additional temporary housing or lodging. These moderate to high impacts would be beneficial as they would increase lodging-related revenue and other ancillary businesses such as restaurants, grocery stores, laundromats, gas stations, and other businesses necessary to support temporary construction workers. As available occupancy becomes limited in the immediate area of construction activities, businesses farther from the project area could begin to see benefits.

As describe in Chapter 3, about 48 temporary jobs would be created by the project (30-80 percent filled locally). This increase in employment would last only through the construction of the project. It would also result in minor indirect employment creation. If construction is timed with other construction-related activities, such as those described above, the need for temporary construction workers could increase. In addition, if the pool of available construction workers is limited locally, it will result in construction workers traveling from other areas to work sites. The impact of hiring local workers, though preferable for many reasons, would reduce the benefits described above for temporary lodging needs.

In terms of wind development, temporary employment resulting from construction would also increase. A 2002 Kittitas County wind study modeled that about 85 full and part-time temporary construction jobs would be created for the development of 360 MW of wind energy (ECONorthwest 2002). In addition, the study suggested that an additional 10 full and part-time construction management positions would be created. When considered in terms of the projects listed in Table 4-2 and other current and future actions, this could result in a number of temporary construction jobs or the increase in duration or temporary jobs depending on the timing of various construction projects. When combined with indirect spending as a result of increased employment, construction jobs could assist in lowering the unemployment rates, at least temporarily, for both counties, which currently hover around 9.2 percent.

Transportation

Past actions that have cumulatively affected transportation in the vicinity of the proposed project include the development of highways, local roads, and railroads; construction and operation of the Columbia River dams and locks; construction and operation of various airstrips in the project vicinity; and traffic associated with residential and commercial development in the area. Present transportation-related actions in the vicinity of the proposed project include ongoing road maintenance projects, and transportation of freight by railroad, barge, and aircraft. Reasonably foreseeable future actions in the vicinity of the proposed project that could affect transportation include ongoing road maintenance activities, continuing residential development (particularly in more rural areas), and construction of commercial and wind energy facilities that would generate increased traffic volumes on local roads.

Cumulative impacts to transportation would be similar across action alternatives because they would all require using the same roads (though there is some minor variation) during construction activities. Cumulative impacts are those that will affect the same roads at the same time as transmission construction related activities. Agricultural vehicles such as tractors and combines traveling along public roads can delay normal traffic patterns. In addition, increased construction-related vehicles for residential and commercial development and wind energy development will further cumulatively impact local traffic patterns. Road reconstruction and maintenance, such as those activities taking place on I-84, would further exacerbate cumulative traffic impacts. Since spring and summer are the primary construction periods, it is likely that construction of the proposed project would contribute to cumulative impacts to traffic volumes and delays; however, given the short-term and relatively low volume nature of traffic associated with the proposed project, the contribution of the proposed project to these cumulative impacts would be small and temporary.

Reasonably foreseeable future actions in the vicinity of the proposed project, along with the proposed project, also would cumulatively increase the number of improved access roads present in the regional landscape. This increase would likely provide for greater ease of access to portions of the vicinity, which may prove beneficial to the owners of land where the new access roads would be located. However, it is likely that more road maintenance activities would be required, as well as greater efforts to control noxious weeds. Because BPA would work with landowners and others to ensure that safe vehicle and equipment access across BPA's easements is provided, the proposed project would not be expected to contribute to any cumulative property access impacts. Overall, however, the proposed project thus would contribute incrementally, though in a relatively minor way, to potential cumulative transportation-related impacts.

Noise

Although implementation of past and present actions in the project vicinity has resulted in some increase on longer-term noise levels, this noise is very location dependent, and the project vicinity continues to enjoy relatively low noise levels on a continual basis. Past and present actions that have cumulatively increased noise levels in some portions of the area include road construction and ongoing associated road maintenance and traffic use, railroad construction and operation, agricultural activities, residential and commercial development; wind energy development, airport construction and use, construction and operation of The Dalles Dam, and construction and operation of various transmission lines in the area. Reasonably foreseeable future actions in the vicinity of the proposed project that could contribute to cumulatively increased noise levels include continuation of these existing uses as well as further development of new residential and commercial uses and wind energy facilities and associated power transmission infrastructure.

Cumulative noise impacts in the project vicinity typically occur when noise receptors are exposed to noise from sources at about the same time, such as from vehicles, train noise, and wind turbines. There could be cumulative noise impacts if these actions are undertaken simultaneously and close to each other. Construction noise from the proposed project would temporarily add to noise from other activities in the immediate vicinity of portions of the proposed project, such as traffic on project area roads, commercial/industrial activities, and railroad operations. In addition, if any wind projects are constructed at the same time in the immediate vicinity of the proposed project, the construction noise for these wind projects could be cumulatively additive with construction noise from the proposed project. The project thus could contribute incrementally to adverse cumulative impacts to noise on a temporary basis during construction. Once the line is built, corona generated noise from the transmission line also could contribute incrementally, though in a relatively minor way, to cumulative noise impacts in areas near the line.

Public Health and Safety

A number of past, present, and reasonably foreseeable actions in both Wasco and Klickitat counties have and could cumulatively contribute to public health and safety impacts. Primary impacts of construction-related activities relate to increased vehicle traffic and congestion in the areas where construction is occurring. The proposed project would contribute a small increase in the overall risk of injury to the public that could occur during construction, as well as an increase in the risk of fire from construction activities. Other construction activities proposed in Wasco and Klickitat counties also would pose similar risks to the public through increased construction-related traffic. However, it is likely that the cumulative impact would remain low given the many safety precautions that are taken.

Injuries to workers would also remain low cumulatively. In 2008, the U.S. Bureau of Labor Statistics reported injury rates for construction workers (BLS 2010). The results indicated that the rate of injury and illness per 100 full-time workers was about 4.7 percent. Injury and illness included those requiring days away from work, job restriction, or transfer. The cumulative impact to worker health and safety would then correspond to the number of those employed and would likely be about 5 percent.

Although the proposed project would result in higher levels of EMF under and immediately near the proposed transmission line, it would not cumulatively increase the overall level of EMF exposure in project vicinity.

Air Quality

Cumulative impacts to air quality would be similar among all action alternatives. A number of activities have occurred throughout the project area that cumulatively contribute to air quality impacts. As described in Table 4-1, these activities include agricultural uses, ongoing road maintenance, and the burning of wood and fossil fuels in residential and commercial/industrial uses and vehicle use. In addition, present and future residential commercial/industrial development and road construction and maintenance, among other sources, will continue to impact air quality. However, there are no major industrial facilities in the project area and no significant existing air quality problems. Local air pollutant emissions are limited mainly to windblown dust from agricultural operations and tailpipe emissions from traffic along state highways and local roads. The project area is currently designated as in attainment under the Clean Air Act.

Air emissions from the proposed action alternatives would occur during project construction from construction activities, as well as use of vehicles and heavy equipment. These emissions would result in a temporary contribution to cumulative impacts on air quality from pollutants generated by agricultural uses, road maintenance, and other sources in the region. During construction, the proposed action alternatives accordingly would contribute incrementally, though in a relatively minor way, to cumulative impacts related to air quality,.

Greenhouse Gases

Cumulative greenhouse gas concentrations in the atmosphere and corresponding climate change occurring over the past 50 years have been primarily caused by anthropogenic contributions. Greenhouse gas emissions have largely originated from the burning of fossil fuels and the clearing of forests around the world from many and varied sources during this time, as well as for a significant period before that (Karl et al. 2009). Therefore, unlike the cumulative impacts analyses for other resources discussed in this section, the global nature of greenhouse gases makes cataloguing past, present, and reasonably foreseeable future actions for this resource impossible.

Nonetheless, in a general sense, any action where fossil fuels have been or are being burned contributes to greenhouse gas concentrations. Examples of such actions include home heating, automobile and other vehicle use, electricity generation, processing and manufacturing of goods, and wood burning activities, among others. In addition, actions that result in the disturbance of soil or loss of vegetation can also increase concentrations. Vegetation can affect concentrations in two ways. First, if vegetation is removed prior to maturation, the carbon storing potential is lost and CO_2 can no longer be sequestered in that vegetation. Second, if that vegetation is burned, it will release all of the carbon it has sequestered back into the atmosphere as CO_2. These actions have occurred in the past and are likely still occurring, and will continue to occur in the future at some unknown level.

In analyzing the cumulative impact of the Proposed Action, global, national, and regional greenhouse gas emissions were considered. In 2006, the United States Energy Information Administration (EIA) estimated global GHG emissions at 29,017,000,000 metric tons of CO_2 equivalent (EIA 2009). In 2008, total U.S. greenhouse gas emissions were estimated at 6,956,800,000 metric tons of CO_2 equivalent.

Overall, total U.S. emissions have risen by approximately 14 percent from 1990 to 2008. In 2007, the four states within BPA's service territory emitted an estimated 180,060,000 metric tons of CO_2 (see Table 4-5 ~~3~~).

Table 4-5 ~~3~~. Estimated Annual CO2 Emissions for Each State in BPA's Service Territory.

State	CO_2 Emissions (metric tons)
Idaho	16,280,000
Montana	37,700,000
Oregon	43,520,000
Washington	82,560,000
Total	**180,060,000**

Source: EPA 2007

As a result of increased greenhouse gas concentrations, the earth's temperature has increased by about 1.5 degrees F over the last century (Karl et al. 2009). Models predict that the warming of the planet will continue and could be as much as 11.5 degrees F warmer by 2100 with the current level of emissions. The effect of increased temperatures include sea level rise due to shrinking glaciers, changes in biodiversity as species try to move into more optimal temperature ranges, early initiation of phonological events, lengthening of growing seasons, and thawing of permafrost (Karl et al. 2009).

In the Northwest region of the United States, statistical data indicates that the annual average temperature has risen about 1.5 degrees F over the past century, with some areas experiencing increases up to 4 degrees F. Many experts believe that this temperature rise is a major contributing factor to the 25 percent reduction in average snowpack in the Northwest over the past 40 to 70 years. A continued decline in snowpack in the mountains will decrease the amount of water available during the warm season. A 25- to 30-day shift in the timing of runoff has been observed in some places, and the trend is expected to continue as the region's average temperature is projected to rise another 3 to 10 degrees F in the 21st century (Karl et al. 2009).

In terms of cumulative impacts to the atmospheric levels of greenhouse gases, any addition, when considered globally, could contribute to long-term significant effects to climate change. However, the concentrations estimated for the Proposed Action, when compared to the regional, national, and global rates, are negligible and comparatively insignificant. National and international efforts to reduce greenhouse gas emissions such as the carbon sequestration markets and the Kyoto Protocol may help reduce the rate of emission. In addition, the ability of the Proposed Action to transmit renewable (non-fossil fuel burning) energy such as wind power by providing additional transmission capacity that allows for better use of renewable energy could be viewed as helping to offset the proposed project's contribution to cumulative greenhouse gas impacts.

Chapter 5
Consultation, Permit, and Review Requirements

This chapter addresses federal statutes, implementing regulations, and Executive Orders and other consultation, review, and permit requirements potentially applicable to the proposed project. This EIS is being sent to Tribes; federal agencies; and regional, state, and local governments as part of the consultation process for this project.

5.1 National Environmental Policy Act (NEPA)

This EIS has been prepared by BPA pursuant to regulations implementing the NEPA (42 USC 4321 et seq.), which requires federal agencies to assess, consider, and disclose the impacts that their actions may have on the environment. BPA has assessed the potential environmental impacts of the proposed project in this EIS, has made this EIS available for public comment, and will consider the potential impacts and public comments when making decisions regarding the proposed project.

5.2 Endangered Species Act (ESA) of 1973

The ESA of 1973 (16 USC 1536) as amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife and plants, and the preservation of the ecosystems on which they depend. The ESA is administered by the USFWS for wildlife and freshwater species and by NOAA Fisheries Service (NOAA Fisheries) for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions. Section 7 of the ESA requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize endangered or threatened species or their critical habitats. A federal agency also is required to consult with USFWS and/or NOAA Fisheries if it is proposing an action that may affect listed species or their designated critical habitat. If listed species or designated critical habitat are present and could be affected by the Proposed Action, Section 7 requires that the federal agency prepare a biological assessment (BA) to analyze the potential effects of the action on listed species and critical habitat and make an effect determination for each species. USFWS and/or NOAA Fisheries review the BA and, if they conclude that the action may adversely affect a listed species or their habitat, issue a biological opinion, which includes a take statement and a list of reasonable and prudent alternatives to follow during construction. If USFWS and/or NOAA Fisheries find that the project may affect, but is not likely to adversely affect a listed species or their habitat, they will issue a letter of concurrence.

BPA reviewed the federal lists of the threatened and endangered fish, wildlife, and plant species that may occur in Klickitat and Wasco counties. From both these lists and field surveys of the proposed project corridors conducted during fall 2009 and spring 2010, BPA determined that four federally protected fish species—Chinook salmon, steelhead, sockeye salmon, and bull trout—had the potential to occur in the project area, primarily along their migration route in the Columbia River. No federally protected wildlife or plant species were determined to have the potential to occur in the project area.

The assessment of potential occurrences of threatened and endangered plant, animal, and fish species and their habitats, and potential impacts to these species from the proposed project, are discussed in Sections 3.3 Vegetation, 3.6 Wildlife, and 3.7 Fish. Since no federally listed wildlife and plant species were found in the project area, and since BPA determined there would be no impacts on protected fish species and their critical habitat, consultation with USFWS and NOAA Fisheries under Section 7 of the ESA is not required. BPA will prepare a No Effect memo that will be sent to the USFWS and NOAA.

5.3 Fish and Wildlife Conservation Act of 1980

This federal act (16 USC §§ 2901 et seq.) encourages federal agencies to conserve and promote the conservation of nongame fish and wildlife species and their habitats. In addition, the Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires federal agencies undertaking projects on water resources to consult with the USFWS and the state agency responsible for fish and wildlife resources.

No federally threatened or endangered species would be impacted by the proposed project, and there would be no major impacts on water resources. Therefore, no consultation would be necessary. Mitigation designed to avoid and minimize impacts to fish and wildlife and their habitats are identified in Sections 3.6 Wildlife and 3.7 Fish.

5.4 Magnuson-Stevens Fishery Conservation and Management Act

Under Section 305(b) (4) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), NOAA Fisheries is required to provide essential fish habitat (EFH) conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. EFH includes all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon.

Wherever possible, NOAA Fisheries uses existing interagency coordination processes to fulfill EFH consultations with federal agencies. EFH occurs in Fifteenmile Creek and the Columbia River, in which no impacts have been identified as part of this project. Towers would be set back at least 400 feet from Fifteenmile Creek and 300 feet from the Columbia River. No towers would be within the 100-year floodplain of Fifteenmile Creek or the Columbia River. Additionally, no new access roads would be constructed across either stream. Thus, there would be no impacts on EFH.

5.5 Migratory Bird Treaty Act of 1918

This act implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds (16 USC 703-712, July 3, 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986, and 1989). Under the act, taking, killing, or possessing migratory birds, their eggs, or nests is unlawful. Most species of birds are classified as migratory under the act, except for upland and nonnative birds such as pheasant, chukar, gray partridge, house sparrow, and European starling.

The proposed project may impact migratory birds through increased potential for power line collisions, loss of habitat, potential disruption of navigational mechanisms by EMF, and potential disruption of breeding if temporary construction activities occur during the breeding season. Potential impacts on migratory birds and mitigation measures are discussed in Sections 3.6 Wildlife and 3.7 Fish. In accordance with the Memorandum of Understanding signed in 2006 between USFWS and the U.S. Department of Energy, BPA will consult with USFWS to ensure appropriate mitigation measures would be employed to minimize the risk of bird mortality and help promote the conservation of migratory bird populations.

5.6 Bald and Golden Eagle Protection Act of 1940

The Bald and Golden Eagle Protection Act of 1940 prohibits the taking or possessing of and commerce in bald and golden eagles, with limited exceptions (16 USC 668-668d, June 8, 1940, as amended 1959, 1962, 1972, and 1978). The Act only covers intentional acts or acts in "wanton disregard" of the safety of bald or golden eagles. Because a small number of both bald and golden eagles may reside within foraging distance of the project area, there is a remote possibility some mortality could result to either bald and/or golden eagles. However, because the Bald Eagle and Golden Eagle Protection Act only covers intentional acts, or acts in "wanton disregard" of the safety of bald or golden eagles, this project is not viewed as subject to its compliance.

5.7 Federal Noxious Weed Act

This federal act, as amended in 2009, directs federal agencies to manage undesirable plant species on federal lands when management programs for those species are in place on state or private land in the same area (7 USC § 2814) (1990). Undesirable plant species are defined as those that are classified as undesirable, noxious, harmful, exotic, injurious, or poisonous, pursuant to state or federal law. A noxious weed list (7 CFR 360.200) is developed by the Secretary of Agriculture, which lists noxious weeds (as defined by the Plant Protection Act) that are subject to restrictions on interstate movement (7 USC § 7712). BPA will conduct surveys for undesirable plant species included on the federal noxious weed lists and included on Oregon and Washington state and county lists.

Construction and maintenance activities would create some risk of spreading undesirable plant species in the project area in Wasco and Klickitat counties. If privately- or state-managed undesirable plant species are found or spread as a result of transmission line construction or maintenance, BPA will coordinate with the state, county, and/or landowner regarding their control or eradication (BPA 2000). See Section 3.3 Vegetation for a discussion of species, impacts, and mitigation measures.

5.8 Clean Air Act

The Clean Air Act as revised in 1990 (PL 101-542, 42 USC §7401) requires EPA and the states to carry out programs intended to ensure attainment of National Ambient Air Quality Standards. The EPA is authorized to establish air quality standards for six "criteria" air pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (PM-2.5, PM-10), and sulfur dioxide. The EPA uses these six criteria pollutants as indicators of air quality. EPA has established National Ambient Air Quality Standards (NAAQS) for each criteria pollutant, which define the maximum legally allowable concentration. If the NAAQS for a pollutant is exceeded, adverse effects on human health may occur. When an area exceeds these standards, it is designated as a nonattainment area. Pollution control measures are mandated for federal actions in nonattainment areas.

A nonattainment area can be listed for any one, or more, of the criteria pollutants. An area that was once a nonattainment area, but has since improved its air quality enough so that it now meets the EPA established air quality standards, is up-graded to a maintenance area designation. Maintenance areas also have pollution controls imposed on them, but because the air quality is not as poor as in nonattainment areas, the control standards are not as strict in maintenance areas. All other areas not listed by the EPA for air quality degradation are considered attainment areas. The General Conformity Requirements of the Code of Federal Regulations require that federal actions do not interfere with state programs to improve air quality in nonattainment areas. There are no nonattainment areas in the vicinity of the project.

Of the six criteria air pollutants, PM is the main concern of the transmission line and substation construction activities. PM-10 are particles with an aerodynamic diameter smaller than 10 micrometers (µm) and include: "dust, dirt, soot, smoke, and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural windblown dust" (EPA 2003). PM-2.5 are "fine particles" with an aerodynamic diameter smaller than 2.5 µm. PM-2.5 particles can be "directly emitted from sources such as forest fires or they can form when gases emitted from power plants, industry and automobiles react in the air" (EPA 2006).

In the project vicinity, authority for ensuring compliance with the Clean Air Act is delegated to DEQ and Ecology (Central Region and Eastern Region). Each of these agencies has regulations requiring all industrial activities (including construction projects) to minimize windblown fugitive dust. Chapter 70.94 RCW-Washington Clean Air Act and Chapter 173-400 Washington Administrative Code (WAC) require owners and operators of fugitive dust sources to prevent fugitive dust from becoming airborne and to maintain and operate sources to minimize emissions.

Air quality impacts from fugitive dust and emissions of the proposed project would be low, as discussed in Section 3.13 Air Quality.

5.9 Greenhouse Gases

Executive Orders 13423 and 13514 require federal agencies to measure, manage, and reduce greenhouse gas emissions by agency-defined target amounts and dates (The White House 2009). BPA is currently developing a Sustainability Action Plan, which addresses managing and reducing greenhouse gas emissions by the agency. The proposed project would remove carbon sequesters (trees and other vegetation) and generate emissions of gases (such as carbon dioxide) that contribute to global warming. The removal of vegetation would result in a net reduction in the collectors of carbon in the project area. However, because the amount of clearing would be relatively small, and because low-growing vegetation would regrow in cleared areas, this loss would be small. Construction of the project would be estimated to produce about 409 metric tons in greenhouse gas emissions over the course of 1 year, and operation and maintenance of the line would be expected to produce about 0.7 metric tons per year. These emissions would be well beneath the threshold of EPA's mandatory reporting threshold. Based on these estimates, the proposed project's contribution to greenhouse gas levels in the atmosphere would be ***low***. See Section 3.14 Greenhouse Gases for the complete analysis and discussion.

5.10 Clean Water Act

The Federal Water Pollution Control Act (popularly known as the Clean Water Act) (33 USC §§ 1251 et seq.), regulates discharges into waters of the United States. Implementation of the project would require a permit pursuant to the Clean Water Act as regulated by the Corps for the placement of fill in and the potential disturbance of wetlands and other waters of the United States. Clean Water Act provisions are implemented by the DEQ under Oregon Administrative Rules (OAR) 340 Divisions 41, 42, and 45; and Ecology (RCW 90.48). For Section 404 and 401 verification and approval, project information should be submitted jointly to the Corps and the Oregon DEQ using the Joint Permit Application, and to the Corps and Ecology using the Joint Aquatic Resources Permit. Requirements for implementation of the Clean Water Act in Oregon and Washington are described as follows:

Section 401 of the Clean Water Act requires applicants to seek a federal permit to conduct an activity that results in a discharge into waters of the United States, including wetlands. This permit is issued only after the affected state certifies that existing water quality standards would not be violated. BPA would potentially be putting fill into wetlands; therefore, permits would be obtained as required. Section 401 requires applicants for Section 404 permits to obtain a Section 401 Water Quality Certification from the certifying agency (DEQ). Application for, and granting of, a construction stormwater permit fulfills most of the application requirements for a Section 401 certification.

Section 402 National Pollutant Discharge Elimination System (NPDES) requires an entity to obtain a permit for discharges of pollutants into navigable waters of the state. In Oregon, NPDES stormwater regulations require the notification of DEQ for ground disturbance activities greater than 1 acre. State regulations require the use of BMPs for control of erosion, stormwater discharges, and non-stormwater discharges to waters of the state. The BMPs, including depiction of structural BMPs on grading plans and in specifications, must be documented in an Erosion and Sediment Control Plan. This plan must be adhered to or appropriately modified during construction. If sufficient quantities of hydrocarbons or other regulated liquids are maintained on site, a Spill Prevention, Control, and Countermeasures Plan could also be required.

In Washington, NPDES construction stormwater permits also require notification to Ecology in advance of ground disturbing activities of 1 acre or more. Stormwater controls must be developed to address during and post-construction erosion control, treatment and discharge of dewatering water (if any), and other construction-related activities that could affect receiving water quality. These controls must be documented in a SWPPP. The SWPPP is developed during final project design, adapted by the contractor prior to construction, and revised onsite as necessary. A copy of the SWPPP is maintained onsite during construction and is a basis for environmental compliance inspection during construction. The BMPs specified in the SWPPP must be inspected periodically by a state-certified inspector. Sampling and analysis of stormwater runoff is required to demonstrate compliance with discharge limits.

Section 404 requires authorization from the Corps when there is a discharge of dredged or fill material into waters of the United States, which include wetlands. As discussed in Section 3.5 Water Resources and Wetlands, the placement of towers and roads may require filling more than 0.1 acre each of a number of wetlands (although no more than 0.5 acre each). BPA will coordinate with the Corps concerning the proposed project and its potential impacts on waters of the United States.

Section 303d requires the development of total TMDLs for the Miles Creek subbasin—which includes Fifteenmile Creek—and the Little Klickitat River basin. The TMDL implementation plan for the Miles Creek subbasin that includes Fifteenmile Creek requires the tracking of, and measuring progress toward, reducing instream temperatures. This includes tracking disturbance within the riparian corridor and reducing or mitigating such disturbance. Impairment of water quality from sedimentation in Fifteenmile Creek limits new discharges of this pollutant to the creek. The TMDL implementation plan for the Little Klickitat River basin requires the tracking of, and measuring progress toward, reducing instream temperatures. This includes tracking disturbance within the riparian corridor and reducing or mitigating such disturbance.

If sufficient quantities of hydrocarbons or other regulated liquids are maintained on site, a Spill Prevention, Control, and Countermeasures Plan could also be required according to state regulations (40 CFR 112). The plan must be adhered to during construction.

5.11 Floodplains and Wetlands (Executive Orders 11988 and 11990)

The U.S. Department of Energy mandates that impacts to floodplains and wetlands be assessed and alternatives for protection of these resources be evaluated in accordance with Executive Orders 11988 and 11990, along with the *Compliance with Floodplain/Wetlands Environmental Review Requirements* (10 CFR 1022.12).

No towers or new access roads would be built in any floodplains. There are eight perennial streams that intersect with the route alternatives being considered. These streams range from having deeply incised channels to low gradient, meandering channel patterns. Associated floodplains are generally limited to narrow riparian fringes. An existing access road would need to be upgraded within the 100-year floodplain of Fifteenmile Creek in Oregon, which could mean slightly more compacted soil along the road, but no change in grade or water storage capability. Approximately 0.8–1.2, 1.0, and 0.5 acres of wetlands along the West, Middle, and East alternatives, respectively, would be permanently impacted by towers and access roads. About 0.8–1.8, 0.4–0.7, and 0.4 acres of wetlands along the West, Middle, and East alternatives, respectively, would be temporarily impacted by construction. Impacts on and mitigation for streams, floodplains, and wetlands are discussed in Section 3.5 Water Resources and Wetlands.

5.12 Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 (33 USC § 403) regulates all work done in or structures placed below the ordinary high water mark of navigable waters of the United States.

No work associated with the proposed project would occur in such water bodies. However, the proposed project includes conductors that would span the navigable waters of the Columbia River, a “water of the United States” as defined in the Rivers and Harbors Act. Pursuant to the implementing regulations for Section 10, Section 10 permits are required for power transmission lines crossing navigable waters of the United States unless those lines are part of a water power project subject to the regulatory authorities of the U.S. Department of Energy under the Federal Power Act of 1920 (33 CFR §322). Therefore, a Section 10 permit would likely be required for this project.

5.13 Hazardous Materials

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (42 USC §6901 et seq. [1976]), as amended, is designed to provide a program for managing and controlling hazardous waste by imposing requirements on generators and transporters of this waste, and on owners and operators of treatment, storage, and disposal (TSD) facilities. Each TSD facility owner or operator is required to have a permit issued by EPA or the state.

Small amounts of hazardous wastes may be generated by the proposed project (paint products, motor and lubricating oils, herbicides, solvents, etc.) during construction or operation and maintenance. These materials would be disposed of according to state law and the RCRA.

Paint from surfaces coated prior to 1978, such as on existing river crossing towers, would be assumed to contain lead and/or other heavy metals unless laboratory analysis proves otherwise. A lead abatement plan would be implemented that would cover removal and disposal of any paint chips in accordance with all federal, state and local environmental and safety standards.

Each of the action alternatives could generate a large amount of solid waste for tower options that involve the teardown of existing lines. Most of the poles and cross arms removed from the 115-kV Chenoweth-Goldendale line were likely treated with a wood preservative (creosote or pentachlorophenol), listed as hazardous waste under RCRA. Removing any existing 230- or 345-kV lines for double-circuiting segments of the proposed routes would create metal waste. These materials would be disposed of according to state law ~~(see Section 5.13.2)~~ and RCRA.

Toxic Substances Control Act

The Toxic Substances Control Act (15 USC §2601 et seq. [1976]) is intended to protect human health and the environment from toxic chemicals. Section 6 of the Act regulates the use, storage, and disposal of PCBs. BPA adopted guidelines to ensure that PCBs are not introduced into the environment. Equipment used for this project will not contain PCBs. Any equipment removed that may have PCBs will be handled according to the disposal provisions of this Act.

Federal Insecticide, Fungicide and Rodenticide Act

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) (77 USC §136 et seq. [1996]) registers and regulates pesticides. BPA limits it use of herbicides (a kind of pesticide) and uses herbicides only under controlled circumstances. Herbicides are used on transmission line rights-of-way and in substation yards to control vegetation, including noxious weeds. When BPA uses herbicides, the date, dose, and chemical used are recorded and reported to state government officials. Herbicide containers are disposed of according to RCRA standards.

5.14 Cultural Resources

Preserving cultural resources allows Americans to have an understanding and appreciation of their origins and history. A cultural resource is an object, structure, building, site or district that provides irreplaceable evidence of natural or human history of national, state or local significance. Cultural resources include National Landmarks, archeological sites, properties of traditional religious and cultural importance to a Native American Tribe (also known as Traditional Cultural Properties), and other properties listed (or eligible for listing) on the National Register of Historic Places. In addition, American Indian Tribes have rights under specific laws, as well as the opportunity to voice concerns about issues under these laws when their aboriginal territory falls within a proposed project area.

Laws and other directives for the management of cultural resources include

- National Historic Preservation Act (NHPA) of 1966 (16 USC 470 et seq.), as amended, inclusive of Section 106
- Executive Order 13007 Indian Sacred Sites
- American Indian Religions Freedom Act of 1978 (PL 95-341, 92 Stat. 469, 42 USC 1996, 1996a)
- Antiquities Act of 1906 (16 USC 431-433)
- Historic Sites Act of 1935 (16 USC 461-467)
- Archaeological Data Preservation Act (ADPA) of 1974 (16 USC 469 a-c)
- Archaeological Resources Protection Act (ARPA) of 1979 (16 USC 470 et seq.), as amended
- Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.)

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. Historic properties are properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. If a federal agency plans to undertake a type of activity that could affect historic properties, it must consult with the appropriate State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) to make an assessment of adverse effects on identified historic properties. BPA's 1996 government-to-government agreement with 13 federally-recognized Native American Tribes of the Columbia River basin provides guidance for the Section 106 consultation process with the Tribes.

The NHPA amendments specify that properties of traditional religious and cultural importance to a Native American Tribe (also known as TCPs) may be determined to be eligible for inclusion on the National Register of Historic Places. In carrying out its responsibilities under Section 106, a federal agency is required to consult with any Native American Tribe that attaches religious or cultural significance to any such properties. NAGPRA requires consultation with appropriate Native American Tribal authorities prior to the excavation of human remains or cultural items (including funerary objects, sacred objects, and cultural patrimony) on federal lands or for projects that receive federal funding. NAGPRA recognizes Native American ownership interests in some human remains and cultural items found on federal lands and makes illegal the sale or purchase of Native American human remains, whether or not they derive from federal or Indian land. Repatriation, on request, to the culturally affiliated tribe is required for human remains.

Executive Order 13007 addresses “Indian sacred sites” on federal and tribal land. “Sacred site” means any specific, discrete, narrowly delineated location on federal land that is identified by a Tribe, or a Tribal individual determined to be any appropriately authoritative representative of a Native American religion. The site is sacred by virtue of its established religious significance to, or ceremonial use by, a Native American religion, provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site. This order calls on agencies to do what they can to avoid physical damage to such sites, accommodate access to and ceremonial use of Tribal sacred sites, facilitate consultation with appropriate Native American Tribes and religious leaders, and expedite resolution of disputes relating to agency action on federal lands. The American Indian Religious Freedom Act protects and preserves to American Indians their inherent right of freedom to believe, express, and exercise traditional religions.

~~In addition to these various laws and directives, the federal government has general trust responsibilities to Tribes under a government-to-government relationship to insure that their reserved rights are protected. Ongoing consultation with the [Tribes] ensures that their rights are protected.~~

~~BPA Tribal Policy follows the Department of Energy’s American Indian Policy (DOE Order No. 1230.2—Apr. 8, 1992) and serves as guidelines to BPA and the Tribes throughout the development of their government-to-government relationships.~~

~~Throughout the EIS process, BPA has worked to involve and consult with the Tribes in the project area and the relevant agencies according to the applicable laws and responsibilities. These include the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of Warm Springs, the Nez Perce Tribe, and the Yakama Nation, as well as the State Historic Preservation Officers for Washington and Oregon and the Advisory Council on Historic Preservation.~~ Tribal lands crossed by the action alternatives consist primarily of private properties owned by tribal members. In addition, the alternative to extend the fiber optic cable to BPA’s Wautoma Substation would cross through the Yakama Indian Reservation.

~~The Tribes have not requested formal government-to-government consultation meetings to date.~~

Construction of the transmission line and related facilities could potentially affect historic properties and other cultural resources. A cultural resources survey of the corridor was conducted to determine if any cultural resources are present and would be impacted. Eleven cultural resource sites are within the West Alternative’s potential right-of-way, although it would be able to avoid all but one of the larger sites and all burial areas. Nine and ten sites are within the Middle and East alternatives’ potential rights-of-way, respectively, but would all be avoided. The Middle and East alternatives also cross over an Oregon Trail segment at two points, but straddle both identified segments, resulting in no physical impacts. (See Section 3.8 Cultural Resources of this EIS for more detail). Surveys completed before construction would help further identify sites that may be impacted if they could not be avoided. If, during construction, previously unidentified cultural resources that would be adversely affected by the proposed project are found, BPA would follow all required procedures set forth in the NHPA, NAGPRA, ARPA, and the American Indian Religious Freedom Act. Also, if some sites cannot be avoided, BPA will consult with federal and state agency landowners and the Oregon or Washington SHPO to determine if those sites are eligible for a listing under the NRHP. If they are, then in consultation with the appropriate federal and state agency landowners, SHPO, and/or the affected tribe’s THPO, effects will be evaluated and appropriate mitigation applied.

5.15 Tribal Consultation

In addition to the laws and directives mentioned in the sections above, the federal government has a general trust responsibility with Tribal governments. BPA recognizes that trust responsibility derives from the historical relationship between the federal government and the Tribes as expressed in treaties, statutes, Executive Orders, and federal Indian case law.

BPA's Tribal Policy follows the principles set forth in the Department of Energy's American Indian Policy (DOE Order No. 1230.2—Apr. 8, 1992). BPA fully respects Tribal law, and recognizes Tribal governments as sovereigns. BPA will consult with Tribal governments to assure that Tribal rights and concerns are considered prior to BPA taking actions, making decisions, or implementing programs that may affect Tribal resources. BPA recognizes that Tribal interests are not limited to cultural resources but may also include fish, wildlife, water resources and wetlands, vegetation, health, socioeconomic, noise, visual, etc. In addition, BPA recognizes that Tribes may have specific rights reserved under treaties, such as fishing, hunting, gathering and grazing rights.

Throughout the EIS process, BPA has worked to involve and consult with Tribes and relevant agencies in the project area. These included the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of Warm Springs, the Confederated Tribes and Bands of the Yakama Nation, and the Nez Perce Tribe of Idaho. BPA staff have reached out to their tribal counterparts to share and gather information, to coordinate project activities where appropriate, to address tribal concerns, and to invite further consultation, including formal government-to-government consultation.

5.16 Federal Aviation Administration Review

As part of transmission line design, BPA seeks to comply with Federal Aviation Administration (FAA) procedures. According to FAR 49 CFR Part 77.13, the FAA requires BPA to submit its designs for FAA approval if a proposed structure is taller than 200 feet from the ground or water surface where the line crosses a body of water, if a conductor is 200 feet above the ground or water surface where the line crosses a body of water, or if any part of the proposed transmission line and/or its structure are within a prescribed distance of an airport. According to FAR 49 CFR Part 77.17, BPA must submit Form 7460-1 (Notice of Proposed Construction or Alteration) for a preliminary transmission line design and receive conditional approval at least 30 days prior to construction. The FAA would then conduct its own study of the project and make recommendations to BPA for airway marking and lighting. General BPA policy is to follow FAA recommendations. At this time, BPA has provided preliminary locations of towers to FAA, which has determined that there are a number of towers along all action alternatives that would require marking and lighting. See Section 3.1 Land Use and Recreation for locations.

5.17 National Trails System Act

The National Trails System Act of 1968 (16 USC §§ 1241–1251) established a National Trails System with the purpose of promoting the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the nation. The Act and its subsequent amendments have created a network of scenic, historic, and recreation national trails throughout the United States. In the project vicinity, there are two national trails: the Lewis and Clark National Historic Trail, and the Oregon National Historic Trail.

Lewis and Clark National Historic Trail. This approximately 3,700-mile-long trail was established under the National Trails System Act ~~(16 USC §§ 1241–1249), as designated by~~ through an act of Congress in 1978, and is administered by the NPS as a component of the National Park System (NPS 2009). The primary purpose of this Trail is to commemorate the Lewis and Clark Expedition of 1804-06. Generally tracing the courses of the Missouri and Columbia rivers, the Lewis and Clark National Historic Trail stretches through 11 states from a point near St. Louis, Missouri to where the Columbia River drains into the Pacific Ocean. From approximately Richland, Washington westward, the Trail generally follows the Columbia River to the Pacific Ocean.

A Comprehensive Management Plan (CMP) was prepared for the Lewis and Clark National Historic Trail in 1982, and the NPS is currently in the process of developing a new CMP. The 1982 CMP recommends various Trail sites, segments, and routes. In the project vicinity, the Columbia River and its shores are considered a water trail, and U.S. Highway 197, Washington State Route 14, and various local roads on the north side of the Columbia River are considered a motor route. The CMP also identifies various campsites and portage points of the Lewis and Clark Expedition along the Columbia River in the project vicinity.

All action alternatives would cross over the Columbia River and thus the trail. BPA is consulting with the NPS on issues relating to the trail and the proposed project.

Oregon National Historic Trail. This approximately 2,170-mile-long trail was established under the National Trails System Act ~~(16 USC 1241–1249), as designated by~~ through an act of Congress in 1978, and is administered by the NPS as a component of the National Park System (NPS 2006). The purposes of this Trail are to (1) identify, preserve, and interpret the sites, route, and history of the Trail and (2) commemorate the westward movement of emigrants to the Oregon County. The Oregon National Historic Trail extends from Independence, Missouri to the Portland, Oregon vicinity.

A CMP was prepared for the Oregon National Historic Trail in 1999, and a Long-Range Interpretative Plan was finalized for the Trail in 2010. These plans cover not only the Oregon National Historic Trail, but also the California, Mormon Pioneer, and Pony Express National Historic Trails as well. Significant Oregon National Historic Trail resources in the project vicinity include resources at or near Biggs Junction (includes one of the last remaining stretches of the Trail along the Columbia River not destroyed by past highway or railroad construction), the Deschutes River Crossing (a location where emigrants frequently camped), and The Dalles Complex (where until 1846, the overland travel route ended and emigrants shifted to boats on the Columbia River for the remainder of their trip; after 1846, emigrants could choose between this option or using the newly built Barlow Road).

The Middle and East alternatives would likely be visible near trail mile markers 1, 6, or 7 south of the Columbia River. BPA is coordinating with the NPS concerning this Trail and any issues related to the proposed project.

5.18 Noise Control Act

The Noise Control Act of 1972 as amended (42 USC §4901 et seq.) sets forth a broad goal of protecting all people from noise that jeopardizes their health or welfare. It places principal authority for regulating noise control with states and local communities. Noise standards applicable to the proposed project are established under Chapter 70.107 RCW for the state of Washington, as described in WAC 173-60-049 and WAC 173-60-050; and ORS Chapter 467 (Noise Control) and the OAR Division 35 (Noise Control Regulations) for the state of Oregon. The regulations are administered by Ecology and DEQ. Responsibility for enforcement of applicable regulations is assigned to local governments in both states.

The allowable hourly noise levels under state law, potential noise impacts associated with the project, and proposed mitigation are described in Section 3.11 Noise.

5.19 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states that each federal agency shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. Minority populations are considered members of the following groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic Origin; or Hispanic if the minority population of the affected area exceeds 50 percent, or is meaningfully greater than the minority population in the project area. The Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin. An analysis of the project area shows that although there are some populations with higher proportions of minority or low income groups compared to those in the county and/or state, these proportions are much lower than half and do not result in any minority or low income populations being disproportionately affected compared to other races or ethnicities (see Section 3.9 Socioeconomics). In addition, BPA has considered all input from persons or groups regardless of race, income status, or other social and economic characteristics.

5.20 Federal Communications Commission Regulations

Federal Communications Commission regulations require that transmission lines be operated so that radio and televisions reception would not be seriously degraded or repeatedly interrupted. Further, Federal Communications Commission regulations require that the operators of these devices mitigate such interference.

BPA would comply with Federal Communications Commission requirements relating to radio and television interference from the proposed transmission line if any such interference occurs. While none of the action alternatives are expected to increase electromagnetic interference above existing levels, each complaint about electromagnetic interference would be investigated (see Section 3.12 Public Health and Safety).

5.21 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 USC §§ 4201 et seq.) directs federal agencies to identify the quantity of farmland converted by federal programs, to identify and consider the adverse impacts of federal programs on farmland preservation, to consider alternative actions that could lessen adverse impacts, and to assure that the federal programs are compatible with state and local plans and programs. The Act's purpose is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to nonagricultural uses. Three types of farmland are recognized by the Act: prime farmlands, unique farmlands, and farmland of statewide or local importance.

Depending on the tower option chosen, the towers and new access roads would permanently occupy about 37.3–51.8 acres of both prime farmland and farmland of statewide importance along the West Alternative; 26.8–28.1 acres along the Middle Alternative, and 24.4–26.2 acres along the East Alternative. In addition, both Knight Substation sites would convert 10 acres of prime farmland to a nonagricultural use. No unique farmlands are located in the area. Impacts and mitigation measures for reducing impacts to farmland are discussed in Section 3.1 Land Use and Recreation.

5.22 National Scenic Byways Program

The National Scenic Byways Program designates scenic and historic roads as All-American Roads and/or National Scenic Highways based on their scenic, historic, recreational, cultural, archeological, or natural intrinsic qualities (National Scenic Byways Program 2009a). If these roadways no longer possess the intrinsic qualities that supported their designation or they are not maintained in accordance with their corridor management plan, they can be de-designated (Federal Highway Administration 1995). The management and protection of these scenic byways is carried out by the state departments of transportation under the Oregon Scenic Byway Program (OAR 734-032) and the Washington Scenic and Recreational Highways Strategic Plan RCW 47.39), or the USFS (if on USFS-managed lands).

Three highways in the project vicinity are designated as All-American Roads and/or National Scenic Highways according to the National Scenic Byways Program, including SR-14 in Washington, US-30 in Oregon, and US-97 in Oregon. SR-14 and US-30 are also designated as Scenic Travel Corridors through the Columbia River Gorge National Scenic Area Act (see Section ~~5.22~~ 5.23). See Sections 3.1 Land Use and Recreation, and 3.2 Visual Resources for a discussion of visual impacts along these highways.

5.23 Columbia River Gorge National Scenic Area Act

The Columbia River Gorge National Scenic Area Act (Scenic Act) (16 USC 544–544p) was enacted in 1986 to: (1) protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge; and (2) protect and support the economy of the Columbia River Gorge area by encouraging growth to occur in existing urban areas and by allowing future economic development. The Scenic Act established the Columbia River Gorge National Scenic Area, which covers nearly 293,000 acres in six Washington and Oregon counties along the Columbia River Gorge. The National Scenic Area extends along the Columbia River from about the confluence of the Columbia and Sandy rivers to just past the village of Wishram, Washington, about 85 miles to the east.

The National Scenic Area is categorized into three areas: Special Management Areas (SMA), General Management Areas (GMA), and Urban Areas. Areas categorized as SMA contain the most sensitive resources and comprise about 114,600 acres of the National Scenic Area. Areas categorized as GMA include a mixture of historic land uses such as farming, logging and cattle grazing. The Columbia River itself is currently designated GMA as well. GMA lands comprise about 149,400 acres of the National Scenic Area. Development and use of SMA and GMA lands is guided by Columbia River Gorge National Scenic Area Management Plan (Management Plan), which was originally adopted in 1991 and updated in 2007.

The remainder of the National Scenic Area is categorized as Urban Areas. These Urban Areas are exempt from National Scenic Area regulations and the Management Plan. There are 13 designated Urban Areas in the National Scenic Area: Cascade Locks, Hood River, Mosier and The Dalles in Oregon;

and North Bonneville, Stevenson, Carson, Home Valley, White Salmon, Bingen, Lyle, Dallesport and Wishram in Washington.

The National Scenic Area is managed on a partnership basis by the Columbia River Gorge Commission, the states of Oregon and Washington, the six counties with land in the National Scenic Area, and the USFS. The Gorge Commission is a bi-state Compact regional planning agency that was authorized by the Scenic Act and created by Washington and Oregon legislation in 1987. The Gorge Commission has several responsibilities under the Act, including planning for the National Scenic Area, implementation of the Management Plan, and monitoring and hearing appeals of land use decisions. The local counties and the Gorge Commission also are responsible for drafting and enforcing land-use ordinances to implement the Management Plan, and for administering development on GMA lands in the National Scenic Area. The USFS's primary role in the National Scenic Area is administering SMA lands, managing 71,000 acres of national forest land, and determining consistency of proposed federal actions in the National Scenic Area with the Scenic Act. Four tribal governments with interests in the National Scenic Area also play an important role in implementing the Management Plan and protecting cultural resources.

Although the Scenic Act provides a comprehensive scheme for regulation of development within the National Scenic Area, the Scenic Act does provide several express exemptions from its provisions for certain uses, activities, and rights. Relevant to the proposed project, the Scenic Act states that:

> Nothing in [this Act] shall . . . affect or modify the ability of the Bonneville Power Administration to operate, maintain, and modify existing transmission facilities. (See 16 USC 544o[a][5]).

Consistent with this exemption, none of the provisions of the National Scenic Act, Management Plan, or any other National Scenic Area regulations can be applied in such a way as to affect BPA's operation and maintenance of its existing transmission lines and associated facilities, or any planned or proposed modification by BPA of these facilities. This exemption is reinforced by the Management Plan, which states:

> The operation, maintenance, and modification of existing transmission facilities of the Bonneville Power Administration shall be exempt from regulation under the Management Plan or land use ordinances adopted by the counties or the Gorge Commission pursuant to the Scenic Area Act. (See Management Plan, Part II, Chapter 7).

In addition to this BPA-specific exemption, the Act states that:

> Nothing in [this Act] shall . . . establish protective perimeters or buffer zones around the scenic area or each special management area. The fact that activities or uses inconsistent with the management directives for the scenic area or special management areas can be seen or heard from these areas shall not, of itself, preclude such activities or uses up to the boundaries of the scenic area or special management areas. (See 16 USC 544o[a][10]).

Accordingly, the provisions of the Management Plan and other National Scenic Area regulations are considered to apply only to lands actually within the boundaries of the National Scenic Area.

Because the proposed project is a federal project, the USFS is the responsible entity under the Scenic Act for carrying out review of the project under the Scenic Act. Through this review, the USFS will make a determination concerning the consistency of the portion of the proposed project that would be located in the National Scenic Area with the Scenic Act, as well as with applicable provisions of the Management Plan and any other applicable National Scenic Area regulations. Please see Chapter 7 for a discussion of the consistency of the proposed project with the Management Plan.

5.24 National Forest Management Act

The Middle and West alternatives would cross USFS lands. Any new or additional right-of-way for the transmission line and associated access roads on these federal lands could require issuance of a Special Use Permit by the USFS under the National Forest Management Act. BPA would obtain real property rights as appropriate for these public lands. BPA will continue to coordinate with the USFS concerning potential permitting requirements.

5.25 State, Area-Wide, and Local Plan and Program Consistency

The proposed project crosses through two counties in two states: Wasco County in Oregon and Klickitat County in Washington. Depending on the action alternative, from 2 to 7 miles are located in the state of Oregon, and from 20 to 24 miles in the state of Washington. The Wautoma Option for the fiber optic cable would pass through Klickitat, Yakima, and Benton counties in Washington for an additional 72 miles.

CEQ regulations for implementing NEPA require EISs to discuss possible conflicts and inconsistencies of a proposed action with approved state and local plans and laws. The proposed project would be undertaken solely by BPA, which is a federal entity. Pursuant to the federal supremacy clause of the U.S. Constitution, BPA is not obligated to apply for local development or use permits in such circumstances. Therefore, BPA would not make formal application to any of the local jurisdictions for permits such as conditional use permits or shoreline development permits. However, BPA is committed to plan the project to meet or exceed the substantive standards and policies of state and local land use plans and programs to the extent practicable, and would provide the local jurisdictions with information relevant to these permits. (BPA would apply for county shoreline permits if the provisions of the Federal Water Pollution Control Act apply, such as for discharges into waters of the United States). Additional information on the project's consistency with state substantive standards is provided in Chapter 6 of this EIS.

The following section discusses possible conflicts or inconsistencies of the proposed project with Wasco County Comprehensive Plan Goals and Zoning Ordinances, Klickitat County Comprehensive Plan Goals and Zoning Ordinances, several other land use plans relevant to the project in Klickitat County, Critical Area Ordinances, and Transportation Permitting requirements. Oregon Statewide Planning Goals are accounted for in the Wasco County Comprehensive Plan Goals, and Washington does not have a specific state land use plan.

5.25.1 Oregon Land Use Planning

Wasco County Comprehensive Plan Goals

The following land use goals of the Wasco County Comprehensive Plan are relevant to the proposed project:

- Goal #3 – Agricultural Lands: To preserve and maintain agricultural lands (see Policy 1A).
- Goal #4 – Forest Lands: To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest

practices that assure the continuous growing and harvesting of forest tree species as the leasing use on forest land consistent with sound management of soil, air, water and fish and wildlife resources and to provide for recreational opportunities and agriculture (see Policy 3A).

- Goal #5 – Open Spaces, Scenic and Historic Areas and Natural Resources: To preserve open space and protect natural and scenic resources (see Policies 7A, 9C and D, and 10B and E).
- Goal #6 – Air, Water, and Land Resources Quality: To maintain and improve the quality of the air, water and land resources of the County (see Policies 1B and C; 3A, C, E, and H; and 4A–C).
- Goal #7 – Areas Subject to Natural Disasters and Hazards: To protect life and property from natural disasters and hazards (see Policies 1B, C, and E; and 2A, B, and D).
- Goal #9 – Economy of the State: To diversify and improve the economy of Wasco County (see Policies 1A–C, 3, and 5A–C).
- Goal #13 – Energy Conservation: To conserve energy (see Policies 1 and 2A).

In most cases, the design, construction, and placement of the proposed project would be consistent with these goals. However, there are a few instances in which the project may be inconsistent.

Regarding Goal #3 and #9, the project would remove a relatively small amount of agricultural land from production and convert it to the nonagricultural use of towers and access roads. However, wherever possible, BPA would allow the right-of-way to continue to be farmed (see Section 3.1 Land Use and Recreation for impacted acreages). From an economic standpoint, landowners would be compensated for land rights, and project construction would have a temporary positive impact on the economy. Therefore, the overall negative impact on the economy of Wasco County would be small (see Section 3.9 Socioeconomics).

Regarding Goal #4, none of the action alternatives are routed through land designated by Wasco County as forest land, and very few trees would be removed from the right-of-way (see Section 3.3 Vegetation).

The proposed project would conflict somewhat with Goal #5, since a small amount of wildlife habitat would be negatively impacted either temporarily due to construction disturbance or permanently through placement of towers or access roads (see Section 3.6 Wildlife). Affected habitats could include small amounts of riparian and wetland habitat as well as sensitive bird habitat sites. However, towers and roads would be placed further than 100 feet outside of the mean high water mark of streams and lakes, and no wetlands identified on the National Wetlands Inventory maps would be impacted in Wasco County. The proposed project could adversely affect the scenic attributes of the National Scenic Area, two scenic byways, the Lewis and Clark Historic Trail, and the Historic Oregon Trail (see Section 3.2 Visual Resources). No conflicts would be expected with the policy regarding historic, cultural, or archaeological resources (see Section 3.8 Cultural Resources).

The project would be consistent with Goals #6, 7, and 13 (for Goal #6, see Sections 3.4 Geology and Soils, 3.5 Water Resources and Wetlands, 3.11 Noise, and 3.13 Air Quality; for Goal #7, see Sections 3.4 Geology and Soils and 3.5 Water Resources and Wetlands; and for Goal #13, see Chapter 1 Purpose of and Need for Action).

Wasco County Zoning Ordinance

The Exclusive Farm Use Zone is the only land use zone that is crossed by the proposed project in Wasco County (see Map 5-1). Within this zone, a new transmission line would be permitted subject to standards, except for those towers over 200 feet tall, which would be a conditional use. Both would typically require review and approval by the county. While BPA would not apply for a permit, the EIS would be provided to the County, and the project would be designed to meet the standards set forth by the County insofar as is feasible. The project would, therefore, be generally consistent with Wasco County's zoning ordinance.

5.25.2 Washington Land Use Planning

Klickitat County Comprehensive Plan Goals

The following land use goals of the Klickitat County Comprehensive Plan are relevant to the proposed project:

- To maintain and enhance Klickitat County's natural resource base (see Policy 1).
- To promote provision of utilities sufficient to protect the public health and welfare (see Policies 7, 9, and 14).
- To preserve open space for its community-shaping, recreational and ecological value (see Policy 1).

In most cases, the design, construction, and placement of the proposed transmission line and substation for all action alternatives would be consistent with these goals. However, there are a few instances in which the project may be inconsistent.

Regarding Klickitat County's natural resource base, all action alternatives would remove a relatively small amount of agricultural land from production and convert it to the nonagricultural use of towers and access roads (see Section 3.1 Land Use and Recreation for impacted acreages). However, wherever possible, BPA would allow the right-of-way to continue to be farmed. From an economic standpoint, landowners would be compensated for land rights, and project construction would have a temporary positive impact on the economy. Therefore, the overall negative impact on the economy of Klickitat County would be small (see Section 3.9 Socioeconomics).

The proposed project would be generally consistent with the goal regarding the provision of utilities, although underground high-voltage transmission lines would not be feasible (see Chapter 2 Proposed Action and Alternatives)—one of the policies of the goal that is desired when possible. All action alternatives would use at least 9 miles of existing utility right-of-way, allowing BPA to consolidate the location of new and existing transmission infrastructure. In addition, the project would be consistent with the objective of fostering energy production in the county, as the project would increase transmission system capacity.

All action alternatives cross land zoned by Klickitat County as open space (see Map 5-1), which conflicts with the third goal stated above. Some open space would be converted to towers and access roads; however, the converted acreage would be minimal when compared to the total amount of zoned open space in Klickitat County. For the length of the transmission line, the land within the right-of-way would be left in its natural condition as much as possible except where trees would need to be removed for safety. Mitigation measures would be applied to restore disturbed vegetation and minimize impacts on open space areas.

Klickitat County Zoning Ordinance

The project area crosses seven Klickitat County zoning districts, shown in Map 5-1. Table 5-1 lists the zoning districts crossed by the project area and whether transmission lines are a permitted, prohibited, or conditional use in each zone.

Table 5-1. Klickitat County Zoning In the Project Area

Zoning District	Approximate Line Miles	Permitted Use
Extensive Agriculture	W12–Knight Substation; M11–Knight Substation; E15–Knight Substation	Conditional
General Commercial	E14	Conditional
General Industrial	W4	Permitted
Industrial Park	W3–W4	Conditional
Open Space	W5–W11; M8/E8; M9–M11; E9–E15	Conditional
Rural Center	M9/E9	Conditional
Rural Residential	W4–W5	Conditional

Utility facilities are not expressly prohibited in any of the zoning districts that fall within the project area. Furthermore, much of the project area falls within the Energy Overlay Zone, including the area adjacent to the National Scenic Area. The Energy Overly Zone is an area in which wind turbines and solar energy facilities are permitted outright, along with supporting utility and utility infrastructure, although projects are to obtain a permit from the Klickitat County Planning Department to ensure compliance with mitigation conditions. While BPA would not apply for a permit, BPA has indicated that the project would be designed to meet the standards set forth by the County insofar as is feasible. The project would, therefore, be generally consistent with Klickitat County's zoning ordinance.

Washington State Parks and Recreation Commission Land Use Plans

Columbia Hills State Park is the only state park crossed by the proposed project (specifically the West Alternative). The West Alternative would cross through a little over 1 mile of the Columbia Hills State Park through portions of the park designated as Resource Recreation (the most common designation), and Natural Area according to the Master Plan for Columbia Hills State Park (Washington State Parks and Recreation Commission 2003). Resource Recreation is a mid-intensity classification intended to allow recreational opportunities of a higher intensity, while still protecting the integrity of the natural landscape. The Natural Area designation is applied to areas identified as supporting rare or sensitive native plants or important wildlife habitat and is intended to emphasize protection and enhancement of the natural environment through increased management efforts. In addition, the proposed right-of-way passes within about 0.3 mile of the Dalles Mountain Ranch, and would pass immediately adjacent to a parking area on the north end of the park, although it would not affect the use of either facility. While the plan does not specifically list allowed and prohibited land uses for these designations, the construction of a high-voltage transmission line through areas designated for protection of sensitive habitat and maintenance of the natural landscape would have the potential to conflict with the Master Plan. (See Sections 3.1 Land Use and Recreation, and 3.3 Vegetation for a discussion of impacts and proposed mitigation measures).

Klickitat County Shoreline Master Plan

This plan regulates usage of shorelines of Washington within Klickitat County, as required by the Washington State Department of Ecology. Klickitat County's Shoreline Master Plan (Shoreline Plan) assigns a shoreline environment designation to each regulated shoreline and established guidelines for development in those areas. Per the legal description contained in the County's 1996 Shoreline Master Plan Update, the shoreline of the Columbia River is designated a Conservancy environment at both of the potential crossing locations proposed for the project. Utility facilities are a conditional use in the Conservancy environment, normally requiring a Shoreline Conditional Use Permit (Klickitat County 2002). While BPA would not apply for a permit, BPA would comply to the extent practicable with any general regulatory standards from the Shoreline Plan. The project would, therefore, be generally consistent with the Shoreline Plan.

Klickitat County Natural Resources State, Federal, and Local Coordination Plan

This plan is concerned with how state and federal agency actions can impact the custom and culture of Klickitat County through its natural resources. The overall intent of the plan is to ensure that state and federal agencies consider impacts on the county's resources, inform the county and its residents of these impacts, mitigate and minimize them to the extent practicable, and coordinate with the County and its adopted plans and ordinances pertaining to natural resource issues. Policies presented in the plan pertain to socioeconomics, forest resources, agriculture, minerals, water resources, energy resources, fish and wildlife, industry and multiple use, recreation, and weed management. Consistent with the requirements of NEPA, this EIS analyzes and proposes mitigation for impacts on most of the resources mentioned excluding minerals, for which no impacts were identified. The proposed project would be generally consistent with the policies described in the plan pertaining to industry and multiple use. In many cases, BPA would allow the proposed transmission line right-of-way to be managed for other uses, such as agriculture. In addition, BPA makes every attempt to minimize impacts and maintain consistency with local plans and ordinances to the extent practicable. See Sections 3.1 Land Use and Recreation, 3.2 Visual Resources, 3.3 Vegetation, 3.5 Water Resources and Wetlands, 3.6 Wildlife, and 3.7 Fish for details on impacts and mitigation. This EIS is also being made available to Klickitat County and the public for review and comment, and BPA will consider those comments in its final analysis and the decision making process.

5.25.3 Critical Areas Ordinances

Counties in Oregon do not have critical areas ordinances that would address potential geologic hazards in the project area. There are no specific plan and program consistency/floodplains and wetlands protection requirements or guidelines issued by the counties with respect to geologic conditions. Current Oregon building codes are specified in ORS 455.010 through 455.895. Geologic hazard regulations are overseen by the Oregon Department of Land Conservation and Development, as defined in ORS 660.015.

In Washington, Klickitat County established their Critical Areas Ordinance (CAO) in 2003, pursuant to the requirements of the Growth Management Act (RCW Chapter 36.70A), and overseen by the Klickitat County Planning Department. The CAO describes the categories of critical areas in the county, setback and buffer distances, mitigation requirements for unavoidable impacts, and guidance for reducing or mitigating hazards to public health and safety in geologically hazardous areas. It identifies five Critical Areas, including Wetlands; Critical Fish/Wildlife Habitat Conservation Areas; Geologically Hazardous

Areas, Aquifer Recharge Areas, and Frequently Flooded Areas, and provides standards for classification and designation of significant geologically hazardous areas. The provisions of the Klickitat County CAO apply to all activities, unless exempted, in unincorporated areas of Klickitat County. BPA has incorporated some of the standards and guidance from the CAO in analyzing and proposing mitigation for impacts on potentially critical areas. See Sections 3.4 Geology and Soils, 3.5 Water Resources and Wetlands, 3.6 Wildlife, and 3.7 Fish for descriptions of impacts and mitigation measures.

5.25.4 Transportation

Oregon and Washington Transportation Permits. According to RCW Chapter 46.44 (Size, Weight, Load) and the ORS Chapter 818 (Vehicle Limits), oversized or overweight vehicles will need transportation permits to travel on highways and local public roads in each state.

The construction contractors will consult with WSDOT, Oregon Department of Transportation (ODOT), Klickitat County Public Works Department, and Wasco County Public Works Department to comply with state and local requirements. Necessary transportation permits for oversized or overweight vehicles used for the project construction and maintenance would be secured as required.

In addition, width and/or height restrictions occur on several locations on SR-14 in the project area. During construction, trucks accessing the project sites via SR-14 will likely pass through most of these areas. The construction contractors will use alternative routes for trucks exceeding the restrictions. Restricted areas include the following:

- Mile Post (MP) 19 to MP 83.53. Located southwest of the study area near line mile W3. No loads longer than 125 feet are allowed. A route detour is available via Oregon.
- Lyle Tunnels, MP 76.77 to 76.91. Loads wider than 10 feet are required to have three pilot cars (two front and one rear).
- Cook Underwood Tunnels. No loads wider than 12 feet are allowed. Loads wider than 8.5 to 10 feet are required to have one front pilot car and loads wider than 10 to 12 feet are required to have three pilot cars (two front and one rear).

Chapter 6
Consistency with State Substantive Standards

As discussed in Chapter 4, BPA is a federal agency subject to state regulation only if there has been a waiver of federal sovereign immunity through federal law, consistent with the supremacy clause of the U.S. Constitution. Certain federal laws, such as the Clean Water Act and Clean Air Act, have provided this waiver of federal sovereign immunity, and BPA's activities thus can be regulated by state entities under these laws. In addition, the Federal Land Policy Management Act (FLPMA), 43 USC §1701 et seq., provides a limited waiver of federal sovereign immunity, such that federal agencies including BPA are required to comply with specific substantive provisions for environmental protection that may be identified by states for portions of the federal agency's activities that would be located on federal lands.

Notwithstanding these aspects of federal supremacy, BPA is committed to planning its proposed transmission line projects to be consistent or compatible to the extent practicable with state plans and programs, as well as any substantive standards that these plans and programs may contain, even when not required by federal law. To work towards this goal, BPA typically provides project information relevant to state permitting processes to state entities with a potential interest in the project. In designing and carrying out its proposed projects, BPA also strives to meet or exceed the substantive standards and policies of state regulations.

To further memorialize this approach, BPA entered into a series of Memoranda of Understanding (MOUs) and Memoranda of Agreement (MOAs) in the 1980s with individual Pacific Northwest states concerning BPA's activities in each state. Each MOU called for general cooperation between BPA and each state regarding BPA's activities in that state, and each MOA called for cooperation specifically on the siting of proposed federal transmission facility projects to be located in that state. Each MOA also called for the development of project-specific work plan agreements between BPA and the state for individual BPA transmission line projects to be located in that state.

In the MOU and MOA with the states of Washington and Oregon, the agencies that were designated with the responsibility for entering into and carrying out work plan agreements for each individual BPA transmission line project are the Washington EFSEC and the Oregon DOE. Because the proposed Big Eddy-Knight Transmission Project would be located in both Washington and Oregon, BPA has entered into work plan agreements with the Washington EFSEC and Oregon DOE for this project. Under these agreements, the state agencies have provided BPA with potentially applicable state substantive standards that they believe should be addressed in this EIS to aid state agency review of the proposed project. It is the objective of BPA and Washington EFSEC and Oregon DOE that by identifying and considering these standards as early as possible, the proposed project can be designed to be consistent or compatible with these standards to the maximum extent practicable.

The remainder of this chapter identifies those state substantive standards that are potentially applicable to BPA's proposed project, and evaluates the extent to which the proposed project would be consistent with these standards. This discussion is organized by the state agency that has established each standard, with the standards of each agency further organized by resource topic where appropriate. In most cases, BPA believes that implementation of its own design, construction, and operation standards would serve to meet or exceed the state substantive standard that has been identified. However, in some cases, additional measures may be required to be consistent with a particular state standard. For any state standards where it is likely that consistency cannot be achieved, an explanation is provided.

6.1 Washington EFSEC Standards

Washington EFSEC is the state agency responsible for siting new energy facilities in the state of Washington, including certain thermal power plants, alternative energy facilities, natural gas pipelines, and electrical transmission lines. Washington EFSEC's authority in this area is provided by RCW Chapter 80.50, and is implemented through WAC Title 463.

BPA's proposed transmission lines are not subject to Washington EFSEC's siting jurisdiction except for portions proposed to be located on federal lands. However, BPA will seek to be consistent with Washington EFSEC's substantive standards to the extent practicable, regardless of the proposed project's location on or off federal lands.

The following Washington EFSEC substantive standards from WAC Title 463 (WAC 463-26, 463-60, 463-72, and 463-74) are potentially applicable to the proposed project:

6.1.1 Natural Environment – Energy and Natural Resources

- The application shall describe the rate of use and efficiency of consumption of energy and natural resources during both construction and operation of the proposed facility.
- The application shall describe the sources of supply, locations of use, types, amounts, and availability of energy or resources to be used or consumed during construction and operation of the facility.
- The application shall describe all nonrenewable resources that will be used, made inaccessible or unusable by construction and operation of the facility.
- The application shall describe conservation measures and/or renewable resources that will or could be used during construction and operation of the facility.

Consistency: While BPA does make every effort to comply with state substantive standards, the above standards are not applicable to the proposed project. Information regarding the rate of use and efficiency of consumption of energy and other resources has not been provided in this EIS because BPA is not required to submit an application to Washington EFSEC for construction of the proposed transmission line. Impacts to natural resources are addressed by resource in Chapter 3. Irreversible and Irretrievable Commitment of Resources (i.e., nonrenewable resources) are discussed in Section 3.17.

- The application shall describe any scenic resources which may be affected by the facility or discharges from the facility.

Consistency: Sections 3.1 Land Use and Recreation and 3.2 Visual Resources describe the proposed project's impact on scenic resources including impacts to recreational areas. Impacts to recreation resources would range from none to moderate. Impacts to scenic resources are assessed in Section 3.2 for the general regional setting, as well as for the National Scenic Gorge and its key viewing areas. There would be no discharges from the transmission line.

6.1.2 Transportation

- Transportation systems. The application shall identify all permanent transportation facilities impacted by the construction and operation of the energy facilities, the nature of the impacts, and the methods to mitigate impacts. Such impact identification, description, and mitigation shall, at least, take into account:

  (a) Expected traffic volumes during construction, based on where the work force is expected to reside;

  (b) Access routes for moving heavy loads, construction materials, or equipment;

  (c) Expected traffic volumes during normal operation of the facility;

  (d) For transmission facilities, anticipated maintenance access; and

  (e) Consistency with local comprehensive transportation plans.
- Vehicular traffic. The application shall describe existing roads, estimate volume, types, and routes of vehicular traffic which will arise from construction and operation of the facility. The applicant shall indicate the applicable standards to be utilized in improving existing roads and in constructing new permanent or temporary roads or access, and shall indicate the final disposition of new roads or access and identify who will maintain them.
- Waterborne, rail, and air traffic. The application shall describe existing railroads and other transportation facilities and indicate what additional access, if any, will be needed during planned construction and operation. The applicant shall indicate the applicable standards to be utilized in improving existing transportation facilities and in constructing new permanent or temporary access facilities, and shall indicate the final disposition of new access facilities and identify who will maintain them.
- Parking. The application shall identify existing and any additional parking areas or facilities which will be needed during construction and operation of the energy facility, and plans for maintenance and runoff control from the parking areas or facilities.
- Movement/circulation of people and goods. The application shall describe any change to the current movement or circulation of people or goods caused by construction or operation of the facility. The application shall indicate consideration of multipurpose utilization of rights of way and describe the measures to be employed to utilize, restore, or rehabilitate disturbed areas. The application shall describe the means proposed to ensure safe utilization of those areas under applicant's control where public access will be granted during project construction, operation, abandonment, termination, or when operations cease.
- Traffic hazards. The application shall identify all hazards to traffic caused by construction or operation of the facility. Except where security restrictions are imposed by the federal government the applicant shall indicate the manner in which fuels and waste products are to be transported to and from the facility, including a designation of the specific routes to be utilized.

Consistency: Construction and improvement of the access road system for the proposed project is discussed in Section 2.3 Project Components (including Access Roads). Section 3.10 Transportation describes the proposed project's impact on transportation resources including expected traffic volumes during construction and maintenance, proposed access routes during construction and maintenance, and possible impacts on local traffic during construction. The movement or circulation of people or goods would not be impacted by the proposed project. Potential impacts to waterborne, rail, and air traffic are also addressed in Section 3.10. Road use during construction and operation of the line would comply with regional transportation plans as discussed in Section 3.10. Access roads constructed and used during line construction would also be used during maintenance of the transmission line. Fuel would be transported to work sites using the same access roads discussed in Chapter 2 and Section 3.10. Staging areas that would be used to store construction materials and vehicles are discussed in Section 2.3 Project Components.

6.1.3 Socioeconomics

- The application shall include a detailed socioeconomic impact analysis which identifies primary, secondary, and positive as well as negative impacts on the socioeconomic environment in the area potentially affected by the project, with particular attention to the impact of the proposed facility on population, work force, property values, housing, health facilities and services, education facilities, governmental services, and local economy. The study area shall include the area that may be affected by employment within a 1-hour commute distance of the project site. The analysis shall use the most recent data as published by the U.S. Census or state of Washington sources.
- The analysis shall include the following:

  (a) Population and growth rate data for the most current 10-year period for the county or counties and incorporated cities in the study area;

  (b) Published forecast population figures for the study area for both the construction and operations periods;

  (c) Numbers and percentages describing the race/ethnic composition of the cities and counties in the study area;

  (d) Average per capita and household incomes, including the number and percentage of the population below the poverty level for the cities and counties within the study area;

  (e) A description of whether or not any minority or low-income populations would be displaced by this project or disproportionately impacted;

  (f) The average annual work force size, total number of employed workers, and the number and percentage of unemployed workers including the year that data are most recently available. Employment numbers and percentage of the total work force should be provided for the primary employment sectors;

  (g) An estimate by month of the average size of the project construction, operational work force by trade, and work force peak periods;

  (h) An analysis of whether or not the locally available work force would be sufficient to meet the anticipated demand for direct workers and an estimate of the number of construction and operation workers that would be hired from outside of the study area if the locally available work force would not meet the demand;

  (i) A list of the required trades for the proposed project construction;

  (j) An estimate of how many direct or indirect operation and maintenance workers (including family members and/or dependents) would temporarily relocate;

  (k) An estimate of how many workers would potentially commute on a daily basis and where they would originate.

- The application shall describe the potential impact on housing needs, costs, or availability due to the influx of workers for construction and operation of the facility and include the following:

  (a) Housing data from the most recent 10-year period that data are available, including the total number of housing units in the study area, number of units occupied, number and *percentage* of units vacant, median home value, and median gross rent. A description of the available hotels, motels, bed and breakfasts, campgrounds, or other recreational facilities;

  (b) How and where the direct construction and indirect work force would likely be housed. A description of the potential impacts on area hotels, motels, bed and breakfasts, campgrounds, and recreational facilities;

  (c) Whether or not meeting the direct construction and indirect work force's housing needs might constrain the housing market for existing residents and whether or not increased demand could lead to increased median housing values or median gross rents and/or new housing construction. Describe mitigation plans, if needed, to meet shortfalls in housing needs for these direct and indirect work forces.

  The application shall have an analysis of the economic factors including the following:

  (a) The approximate average hourly wage that would likely be paid to construction and operational workers, how these wage levels vary from existing wage levels in the study area, and estimate the expendable income that direct workers would likely spend within the study area;

  (b) How much, and what types, of direct and indirect taxes would be paid during construction and operation of the project, and which jurisdictions would receive those tax revenues;

  (c) The other overall economic benefits (including mitigation measures) and costs of the project on the economies of the county, the study area, and the state, as appropriate, during both the construction and operational periods.

- The application shall describe the impacts, relationships, and plans for utilizing or mitigating impacts caused by construction or operation of the facility to the following public facilities and services:

Fire	Maintenance
Police	Communications
Schools	Water/ storm water
Parks or other recreational facilites	Sewer/ solid waste
Utilities	Other governmental services

- The application shall compare local government revenues generated by the project (e.g., property tax, sales tax, business and occupation tax, payroll taxes) with their additional service expenditures resulting from the project; and identify any potential gaps in expenditures and revenues during both construction and operation of the project. This discussion should also address potential temporal gaps in revenues and expenditures.
- To the degree that a project will have a primary or secondary negative impact on any element of the socioeconomic environment, the applicant is encouraged to work with local governments to avoid, minimize, or compensate for the negative impact. The term "local government" is defined to include cities, counties, school districts, fire districts, sewer districts, water districts, irrigation districts, or other special purpose districts.

Consistency: Section 3.9 Socioeconomics provides a detailed discussion of the socioeconomic impacts from the proposed project including impacts on population, work force, property values, housing, health facilities and services, education facilities, governmental services, and local economy in Klickitat and Wasco counties.

6.1.4 Land Use Zoning

- The council shall make a determination as to whether the proposed site is consistent and in compliance with land use plans and zoning ordinances pursuant to RCW 80.50.090 (2).

Consistency: Area-wide and local plan and program consistency is addressed in Section 5.25 ~~5.24~~. Potential impacts to land use are addressed in Section 3.1 Land Use and Recreation.

6.1.5 Site Restoration and Preservation

- When a site is subject to preservation or restoration pursuant to a plan as defined in WAC 463-72-040 through 463-72-060, the certificate holder shall conduct operations within terms of the plan; shall advise the council of unforeseen problems and other emergent circumstances at the site; and shall provide site monitoring pursuant to an authorized schedule. After approval of an initial site restoration plan pursuant to WAC 463-72-040, a certificate holder shall review its site restoration plan in light of relevant new conditions, technologies, and knowledge, and report to the council the results of its review, at least every 5 years or upon any change in project status. The council may direct the submission of a site preservation or restoration plan at any time during the development, construction, or operating life of a project based upon council's review of the project's status. The council may require such information and take or require such action as is appropriate to protect the environment and all segments of the public against risks or dangers resulting from conditions or activities at the site.

Consistency: Implementation of mitigation measures described in Chapter 3 of this EIS would reduce possible impacts during construction and maintenance and provide site restoration following construction.

6.1.6 Geology and Soils

- The seismicity standard for construction of energy facilities shall be the standards contained in the state building code.

Consistency: BPA will include any seismic standards applicable to transmission line construction from the State of Washington's building code in its design specifications for the proposed transmission line.

6.1.7 Water Quality

- Waste water discharges from projects under [EFSEC's] jurisdiction shall meet the requirements of applicable state water quality standards, chapter 173-201A WAC, state groundwater quality standards, chapter 173-200 WAC, state sediment management standards, chapter 173-204A WAC, requirements of the Federal Water Pollution Control Act as amended (86 Stat 816,33 USC 1251, et seq.) and regulations promulgated thereunder.

Consistency: Through its compliance with the Clean Water Act, BPA seeks appropriate certifications and authorizations from state water quality regulatory agencies for its proposed projects. BPA will meet all applicable standards identified through this process to protect water quality from construction and operation of the proposed transmission line. See Section 3.5 for information concerning the proposed project's potential impacts on water quality, and Section 5.10 for more information concerning BPA's Clean Water Act compliance activities.

6.1.8 Wetlands

- Wetland impacts shall be avoided wherever possible.
- Where impacts cannot be avoided, the applicant shall be required to take one or more of the following actions (in the following order of preference): Restore wetlands on upland sites that were formerly wetlands; create wetlands on disturbed upland sites; enhance significantly degraded wetlands; and preserve high-quality wetlands that are under imminent threat.
- Wetland mitigation actions proposed to compensate for project impacts shall not result in a net loss of wetland area except when the lost wetland area provides minimal functions and the mitigation action(s) will clearly result in a significant net gain in wetland functions as determined by a site-specific function assessment.

Consistency: In designing its proposed projects, BPA attempts to avoid identified wetland areas where feasible. If wetlands cannot be avoided, BPA works to minimize potential impacts and compensate appropriately for unavoidable impacts. BPA thus would act consistently with EFSEC's standards related to wetlands during construction and operation of the proposed transmission line. See Section 3.5 for information concerning the proposed project's potential impacts on wetlands, and Section 5.10 for more information concerning BPA's activities to comply with wetland regulations such as Section 404 of the CWA.

6.1.9 Fish and Wildlife

- EFSEC encourages applicants to select sites that avoid impacts to any species on federal or state lists of endangered or threatened species or to priority species and habitats.
- An applicant must demonstrate no net loss of fish and wildlife habitat function and value.
- Restoration and enhancement are preferred over creation of habitats due to the difficulty in successfully creating habitat.
- Mitigation credits and debits shall be based on a scientifically valid measure of habitat function, value, and area.
- The ratios of replacement habitat to impacted habitat shall be greater than 1:1 to compensate for temporal losses, uncertainty of performance, and differences in functions and values.
- Fish and wildlife surveys shall be conducted during all seasons of the year to determine breeding, summer, winter, migratory usage, and habitat condition of the site.

Consistency: In designing its proposed projects, BPA attempts to avoid impacts to fish and wildlife species where possible. Field surveys of the project corridor for wildlife species were conducted in summer 2009 and spring 2010. Potential impacts to ESA-listed species discussed in Sections 3.6 Wildlife and 3.7 Fish, which also assess potential effects to state-listed species and priority habitat and species.

6.1.10 Air Quality

- Air emissions from energy facilities shall meet the requirements of applicable state air quality laws and regulations promulgated pursuant to the Washington State Clean Air Act, chapter 70.94 RCW, and the Federal Clean Air Act (42 USC 7401 et seq.), and chapter 463-78 WAC.

Consistency: To the extent that air emissions resulting from construction and maintenance of the proposed transmission line and substation are regulated under state law, the project would comply with these regulations (see Section 3.13 Air Quality). Because operation of the proposed line would not result in any air emissions, there are no applicable standards for project operation.

6.1.11 Public Health and Safety

- The provisions of chapter 173-303 WAC shall apply to the on-site activities, at energy facilities subject to this chapter, which involve the generation, storage, transportation, treatment or disposal of dangerous wastes.
- No person shall cause or permit noise to intrude into the property of another person which noise exceeds the maximum permissible noise levels set forth below in this section.
- The noise limitations established are as set forth in the following table after any applicable adjustments provided for herein are applied.

Table 6-1. Noise Limitations

EDNA[1] of Noise Source	EDNA of Receiving Property		
	Class A	**Class B**	**Class C**
Class A	55 dBA	57 dBA	60 dBA
Class B	57	60	65
Class C	60	65	70

[1] EDNA, environmental designations for noise abatement.

- Between the hours of 10:00 p.m. and 7:00 a.m. the applicable noise limitations shall be reduced by 10 dBA for receiving property within Class A environmental designations for noise abatement (EDNAs).
- At any hour of the day or night the applicable noise limitations may be exceeded for any receiving property by no more than: (i) 5 dBA for a total of 15 minutes in any one-hour period; or (ii) 10 dBA for a total of 5 minutes in any one-hour period; or (iii) 15 dBA for a total of 1.5 minutes in any one-hour period.
- Sounds originating from temporary construction sites as a result of construction activity are exempt from these standards, except where such provisions relate to the reception of noise within Class A EDNAs between the hours of 10:00 p.m. and 7:00 a.m.

Consistency: BPA would comply with all applicable state regulations concerning the generation, storage, transportation, treatment or disposal of dangerous wastes during construction and maintenance of the proposed transmission line. BPA also would conduct its construction activities for the proposed line in conformance with EFSEC's standards concerning maximum permissible noise levels through using appropriate muffling devices on construction equipment and limiting construction to daytime and evening hours (see Section 3.11 Noise). Noise impacts during operation of the proposed line would be negligible, and Knight Substation would meet state noise standards as discussed in Section 3.11.

6.2 Washington Department of Natural Resources Standards

The project area includes state lands managed by DNR. This agency manages uplands for many purposes, including protection of state and federal threatened and endangered species, revenue for school construction, and environmental protection. Lands held in trust to support public beneficiaries generate earnings that help build or remodel public schools and universities. These revenues come from timber harvest on state trust lands, as well as from leases to farmers and ranchers and leases for mineral exploration and wind power generation (DNR 2009). The DNR trust lands crossed by the proposed action alternatives are currently leased to farmers, ranchers, and wind development. A portion of the DNR lands crossed lies within a DNR-designated Natural Area Preserve. BPA would obtain easements and permits as appropriate for any DNR lands crossed by the proposed project.

The project area includes state trust lands, State Owned Aquatic Lands managed by DNR and other state and private lands regulated by DNR. Within the scope, the Department has multiple responsibilities ranging from the management, disposition and acquisition of certain public trust lands including aquatic lands and natural areas, to regulation of timber harvest activities and fire protection on non-federal lands. The Department collects, analyzes, and distributes scientific data about state plants. The Washington State Geologist is also part of the DNR and maintains and provides information on geologic hazards throughout the state.

The following DNR policies are potentially applicable to the proposed project:

6.2.1 Compliance and Cooperation with other State and Federal Laws

- PO08-028: The department will comply with SEPA by managing activities on trust agricultural and grazing lands through a phased review process.
- PO08-035: The department will actively promote and maintain long-term relationships with public and private organizations that affect the agricultural and grazing program.
- PO13-002: It is the policy of the department to prepare a site-specific management plan for each Natural Area Preserve. The provisions in Natural Areas Preserve Act in Chapter 79.70 RCW establish a state system of natural area preserves and a means of preservation for those areas.
- The department will comply with Chapter 43.21C RCW SEPA and Chapter 197-11 WAC SEPA Rules for all non-exempt proposed actions as defined by the SEPA laws including Chapter 332-41 WAC DNR SEPA Procedures.

Consistency: BPA is committed to planning its proposed transmission line projects to be consistent or compatible to the extent practicable with existing land uses. See Sections 3.1 Land Use and Recreation, 3.3 Vegetation, and 3.9 Socioeconomics for information concerning the proposed project's potential impacts on agricultural and grazing lands and mitigation measures identified to reduce or eliminate impacts to those resources. See Section 5.21 ~~5.20~~ for information on the Farmland Protection Policy Act which directs federal agencies to identify and quantify adverse impacts on farmlands.

As described in the introduction to this chapter, BPA is working with Washington EFSEC to help ensure this EIS is adoptable under SEPA for all state and local agencies. This EIS does analyze the significant impacts of the proposal to the SEPA-defined natural and built environment.

6.2.2 Natural Areas Preserve Act

- PO13-002: It is the policy of the department to prepare a site-specific management plan for each Natural Area Preserve. The provisions in Natural Areas Preserve Act in Chapter 79.70 RCW establish a state system of natural area preserves and a means of preservation for those areas.

DNR's Natural Heritage Plan 2007 and 2009 update identify priorities for conserving the State of Washington's native species, ecosystems, and natural heritage. The plan is updated every two years to reflect new conditions that affect conservation planning and priorities.

Consistency: The proposed West Alternative would cross the Columbia Plateau Eco Region's Columbia Hills Natural Area Preserve. See Sections 3.1 Land Use and Recreation, 3.3 Vegetation, 3.6 Wildlife and 3.7 Fish.

6.2.3 Geology and Soils

- PO08-029: The department will actively maintain or enhance soil productivity and quality on agricultural and grazing lands.
- The provisions in chapter 43.92 RCW shall apply to geologic hazards, which include assessment and mapping of seismic, landslide, and tsunami hazards, estimation of potential consequences, and likelihood of occurrence.

Consistency: In designing its proposed projects, BPA attempts to reduce impacts to soil productivity by implementing mitigation measures as listed in Section 3.4 Geology and Soils. Geologic hazards are also taken into account during line design; landslides are avoided if possible and towers are designed to withstand seismic hazards. See Section 3.4 for a discussion of areas along the proposed routes with landslide or seismic hazards.

6.2.4 Water Quality

- PO08-031: The department will maintain or enhance the quality and longevity of water resources originating from, flowing through, or applied on department-managed lands.

Consistency: As discussed above for Washington EFSEC water quality standards and in Section 5.10 Clean Water Act, BPA seeks appropriate certifications and authorizations from state water quality regulatory agencies and will meet all applicable standards identified through this process to protect water quality. See Section 3.5 Water Resources and Wetlands for information concerning the proposed project's potential impacts on water quality and for mitigation measures that would reduce those impacts.

6.2.5 Biological Resources

- PO-008: The department will actively participate with public and private sectors in developing and implementing pest and weed management programs.
- PO08-030: The department will maintain and enhance desirable vegetative communities on trust lands used for crop production, grazing, and wildlife habitat when compatible with agricultural and grazing program goals.
- The department will comply with Title 17 RCW Weeds, Rodents, and Pests.
- The department will comply with Chapter 15.58 RCW Washington Pesticide Control Act.

Consistency: As discussed in Section 2.3.5 Vegetation Clearing, BPA's vegetation management would be guided by its Transmission System Vegetation Management Program EIS. Additionally, BPA works with the county weed boards and landowners on area-wide plans for noxious weed control.

6.2.6 Cultural Resources

- PO08-034: The department will, within trust management obligations, protect significant archaeological and cultural resources on agricultural and grazing lands.
- The department will comply with PO06-001 Historical, Cultural, and Archeological sites.

Consistency: As discussed in Section 5.14 Cultural Resources, there are many laws and other directives for the management of cultural resources with which BPA seeks compliance. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties on all lands impacted by projects including agricultural and grazing lands. As discussed in Section 3.8 Cultural Resources, a cultural resources inventory of the action alternatives is being conducted.

6.2.7 Land Use and Socioeconomics

- PO08-012: The department will sell valuable materials from and lease, permit or contract agricultural and grazing lands for other surface and subsurface uses when in the best interest of the trust beneficiaries. In such cases:
- Existing agricultural lessees will be compensated by subsequent users for loss when crops or authorized improvements are damaged, when the lease is terminated, or lease renewal negotiation is denied.
- Existing grazing lessees will be compensated by subsequent users for loss when crops or authorized improvements are damaged, when the lease is terminated, or lease renewal negotiation is denied.
- Chapter 332-52 WAC public access and recreation.
- RCW 79.10.120 Multiple uses compatible with financial obligations of trust management.
- RCW 79.10.125 Land open to public for fishing, hunting, and nonconsumptive wildlife activities.
- RCW 79.36.440 Right-of-way for public roads.
- RCW 79.36.510 Utility pipe lines, transmission lines, etc.
- RCW 79.36.520 Utility pipe lines, transmission lines, etc. – Procedure to acquire.

- RCW 79.36.530 Utility pipe lines – Appraisal – Certificate – Reversion.
- RCW 79.38.040 Permits for use of roads.

Consistency: As described above, BPA is committed to planning its proposed transmission line projects to be consistent or compatible to the extent practicable with existing land uses. See Section 3.1 Land Use and Recreation for mitigation measures identified to reduce potential impacts to landowners and their lessees and socioeconomics.

6.2.8 Fish and Wildlife

- PO08-032: The department will recognize the natural resource values of riparian zones and implement management plans to maintain or enhance these zones.
- PO08-033: The department will avoid effects on plant and animal species considered endangered. Within trust management obligations, the department will avoid adverse effects on species considered threatened and consider avoiding or lessening effects on species considered sensitive.

Consistency: As described above under consistency with EFSEC standards, BPA attempts to avoid impacts to fish and wildlife species where possible. Sections 3.6 Wildlife and 3.7 Fish display the listed and proposed species that are either known to occur or have the potential to occur in the project area, the proposed project's potential impacts on wildlife and fish, and mitigation measures identified to minimize those impacts.

6.2.9 Transportation and Access

PO14-020 pertaining to forest roads in DNR's Policy Manual states the following:

- The department will develop and maintain forest roads to meet trust objectives and Board of Natural Resources policy, including protecting and enhancing the asset value.
- To minimize adverse environmental impacts, the department will rely on the requirements of DNR's Habitat Conservation Plan, state forest practices rules and the State Environmental Policy Act, and will minimize the extent of the road network, consistent with other Board of Natural Resources policy.

In response to DNR's policy and in order to achieve the regulatory requirements under Washington Forest Practice Act, a comprehensive discussion of DNR standards for roads designed, constructed, maintained, and abandoned on state managed lands was developed in the Draft 2010 Forest Roads Guidebook.

Three general management practices characterize a small portion of the objectives and standards outlined in the Draft 2010 Forest Roads Guidebook, but are representative of the considerations DNR must make when adding a new road to the overall transportation system:

Build no more new road than is necessary to accomplish and economically conduct harvest and/or management objectives for the basic plan of operations, regardless of whether a road is in sensitive areas or not.

The protection of sensitive species and areas including, but not limited to, streams and watersheds is vital. Proper logging methods, road locations and construction techniques must be considered to mitigate a potential increase in erosion from forest areas and sediment delivery to surface water.

Consider the overall transportation plan for a geographic area. Don't ignore pre-planning for future sales and access. This will avoid construction of parallel roads or extra lengths of roads to access far corners that will be harvested in the future.

Consistency: Where the West Alternative would cross DNR land, some trees would be removed. However, the amount would be relatively small and would not require additional roads not planned for the project. The trees that would be removed for the project are not for timber harvest (see Section 3.3 Vegetation).

6.2.10 Public Health and Safety

- The provisions of chapter 332-24 WAC and chapter 76.04 RCW shall apply to forest protection measures and operator responsibilities related to fire prevention and fire hazard abatement.

Consistency: BPA is committed to reducing the potential for fire during construction. See Sections 3.3 Vegetation and 3.12 Public Health and Safety for mitigation measures identified to minimize potential health and safety risks from fire.

6.2.11 Washington's Forest Practices Act and Rules

DNR's Forest Practices Program is responsible for the implementation of the state's Forest Practices Act and rules (Chapter 76.09 RCW and Chapter 222 WAC). The rules provide the framework for the protection of public resources on all state and private forest land and are a responsibility of forest landowners, timber owners and operators when conducting forest practices activities.

Consistency: No state or private lands governed under the Forest Practices Act and Rules managed for forest or timber are crossed by the project alternatives. The West Alternative would cross the DNR Columbia Hills Natural Area Preserve where some upland trees would require removal (see Section 3.3 Vegetation).

6.2.12 State Owned Aquatic Lands

The following conservation measures are implemented on a case-by-case basis as site-specific conditions warrant. As good stewards of the state's aquatic lands these are the measures that the department currently uses to lessen the impact from development. These measures are currently under review in the development of an Aquatic Lands HCP with an incidental take permit that is anticipated for final adoption in about another 18 months. This process somewhat parallels the current timeline for the decision on the Big Eddy-Knight proposal. These measures may change when the Aquatics HCP is finalized and adopted and there may be additional requirements.

1) In saltwater systems, treated wood is only allowed as part of above water structural framing and may not be used as decking, pilings or for any other uses. Treated wood is prohibited for all uses in freshwater. During maintenance, existing treated wood timbers and pilings must be replaced with alternative materials, such as untreated wood, steel, concrete, or recycled plastic, or encased in a manner that prevents leaching of contaminants into surface water. Structural framing in saltwater systems may be replaced with non-creosote treated wood.
2) New bulkheads or hard bank armoring will only be allowed on state-owned aquatic land in exceptional circumstances such as those needed to protect infrastructure. Over time,

existing bulkheads must be replaced with softer shoreline protection systems. Bulkheads which cannot be replaced with softer shoreline materials due to design or infrastructure protection issues may be considered for replacement, provided that the bulkhead occupies the same footprint, or smaller, than the existing one.

3) New fill, or additional placement of fill, will not be allowed on state-owned aquatic lands. Fill may be allowed for sediment remediation, authorized habitat creation or restoration projects. Washed gravel or shell may be applied as a substrate amendment for authorized shellfish aquaculture activities.
4) Dredging, including sand and gravel mining, is not allowed on state-owned aquatic lands except where required for navigation for trade and commerce, flood control, or maintenance of water intakes.
5) New activities or structures must avoid existing native aquatic vegetation (Protected Vegetation to be provided by DNR).
6) New outfalls must be located at least 16 feet (5 meters) from existing aquatic vegetation (may change subject to site-specific situations).
7) Species work windows (See Species Work Windows and Buffers provided by DNR) must be used for the timing of any construction, operation or maintenance activities, to protect listed and sensitive species and forage fish species in sensitive live history phases (See Listed and Sensitive Species provided by DNR).
8) Lessees and grantees must remove unused, abandoned structures, treated wood, pilings, derelict vessels, and equipment from the lease or easement site. A timeframe for removal will be specified in the authorizing document.
9) Lessees shall assess water drainage and runoff patterns, and shall develop and implement a plan to alter them to reduce direct inputs of contaminants and nutrients.

Consistency: The State Owned Aquatic Lands applicable to the project are the Washington side of the Columbia River. The proposed project would not place any structures in the Columbia River, and the proposed project facilities would be 250 feet to over 500 feet (depending on the alternative) from the edge of the Columbia River. In addition, no riparian vegetation along the Columbia River would be removed for any of the alternatives.

6.3 Washington Department of Fish and Wildlife Standards

WDFW serves as state's principal agency on species protection and conservation. Legislative mandate RCW 77.04.012 established that wildlife, fish, and shellfish are property of the state and that WDFW is entrusted by and through the Fish and Wildlife Commission to…"preserve, protect, perpetuate, and manage the wildlife and food fish, game fish, and shellfish…" and "…attempt to maximize the public recreational game fishing and hunting opportunities of all citizens…"

In 2003, WDFW and a broad range of wind power stakeholders developed the WDFW Wind Power Guidelines to provide consistent statewide direction for development of land-based wind energy projects still protecting the state's wildlife and habitat. The Guidelines were revised in 2009 (WDFW 2009c). While the proposed project is not a wind energy project, the following guidelines for impact avoidance and minimization are potentially applicable to the proposed project:

- Where appropriate develop in agricultural and other disturbed lands, including using existing transmission corridors and roads where possible.

Consistency: Where feasible, BPA typically considers line alternatives that are routed across already disturbed areas such as agricultural lands, and attempts to use existing roads where possible. See Sections 2.2 Transmission Line Siting and 2.34 Access Roads for proposed alternative development and placement of roads, and Section 3.1 Land Use and Recreation for potential impacts to land uses including agriculture.

- Avoid high bird and bat aggregation areas, and areas used by sensitive status species.

Consistency: BPA attempts to route transmission lines away from these areas where possible; however, because new lines most often extend from one specific existing substation to another existing substation, routing options can be limited. See Section 3.6 Wildlife for the proposed project's potential impacts on wildlife and mitigation measures identified to minimize those impacts.

- Encourage the protection of Priority Habitats and Species.

Consistency: BPA attempts to route transmission lines away from sensitive species' habitat where possible; however, because new lines most often extend from one specific existing substation to another existing substation, routing options can be limited. As described above, see Section 3.6 Wildlife of this EIS.

- Minimize use of overhead collector lines, unless underground collector lines are not appropriate or feasible due to environmental conditions (e.g., topography, soil conductivity, environmental impacts, etc.).

Consistency: BPA would not construct collector lines for the proposed project. Undergrounding of high-voltage (230- and 500-kV) transmission lines is usually not an option because of the greater environmental impacts and costs of undergrounding. See Section 2.6 for alternatives considered but eliminated from detailed study.

- When overhead lines are used, use designs that avoid and minimize impacts to raptors and other birds (refer to APLIC guidelines regarding adequate conductor spacing and use of perch guards).

Consistency: BPA always designs conductor spacing to comply with APLIC (see Section ~~3.5.2~~ 3.6.2 Environmental Consequences).

- Use tubular towers to reduce the likelihood that birds will perch on towers and to possibly reduce the risk of collision. Avoid use of lattice towers, particularly those with horizontal cross-members.

Consistency: The industry standard design for towers for high-voltage transmission lines is steel lattice towers. See Section 2.3 Project Components for information on the design of the proposed transmission line.

- Avoid using permanent tower types that employ guy wires. If guy wired towers are approved, encourage the requirement of bird flight diverters on the guy wires.

Consistency: BPA typically does not use guy wires on towers for its high-voltage transmission lines. In the event that guy wires are necessary, BPA would consider placing bird flight diverters on the guy wires. See Section 3.6 Wildlife for proposed mitigation measures identified to minimize impacts to birds.

- Discourage the use of rodenticides to control rodent burrowing around towers.

Consistency: BPA does not use rodenticides.

- Minimize the use of lights on towers and facilities structures, in accordance with federal, state, and local requirements.

Consistency: BPA typically only uses lights on very tall towers (such as at river crossings) and towers near airports/heliports, in compliance with FAA requirements. See Section 3.1 Land Use and Recreation for locations where lights may be required.

- Control noxious weeds in accordance with federal, state, and local laws.

Consistency: BPA controls weeds in accordance with federal, state, and local laws. See Section 3.3 Vegetation for proposed mitigation measures to reduce or eliminate the potential for the spread of noxious weeds under the action alternatives.

- Encourage the control of detrimental weedy species that invade as a result to disturbance from construction, maintenance and operation.

Consistency: BPA controls weeds in accordance with federal, state, and local laws (see Section 3.3 Vegetation).

- Encourage the permitting authority to require a fire protection plan and a complete road siting and management plan that includes vehicle-driving speeds that minimize wildlife mortality.

Consistency: Because BPA is not subject to state or county permitting authorities, this guideline does not apply to the proposed project. However, Section 3.12 Public Health and Safety does include proposed mitigation for the safe operation of vehicles and construction equipment.

- Reduce availability of carrion *(animal carcasses).*

Consistency: This guideline does not apply to the proposed project.

- Minimize roads and stream crossings.

Consistency: BPA typically proposes to build/improve the minimum amount of roads needed to access the transmission line and avoid stream crossings where possible. See Section 2.3 for information on the design of the proposed transmission line.

- Encourage a decommissioning condition for restoration of the site to approximate or improved pre-project conditions that would require removal of the turbines and infrastructure when the project ceases operation.

Consistency: This guideline does not apply to the proposed project.

6.4 Washington Department of Ecology

Ecology is the state agency responsible for protecting air and water quality in the state of Washington, including management of shorelines and wetland areas and implementation of federal and state water pollution control laws and regulations.

6.4.1 Shorelines and Wetlands

The Coastal Zone Management Program is authorized by the Coastal Zone Management Act of 1972 and administered at the federal level by the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management, Coastal Programs Division. Management of the program is delegated to the states participating in the program. In Washington, Ecology administers the program. The Coastal Zone Management Act requires federal development projects and activities directly affecting the coastal zone "shall be conducted in a manner which is, to the maximum extent practicable, consistent with approved state management programs" (see Section 307(c)(1), (2)).

A federal agency or applicant for a federal license, permit, or financial assistance is responsible for determining whether the proposed activity may affect any natural resource, land use, or water use in Washington's coastal zone. Ecology will concur with a determination if the federal activity is consistent to the maximum extent practicable with the Washington Coastal Zone Management Program. Consistency with the state program is described below.

The Washington State Shoreline Management Act establishes a planning program and regulatory permit system initiated at the local level under state guidance. While Ecology is designated as the lead state agency, local governments exercise primary authority for implementing the Act. Each local government's master program consists of a shoreline inventory and a "shoreline master program" (SMP) to regulate shoreline uses. The SMP for Columbia County, adopted June 1975, regulates land uses impacting shorelines of the state in Columbia County. The proposed transmission facilities would only impact state shorelines if the towers or access roads would be located within 200 feet of them or their associated wetlands. Regulations pertaining to utilities are listed in Section 16 of the SMP. Utility services in shoreline areas designated Conservancy, Rural and Urban Environments, shall be permitted subject to the following regulations:

- All utility systems shall be underground when such undergrounding is economically feasible.
- All clearing for installation of maintenance shall be kept to the minimum width necessary.
- Upon completion of the installation of utility systems or of any maintenance, disturbed areas shall be restored as nearly as practical to the pre-existing condition.
- Utilities shall be located above flood levels wherever practical.

Consistency: In Washington, the action alternatives for the proposed project would cross the Columbia River, Swale Creek, and the Little Klickitat River. Towers and access roads would be placed as far from the water's edge as feasible, floodplains would be avoided, clearing kept to a minimum, and disturbed areas would be reseeded. Please see Section 3.5 Water Resources and Wetlands.

6.4.2 Water Quality

The following Ecology substantive standards from Chapter 90.48 RCW, Chapter 173-216 WAC, Chapter 173-220 WAC, Chapter 173-200 WAC, and Chapter 173-201A WAC are potentially applicable to the proposed project:

- Proper erosion and sediment control practices must be used on the construction site and adjacent areas to prevent upland sediments from entering surface water. All ground disturbance by construction activities must be stabilized. When appropriate, use native vegetation typical of the site.
- Any operation which would generate a waste discharge or have the potential to impact the quality of state waters, must receive specific prior authorization from Ecology.
- Routine inspections and maintenance of all erosion and sediment control BMPs are recommended both during and after development of the sites.
- A Stormwater Pollution Prevention Plan for the project site may be required and should be developed by a qualified person(s). Erosion and sediment control measures in the plan must be implemented prior to any clearing, grading, or construction. These control measures must be effective to prevent soil from being carried into surface water by stormwater runoff. Sand, silt, and soil can damage aquatic habitat and are considered pollutants. The plan must be upgraded as necessary during the construction period.
- Proper disposal of construction debris must be in such a manner that debris cannot enter the natural stormwater drainage system or cause water quality degradation of surface waters. Dumpsters and refuse collection containers shall be durable, corrosion resistant, nonabsorbent, nonleaking, and have close fitting covers. If spillage or leakage does occur, the waste shall be picked up immediately and returned to the container and the area properly cleaned.
- The operator of a construction site that disturbs one acre or more of total land area, and which has or will have a discharge of stormwater to a surface water or to a storm sewer, must apply for coverage under Ecology's NPDES Construction Stormwater General Permit.

Consistency: Water quality standards are discussed in Section 5.10 Clean Water Act. BPA seeks appropriate certifications and authorizations from state water quality regulatory agencies and will meet all applicable standards identified through this process to protect water quality. See Sections 3.4 Geology and Soils and Recreation and 3.5 Water Resources and Wetlands, respectively, for information concerning the proposed project's potential impacts on soils and water quality and for mitigation measures that would reduce potential impacts.

6.4.3 Air Quality

Ecology substantive standards from Chapter 42.21A RCW and Chapter 173-400 WAC related to general regulations of air pollution sources establish attainable standards and rules applicable to control and/or prevention of emissions of air contaminants. Ecology suggests the development of a Fugitive Dust Control Plan (FCDP) to identify project-related fugitive dust sources, implementation procedures for dust abatement, and how dust control measures will comply with applicable provisions outlined in WAC 173-400-040.

Consistency: See Sections 3.4 Geology and Soils and 3.13 Air Quality for a discussion of dust and air quality impacts and for mitigation measures to control emissions and fugitive dust. BPA will prepare a Fugitive Dust Control Plan.

6.5 Washington Department of Archaeology and Historic Preservation Standards

The Department of Archaeology and Historic Preservation works with agencies, tribes, private citizens, and developers to identify and develop protection strategies to ensure that Washington's cultural heritage is not lost. In Washington, archaeological sites and Native American graves are protected from known disturbance by a variety of state laws. While federal law applies to all federal and Native American lands, Washington state law applies to all other lands. The following state laws on archaeology and historic preservation for the management of cultural resources are potentially applicable to the proposed project:

- Indian Graves and Records (RCW 27.44)
- Archaeological Sites and Resources (RCW 27.53)
- Archaeological Excavation and Removal Permit (WAC 25-48)
- Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60)
- Advisory Council on Historic Preservation (WAC 25-12)

Consistency: As discussed in Section 5.14 Cultural Resources, Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties. If a federal agency plans to undertake a type of activity that could affect historic properties, it must consult with the appropriate State Historic Preservation Officer to make an assessment of adverse effects on identified historic properties. BPA will comply with NHPA and all applicable state laws.

6.6 Oregon Department of Energy

DOE is the state agency responsible for overseeing the development of large energy facilities in Oregon. A proposed facility must undergo a review process that meets the siting standards before being issued a site certificate, which authorizes a developer to construct and operate an energy facility.

The following substantive standards from OAR Chapter 345, Division 22 and Division 24 are potentially applicable to the proposed project:

6.6.1 Soil and Geologic Resources

- The provisions in OAR 345-022-0022 require that applicants consider potential impacts to soil resources.
- The provisions in OAR 345-022-0020 require that applicants design, engineer, and construct proposed facilities to avoid dangers to human safety presented by seismic hazards expected to result from maximum probably ground motion events.

Consistency: BPA will include any seismic standards applicable to transmission line construction from the state of Oregon's building code in its design specifications for the proposed transmission line (see Section 3.4 Geology and Soils).

6.6.2 Land Use

- The provisions in OAR 345-022-0030 ensures that proposed energy facilities will comply with Oregon's land use planning goals adopted by the Land Conservation and Development Commission (LCDC).
- The Council must decide whether the proposed energy facility complies with LCDC rules and goals directly applicable to the facility under ORS 197.646(3).

Consistency: BPA is committed to planning its proposed transmission line projects to be consistent or compatible to the extent practicable with existing land uses. See Section 3.1 Land Use and Recreation for mitigation measures identified to reduce potential impacts to land use.

6.6.3 Fish and Wildlife Habitat

- The provisions in OAR 345-022-0060 require that proposed facilities comply with habitat mitigation goals and standards of ODFW.
- The provisions in OAR 345-022-0070 require that applicants provide appropriate studies that identify state-listed threatened or endangered species that could be affected by the proposed energy facility. Applicants should consult with the Oregon Department of Agriculture (ODA) and ODFW.

Consistency: In designing its proposed projects, BPA attempts to avoid impacts to fish and wildlife species where possible. Field surveys of the project corridor for wildlife species were conducted in summer 2009 and spring 2010. Potential impacts to ESA-listed species discussed in Sections 3.6 Wildlife and 3.7 Fish, which also assess potential effects to state-listed species and priority habitat and species.

6.6.4 Aesthetics

- The provisions in OAR 345-022-0080 protect scenic values that local land use or federal management plans identify as significant or important. Proposed facilities affecting scenic values identified as significant must propose appropriate measures to reduce impact.

Consistency: Please see Section 3.2 Visual Resources for impacts to visual resources and mitigation measures to lessen those impacts.

6.6.5 Historic, Cultural, and Archaeological Resources

- The provisions in OAR 345-022-0090 protect public interest in preserving historic, cultural, or archaeologically significant places. Applicants must conduct appropriate surveys to identify and avoid places of potential significance. If the project involves construction on an archaeological site, the applicant may need a permit from the SHPO.

Consistency: As discussed in Section 5.14 Cultural Resources, there are many laws and other directives for the management of cultural resources with which BPA seeks compliance. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties on all lands impacted by projects including agricultural and grazing lands. As discussed in Section 3.8 Cultural Resources, a cultural resources inventory of the action alternatives is being conducted.

6.6.6 Recreation

- The provisions in OAR 345-022-0100 require evaluation of potential impact to recreational opportunities at the construction site or in the surrounding area. If significant impact is likely, the Council may require avoidance or mitigation measures to reduce impact to recreational opportunities.
- Impacts to protected state and national areas specified in OAR 345-022-0040 will be sufficiently mitigated to less than significant impact.

Consistency: Please see Section 3.1 Land Use and Recreation for impacts to recreational areas in the project and for mitigation measures to lessen those impacts.

6.6.7 Socioeconomics

- The provisions in OAR 345-022-0110 require applicants to assess proposed facility needs for water, wastewater disposal, storm water, and solid waste. Expected population increases, impacts to housing, traffic safety, police, and fire protection, heath care and schools must also be analyzed for expected temporary and permanent impacts.

Consistency: Please see Section 3.9 Socioeconomics for potential impacts to socioeconomics for the project and mitigation measures to lessen those impacts.

6.6.8 Public Health and Safety

- ORS Chapter 467.020 and 467.030 relate to DEQ noise regulation for energy facilities. OAR 340-035-0035 establish noise control regulations for industry and commerce, including energy facilities.
- No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L10 or L50, by more than 10 dBA in any one hour, or exceed the levels specified in Table 8.
- Provisions in OAR 345-022-0120 require applicants to plan to minimize solid waste and wastewater generated during construction and operation of the proposed facility. Applicants must propose methods to handle waste through collection, storage and disposal.
- The applicant should consult with DEQ to list all hazardous materials potentially stored or used at the facility site during construction and operation as well as ensure compliance with ORS Chapters 465 and 466 related to use, clean up, and disposal of hazardous materials.

Consistency: BPA would comply with all applicable state regulations concerning the generation, storage, transportation, treatment or disposal of dangerous wastes during construction and maintenance of the proposed transmission line (see Section 3.12 Public Health and Safety). BPA also would conduct its construction activities for the proposed line in conformance with DEQ's standards concerning maximum permissible noise levels through using appropriate muffling devices on construction equipment and limiting construction to daytime and evening hours (see Section 3.11 Noise). Noise impacts during operation of the proposed line would be negligible as discussed in Section 3.11.

6.6.9 Air Quality

- Provisions in OAR 345-024-05000 provide specific standards for base load gas plants, non-base load power plants, and non-generating energy facilities that emit carbon dioxide. The following limitations are in place:

Base load gas plants	0.675 lb. CO_2 / kWh
Non-base load gas plants	0.675 lb. CO_2 / kWh
Nongenerating facilities	0.504 lb. CO_2 / horsepower-hour

Consistency: To the extent that air emissions resulting from construction and maintenance of the proposed transmission line are regulated under state law, the project would comply with these regulations (see Section 3.13 Air Quality). Because operation of the proposed line would not result in any air emissions, there are no applicable standards for project operation.

6.6.10 Water Resources

- The Oregon Department of State Lands will require a removal-fill permit if 50 cubic yards or more of material is removed, filled or altered within a jurisdictional water of the State. The removal-fill permit will be issued separately from the 404 permit issued by the US Army Corps of Engineers.
- A Limited Water Rights permit is required if new water rights are necessary for the proposed project.

Consistency: Through its compliance with the Clean Water Act, BPA seeks appropriate certifications and authorizations from state water quality regulatory agencies for its proposed projects. BPA will meet all applicable standards identified through this process to protect water quality from construction and operation of the proposed transmission line. See Section 3.5 Water Resources and Wetlands for information concerning the proposed project's potential impacts on water quality, and Section 5.10 for more information concerning BPA's Clean Water Act compliance activities.

In designing its proposed projects, BPA attempts to avoid identified wetland areas where feasible. If wetlands cannot be avoided, BPA works to minimize potential impacts and compensate appropriately for unavoidable impacts. BPA thus would act consistently with standards related to wetlands during construction and operation of the proposed transmission line. See Section 3.5 for information concerning the proposed project's potential impacts on wetlands, and Section 5.10 for more information concerning BPA's activities to comply with wetland regulations such as Section 404 of the Clean Water Act.

Chapter 7
Consistency with the Management Plan for the Columbia River Gorge National Scenic Area Substantive Standards

7.1 Overview

Portions of the action alternatives for the proposed project are located within the Columbia River Gorge National Scenic Area, which was established in 1986 by the Columbia River Gorge National Scenic Area Act (16 U.S.C. 544-544p). The National Scenic Area, which covers nearly 293,000 acres in six Washington and Oregon counties, extends east along the Columbia River from about the confluence of the Columbia and Sandy rivers to about 85 miles just past the town of Wishram, Washington. Because the proposed project is a federal project, the U.S. Forest Service is the responsible entity under the Scenic Act for carrying out review of the project. Through this review, the USFS will make a determination concerning the consistency of the portion of the proposed project that would be in the National Scenic Area with the provisions of the Scenic Act.

To carry out the Scenic Act, the Columbia River Gorge Commission and the USFS have developed the Columbia River Gorge National Scenic Area Management Plan. The Gorge Commission adopted the original Management Plan in October 1991, and the U.S. Secretary of Agriculture concurred with the Management Plan in February 1992. Revisions to the Management Plan were adopted in 2004 and incorporated into an updated Management Plan in 2007.

The Management Plan includes guidelines and land use designations within the National Scenic Area and identifies goals, objectives, policies and guidelines for resource protection and enhancement; action programs for recreation development, economic development, enhancement strategies, and interpretation and education; and establishes the roles of the Gorge Commission, the USFS, and Indian tribal governments. Part II, Chapter 7 of the Management Plan also states that operation, maintenance, and modification of BPA's existing transmission facilities in the National Scenic Area are exempt from regulation under the Management Plan or land use ordinances adopted by the counties or the Gorge Commission pursuant to the Scenic Area Act.

To facilitate USFS review of the project, this chapter describes project consistency with the land use designations crossed by the project as well as the four resources identified for protection and enhancement: Scenic Resources, Natural Resources, Cultural Resources, and Recreation Resources.

7.2 Land Use

The three action alternatives have varying transmission line routes through the National Scenic Area, with different miles of line, uses of existing rights-of-way and access roads, and acreages of impact. Please see Table 7-1 for a comparison of impacts of the alternatives within the National Scenic Area.

Table 7-1. Impacts in the National Scenic Area by Action Alternative

				Permanent Impacts				Temporary Impacts
	New Right-of-Way[1] (acres)	Miles of Line	Miles of New Corridor	Towers[1]	New Roads	Upgrade Existing Roads	Total Permanent Impacts[1]	Total Temporary Impacts (acres)[1]
West Alternative	72–119	9.5	5.2	6–14	~~23~~ 22	~~23~~ 30	~~52–60~~ 58–66	18–42
Middle Alternative	40–43	5.5	1.8	3–4	~~14~~ 21	~~6~~ 20	~~23–24~~ 44–45	~~11–16~~ 14–19
East Alternative	1–5	7.5	0	4–7	12	20	36–39	~~14–44~~ 17–47

[1] Impacts are presented as ranges from all possible tower options. ~~Double-circuit options would have the greatest impacts from towers.~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 1.5 acres for the West Alternative, 2.0 acres for the Middle Alternative, and 3.5 acres for the East Alternative.

[2] The "Temporary Tower Impacts" column provides the total of the temporary tower construction impacts and removal of existing towers (where applicable).

The Management Plan includes guidelines and land use designations for lands designated as General Management Areas (GMA) and Special Management Areas (SMA) within the National Scenic Area. All action alternatives would be located in GMAs. The GMA is further broken down by land use designations. The alternatives cross four of these designations: Urban Areas, Bureau of Indian Affairs land, Large Scale Agriculture, and Agriculture Special (see Tables 7-2~~1~~ and 7-3~~2~~ and Map 7-1).

Urban Areas and Bureau of Indian Affairs lands are exempt from the provisions of the Scenic Act; Large Scale Agriculture has review requirements for utility use, and Agriculture Special prohibits new utility facilities.

Table 7-2. National Scenic Area Land Use Designations and Review Use Requirements

Land Use Designation	Line Mile Locations[1]	Review Use and Applicable Requirements[2]
Urban Area	WME0; W3–4; ME9	Exempt
Bureau of Indian Affairs	W3; M9–10; E9–11; E12	Exempt
Large Scale Agriculture	W1–2; W4–9; ME1; ME7–ME8; M10–11; E10; E11–13	Review Required May be allowed if the following are met: • There is no practicable alternative location with less adverse effect on agricultural lands. • The size is the minimum necessary to provide the service.
Agriculture Special	W2–3; W9–10	Prohibited

[1] Approximate line miles are the miles along each alternative (West=W, Middle=M, East=E), starting from 0 miles at Big Eddy Substation and ending at Knight Substation Sites 1 or 2.

Source: Management Plan with revisions 2004, amendments through June 2007.

Table 7-3. National Scenic Area Land Use Designations Crossed by the Action Alternatives

	Miles of Transmission Line per Alternative		
National Scenic Area Land Use Designation	**West Alternative**	**Middle Alternative**	**East Alternative**
Urban Areas	2.2	0.8	0.8
Bureau of Indian Affairs	0	0.8	1.3
Large-Scale Agriculture	6.0	3.5	4.7
Agriculture Special	0.9	0	0

Source: Management Plan with revisions 2004, amendments through June 2007

Large Scale Agriculture. Locating new utilities within large-scale agriculture would require certain conditions be met for consistency with that designation. New ~~U~~utility facilities necessary for public service may be allowed subject to compliance with Management Plan guidelines for the protection of scenic, cultural, natural, and recreation resources and upon a showing that (1) there is no practicable alternative location with less adverse effect on agricultural lands, and (2) the size is the minimum necessary to provide the service (Management Plan, page ll-1-12).

Replacing existing aboveground overhead utility facilities is allowed outright within large-scale agriculture if the replacement facilities would have the same location and size as the existing facilities and consist of the same or other appropriate building materials as the existing facilities (Management Plan, pages ll-7-14 and II-7-15). Expedited review of replacement facilities is also available, provided that the replacement facilities would be in the same location as and no more than 15 percent larger than the physical size of the existing facilities (Management Plan, page ll-7-22) and meet buffer requirements for sensitve wildlife areas and plants (Management Plan, pages II-7-24 and II-7- 25). Replacement facilities more than 15 percent larger than the physical size of the existing facilities would be considered a “review use” under the Management Plan and reviewed accordingly (Management Plan, pages ll-7-58 through II-7-61). BPA currently is coordinating with the USFS to help determine the appropriate applicable Management Plan provisions, particularly in light of the BPA-specific exemption in the Scenic Act (see Section 5.23 Columbia River Gorge National Scenic Area Act).

Through the large scale agricultural areas, the proposed action alternatives would mostly impact rangeland with a slight impact on nonirrigated agricultural land (see Table 7-4~~3~~ for acreages of land uses impacted by each action alternative). As described in Section 3-1 Land Use and Recreation, although tower footprints and access roads would remove acreage from grazing, the line would generally be compatible because livestock could still maneuver around the towers, within the right-of-way, and along roads to access their range. All action alternatives use portions of existing right-of-way, and for options that would use double-circuit towers, rebuilding existing towers would lessen the overall amount of agricultural area removed from use (new tower footprints, minus the existing tower footprints).

Table 7-4. Land Uses Impacted by the Action Alternatives within the National Scenic Area

Land Use	Permanent Impacts[1,2] (acres)		
	West Alternative	**Middle Alternative**	**East Alternative**
Irrigated Cropland	0	0	0
Nonirrigated Cropland	3–4	0.3–0.4	0.3–0.4
Orchards/Vineyards	0.3	0	0
Rangeland	30–34	23	35–37
Conservation/Recreation	19–23	0	0
Prime Farmland	0	0.9	0.9
Farmland of Statewide Importance	38–44	24	21–22

[1] Permanent impacts are due to tower footings, new access roads, and access road upgrades.

[2] Impacts are presented as ranges from all possible tower options. ~~Double-circuit options would have the greatest impacts from towers.~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 1.5 acres for the West Alternative, 2.0 acres for the Middle Alternative, and 3.5 acres for the East Alternative.

The proposed 500-kV line is the minimum kilovolt size necessary to meet the proposed project need (see Chapter 1 of this EIS). BPA is considering two tower ~~sizes~~types for the proposed line: single-circuit towers~~, which are the minimum size necessary to hold the proposed 500-kV line;~~ and double-circuit towers. The two tower types have different advantages. Single-circuit towers are a smaller tower type, but can not accommodate exsting lines so the overall BPA footprint would be greater. Although double-circuit towers are larger, they would accommodate two lines, allowing some existing lines to be removed and reducing BPA's overall footprint. Also, double-circuit towers would allow future upgrades of existing lines without the construction of new towers. For example, East Option 3 would place the existing Harvalum-Big Eddy 230-kV line on double-circuit towers for a portion of the route and the McNary-Ross 345-kV line on double-circuit towers for a portion of the route. This would allow for a future upgrade of the existing lines to 500-kV without requiring new towers for these route portions, which cross the Columbia River and head into Big Eddy Substation. For the West Alternative, Options 4, 5, and 6 propose double-circuit towers for the first 5 miles from Big Eddy Substation. The use of double-circuit towers for this portion of the West Alternative would not remove an existing line (there are no existing lines in this area), but it would allow for a future line to cross the Columbia River and connect into Big Eddy Substation without needing new towers through this area.

Agriculture Special. Two portions of the West Alternative (near line miles W2-3 and W9-10) would cross land designated as Agriculture Special under the Management Plan. Construction of new utility facilities or roads is prohibited in Agriculture Special-designated areas (Management Plan, page ll-1-19). Any construction of new facilities or roads in this area thus would be inconsistent with the Agriculture Special designation. BPA could likely route the West Alternative around the Agriculture Special land at line miles W2-3. At line miles W9-10, the land crossed has an existing BPA transmission line, right-of-way and access roads that were built in 1947, prior to the Scenic Act. Limiting construction to modification of existing BPA facilities in this area may serve to exempt this construction from Scenic Act review requirements, pursuant to the BPA-specific exemption in the Scenic Act (see Section 5.23 ~~5.22~~ Columbia River Gorge National Scenic Area Act). BPA currently is working with the USFS to help further assess the consistency of the proposed project in this area with applicable Management Plan provisions.

7.3 Scenic Resources

For scenic resources, the goal of the Management Plan is to emphasize protection and enhancement of Columbia River Gorge landscapes seen from key viewing areas. New utility transmission lines shall be visually subordinate as seen from key viewing areas to the maximum extent practicable (Management Plan, page I-1-6).

"New main lines on lands visible from key viewing areas for the transmission of electricity…shall be built in existing transmission corridors unless it can be demonstrated that use of existing corridors is not practicable. Such new lines shall be underground as a first preference unless it can be demonstrated to be impracticable" (Management Plan, page I-1-10).

Unlike lower-voltage distribution cables used to deliver power to individual homes, it is impracticable to underground high-voltage transmission cables. For a 500-kV line, three individual cables would have to be manufactured and installed at a cost about 10 times the cost of an overhead design. In addition, the costs of maintaining an underground high-voltage line is much greater and more difficult, and the environmental impacts are typically greater than impacts from an overhead line. Please see Section 2.6 Alternatives Considered but Eliminated from Detailed Study for more information about undergrounding.

The proposed action alternatives would be seen from three of the key viewing areas identified in the Management Plan: Highway I-84, Washington State Route 14, and the Columbia River (see Table 7-5~~4~~). The other key viewing areas in the Management Plan are either too far away or blocked by terrain. The West Alternative is also potentially visible from Rowena Plateau, but it is far enough away that it would be difficult to distinguish the transmission towers. See Section 3.2 Visual Resources for more description and photo simulations of the views from these key viewing areas. Also see Appendix C for maps that show viewshed analyses from key viewing areas and for skyline assessments that show which towers would break the skyline from key viewing areas.

All three action alternatives use existing corridor for some or all of their routes through the National Scenic Area (see Table 7-1); some would be parallel to existing BPA right-of-way and some would use existing, vacant BPA right-of-way.

7.4 Natural Resources

The Scenic Area Act directs the Gorge Commission and the USFS to inventory, protect, and enhance natural resources. New development may not adversely affect natural resources [Scenic Gorge Act, Section 6(d)(3)]. The Management Plan provides guidelines and regulates uses for the protection of wetlands; streams, ponds, lakes, and riparian areas; wildlife habitat; rare plants; and natural areas.

Wetlands. See Section 3.5 Water Resources and Wetlands for potential impacts of the project alternatives on wetlands. BPA will work to locate all towers and roads to avoid wetlands and wetland buffers where possible. If avoidance is not feasible, BPA will work with the USFS regarding wetland delineations, determination of wetland buffers, replanting buffer zones with native plant species, rehabilitation of wetland areas, and wetland compensation as applicable.

Table 7-5. Key Viewing Areas

Key Viewing Area	Possible Views of Project Area?	Alternatives Visible
Historic Columbia River Highway	No	
Crown Point	No	
Highway I-84, including rest stops	Yes	West, Middle, East (but not from rest stops)
Multnomah Falls	No	
Washington State Route 14	Yes	West, Middle, East
Beacon Rock	No	
Panorama Point Park	No	
Cape Horn	No	
Dog Mountain Trail	No	
Cook-Underwood Road	No	
Rowena Plateau and Nature Conservancy Viewpoint	Unlikely	Small portion of Middle and East, but distant so towers would not be visible
Portland Women's Forum State Park	No	
Bridal Veil State Park	No	
Larch Mountain	No	
Rooster Rock State Park	No	
Bonneville Dam Visitor Centers	No	
Columbia River	Yes	West, Middle, East
Washington State Route 141	No	
Washington State Route 142	No	
Oregon Highway 35	No	
Sandy River	No	
Pacific Crest Trail	No	
Old Washington State Route 14 (County Road 1230)	No	
Wyeth Bench Road	No	
Larch Mountain Road	No	
Sherrard Point on Larch Mountain	No	

Streams, Ponds, Lakes and Riparian Areas. See Section 3.5 Water Resources and Wetlands for potential impacts of the action alternatives on water bodies and Section 3.3 Vegetation for potential impacts to riparian zones. No transmission towers would be located in water bodies, and very little riparian vegetation would be removed (West Alternative only). Culverts would likely be needed in intermittent streams or dry washes. BPA will work with the USFS on tower and road siting, appropriate buffer rehabilitations, and culvert style and sizing, as applicable.

Wildlife Habitat. See Section 3.6 Wildlife for potential impacts of the action alternatives on wildlife and wildlife habitats. Additional assessment of potential occurrence and impacts of species protected within the National Scenic Area is found in Appendix D. Field surveys have been conducted by professional wildlife biologists to determine occurrences of wildlife species, and BPA will continue to work with the USFS and the appropriate state Departments of Fish and Wildlife to avoid and protect sensitive wildlife areas and sites.

Rare Plants. See Section 3.3 Vegetation for potential impacts of the action alternatives on rare plants. Additional assessment of potential occurrence and impacts of species protected within the National Scenic Area is found in Appendix D. Field surveys have been conducted by a professional botanist to determine occurrences of rare plant species, and BPA will continue to work with the USFS and the appropriate state Natural Heritage Programs to avoid and protect rare plants. See Table 7-~~5~~6 for the acreage of impact each action alternative would have on various vegetation cover types and priority ecosystems within the National Scenic Area.

Natural Areas. Of the 45 natural areas identified for protection under the Management Plan, the proposed action alternatives would affect one, the Columbia Hills. Chapter 3 describes the potential impacts of the action alternatives and access roads across the Columbia Hills.

Table 7-6 ~~5~~. Vegetation Types Impacted by the Action Alternatives within the National Scenic Area

Vegetation Cover Types and Associated Priority Ecosystems[1]	Permanent Impacts[1,2] (acres)		
	West Alternative	Middle Alternative	East Alternative
Shrub-Steppe	0	0	0
Grassland	17–21	0	0
Idaho fescue-houndstongue hawkweed[3]	2.7–3.1	0	0
Disturbed Shrub-Steppe/Grassland	31–34	23	35–38
Woodland[4]	1.6–2.2	0	0
Total	~~6–15~~ 50–57	23	35–38

[1] Priority Ecosystems are listed in italics beneath their associated Vegetation Cover Type in this column.

[2] Impacts for tower construction are presented in a range because they differ by tower option. ~~Single-circuit tower options have lower impacts; double-circuit tower options higher impacts.~~ The upper end of each range reflects the double-circuit options, but does not reflect removal of the existing line, which would remove existing tower footprint impacts by a total of about 1.5 acres for the West Alternative, 2.0 acres for the Middle Alternative, and 3.5 acres for the East Alternative.

[3] Idaho fescue-houndstongue hawkweed values are included with grassland values, and so are not added into the totals.

[4] Impacts to woodlands are calculated based on tree removals, which are considered permanent impacts only.

7.5 Cultural Resources

One purpose of the Scenic Area Act is to "protect and provide for the enhancement of the …cultural…resources of the Columbia River Gorge [Section 3(1)]." Cultural resources include archaeological resources, historic buildings and structures, and traditional cultural properties. As a federal agency, BPA will comply with Section 106 of the Historic Preservation Act of 1966 (see Sections 3.8 Cultural Resources and 5.14 Cultural Resources). As part of this compliance, BPA is conducting cultural surveys and is in consultation with the appropriate tribes, the Oregon State Historic Preservation Office, the Washington State Department of Archaeology and Historic Preservation, and the USFS. Known cultural sites will be avoided where feasible and mitigation and monitoring will be implemented where appropriate.

7.6 Recreation Resources

The Scenic Act has a directive to protect and enhance the recreation resources of the Columbia River Gorge [Section 3(1)]. The proposed project would not affect the function of or access to recreational resources, but would have some visual impacts (see Sections 3.1 Land Use and Recreation, and 3.2 Visual Resources). During the construction period, access to isolated areas around tower and road sites would be limited and traffic may be slowed with the movement of trucks or equipment to construction sites. For information about potential visual impacts to scenic byways, see Sections 3.2 Visual Resources and 7.2 Land Use.

Chapter 8
List of Preparers

The Big Eddy–Knight Transmission Project EIS is being prepared by BPA with the technical assistance of environmental consultants. Individuals responsible for preparing the EIS, along with their affiliation, experience, and education, are listed below in alphabetical order by last name.

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Chapter 9
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Chapter 10
Agencies, Organizations, and Persons Receiving Notice of the Availability of this EIS

The project mailing list contains tribes; local, state, regional, and federal agencies; utilities; public officials; interest groups; businesses; special districts; libraries; colleges/universities; the media; and potentially interested or affected landowners. They have directly received or have been given instructions on how to receive all project information made available so far, and they will have an opportunity to review the draft and final EIS. Specific entities (other than private persons) receiving this EIS are listed below by category.

Federal Agencies

Army Corps of Engineers

Bureau of Indian Affairs

Bureau of Land Management

Environmental Protection Agency

Department of Agriculture

Department of Interior

Fish and Wildlife Service

Forest Service Center

Forest Service, Columbia River Gorge National Scenic Area

National Marine Fisheries Service

National Park Service

Rural Development

Regional Commission

Columbia River Gorge Commission

Tribes or Tribal Groups

Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of the Warm Springs Reservation

Confederated Tribes and Bands of the Yakama Nation

Nez Perce Tribe of Idaho

State Agencies, Oregon

Department of Agriculture
Department of Economic & Community Development
Department of Energy
Department of Environmental Quality
Department of Fish and Wildlife Northeast Region
Department of Fish and Wildlife
Department of Forestry
Department of Human Services
Department of Land Conservation and Development
Department of Lands Eastern Region
Department of Parks and Recreation
Department of State Lands
Department of Transportation
Department of Water Resources
Natural Resource Office

State Agencies, Washington

Department of Agriculture
Department of Commerce
Department of Economic and Community Development
Department of Community Trade and Economics
Department of Ecology
Department of Ecology Central Regional Office
Department of Fish and Wildlife
Department of Natural Resources
Department of Parks and Recreation
Department of Transportation
Department of Planning
Department of Public Works
Energy Facility Site Evaluation Council
Governor's Office of Regulatory Assistance (Central Region)
Library Government Publication
Natural Heritage Conservation and Recreation
Office of Governor, Natural Resources Office
Parks and Recreation Commission

Public Officials, Oregon

Federal Representative Greg Walden
Federal Senator Ron Wyden
Federal Senator Jeff Merkley
Governor John Kitzhaber
State Representative John Huffman
State Senator David Nelson
State Senator Ted Ferrioli

Public Officials, Washington

Federal Representative Doc Hastings
Federal Senator Maria Cantwell
Federal Senator Patty Murray
Governor Christine Gregoire
State Representative Bruce Chandler
State Senator Jim Honeyford

Local Governments, Oregon

City of The Dalles
Wasco County

Local Governments, Washington

City of Goldendale
Benton County
Klickitat County
Yakima County

Businesses

101 Bar Ranch LLC
~~Alternative Wind Power LLC~~
Alternity Wind Power LLC
Aviation Division
Beaconsfield Associates II LP
Bosma Enterprises Inc.
Bowdish Farms LLC
BP Alternative Energy North America Inc.
BP West Coast Products LLC
Bull Mountain Development Company No. 1 LLC
Burlington Northern & Santa Fe Railroad Company
Caithness Shephards Flat LLC
Cannon Power Group
Cedarwood Farm LLC
Chehalis Power Generating LTD
Cogen, Owen & Cogen LLC
Columbia Energy Partners LLC
D & B Farms
Dallesport Lumber Company LLC
Dallesport Properties LLC
Davenport Power LLC
DCS Morgan
Divers Company LLC
East Granger Properties LLC
Eckton Ranch LLC
Elcon Associates
EnXco
Erikson Phillips PLLC
Estate of William L. Eddins
Eurus Energy America Corporation
Evans Rattlesnake Ranch
Exxel Energy USA, Inc.
Finley BioEnergy LLC
Flying H Ranch, Inc.
Fulton Gard Family LTD Partnership
Garner Family Partnership
Grays Harbor Public Development Authority
Hardy Energy Consulting
Harvest Wind Energy Corporation
HBC Properties Inc.
Hendricks & Lewis, PLLC
Henley Group LTD
Hill Ken, Inc.
Hook Stables Inc.
Horizon Wind Energy LLC
Horseshoe Bend Ranch
Iberdrola Renewables, Inc.
ICF, formerly Jones and Stokes
Idaho Power Company LP
Industrial Services
Infinity Wind Power, Inc.
K & L Gates
Kay Kayser Ranches, Inc.
Kiroze Inc.
Klickitat County Title
Klickitat River Enterprises LLC
Lewis County Title Company
Lotus Group USA, Inc.
McGraw Hill Construction
McKay & Sposito, Inc.
Midnight Sun Inc.
MWH Americas, Inc.
Northwest Storage, Inc.
Oliver Wintersheid Properties LLC

Oregon Trail Wind Farm LLC
Pacific Northwest Generating Coop
Patu Wind Farm
Planet Glassberg
Point Environmental, Inc.
Powerex Corporation
PP&L Energyplus Company LLC
PPM Energy LLC
Project Patch
PS Power Generation
Public Power Council
Puget Sound Energy, Inc.
Pyramid Land & Cattle Company
Rattlesnake Orchards
RES America Developments, Inc.
RES Americas
Schreiner Farms, Inc.
SNL Financial LC
Spokane County Title Company
Spring Canyon Ranch
Teck Cominco Metals LTD
Thomas Foley and Associates, Renewable Northwest Project
Transalta Energy Marketing US Inc.
UPC Oregon Wind LLC
Wautoma Valley LLC
Western Pacific Timber LLC
Western Renewable Power LLC
Western Wind Power
Williams
Wind Power Associates Inc.
Wind Power Associates LLC
Windy Flats Partners LLC
Windy Point Partners LLC

Utilities

Avista Corporation
Clark Public Utilities No. 1
Clatskanie PUD
Cowlitz County PUD No. 1
Flathead Electric Coop
Klickitat County PUD
Lakeview Light and Power
Lewis County PUD No. 1
Northern Wasco County PUD
Pacific Power and Light
PacifiCorp
Portland General Electric Company
Snohomish PUD
Tacoma Power
Wasco Electric Coop Inc.

Interest Groups

1000 Friends of Oregon
Affiliated Tribes of Northwest Indians
Audubon Society of Portland
Audubon Washington
Blue Mountain Audubon Society
Blue Mountain Land Trust
Central Oregon Audubon Society
Charitable Trust
Columbia Gorge Economic Development Association
Columbia Gorge Windsurfing Association
Columbia Land Trust
County of Wasco Historical Society
East Fork Hills Rural Association
Freshwater Trust
Friends of the Columbia Gorge
Klickitat County Historical Society
Lower Columbia Basin Audubon Society
Maryhill Museum of Fine Arts

Mid Columbia Council of Governments
National Wildlife Federation
National Wind Watch
Nature Conservancy Oregon
Nature Conservancy Washington
Northwest Energy Coalition
NW Wind Partners
Oregon Apollo Alliance
Oregon Environmental Council
Oregon Farm Bureau Federation
Oregon Natural Desert Association
Oregon Public Utilities Commission
Oregon Rangeland Trust
Oregon Rural Action
Oregon Wild
Pacific Environmental Advocacy Center/Northwest Environmental Defense Center
Palouse Audubon Society
Peace Meal Gardens
Public Generating Pool
Renewable Northwest Project
Save our Scenic Area
Seattle Audubon Society
Sierra Club
Spokane Audubon Society
The Mountaineers
Trust for Public Lands
Vancouver Audubon Society
Washington Environmental Council
Washington Environmental Law Center
Washington Farm Bureau
Washington Pilots Association
Washington State Cattlemen's Association
Washington Trails
Washington Wildlife Federation
Willapa Hills Audubon Society
Yakima Valley Audubon Society

Media

Newspapers:
The Dalles Chronicle
Tri-City Herald
Goldendale Sentinel

Television:
KNDU (Tri-Cities)
KVEW (Tri-Cities)
KFFX (Tri-Cities)

Radio Stations:
KONA-AM (Tri-Cities)
KFLD-AM (Tri-Cities)
KTCR-AM (Tri-Cities)
KWWS-AM (regional public radio)
KODL-AM (The Dalles)
KOCI-AM (The Dalles)
KLCK-AM (Goldendale)
Bicoastal Media (The Dalles)

Libraries

Central Washington University
City of The Dalles
City of White Salmon
Eastern Washington University
Evergreen State College
Goldendale Community
Northwestern University
Oregon State University
Portland State University
Sherman County Public School
State of Oregon
University of Oregon
University of Washington
Washington State University

Chapter 11
Glossary and Acronyms

Glossary

access road — Roads constructed to each tower site first to build the tower and line, and later to maintain and repair it.

alluvial fan — A fan-shaped geological deposit consisting of material deposited by a moving stream that radiates downslope from the point where the stream emerges from a narrow valley onto a plain.

alluvium — Deposits left by flowing water, usually clay, silt, sand, or gravel.

altithermal — The dry postglacial period extending from 7500 to 4000 years ago, during which time temperatures were believed to be distinctly higher than present temperatures. The term can also be used relating to any time period or climate characterized by high or rising temperatures.

ambient — Surrounding natural conditions or environment of a given place at a given time.

ampere (A) — A unit of measurement of electric current, which is the rate that electrons flow in a wire; one ampere is 6.023 x 1023 electrons per second. The measurement is similar to gallons per minute of water in a pipe.

anadromous fish – Fish that hatch and rear in fresh water, migrate to the ocean (salt water) to grow and mature, and migrate back to fresh water to spawn and reproduce.

anticline — A fold in which older rocks are at the core of the fold and younger rocks are at the outer surface of the fold (e.g., an inverted "U").

aquatic exploitation — The fishing and/or gathering of food resources from water, in this case, from the Columbia River.

aquifer — Groundwater zone with water of sufficient volume, transmissivity, and quality to facilitate economic use.

arcuate – Shaped like an arc.

armoring — To give protection using a surface layer of gravel in a river bed preventing erosion of the material below.

average daily traffic — The total number of cars passing over a segment of roadway, in both directions, on a typical day.

back-up generator — The emergency power system that provides backup power resources to a substation in a crisis or when regular systems fail.

basalt — Lava with a composition that is relatively high in iron and manganese.

bedrock — Solid rock beneath the soil and surface rock.

benching — A shelf-like area of rock with steep slopes above and below.

benthic — Of, relating to, or occurring at the bottom of a body of water.

Best Management Practices (BMPs) — A practice or combination of practices that are the most effective and practical means of preventing or reducing the amount of pollution generated by nonpoint sources.

Biological Opinion — A document that states the opinion of the USFWS as to whether a federal action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. It may also determine if the proposed action would result in an "incidental taking" of a listed species (see "incidental take" below).

bird diverters — Devices utilities place on transmission conductors, overhead ground wires, fiber optic cables or other wires so birds can see the wires and avoid colliding with them**.**

blackout — The disconnection of the source of electricity from all electrical loads (users) in a certain geographical area.

blasting — The controlled use of explosives to excavate or remove rock.

breeding area —The geographic area used by a pair of bald eagles during the breeding season. Breeding areas must include some evidence of past reproduction, but may not include an existing nest of bald eagles.

buffer — A barrier of permanent vegetation between waterways and human land uses.

bull trout — Members of the char subgroup of the salmon family (salmonids), which also include the Dolly Varden, lake trout, and Arctic char.

bus — A conductor or group of conductors that serves as a common connection for two or more circuits and is used to interconnect equipment of the same voltage. In substations, BPA uses mostly rigid bus made of aluminum pipe which varies in size from 2 inches to 8 inches in diameter.

bairn — A small grouping of rocks stacked in a linear or circular manner.

candidate species — Species identified by the USFWS or NMFS as meeting the definition of threatened or endangered and therefore considered candidates for being placed on the federal lists of threatened or endangered wildlife and plants.

capacity — The maximum load that a generator, piece of equipment, substation, transmission line, or system can carry under existing service conditions.

carbon monoxide (CO) — An odorless and colorless gas formed from one atom of carbon and one atom of oxygen.

Category 5 water — A category of water quality as defined by EPA that includes polluted water bodies that require but do not yet have a water quality improvement project (TMDL). These impaired water bodies make up the 303 (d) list under the Clean Water Act (CWA).

census block group — The smallest area for which a census compiles sample data; comprised of census blocks.

census county division (CCD) – A subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities.

census tract – A subdivision of a county smaller than a CCD that often follows visible features, but may also follow governmental boundaries and other non-visible features; homogenous with respect to population characteristics, economic status, and living conditions.

circuit — One alternating current transmission line, made up of three conductors; this would be called a "single-circuit line." A "double-circuit line" would be made up of two sets of three conductors.

Clean Water Act 303(d) list – List of waterbodies that do not meet water quality standards as set by the EPA under the CWA.

climax — The stable and self-perpetuating end stage of an ecosystem.

colluvium — Rock fragments, sand, etc., that accumulate on steep slopes or at the foot of cliffs.

combustion pollutants — Gases or particles that come from burning materials.

compaction (Soils) — Compression of soil pores from rolling, tamping, or use of heavy equipment on soil. Soils become hardened, difficult to cultivate, and impermeable to air and water.

conductor — The wires that carry the electrical current on a transmission line.

conductor fitting — A steel inner sleeve, and an aluminum outer sleeve that when compressed with a hydraulic press, connect two lengths of conductor together.

construction agreement roads — Roads that are proposed by the construction contractor to facilitate the construction process.

corona — Corona occurs in regions of high electric field strength on conductors, insulators, and hardware when sufficient energy is imparted to charged particles to cause ionization (molecular breakdown) of the air.

corridor — A strip of land forming a passageway for transportation or utility facilities.

counterpoise — A series of aluminum wires buried in the ground at the base of transmission towers that take a lightening charge from the ground wire on the tower and dissipate it into the earth.

critical habitat – As defined in the Endangered Species Act, specific areas within the geographic area occupied by a listed species at the time of listing, on which are found biological and physical features essential to the conservation of the species and which may require special management considerations for protection.

cross arms — The horizontal supports on a wood pole or steel transmission tower that support the insulators.

Cross-linked polyethylene (XLPE) — The primary insulation material used with high voltage extruded dielectric (HVED) cable in underground transmission lines.

CRP lands — Lands enrolled in the Conservation Reserve Program.

cryptogamic crust — A hard soil crust dominated by a plant community of algae, lichens, or mosses. These soil crust organisms are called cryptogams.

cull — Culls are live trees with external, visible defects that make them unsuitable for merchantable timber.

cultural resources — A general term frequently used to refer to a wide range or archeological sites, historic structures, museum objects, and traditional cultural places.

culvert — A corrugated metal or concrete pipe used to carry or divert runoff water from a drainage; usually installed under roads to prevent washouts and erosion.

cumulative impacts – The impact on the environment which results from the incremental impact of the action when added to the past, present, and reasonably foreseeable future actions, regardless of who undertakes such actions.

current — The amount of electrical charge flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge).

cut-and-fill — Process of constructing a road or canal whereby the amount of material from cuts roughly matches the amount of fill needed to make nearby embankments.

danger tree — A tree of sufficient height to potentially hit a tower or the conductors if it were to fall or be blown over.

dBA — The first two letters (dB) are an abbreviation for decibel, the unit in which sound is most commonly measured (see decibel). The last letter (A) is an abbreviation for the scale (A-scale) on which the sound measurements were made.

dead-end towers — Heavy towers designed for use where the transmission line loads the tower primarily in tension rather than compression, such as in turning large angles along a line or bringing a line into a substation.

debitage — Residual material resulting from stone tool manufacture or maintenance. Individual pieces are referred to as flakes or blades if they contain evidence of manufacturing, or shatter, if they lack such evidence.

debris flow — Rapid movement of water-charged mixtures of soil, rock, and organic debris down steep stream channels.

decibel (dB) — A unit of sound measurement. In general, a sound doubles in loudness for every increase of ten decibels.

delta configuration — Three wires of a transmission line circuit in a triangular, or delta, shape with one wire higher than the others. EMF levels decline more rapidly with this design.

dewatering — To divert or remove water from a excavated area, stream or river channel.

diagnostic artifacts — An artifact that maintains a distinguishing mark or displays a certain characteristic that allows the object to be placed with some certainty into a chronological period.

distinct population segments (DPS) — A subgroup of a vertebrate species that is treated as a species for purposes of listing under the Endangered Species Act. It is required that the subgroup be separable from the remainder of and significant to the species to which it belongs.

distribution line – The local wires from a distribution utility's lower voltage electric system used to deliver electric energy to end users.

double-circuit towers — Towers that can hold two transmission lines.

downcutting — When streams cut channels down into the rock, steepening valley walls; downcutting typically produces narrow valleys.

dry wash — A streambed that carries water only during and immediately following rainstorms.

duripan — A highly consolidated or weakly cemented soil layer that can impede plowing.

easement — A grant of certain rights to the use of a piece of land. This includes the right to enter the property to build, maintain, and repair the facilities. Permission for these activities is included in the negotiation process for acquiring easements on private land.

ecosystem — Interacting system of elements in a biological community, together with interactions with the surrounding environment.

electromagnetic fields (EMF) — The two kinds of fields (electric and magnetic) produced around the electric wire or conductor when an electric transmission line or any electric wiring is in operation.

electrofishing — Employing an electric current to attract or stun fish in order to take a census of a population.

emergent — An aquatic plant having its stem, leaves, etc., extending above the surface of the water.

endangered species — Those species officially designated by the USFWS or the NMFS as being in danger of extinction throughout all or a significant portion of their range. A designation (or the variant "listed endangered [LE]") also used by state agencies for state lists.

Endangered Species Act (ESA) — A 1973 Federal law, amended in 1978 and 1982, to protect troubled species from extinction. NOAA Fisheries and the USFWS decide whether to list species as threatened or endangered. Under the Act, federal agencies must avoid jeopardy to and aid the recovery of listed species.

Energy Overlay Zone — A Klickitat County, Washington zoning overlay that promotes construction of wind power generation and associated transmission infrastructure.

environmental impact statement (EIS) — A detailed statement of environmental impacts caused by an action, written as required by the National Environmental Policy Act.

eolian sands — Sands that are the product of wind erosion.

ephemeral stream — A channel that carries water only during and immediately following rainstorms. Sometimes referred to as a dry wash.

essential fish habitat (EFH) — Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson Fishery Conservation and Management Act).

evolutionarily significant units – A population or group of populations that is considered distinct for purposes of conservation under the ESA.

exceedence levels (L levels) — Refers to the A-weighted sound level that is exceeded for a specified percentage of the time during a specified period. Thus, L10 refers to a particular sound level that is exceeded 10 percent of the time.

expansive soil — Soil that contains minerals that are capable of absorbing water.

exotic species — Species that are not native to a particular region.

eyrie — The nests of birds of prey usually built in high places such as trees or cliffs.

fallow land — Cropland that is not seeded for a season; it may or may not be plowed.

farmland of statewide importance — Land, in addition to prime farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Farmlands of statewide importance typically include land that is nearly prime farmland and has the potential to economically produce high crop yields.

federally listed — Species listed as threatened or endangered by the USFWS.

fiber optic cable — Special wire installed on the transmission line that is used for communication between one location and another. Fiber optic technology using light pulses instead of radio or electrical signals to transmit messages.

fish-bearing stream — Any water that has fish presence, or is used by fish, even if for only one day a year.

fissure — A long narrow depression in the land surface.

Flashover — A disruptive discharge through the air around or over the surface of an insulator produced by the application of a voltage of sufficient magnitude to cause the breakdown path to become ionized and result in an electric arc or fault. Can be caused by lightning surges on a transmission line.

floodplains — Areas adjacent to rivers and streams that might be flooded during high water; those that have a 1 percent chance of being flooded in a given year are 100-year floodplains.

forb — Any herbaceous plant that is not a grass or not grasslike.

ford — A shallow place in a stream, river, etc., where the water depth does not prevent vehicle movement. Ford construction can include grading and stabilizing streambanks at the approaches and adding coarse fill material within the channel to stabilize the road.

fugitive dust— Any solid particulate matter that becomes airborne, other than that emitted from an exhaust stack, directly or indirectly as a result of the activities of people.

gauss — A unit of magnetic induction.

geographic information system (GIS) — A computer system that analyzes graphical map data.

geologic unit — Geologic units are physiographic units and rock lithology or coarse stratigraphy of exposed bedrock.

glacial moraine — Material transported by a glacier and then deposited; can be sand, gravel, boulders, etc.

glacial outburst flooding —A hydrological phenomenon that refers to the sudden release of water stored in glaciers.

glacial outwash — Stratified sediment, consisting chiefly of sand and gravel, removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the terminal moraine or the margin of an active glacier.

glacial till — Unstratified, unsorted, glacial drift of clay, silt, sand, boulders and gravel.

greenhouse gas — Chemical compounds found in the earth's atmosphere that absorb and trap infrared radiation, or heat, re-radiated from the surface of the earth.

ground wires — A protective wire strung above the conductors on a transmission line to shield the conductors from lightning; also called shield wire or overhead ground wire.

groundwater — Water that occurs below the surface of the erth, where it occupies spaces in soils or geologic strata.

grubbing — Removal of all surface objects, brush, roots, and other protruding obstructions, not designated to remain, and all trees and stumps marked for removal.

habitat types — Lands capable of producing similar plant communities at climax.

headscarp — The uppermost failure plane on a landslide.

herbaceous — Plants whose growing stems possess little or no woody tissue.

herbicide — A chemical substance used to kill, slow, or suppress the growth of plants.

hertz (Hz) — The unit of frequency in cycles per second; power systems in the U.S. operate with a frequency of 60 Hz.

high-voltage — Lines with 230-kV or above electrical capacity.

High voltage extruded dielectric (HVED) cable — A type of cable used in underground transmission lines.

horst — A geologic block that is bounded by normal faults with the down-thrown side of the faults to the outside of the block.

hydrocarbons — A group of chemical compounds containing only hydrogen and carbon.

hydrolic modifications — Permanent impacts to streams or other water bodies that can be caused by installing culverts or bridges.

hydrology — The science of the properties, distribution, and circulation of water.

hydroperiod — Within wetlands, the hydroperiod is the duration of soil saturation or inundation.

hydrofluorocarbons (HFCs) — Hydrofluorocarbons, organic compounds that contain only one or a few fluorine atoms, are the most common type of industrial organofluorine compounds found. HFCs are used as refrigerants and their atmospheric concentrations are rapidly increasing causing international concern about their rising contribution to anthropogenic radiative forcing emissions (global warming).

indigenous — Existing naturally in a region, state, country, etc.

insulators — Nonreflective bell-shaped devices made of porcelain or fiberglass that prevent the electricity from jumping from the conductors to the tower and going to the ground.

intermittent — Referring to periodic water flow in creeks or streams.

invertebrates — Any animal without a backbone or spinal cord; any animal other than a fish, amphibian, reptile, bird, or mammal.

irreversible commitment of resources —The use of nonrenewable resources such as minerals and petroleum-base fuels. Irretrievable commitments of resources cause the lost production or use of renewable resources such as timber or rangeland.

isolate finds — A singular artifact (e.g., projectile point, historic bottle, or 1922 Model T) or a grouping of artifacts that do not meet a specific density ratio to be classified as a site.

kilovolt — One thousand volts. (See **Volt.**)

landslide — Any mass-movement process characterized by downslide transport of soil and rock, under gravitational stress, by sliding over a discrete failure surface; or the resultant landform. Can also include other forms of mass wasting not involving sliding (rockfall, etc.).

large woody debris (LWD) — Any piece of downed wood larger than 4 inches in diameter and 6 feet long.

liDAR — A remote sensing technology employing eye-safe laser pulses originating from a helicopter or airplane and used to collect terrain data.

line losses — Energy consumed by the conductor generating heat during transport of power through each line; a function of load, circuit length, conductor size, and electrical “resistance.”

liquefaction — The fluid-like behavior of soils during a seismic event.

lithic — Made of stone.

lithosol – Literally, rocky soil. Very thin soil formed from the weathering of the underlying rocks.

load — The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of customers.

load growth — Increase in demand for electricity. (See **Load**.)

loess — An unstratified usually buff to yellowish brown loamy deposit found in North America, Europe, and Asia and believed to be chiefly deposited by the wind.

lomatium — Lomatium, referred to in English by Sahaptin native speakers as Indian celeries, produces edible sprouts, stems, and shoots and would be harvested seasonally. Lomatium habitat is fund on talus slopes and rocky lowlands along streams.

low-gradient — With gentle slopes.

mafic vent — Eruptive location for lava with relatively high concentrations of iron and manganese (i.e., in this area, basalt).

marker balls – Marker balls are used on power transmission lines that span a large distance. The purpose of these marker balls is to indicate to low-flying aircraft where the transmission lines are so that they do not fly into them (these collisions are referred to as a “wire strike”). The FAA mandates their usage. While from the ground it is easy to identify where the transmission lines are against the sky as a backdrop, the thin transmission lines are often difficult to see from the air with a varied terrain backdrop.

mass wasting — The downward movement of rock debris.

megawatts (MW) — A megawatt is one million watts, or one thousand kilowatts; an electrical unit of power.

midden — The layer of soil which contains the byproducts of human activity as the result of the accumulation of these materials on their living surface.

milligauss (mG) — A unit used to measure magnetic field strength; one-thousandth of a gauss.

Miocene epoch — A subdivision of geologic time within the Tertiary Period, between about 26 and 7 million years ago.

mitigation measures — Steps taken to lessen the impacts of proposed activities on a specific resource. Measures may include reducing the impact, avoiding it completely, or compensating for the impact.

monitor species — Those species for which Washington state monitors status and distribution either because they have been listed as state threatened, endangered, or sensitive within the previous 5 years; they require a habitat that has limited availability during at least some portion of their life cycle; they are environmental indicators; or their taxonomy is in question and it is unclear whether they should be included as listed species.

National Environmental Policy Act (NEPA) — This act requires an environmental impact statement on all major federal actions significantly affecting the quality of the human environment. [42 U.S.C. 4332 2(2)(C).]

native species— Species of plants, animals, or birds that originated in a given ecological area.

nitrogen oxides — A group of compounds consisting of various combinations of nitrogen and oxygen atoms.

nonattainment area — An area that does not meet air quality standards set by the Clean Air Act for specified localities and periods.

nonnative species — Species that have migrated or have been imported to an ecological area. Nonnative plants or species may compete for space and nutrients with a (more desirable) native species.

normal fault — A fault where overlying rocks have dropped downward relative to the underlying rocks across a failure plane; fault plane surfaces are typically near vertical.

Notice of Intent (NOI) — A public notice that an environmental impact statement will be prepared and considered in the decision making for a proposed action.

noxious weeds — Plants that are injurious to public health, crops, livestock, land or other property.

100-year floodplain — Areas that have a 1 percent chance of being flooded in a given year. (See **Floodplain**.)

ordinary high water mark (OHWM) — An elevation that marks the boundary of a lake, marsh, or streambed. It is the highest level at which the water has remained long enough to leave its mark on the landscape. Typically, it is the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

outage — Events caused by a disturbance on the electrical system that requires the provider to remove a piece of equipment or a portion or all of a line from service. The disturbances can be either natural or human-caused.

overload — Moving too much current flow over transmission facilities. Equipment has safeguards: in the event of system overload, switches will disconnect sensitive equipment from the flow of electricity.

palliatives — Compounds used to mitigate fugitive dust on roads in arid climates. Several types of palliatives are found to control dust which includes polymer emulsions, lignosulfonates, chloride salts, synthetic fluids, an asphalt emulsion, a polysaccharide solution, a polyacrylamide, and a guar gum.

palustrine— Wetland or marsh, including inland marshes, swamps, bogs, fens, tundra, and floodplains.

particulate matter (PM) — Airborne particles including dust, smoke, fumes, mist, spray, and aerosols.

passerines — Birds belonging to the avian order *Passeriformes*, which includes the perching birds. Passerine birds make up more than half of all living birds. They are of small to medium size, have three toes pointing forward and one pointing back, and are often brightly colored. Larks, swallows, jays, crows, wrens, thrushes, cardinals, finches, sparrows, and blackbirds are all passerine birds.

perched groundwater — Ground water in a saturated zone of material that is underlain by a relatively impervious stratum which acts as a barrier to downward flow and which is separated from the main ground water body by a zone of unsaturated material above the main ground water body.

perennial streams — a watercourse that flows throughout a majority of the year in a well-defined channel.

pithouse — A semi-subterranean “earth-lodge” dwelling. Usually consisted of an earth-covered log framework roof over a circular to rectangular structure.

polychlorinated biphenyls (PCBs) — Oily, persistent substance formerly manufactured for use in electrical equipment, primarily as a dielectric in capacitors, no longer used by BPA.

power circuit breakers — A breaker is a switching device that can automatically interrupt power flow on a transmission line at the time of a fault, such as a lightning strike, tree limb falling on the line, or other unusual events. The breakers would be installed at the substation to redirect power as needed.

prehistoric — Referring to cultural resources that predate European settlement in North America.

prime farmland – Federally designated land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

priority area or ecosystem — A specific plant-community type identified by the Oregon Natural Heritage Program or Washington Natural Heritage Program as high-quality or rare ecosystems based on global, national, and state data, for which conservation efforts should be focused.

priority habitat — Natural animal habitats that have unique or significant value to a diverse assemblage of animal species and are used in guiding conservation and management priorities of the state.

radial power source — A single source of power to a particular customer.

redundant power source —Two sources of power to a particular customer.

revegetate — Re-establishing vegetation on a disturbed site.

right-of-way — For the purposes of this EIS, a right-of-way is an easement for a strip of land used for a transmission line.

riparian habitat — The zone of vegetation that extends from the water's edge landward to the edge of the vegetative canopy. Associated with watercourses such as streams, rivers, springs, ponds, lakes, or tidewater.

roller-chopper — A drum with bars attached to the side that is pulled behind a bulldozer or tractor. The roller-chopper is used to break down slash.

sag — The distance that the conductor droops below a straight line between two towers.

salmonid — Fish belonging to the family of salmonidae, including salmon, trout, char, whitefish, and allied freshwater and anadromous fish.

scabland — Elevated land that is essentially flat-lying and covered with basalt and has only a thin soil cover, sparse vegetation, and usually deep, dry channels.

scoping — Part of the environmental impact document process where significant issues are identified for detailed analysis.

sedimentation — The deposition or accumulation of sediment.

sensitive species — A species that is vulnerable or declining and could become endangered or threatened in the state of Washington.

sere — A sequence of ecological stages from the initial stage (early-seral; usually following a disturbance) to the climax stage (late-seral).

shunt reactor — An electromagnetic device connected between phases or between phase and ground, used to introduce inductive reactance in a system. Can be connected to a bus or to a line and used to absorb reactive (capacitance) power and lower system voltage.

single-circuit tower — A tower that can support only one transmission line.

special-status species — Those species protected under the federal ESA as threatened, endangered, or candidate species; those listed by USFWS as species of concern; and those listed for protection by the states of Oregon and Washington.

species — A group of interbreeding individuals not interbreeding with another such group; similar, and related species are grouped into a genus.

Species of Concern — Species considered by the USFWS to potentially be in jeopardy, but for which sufficient information does not exist to support listing on the federal threatened or endangered wildlife and plant lists.

strike-slip fault – Fault where one rock body moves horizontally against another along a failure plane; fault plane surfaces are typically vertical. A right lateral fault indicates that rocks across the fault have moved to the right relative to the observer.

substation dead-end towers — These are the towers within the substation where incoming or outgoing transmission lines end. Substation dead-ends are typically the tallest structure within the substation.

substation rock surfacing — A 3-inch layer of rock, selected for its insulating properties, is placed on the ground within the substation to protect operation and maintenance personnel from danger during substation electrical failures.

surface water — Water collecting on the ground or in a stream, river, lake, sea or ocean.

suspension tower — A tower designed to support conductors strung along a virtually straight line with only small turning or descending or ascending angles. About five suspension towers are used each mile; tangent towers have no turn angle; angle towers have light or heavy turning abilities.

switches — Devices used to mechanically disconnect or isolate equipment; found on both sides of circuit breakers.

syncline — Fold in which older rocks are at the outer surface of the fold and younger rocks are at the core of the fold (e.g, “U”).

system reliability — The ability of a power system to provide uninterrupted service, even while that system is under stress.

tap — The point at which a transmission line is connected to a substation or other electrical device to provide service to a local load.

tariff — Schedules detailing utility rates, rules and regulations, and terms of service filed for approval with a regulatory agency. Usually relative to retail, end-use customer service, although for all practical purposes BPA's Wholesale Power and Transmission Rate Schedules are tariffs filed before FERC.

threatened species — Those species listed by the USFWS or the NMFS as likely to become endangered within the foreseeable future through all or a significant portion of their range. A designation also used by state agencies for state lists.

thrust fault — A fault where overlying rocks have overridden the underlying rocks along a failure plane; fault plane surfaces are typically much flatter than those associated with normal or strike-slip faults.

trackhoe — (Also known as excavators) are heavy equipment consisting of a boom, bucket and cab on a rotating platform.

traditional cultural properties (TCPs) — Landmarks or sites identified by an existing community as being important to that community's historic identity, traditional knowledge and culture.

transformers — Electrical equipment usually contained in a substation that is needed to change voltage on a transmission system.

transmission line — The towers, insulators, conductors, and other equipment used to transmit electrical power at high voltage to electric distribution facilities (substation).

tuff – Volcanic fragments (usually ash) consolidated to the point of becoming a rock. Tuffaceous indicates rocks with a high proportion of volcanic ash.

turbidity — The extent to which water is muddy or cloudy due to the presence of suspended matter.

undesirable plant species — Those plant species that are "undesirable, noxious, harmful, exotic, injurious, or poisonous, pursuant to state or federal law," and that should be managed where county or private management plans are in place, as stated in the federal Noxious Weed Act.

volt — The international system unit of electric potential and electromotive force.

voltage — The driving force that causes a current to flow in an electrical circuit.

watershed — The area that drains to a common waterway.

wetlands — An area where the soil experiences anaerobic conditions because of inundation of water during the growing season. Indicators of a wetland include types of plants, soil characteristics, and hydrology of the area.

woody debris — Materials left over from cutting or harvesting, such as limbs of branches of a tree. Woody debris may be placed in stream channels to slow and divert water flow and improve habitat for fish.

zoning — Regulations used to guide growth and development; typically involve legally adopted restrictions on uses and building sites in specific geographic areas to regulate private land use.

Acronyms

acre·year	per acre per year
µm	micrometers
ACGIH	American Conference of Governmental Industrial Hygienists
ACHP	Advisory Council on Historic Preservation
ADPA	Archaeological Data Preservation Act
ADT	average daily traffic
AGC	Associated General Contractors of Washington
aMW	average megawatts
APLIC	Avian Power Line Interaction Committee
ARPA	Archaeological Resources Protection Act
ATC	available transmission capacity
BLM	Bureau of Land Management

BIA	Bureau of Indian Affairs
BA	Biological Assessment
BLM	Bureau of Land Management
BMPs	Best Management Practices
BNSF	Burlington Northern Santa Fe Railroad
BPA	Bonneville Power Administration
°C	degrees Celsius
CAO	Critical Areas Ordinance
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CHNAP	Columbia Hills Natural Area Preserve
CO_2	carbon dioxide
Corps	U.S Army Corps of Engineers
CP	counterpoise
CRGC	The Columbia River Gorge Commission
CRGNSA	Columbia River Gorge National Scenic Area
CRP	Conservation Reserve Program
DAHP	Department of Archaeology and Historic Preservation
dBA	A-weighted decibels
DEQ	Oregon Department of Environmental Quality
DGER	Washington Department of Geology and Earth Resources
DLCD	Department of Land Conservation and Development
DNR	Washington Department of Natural Resources
DOE	Department of Energy
DPS	distinct population segment
DSL	Oregon Department of State Lands
E	endangered species
Ecology	Washington State Department of Ecology
EDNA	Environmental Designations for Noise Abatement
EFH	essential fish habitat
EFSC	Oregon Energy Facility Siting Council

EFSEC	Washington Energy Facility Site Evaluation Council
EIA	Energy Information Administration
EIS	environmental impact statement
EMF	electromagnetic fields
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
F	fahrenheit
FAA	Federal Aviation Administration
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
FAR	Federal Aviation Regulation
FCDP	Fugitive Dust Control Plan
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy Management Act
FR	Federal Register
FSA	Farm Service Agency
G	gauss
GIS	geographic information system
GMA	General Management Areas
Gorge	Columbia River Gorge
GPS	global positioning system
GUA	Gorge Urban Area
GWP	global warming potential
HFCs	hydrofluorocarbons
HVED	high voltage extruded dielectric cable
I	Interstate
ICES	International Committee on Electromagnetic Safety
IMPLAN	Impact Analysis for Planning
IPCC	Intergovernmental Panel on Climate Change
kV	kilovolt

kWh	kilowatt hours
L_{eq}	equivalent sound level
LCDC	Land Conservation and Development Commission
LE	listed (state) endangered species
LiDAR	Light Detection and Ranging
Line mile W, M, E, WM, ME	line mile West (W), Middle (M), East (E), West and Middle (WM), Middle and East (ME)
m	meter
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
Management Plan	Columbia River Gorge National Scenic Area Management Plan
mG	milligauss
mg/l	milligrams/liter
MOU	memorandum of understanding
MOA	memorandum of agreement
MP	milepost
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards (NAAQS)
NAGPRA	Native American Graves Protection and Repatriation Act
National Scenic Area	Columbia River Gorge National Scenic Area
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act
NI	no indicator
NL	not listed
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NOS	Network Open Season
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service

NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NTUs	nephelometric turbidity units
NWI	National Wetlands Inventory
OAR	Oregon Administrative Rules
OASIS	Open-Access Same-Time Information System
OBL	obligate
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
ORNHIC	Oregon Natural Heritage Information Center
DOGAMI	Oregon Department of Geology and Mineral Industries
ORS	Oregon Revised Statutes
Parks	Washington Department of Parks and Recreation
PCBs	polychlorinated biphenyls
PEM	palustrine emergent
PFCs	perfluorocarbons
PL	public law
PM	particulate matter
ppm	parts per million
PSS	palustrine scrub-shrub
PUD	public utility district
RAS	remedial action scheme
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RM	river mile
ROW	right-of-way
RUSLE	Revised Universal Soil Loss Equation
S	(State) sensitive species
SCS	Soil Conservation Service
SEPA	State Environmental Policy Act
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office

SMA	Special Management Areas
SMP	Shoreline Master Program
SoC	species of concern
SPCC	Spill Prevention, Control, and Countermeasures
SPPP	Stormwater Pollution Prevention Plan
SR	State Route
SF_6	sulfur hexafluoride
SWPPP	Stormwater Pollution Prevention Plan
T	threatened species
TCP	traditional cultural properties
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TSD	treatment, storage, and disposal facility
USC	United States Code
UPRR	Union Pacific Railroad
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey
VDTs	video display terminals
V/m	volts/meter
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WECC	Western Electricity Coordinating Council
WNHP	Washington Natural Heritage Program
WHO	World Health Organization
WL	wetland
WRD	Oregon Water Resources Department
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
WSPRC	Washington State Parks and Recreation Commission
WWTP	wastewater treatment plant
XLPE	cross-linked polyethylene

Chapter 12
Index

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BONNEVILLE POWER ADMINISTRATION

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