Chapter 2 — Alternatives

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BPA studied ways to relieve constraints on the transmission system in central Washington. Four construction alternatives were developed, all of which involve constructing a new transmission line. The alternatives are divided into segments for ease in analysis and are shown on Map 2, *Alternatives*. Segment A is common to all construction alternatives. Segment B has two route options (B_{NORTH} and B_{SOUTH}), which begin and end at the same points. The remaining segments are C, D, E, and F.

For Your Information

Construction Preferred Alternative and Alternatives 1, 3, and 1a are made up of Segments A through F.

This chapter describes the segments and alternatives, summarizes how environmental consequences would differ among them, and compares the alternatives against the purposes of the project. BPA has identified a preferred alternative that best meets the purpose and need for the project.

This chapter also describes other alternatives (e.g., burying transmission lines) that were briefly studied and eliminated from detailed consideration for technical or economic reasons.

2.1 Segments

The following is a description of Segments A through F. (See Map 2, *Alternatives*.)

2.1.1 Segment A

Common to all alternatives, Segment A starts at BPA's Schultz Substation and goes southeast, following the existing Vantage–Schultz 500-kV transmission line. Figure 2.1, *Schultz Substation Area Redesign,* shows the Schultz Substation area. BPA plans to redesign the existing lines that exit the Schultz Substation to the east, in order to make room for the new line and improve the configuration of the existing lines. BPA would relocate the first mile of the existing Sickler-

For Your Information

*A **bay** is an area set aside in a substation for special equipment.*

Schultz 500-kV transmission line. Instead of its current location, the Sickler-Schultz line would exit a new ***bay*** on the north side of the substation and head northeast for about a mile to intersect with the existing Rocky Reach–Maple Valley 345-kV line. It would then follow the Rocky Reach–Maple Valley line for about 1.5 miles. At this point, the relocated Sickler-Schultz line would reconnect with the existing Sickler-Schultz line and continue to the northeast.

*To **reconductor** means to take the existing conductors off of the structures and replace them with new conductors.*

The existing Schultz-Vantage 500-kV line from Schultz Substation to the Naneum Crossing would be ***reconductored*** or rebuilt. The line would then be connected with the new transmission line continuing to the southeast parallel to the existing Schultz-Vantage line. The existing Schultz-Vantage line would be connected to the vacated portion of the Sickler-Schultz line running into the Schultz Substation. The portion of the Sickler-Schultz line that runs due north from the Naneum crossing would be removed because it would no longer be needed. This combination of rerouting and reconnecting lines would eliminate 500-kV lines from crossing each other.

Southeast of Naneum crossing, the new transmission line would be constructed parallel and up to 1,400 feet to the north of the existing Schultz-Vantage line. Segment A is about 29.4 miles long and ends south of Interstate 90 (I-90).

There is a small potential reroute within Segment A, referred to on Map 2, *Alternatives,* and shown in detail on Map 3, *Reroute in Segment A*. The existing Schultz-Vantage line and the new transmission line would be rerouted to the south of the existing alignment. They would run parallel to each other at a separation of about 200 feet. A little over a mile in length, the reroute would start about a half-mile south of Coleman Road. The lines would be rerouted to the south and then the east, joining the existing alignment just west of Colockum Road.

2.1.2 Segment B

Segment B has two route options, B_{NORTH} and B_{SOUTH}.

Segment B begins where the new transmission line would cross to the south side of the existing Schultz-Vantage line; about 5.75 miles south of where the Schultz-Vantage transmission line crosses I-90. (See Map 2, *Alternatives*.)

B_{NORTH} runs to the east, parallel to and 1,200 feet south of the Schultz-Vantage line. This route option follows the existing line across the Columbia River and ends at the BPA Vantage Substation. B_{NORTH} is 9.5 miles long.

B_{SOUTH} initially runs farther to the south and then heads east immediately parallel to an existing 230-kV wood pole transmission line on the south side of the John Wayne Trail. Just before the Columbia River, B_{SOUTH} angles slightly to the north towards the Schultz-Vantage line and crosses the Columbia River adjacent to the existing Schultz-Vantage line river crossing. B_{SOUTH} ends at the BPA Vantage Substation. B_{SOUTH} is 10.4 miles long.

2.1.3 Segment C

Segment C starts in the same place as Segment B (where the new line would cross the existing Schultz-Vantage line). The segment would turn south, crossing the Yakima Training Center (YTC). This segment would not parallel an existing line. The segment would angle southeast, leave the YTC, cross Highway 24 and end where it intersects the existing Hanford-Ostrander and Hanford-John Day 500-kV transmission lines. This intersection of lines would be the site of a new substation, called Wautoma Substation. Segment C is 29.8 miles long.

2.1.4 Segment D

Segment D begins in the area just south of Vantage Substation (See Map 2, *Alternatives*). The new line would not enter the substation. Segment D would head in a southeasterly direction, directly adjacent and parallel to the existing Midway-Vantage 230-kV line on the west side. The segment would cross Crab Creek and climb the Saddle Mountains.

Starting at about nine miles south of the Vantage Substation, the Midway-Vantage line structures would be removed and replace with ***double-circuit*** structures. The structures would carry the existing and new lines through irrigated areas. This double-circuit section would be about eight miles long from existing structure 11/1 to 2/4. The conductors on the east side of the double-circuit structures would operate at 230-kV (existing Midway-Vantage line), and the west side would operate at 500-kV (new line). Beyond the irrigated areas, Segment D would again parallel the Midway-Vantage line on the west side and cross the Columbia River. Segment D would pass the BPA Midway Substation and continue south to the new substation site, while immediately paralleling the existing Midway-Big Eddy 230-kV line on the west side. Segment D is 27.3 miles long.

➡ For Your Information

Double-circuit *structures hold conductors for two transmission lines.*

BPA structures are numbered. The first number is the transmission line mile, and the second number is the structure in that mile.

2.1.5 Segment E

Segment E begins at Vantage Substation and heads south, paralleling the existing Vantage-Hanford 500-kV line 1,200 feet to the north. It would cross Crab Creek, climb the Saddle Mountains and head

Map 2, Alternatives, shows all segments.

southeast, crossing the Saddle Mountain Unit of the Hanford Reach National Monument. After crossing the Columbia River, Segment E would end at the existing BPA Hanford Substation. Segment E is 23.2 miles long.

2.1.6 Segment F

Segment F begins at Vantage Substation and heads east, then south crossing Crab Creek and climbing the Saddle Mountains. It would then follow the Vantage-Hanford line for a short length before turning due east. Segment F would traverse about 14 miles along the south slope of the Saddle Mountains, and then intersect the Grand Coulee-Hanford 500-kV transmission line. It would then turn south and parallel the existing Grand Coulee-Hanford line 1,200 feet to the east across the Wahluke Slope. After crossing the Columbia River, the segment ends at the Hanford Substation. Segment F is 32.1 miles long.

2.2 Agency Preferred Alternative (Alternative 2)

BPA is proposing to construct a new 500-kV transmission line between the Schultz Substation, almost nine miles north of Ellensburg, Washington, and a new substation (Wautoma Substation) in Benton County, two miles south of Hwy 24 (T12N, R24E, Sec. 20). The Preferred Alternative is Alternative 2 and is made up of Segments A, $B_{SOUTH,}$ and D (see Map 2, *Alternatives*). The Preferred Alternative would cost approximately $76,500,000 (2001 dollars).

➡ For Your Information

These preliminary estimates were generated shortly after the scoping period.

2.2.1 Transmission Line

*A transmission line designed to hold one electrical circuit is called **single-circuit.***

2.2.1.1 Structures

The Preferred Alternative would primarily use 500-kV, ***single-circuit*** steel lattice structures, also called towers, to support the transmission line conductors (see Figure 2.2, *Proposed Structures*). On YTC land, flat configuration 500-kV single-circuit structures would be used. Outside of the YTC, delta configuration structures would be used for single-circuit structures. In one area of Segment D, 500-kV double-circuit lattice structures would be used to hold the new 500-kV and the existing 230-kV line. The height of each structure would vary by location and surrounding land forms. Single-circuit structures would average 135 feet high. The double-circuit structures would average 170 feet high. For a more thorough description of transmission construction, see Appendix B, *Construction and Maintenance Activities*.

2.2.1.2 Conductors

For Your Information

Alternating current *is an electric current that reverses directions at regular intervals.*

The wires or lines that carry the electrical current in a transmission line are called conductors. ***Alternating current*** transmission lines, like the new line, require three sets of wires to make up a circuit. For a single-circuit 500-kV transmission line, there would be three sets of wires and for a double-circuit line (Segment D) there would be six sets of wires.

Conductors are not covered with insulating material, but rather use the air for insulation. Conductors are attached to the structure using porcelain or fiberglass insulators. Insulators prevent the electricity in the conductors from moving to other conductors, the structure, and the ground.

Two smaller wires, called overhead ground wires, are attached to the top of transmission structures. Overhead ground wires protect the transmission line from lightning damage. To disseminate the electrical power from lightning, the power is routed to the ground at each tower through wires called counterpoise.

2.2.2 Right-of-Way

New ROW would be needed for the new structures and line. The new ROW would be 150 feet wide. Where the new line would parallel an existing 500-kV line (Segment A) the new line would be up to 1,400 feet from the existing line. See Appendix C, *Line Separation Issue Paper,* for an explanation of the separation distance. In Segment D where the existing line would be replaced with a double-circuit line, the existing ROW would be expanded 25 feet on the west side, to increase the ROW from the existing 100 feet to 125 feet. (See Figure 2.2, *Proposed Structures.)* Where the new line is parallel to the 230-kV line in Segment D, the new 150 feet ROW would be directly adjacent to the existing ROW.

BPA would obtain easements from landowners for new ROW. These easements give BPA the right to construct, operate, and maintain the line. Fee title to the land covered by the easement generally remains with the owner, and is subject to the provisions of the easement. For more information on easement acquisition, see Appendix D, *Property Impacts*.

The easement prohibits large structures, tall trees, storing flammable materials, and other activities that could be hazardous to people or endanger the transmission line. Activities that do not interfere with the transmission line or endanger people are usually not restricted.

2.2.3 Clearing

Vegetation within the ROW is restricted by height. This is required for the safe and uninterrupted operation of the line. It is not anticipated that a large number of trees will need to be cleared for this project; however, because of safety considerations, there may be some trees at water crossings that would need to be cut.

At the structure sites, all trees and brush would be cut and removed within a quarter acre area, with root systems being removed from a 50-by-50-foot area for the tower footings. A portion of the site would be graded to provide a relatively level work surface for the erection crane. The Preferred Alternative would require an estimated 71 acres to be cleared for structure sites along the 67-mile route.

Woody debris and other vegetation would either be left lopped and scattered, piled, or chipped, or would be taken off-site. Burning would not be used.

2.2.4 Access Roads

Access roads on and off the ROW would be used to construct and maintain a new line. Where the new line would be 1,200 feet to 1,400 feet from the existing line, a new road system would be built. Where the new line would be built directly adjacent to the existing line, existing access roads would be used, with ***spur roads*** constructed to the new structures.

➡ For Your Information

Spur roads *are short road segments branching off the trunk roads that go to each structure if the structure is not located on a trunk road.*

New roads would be located within the ROW wherever possible. Where conditions require, such as at steep cliffs, roads would be constructed and used outside the ROW. BPA normally acquires easements for the right to develop and maintain permanent over-ground access for wheeled vehicle travel to each structure. No permanent access road construction would be allowed in cultivated or fallow fields unless previously agreed to by the landowner. After construction of the line is completed, BPA would allow any roads in cropland to be returned to crop production.

Where existing access roads would be used, BPA would improve them to a level that supports construction travel needs. This would be done by grading, improving drainage, and adding gravel to the road surface.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of the Preferred Alternative. Assumptions were made based on terrain and line location.

New access roads surfaces would be 16 feet wide, with additional road widths of up to 25 feet for curves. When needed, a 5-foot ditch would be added to one side of the road. Roads would be dirt, gravel, or rock.

Table 2.2-1
Preferred Alternative: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total Improvement (mi)
A	29.4	1.6	47.0	0.8	23.5
BSOUTH	10.4	1.7	17.7	1.5	15.6
D	27.3	0	0	1.3	35.5
TOTAL	**67.1**		**64.7**		**74.6**

For Your Information

Waterbars *are smooth shallow ditches excavated at an angle across a road to decrease water velocity and divert the water off and away from the road surface.*

Dips, culverts, and ***waterbars*** would be installed within the roadbed to provide drainage. Temporary roads would be repaired and if the land use permits, the road would be reseeded with appropriate seed mixtures.

Fences, gates, cattle guards, and additional rock would be added to access roads where necessary.

Table 2.2-2
Preferred Alternative: Estimate of Access Road Disturbance (Area)

Segment	Existing Road Disturbance Width (ft)	New Road Disturbance Width (ft)	New Road (Ac)	Improved Roads (Ac)	Road Work (Ac)
A	16	25	142.4	45.6	188.0
BSOUTH	16	25	53.6	30.3	83.9
D	16	25	0	68.8	68.8
TOTAL			**196**	**144.7**	**340.7**

2.2.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be one acre in size and located every 2.5 miles. The Preferred Alternative would require an estimated 28 acres to be cleared for the pulling and reeling areas along the route.

2.2.6 Staging Areas

During construction of the transmission line, areas would be needed off the main highways, near the ROW, where equipment such as

steel, spools of conductor, and other construction materials would be stored until material is needed.

At this time, staging area locations are not known. Prior to construction these would be determined and agreements with landowners made.

2.2.7 Substations

For the Preferred Alternative, a new transmission line would begin at Schultz Substation and terminate at a new substation, called Wautoma Substation. Additions and modifications would occur at Schultz Substation. No work would be needed at the Vantage or Midway Substations.

Schultz Substation – A new bay would be constructed within the existing fenced yard of the substation. The following equipment would be installed in the Schultz Substation.

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. The breakers would be installed in the substations at either end of the line. The breakers would be gas breakers, which are insulated by special non-conducting gas (sulfur hexafluoride). The breakers would not contain oil, except for a small amount of hydraulic fluid used to open and close the electrical contacts.

Switches – These devices are used to mechanically disconnect or isolate equipment. Switches are normally located on both sides of circuit breakers.

Buswork – Power moves within the substation on rigid aluminum pipes called bus tubing. The tubing is supported and vertically elevated by pedestals called bus pedestals. Buswork is a generic term to describe all equipment associated with the bus tubing.

Potential transformers (PTs) – A type of transformer that uses low-voltage to monitor the high-voltage system. The low-voltage output of this transformer is used for relaying and metering.

Substation dead-end towers – Towers within the confine of the substation where incoming and outgoing transmission lines end. Dead-ends are typically the tallest structures in a substation.

Wautoma Substation – A new substation would be constructed in Benton County, two miles south of Hwy. 24 (T12N, R24E, Section 20). The new substation would be sited at the intersection of the new transmission line and the Hanford-Ostrander 500-kV and

Hanford-John Day 500-kV transmission lines. These two lines would be tied into the new substation. A parcel of approximately 25 acres would be needed for the new substation. Land for the new substation would be acquired in fee and would remain in BPA and federal government ownership.

The footprint of the substation would be approximately 800 feet by 500 feet. This area would include the substation yard (equipment within the fence) and grading outside of the fence. The actual fenced area would be about 760 feet by 450 feet. See Figure 2.3, *New Wautoma Substation Footprint*.

In order to build a new substation, construction crews would first clear and grade the substation site. Conduits, drainage pipes, and the grounding system would be trenched or dug into the ground. Footings for the equipment and foundation for the control house would be placed in appropriate positions. A chain link fence around the substation would be installed. About six inches of rock would be laid, which would extend outside of the fence. Equipment such as breakers, buswork, switches, and PT's would be installed in the yard, and the control rack would be installed in the control house.

2.2.8 Communication Equipment

BPA substations are electronically connected to BPA's transmission system control centers. Microwave communication sites and fiber-optic communication lines connect BPA's high-voltage substations to system control centers located in Vancouver and Spokane, Washington. Dispatchers within the control centers remotely monitor meters and gauges on electric power equipment within each substation and receive alarm signals when emergency conditions occur. Dispatchers have the ability to disconnect lines and electrical equipment when transmission failures occur.

As part of the Preferred Alternative, BPA would install fiber optic cable between Vantage Substation and the new Wautoma Substation (about 27.3 miles) and from Vantage Substation north to the BPA Columbia Substation (about 32 miles). The new fiber would reinforce BPA's communication network and make the fiber optic system more reliable.

From Vantage to Columbia Substation, fiber would be strung on existing transmission line structures. From Vantage to the new Wautoma Substation, the fiber would either be strung on the new transmission line or existing lines, where available. The fiber would be mounted under the conductors. The fiber cable would be less than an inch in diameter. Detailed design is still to be determined.

2.2.9 Maintenance

BPA would perform routine, periodic maintenance and emergency repairs on structures, substations, and accessory equipment. These activities typically include replacing insulators, inspections of structures, and vegetation control. Within the substations, BPA may need to periodically replace equipment.

Existing and new permanent access roads to structures would remain throughout the life of the line so that BPA can perform routine and emergency maintenance on the transmission line. Road maintenance could include grading and clearing, and repairing ditches and culverts.

A large part of maintenance activities is vegetation control. In Central Washington, this primarily focuses on the spread of noxious weeds. Tall growing vegetation would also need to be managed in and adjacent to the ROW, primarily where the line crosses water bodies. Vegetation maintenance activities would follow the guidelines set in the BPA Transmission System Vegetation Management Program EIS. When vegetation control is needed, a vegetation management checklist would be developed for the right-of-way. It would identify sensitive resources and the methods to be used to manage vegetation. Substations are periodically sprayed with herbicide to keep plants from growing and creating a safety hazard.

➡ For Your Information

The BPA Transmission System Vegetation Management Program EIS was completed in August 2000, and describes the planning steps, agencies and landowners to be coordinated with, and the tools to be used to control vegetation along BPA facilities. This document is available for review on the Web at http://www.efw.bpa.gov/cgi-bin/PSA/NEPA/SUMMARIES/VegetationManagement_EIS0285.

2.3 Alternative 1

Alternative 1 would start at the Schultz Substation and follow the Schultz-Vantage line along Segments A and B. The line would enter the Vantage Substation in order to get to the east side of existing lines. It would then follow the existing Vantage-Hanford 500-kV line 1,200 feet to the north along Segment E. The new line would end at the existing Hanford Substation. The outside limits of the Hanford Substation would not need to be expanded for this alternative. This alternative has an estimated cost of $88,000,000.

2.3.1 Transmission Line

2.3.1.1 Structures

Alternative 1 would use 500-kV single-circuit steel lattice structures. See Figure 2.2, *Proposed Structures*. The height of each structure would vary by location and surrounding land forms, with an average height of 135 feet.

2.3.1.2 Conductors

The single-circuit transmission line would be made up of three sets of wires. The insulators and overhead ground wires would be the same as discussed earlier for the Preferred Alternative.

2.3.2 Right-of-Way

New ROW would be needed for the new structures and line. The new ROW would be 150 feet wide and offset from the existing 500-kV line up to 1,400 feet along Segment A, as described for the Preferred Alternative. Where the new ROW would parallel existing 500-kV lines along Segments B and E, the offset would be 1,200 feet. See Appendix C, *Line Separation Issue Paper,* for an explanation of the line separation.

Easement provisions would be the same as those discussed earlier for the Preferred Alternative.

2.3.3 Clearing

Clearing requirements would be the same as those discussed earlier for the Preferred Alternative. Alternative 1 would require an estimated 63 acres to be disturbed for structure sites along the 63-mile route.

2.3.4 Access Roads

A new access road system would be built for the majority of Alternative 1. Wherever possible, the access roads would be located on the ROW. BPA normally acquires easements for the right to develop and maintain permanent over-ground access for wheeled vehicle travel to each structure. No permanent access road construction would be allowed in cultivated or fallow fields. Any roads in cropland would be removed and the ground would be restored to the original contour when construction of the line is completed.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of Alternative 1. Assumptions were made based on terrain and line location.

New access roads surfaces would be 16 feet wide, with additional road widths of up to 25 feet for curves. When needed, a 5-foot ditch would be added to one side of the road. Roads would be dirt, gravel, or rock.

Drainage, fences, and gates would be installed where needed as described earlier for the Preferred Alternative.

Table 2.3-1
Alternative 1: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total Improvement (mi)
A	29.4	1.6	47.0	0.8	23.5
BNORTH	9.5	1.7	16.2	1.5	14.3
BSOUTH	10.4	1.7	17.7	1.5	15.6
E	23.2	1.3	30.2	2	46.4
TOTAL B_N	**62.1**		**93.4**		**84.2**
TOTAL B_S	**63.0**		**94.9**		**85.5**

Table 2.3-2
Alternative 1: Estimate of Access Road Disturbance (Area)

Segment	Existing Road Disturbance Width (ft)	New Road Disturbance Width (ft)	New Road (Ac)	Improved Roads (Ac)	Road Work (Ac)
A	16	25	142.4	45.6	188.0
BNORTH	16	25	99.1	27.7	76.8
BSOUTH	16	25	53.6	30.3	83.9
E	16	25	91.5	90.0	181.5
TOTAL B_N			**283**	**163.3**	**446.3**
TOTAL B_S			**287.5**	**165.9**	**453.4**

2.3.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be one acre in size and located every 2.5 miles. Alternative 1 would require an estimated 27 acres to be cleared for the pulling and reeling areas along the route.

2.3.6 Staging Areas

Staging areas would be located and used similar to those described earlier for the Preferred Alternative.

2.3.7 Substations

For Alternative 1, a new transmission line would begin at the Schultz Substation and end at Hanford Substation. The line would pass through the Vantage Substation, but no electrical equipment would be installed within the Substation as part of this project.

Schultz Substation – The new equipment installed at Schultz Substation would be the same as described earlier for the Preferred Alternative.

Hanford Substation – A new bay would be constructed within the existing fenced yard of the substation. Outside of the substation fence, one or two of the existing transmission line structures may need to be relocated in order to align with the readjusted substation equipment. The new equipment within the substation would include breakers, switches, buswork, and PT's.

Vantage Substation – The line would pass through the Vantage Substation in order to get from the west to east side of existing lines. A new bay and dead end would be constructed within the existing fenced yard of the substation. Some existing transmission line towers may need to be moved to make room for the new line.

2.3.8 Communication Equipment

As part of Alternative 1, BPA would install fiber optic cable between Vantage Substation and Midway Substation (about 19.3 miles) and from Vantage Substation north to the BPA Columbia Substation (about 32 miles). The new fiber would reinforce BPA's communication network and make the fiber optic system more reliable.

The fiber optic cable would be strung on existing transmission line structures. The fiber cable would be less than an inch in diameter. Detailed design is still to be determined.

2.3.9 Maintenance

Maintenance activities would be similar to those described earlier for the Preferred Alternative.

2.4 Alternative 3

Alternative 3 would start at the Schultz Substation and follow Segment A. It would then turn south and follow segment C through the YTC. South of the YTC in Benton County, the line would terminate at the new Wautoma Substation as described earlier for the Preferred Alternative. This alternative has an estimated cost of $67,000,000.

2.4.1 Transmission Line

Structures and conductor would be the same as described earlier for Alternative 1.

2.4.2 Right-of-Way

New ROW would be needed for the new structures and line. The new ROW would be 150 feet wide and offset from the existing 500-kV line up to 1,400 feet along Segment A. See Appendix C, *Line Separation Issue Paper,* for an explanation of the line separation. In Segment C, the transmission line would be in a new ROW and not parallel to any existing lines.

Easement provisions would be the same as those discussed earlier for the Preferred Alternative.

2.4.3 Clearing

Clearing requirements would be the same as those discussed earlier for the Preferred Alternative. Alternative 3 would require an estimated 62 acres to be disturbed for structure sites along the 59-mile route.

2.4.4 Access Roads

New access roads would be built for the majority of Alternative 3. Roads would be built as described earlier for Alternative 1.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of Alternative 3. Assumptions were made based on terrain and line location.

Table 2.4-1
Alternative 3: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total Improvement (mi)
A	29.4	1.6	47.0	0.8	23.5
C	29.8	2.8	83.4	2.5	74.5
TOTAL	**59.2**		**130.4**		**98.0**

Table 2.4-2
Estimate of Access Road Disturbance (Area)

Segment	Existing Road Disturbance Width (ft)	New Road Disturbance Width (ft)	New Road (Ac)	Improved Roads (Ac)	Road Work (Ac)
A	16	25	142.4	45.6	188.0
C	16	25	252.7	144.5	397.2
TOTAL			**395.1**	**190.1**	**585.2**

2.4.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be one acre in size and located every 2.5 miles. Alternative 3 would require an estimated 24 acres to be cleared for the pulling and reeling areas along the route.

2.4.6 Staging Areas

Staging areas would be located and used similar to those described earlier for the Preferred Alternative.

2.4.7 Substations

For Alternative 3, a new transmission line would begin at the Schultz Substation and end at the new Wautoma Substation.

Schultz Substation – The new equipment installed at Schultz Substation would be the same as described earlier for the Preferred Alternative.

Wautoma Substation – The construction of the substation would be the same as described earlier for the Preferred Alternative.

2.4.8 Communication Equipment

As part of Alternative 3, BPA would install fiber optic cable between Vantage Substation and Midway Substation (about 19.3 miles) and from Vantage Substation north to the BPA Columbia Substation (about 32 miles). BPA would also install fiber from Midway Substation to the new Wautoma Substation using a combination of existing lines and the new transmission line. The exact route has not been determined.

2.4.9 Maintenance

Maintenance activities would be similar to those described earlier for the Preferred Alternative.

2.5 Alternative 1A

Alternative 1A would start at the Schultz Substation and follow Segments A and B. The new line would enter the Vantage Substation and cross to the east side of the existing transmission lines. The line would then follow Segment F into Hanford Substation. The outside limits of the Hanford Substation would not need to be expanded for

this alternative. This alternative has an estimated cost of $67,000,000.

2.5.1 Transmission Line

Structures and conductor would be the same as described earlier for Alternative 1.

2.5.2 Right-of-Way

New ROW would be needed for the new structures and line. The new ROW would be 150 feet wide and offset from the existing 500-kV line up to 1,400 feet along Segment A, as described in the Preferred Alternative. Where the new ROW would parallel existing 500-kV lines along Segments B and F, the offset would be 1,200 feet. See Appendix C, *Line Separation Issue Paper,* for an explanation of the line separation. A new 150 feet wide ROW would also be acquired in the areas of Segment F that are not parallel to an existing line.

Easement provisions would be the same as those discussed earlier for the Preferred Alternative.

2.5.3 Clearing

Clearing requirements would be the same as those discussed earlier for the Preferred Alternative. Alternative 1A would require an estimated 75 acres to be disturbed for structure sites along the 72-mile route.

2.5.4 Access Roads

New access roads would be built for the majority of Alternative 1A. Roads would be built as described earlier in Alternative 1.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of Alternative 1A. Assumptions were made based on terrain and line location.

Table 2.5-1
Alternative 1A: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total Improvement (mi)
A	29.4	1.6	47.0	0.8	23.5
BNORTH	9.5	1.7	16.2	1.5	14.3
BSOUTH	10.4	1.7	17.7	1.5	15.6
F	32.1	1.5	48.2	1	32.1
TOTAL B_N	**71.0**		**111.4**		**69.9**
TOTAL B_S	**71.9**		**112.9**		**71.2**

Table 2.5-2
Alternative 1A: Estimate of Access Road Disturbance (Area)

Segment	Existing Road Disturbance Width (ft)	New Road Disturbance Width (ft)	New Road (Ac)	Improved Roads (Ac)	Road Work (Ac)
A	16	25	142.2	45.6	188.0
BNORTH	16	25	49.1	27.7	76.8
BSOUTH	16	25	53.6	30.3	83.9
F	16	25	146.1	62.3	208.4
TOTAL B_N			**337.6**	**135.6**	**473.2**
TOTAL B_S			**342.1**	**138.2**	**480.3**

2.5.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be one acre in size and located every 2.5 miles. Alternative 1A would require an estimated 30 acres to be cleared for the pulling and reeling areas along the route.

2.5.6 Staging Areas

Staging areas would be located and used similar to those described earlier for the Preferred Alternative.

2.5.7 Substations

For Alternative 1A, a new transmission line would begin at the Schultz Substation and end at Hanford Substation. The line would pass through Vantage Substation.

Schultz Substation – The new equipment installed at Schultz Substation would be the same as described earlier for the Preferred Alternative.

Hanford Substation – The new equipment installed at the Hanford Substation would be the same as described earlier for Alternative 1.

Vantage Substation – The line would pass through the Vantage Substation in order to get from the west to east side of existing lines as described earlier for Alternative 1.

2.5.8 Communication Equipment

BPA would install fiber optic cable similar to what is described earlier for Alternative 1.

2.5.9 Maintenance

Maintenance activities would be similar to those described earlier for the Preferred Alternative.

2.6 No Action Alternative

The No Action Alternative is traditionally defined as the no build alternative. This alternative would mean that a new transmission line would not be built, and no other equipment would be added to the transmission system. Maintenance and operation of the existing transmission line and substations would continue unchanged.

2.7 Alternatives Eliminated from Detailed Consideration

BPA studied a variety of alternatives to meet the need for the project. After preliminary study, the following alternatives were eliminated from detailed consideration because they either could not meet the need for the project or they were considered unreasonable.

2.7.1 Alternative 4 Transmission Line

BPA studied the possibility of paralleling the existing Columbia-Ellensburg-Moxee-Midway 115-kV transmission line. The new line would begin at Schultz Substation and be routed through Ellensburg and Yakima, west of the Yakima Training Center and into a new substation. This was referred to as Alternative 4 during the scoping period. BPA received a large number of comments from the public in opposition to this alternative. The existing 115-kV line is adjacent to many homes. Early estimates showed that the cost to buy property and relocate residents would be over $60,000,000. This did not include new transmission equipment, substation equipment, or construction costs. This alternative was eliminated from further study due to cost.

2.7.2 Schultz-Ashe Transmission Line

During the scoping process, maps presented by BPA showed a possible route going through the Hanford Substation and on to the BPA Ashe Substation located on the Hanford Site. Transmission system studies showed that line termination at the Ashe Substation, rather than the Hanford Substation, did not improve reliability. Termination of the line at the Ashe Substation also did not improve transfer capability over the Hanford Substation or Wautoma Substation alternatives. The 17 additional miles of transmission line needed for this alternative would increase the cost of construction by about $13,000,000.

This alternative was eliminated from further study because the system studies did not show an electrical benefit versus the added cost associated with the added miles of transmission line.

2.7.3 Undergrounding

During the scoping process, some people suggested burying the transmission line. Occasionally BPA has used underground transmission cables for new lines. Transmission line cables are highly complex in comparison to overhead transmission lines. For a 500-kV line, the underground cable could be 10 to 15 times the cost of an overhead design.

Because of cost, BPA uses underground cable in limited situations. Underground cables are considered where an overhead route is not appropriate, such as water crossings, such as in the San Juans, or in urban areas.

Underground transmission cables used by BPA are short in comparison to typical overhead transmission lines. BPA's longest underground transmission cable (at 115-kV) is 8 miles. The Bureau of Reclamation operates two 500-kV underground cable circuits at Grand Coulee Dam. These circuits are about 6,000 feet long.

Cable technologies have not advanced as fast as the industry anticipated they would 10 years ago, nor have costs declined as expected. Underground cable remains a tool available for special situations, but because of its high cost it was eliminated from further consideration.

2.8 Comparison of Alternatives and Summary of Impacts

For Your Information

Impacts to resources along route options B_{NORTH} and B_{SOUTH} ranged from none to moderate. For all resources studied, there were no significant differences in impacts between B_{NORTH} and B_{SOUTH}.

Impacts to resources along the reroute in Segment A would be similar to those along Segment A.

A team of environmental specialists evaluated the impacts associated with each of the alternatives. Each resource specialist developed an impact assessment methodology that determined the level, magnitude, and significance of their impact findings, which are described in Chapter 4, *Environmental Consequences*. Table 2.8-1, *Summary of Impacts*, summarizes the environmental impacts for each alternative.

Chapter 1, *Purpose and Need*, identifies the purposes for this project. Purposes help decision-makers decide which alternative is the best solution to meet the need. Table 2.8-2, *Comparison of Alternatives to the Purposes*, describes how each alternative fulfills the purposes.

Table 2.8-1
Summary of Impacts

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Water Resources (See Sections 3.1, *Water Resources*, and 4.1, *Water Resources, Soils, and Geology*.)	Watersheds within the project area are a part of the Yakima and Columbia River Basins. With the exception of the Columbia River, water is scarce. Streams are generally small and intermittent. Lower Crab Creek and the Columbia River are listed as water-quality limited under Section 303(d) of the Federal Clean Water Act, due to extensive habitat modification. In addition, the project area is within the Columbia Plateau basaltic aquifer system. Groundwater quality issues are mostly due to elevated concentrations of nutrients, trace organic compounds and nitrates.	Impacts would be low to moderate and short term. Sedimentation, increased runoff, and short-term turbidity would occur. It is not anticipated that impacts to streams listed as water-quality limited under Section 303(d) would alter the parameters for which they are listed. Impacts to aquifers are not anticipated.	Impacts would be low to moderate and short term. Similar to the Preferred Alternative.	Impacts would be moderate and short term. This alternative has the largest number of acres of new access roads. This would cause sedimentation, increased runoff, and short-term turbidity to water resources. No Section 303(d) stream would be crossed. Impacts to aquifers are not anticipated.	Impacts would be low to moderate and short term. Similar to the Preferred Alternative.	No new impacts are expected.
Floodplains (See Sections 3.2, *Floodplains and Wetlands,* and 4.2, *Floodplains and Wetlands*.)	All proposed alternatives would cross 100-year floodplain areas. The floodplain associated with the Columbia River is narrow, due to the regulation of flows by upstream dams. One floodplain is associated with Nunnally Lake, a narrow water body. The remainder of the floodplains in the project area are narrow and associated with creeks, including Wilson, Naneum, Caribou, Crab, and Dry Creeks. Impacts to floodplains could occur from the placement of structures. Because the placement of access roads in floodplains would not affect flood storage or the course of floodwaters, the impact would be low.	There would be no impacts to floodplains, except for a possible low impact if a structure is placed within the Columbia River floodplain at the southern crossing. The new substation would be located outside of the floodplain, some dirt access roads may be within it along Dry Creek, resulting in a low impact.	There would be no impacts to floodplains, except for a possible low impact if a structure is placed within the Columbia River floodplain at the southern crossing.	No impacts to floodplains would occur along the transmission line. The new substation would be located outside of the floodplain, some dirt access roads may be within it along Dry Creek, resulting in a low impact.	Impact would be the same as Alternative 1.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Wetlands (See Sections 3.2, *Floodplains and Wetlands,* and 4.2, *Floodplains and Wetlands.*)	Many of the wetlands identified in the study area are associated with streams. The few small isolated wetlands that occur in the study area would be avoided.	Impacts to wetlands would be moderate. The construction of fords and other water crossings for access roads could impact 16 wetlands associated with creeks. This represents a moderate impact. The implementation of erosion control measures could minimize impacts. Trees may be removed in four riparian areas. Maintenance activities such as improving access roads could impact wetlands.	Impacts to wetlands would be moderate, similar to the Preferred Alternative, with 17 creek crossings and possible removal of trees in four riparian areas.	Impacts to wetlands would be moderate, similar to the Preferred Alternative, with 22 creek crossings and possible removal of trees in three riparian areas.	Impacts to wetlands would be moderate, similar to the Preferred Alternative, with 15 creek crossings and possible removal of trees in five riparian areas.	No new impacts are expected.
Soils & Geology (See Sections 3.3, *Soils and Geology*, and 4.1, *Water Resources, Soils, and Geology.*)	There are diverse landforms and geologic features within the Columbia Plateau. The plateau's landscape consists mostly of large and small hills with flat tops, extensive plateaus, incised rivers, and anticline ridges. Geologic hazards include steep slopes and erosion. Blowing soil and water erosion are the most active erosion processes, due to the area's high relief, steepness of slope, and restricted available water.	Low to moderate impact is anticipated, caused by erosion, the loss of productive soils, and increased runoff.	Low to moderate impacts are anticipated similar to the Preferred Alternative.	Moderate impacts would occur caused by erosion, loss of productive soils, and increased runoff.	Low to moderate impacts are anticipated similar to the Preferred Alternative.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Vegetation (See Sections 3.4, *Vegetation*, and 4.3, *Vegetation*.)	The vegetation in most of the project area is shrub-steppe. With the exception of some riparian areas, few trees are found. Sagebrush species are the dominant woody vegetation. Two Washington Natural Heritage Program (WNHP) high-quality plant communities occur in the project area: the Wyoming big sagebrush/ bluebunch wheatgrass shrubland (Segment A), and the bitterbrush/ Indian ricegrass shrubland (Segments D, E, and F).	There are potential impacts to areas within 43.3 miles of shrubland and 11.9 miles of grasslands, ranging from low to moderate. In Segment A, there are potential impacts within 0.2 mile of a WNHP high-quality plant community. This represents a moderate to high impact. In Segment D, there is 0.8 mile of high quality plant community. Degradation would cause a moderate impact. The introduction or spread of weed species would be a low to moderate impact.	There are potential impacts to areas within 46.1 miles of shrubland and 8.5 miles of grasslands, ranging from low to moderate. There are potential impacts within WNHP high-quality plant communities, including 0.2 mile in Segment A and 2.8 miles in Segment E. This represents a moderate to high impact. The introduction or spread of weed species would be a low to moderate impact, depending on the quality of the plant communities affected.	There are potential impacts to areas within 48.3 miles of shrubland and 9.2 miles of grasslands, ranging from low to moderate depending on the types of impacts. In Segment A, there are potential impacts within 0.2 mile of a WNHP high-quality plant community. This represents a moderate to high impact. The construction of a new transmission line in an area currently without one is expected to degrade existing plant communities. This could result in a low to high impact, depending on the quality of the plant communities impacted. The introduction or spread of weed species would be a low to moderate impact, depending on the quality of the plant communities affected.	There are potential impacts to areas within 55.9 miles of shrubland and 12.4 miles of grasslands, ranging from low to moderate depending on the types of impacts. The construction of a new transmission line in an area currently without one is expected to degrade existing plant communities. This could result in a low to high impact, depending on the quality of the plant communities impacted. There are potential impacts within WNHP high-quality plant communities, including 0.2 mile in Segment A and 0.3 mile in Segment F. This represents a moderate to high impact. The introduction or spread of weed species would be a low to moderate impact depending on the quality of the plant communities affected.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Threatened & Endangered, and Sensitive Vegetation (See Sections 3.4, *Vegetation*, and 4.3, *Vegetation*.)	Potential habitat for rare and endangered plant species is scattered throughout the study area. A survey of the preferred alternative would locate any populations, and they would be avoided, if possible. BLM sensitive species may occur within BLM managed lands.	Impacts would be moderate to high if species are not avoided. Along Segment D, there is known and potential habitat for Umtanum wild buckwheat. Segments A and D have potential habitat for Ute ladies' tresses. The Columbia River crossings have potential northern wormwood habitat. Segment D has potential habitat for basalt daisy. BLM sensitive species may occur within the BLM managed lands in Segments A and D. Impacts would be moderate if BLM species are not avoided.	Segments A and E have potential habitat for Ute ladies' tresses and Segments B and E have potential habitat for northern wormwood at the Columbia River crossings. BLM sensitive species may occur within the BLM managed lands in Segments A and E. Impacts would be moderate if BLM species are not avoided.	Segment A has potential habitat for Ute ladies' tresses, and Segment C has potential habitat for basalt daisy. BLM sensitive species may occur within the BLM managed lands in Segment A. Impacts would be moderate if BLM species are not avoided.	Segments A and F have potential habitat for Ute ladies' tresses. Segments B and F have potential habitat for northern wormwood at the Columbia River crossing. BLM sensitive species may occur within the BLM managed lands in Segment A and along the Saddle Mountain area crossed by Segment F. Impacts would be moderate if BLM species are not avoided.	No new impacts would occur.
Wildlife (See Sections 3.5, *Wildlife*, and 4.4, *Wildlife*.)	The shrub-steppe habitat in the study area supports a variety of wildlife species including birds, mammals, reptiles, and amphibians. The study area is located within the Pacific Flyway. Crab Creek (Segments D, E, and F) is an important wildlife migratory corridor, and one of the most important flyways in Washington for migrating birds.	Impacts would be high to low. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Existing habitat along Segment D is highly degraded.	Impacts would be high to moderate. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Segment E is mostly disturbed agricultural area with low habitat value, except for the Hanford Site, which is high quality, important undisturbed shrub-steppe habitat.	Impacts would be high. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Existing habitat in Segment C is relatively undisturbed, especially in the YTC.	Impacts would be high. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Segment F along Saddle Mountains is high elevation, sensitive habitat that is relatively undisturbed. The Hanford Site is high quality, important undisturbed shrub-steppe habitat.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Threatened & Endangered Wildlife (See Sections 3.5, *Wildlife*, and 4.4, *Wildlife*.)	The south side of Umtanum Ridge (Segment C) is a core area for sage grouse. Wintering and breeding bald eagles occur in the project area.	With mitigation, impacts would be moderate. Bald eagles winter along Wilson and Naneum Creeks on Segment A. Segment D has few T&E species occurrences.	With mitigation, impacts would be moderate. Bald eagles winter along Wilson and Naneum Creeks on Segment A. Bald eagles are present in the Hanford Reach National Monument on Segment E.	With mitigation, impacts would be high. Bald eagles winter along Wilson and Naneum Creeks on Segment A. Segment C has core sage grouse areas.	With mitigation, impacts would be moderate. Bald eagles winter along Wilson and Naneum Creeks on Segment A. Bald eagles are present in the Hanford Reach National Monument on Segment F.	No new impacts would occur.
Fish Resources (See Sections 3.6, *Fish Resources*, and 4.5, *Fish Resources*.)	Several streams that the project would cross provide habitat for over 16 species of fish. In addition, the Columbia River hosts approximately 40 species of fish. Chinook salmon, sockeye salmon, steelhead, and Pacific lamprey use the Columbia River in the study area as a migration corridor. Fish commonly pursued for sport include whitefish, small-mouth bass, sturgeon, catfish, walleye, and perch. Rough fish such as squawfish, carp, suckers, and shiners are also present in large numbers.	Impacts would be low to none. Ten fish-bearing streams would be crossed.	Impacts would be low to none. Eleven fish-bearing streams would be crossed.	Impacts would be moderate to low. Seventeen fish-bearing streams would be crossed.	Impacts would be low to none. Eleven fish-bearing streams would be crossed.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Land Use (See Sections 3.7, *Land Use*, and 4.6, *Land Use*.)	The alternatives cross private and public land in four Washington counties. Land use varies by line segment, but mostly include rangelands and agricultural lands, some military lands and lands designated for preservation, and limited residential lands.	The overall land use impact would be moderate to high. There would be a moderate to high impact on residential and quarry land uses, which are localized. The impact to the YTC would be moderate/ low. Impacts to other public lands would be low. Agricultural impacts would be moderate along Segment D, because about 8 miles would be double-circuited.	Overall impact to land use would be high. Impacts to the YTC and quarry land use are similar to the Preferred Alternative. About 6.4 miles of agricultural lands on both public and private land would be affected, a high impact. Impacts to residential uses along portions of Segment E would be low. Impact to BLM lands would be low. The land crossed on the Hanford Reach National Monument and the Hanford Site has a Preservation land use designation. Since this alternative would require new ROW, the impact to preservation efforts would be high.	Impacts to land use would be high. The majority of land crossed is on the YTC. The new transmission line would eliminate the Department of Defense's ability to perform the training, aviation, and ground maneuvers that currently occur, which would be a high impact. The remaining land crossed is both public and private rangeland and a small portion of agricultural land. Impacts to rangeland would be low, and impacts to agricultural lands would be high. There would be a moderate to high impact on residential and quarry land uses, which is localized.	Impacts to land use would be moderate to high. Impacts to the YTC, residential, and quarry land uses are similar to the Preferred Alternative. Segment F would require new ROW, with 39.8% of the line crossing land administered by BLM for multiple land uses. Impact to the BLM lands would be low. The land crossed on Hanford Reach National Monument and the Hanford Site has a Preservation land use designation. Since this alternative would require new ROW, the impact to preservation efforts would be high.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Socioeconomics (See Sections 3.8, *Socioeconomics*, and 4.7, *Socioeconomics*.)	The rural character of central Washington is linked to the local socioeconomics. Agriculture is an important industry sector that influences local economies and demographic composition. Other industries important to the area include service, retail trade, and manufacturing sectors. In general, Kittitas, Grant, Yakima, and Benton counties are less racially diverse, have lower per capita and median household incomes, and have a lower percentage of income derived from work earnings than Washington state as a whole.	No impacts to local populations are expected to occur. A positive impact to local and state tax revenues and local economies would result from construction-related jobs and expenditures. A small negative impact in property tax revenues would occur from BPA's purchase of land to locate the new substation.	No impacts to local populations are expected to occur. A positive impact to local and state tax revenues and local economies would result from construction-related jobs and expenditures.	Impacts would be similar to the Preferred Alternative.	Impacts would be similar to Alternative 1.	The No Action Alternative would not directly or indirectly impact the local population, economy, or tax base. However, this alternative would have other socio-economic impacts to the local area and greater region, as a result of the lack of adequate transmission line infrastructure to support expected growth in the Pacific Northwest.
Visual Resources (See Sections 3.9, *Visual Resources*, and 4.8, *Visual Resources*.)	The area's visual character and quality are primarily natural and rural. It is defined by rolling mountains, steep and dramatic mountain ranges, consistent stretches of scrub-steppe vegetation, and agricultural uses such as orchards, vineyards, and crop circles.	Visual impacts would be low to moderate. Segment A in the Colockum Pass area would pass close to a number of residences. The proposed structures would not dominate the view. The route through Segments D would be clearly visible to residents, tourists, and recreationists in the Saddle Mountains area. Segment G would parallel the John Wayne Trail and be visible to users of this recreational feature.	Visual impacts would be low to moderate. Impacts would be similar to the Preferred Alternative, except Segment E's location in the Saddle Mountains area is slightly further from most viewers than the Segment D alignment.	Visual impacts would be low to moderate. Impacts to the Colockum Pass area would be similar to the Preferred Alternative.	Visual impacts would be low to moderate. Impacts would be similar to the Preferred Alternative, except Segment F would cross the north face of the Saddle Mountains furthest from most viewers, and has a sensitive siting relationship with the Saddle Mountains Ridge.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Recreation Resources (See Sections 3.10, *Recreation Resources*, and 4.9, *Recreation Resources*.)	Recreational activities in the area are dispersed.	Impacts to recreational resources would be low. No long-term effects to recreational resources are expected. All impacts would be temporary and related to construction.	Impacts would be low and similar to the Preferred Alternative.	Impacts would be low and similar to the Preferred Alternative.	Impacts would be low and similar to the Preferred Alternative.	No new impacts are expected.
Cultural Resources (See Sections 3.11, *Cultural Resources*, and 4.10, *Cultural Resources*.)	Cultural areas located in the study area include prehistoric camps, lithic scatters, prehistoric stone tool quarries, historic homesteads, historic railroad sites, and traditional root-gathering areas. There are no recorded sacred sites in the study area.	Thirty-six recorded cultural areas. All sites important, no levels given.	Thirty-eight recorded cultural areas. All sites important, no levels given.	Thirty-eight recorded cultural areas. All sites important, no levels given.	Forty recorded cultural areas. All sites important, no levels given.	No new impacts would occur.
Public Health & Safety (See Sections 3.12, *Public Health and Safety*, and 4.11, *Public Health and Safety*.)	Electric and magnetic fields are found around existing transmission lines. Corona-generated audible noise is present near existing transmission lines in the area. Hazardous and toxic materials are found in substation equipment and are used in maintenance activities.	Health and safety impacts would be low to moderate. Noise impacts would be low.	Impact would be similar to the Preferred Alternative.	Health and safety impacts would be low. Noise impacts would be low.	Impacts would be similar to Alternative 3.	No new impacts would occur.
Air Quality (See Sections 3.13, *Air Quality*, and 4.12, *Air Quality*.)	Air quality in the area is generally good. Wind-blown dust is the leading cause of diminished air quality.	Dust during construction activities would have a temporary low impact. There would be no long-term air quality impacts from this alternative.	Similar to Preferred Alternative.	Similar to Preferred Alternative.	Similar to Preferred Alternative.	No new impacts would occur.

Table 2.8-2
Comparison of Alternatives to Project Purposes

Purposes	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action Alternative
Maintain transmission system reliability	• Provides another line north of the Hanford Substation. • Connecting two existing 500-kV lines and the new line to Wautoma Substation would reduce system impacts resulting from the potential loss of two existing lines south of the Hanford Substation. • Creates a new switching station for the 500-kV transmission grid.	• Provides another line north of the Hanford Substation.	• Provides another line north of the Hanford Substation. • Connecting the existing 500-kV lines and the new line to Wautoma Substation would reduce system impacts resulting from the potential loss of two existing lines south of the Hanford Substation. • Creates a new switching station for the 500-kV transmission grid.	• Provides another line north of the Hanford Substation. • May increase the risk of losing the existing and new line north of the Hanford Substation.	• Transmission system would remain at the existing level of capacity and reliability.
Optimize System Usage	• Would reduce loading of existing transmission lines west of the Cascades by 170 MW. • Would facilitate the integration of new generation.	• Would reduce loading of existing transmission lines west of the Cascades by 140 MW. • Would facilitate the integration of new generation.	• Would reduce loading of existing transmission lines west of the Cascades by 170 MW. • Would facilitate the integration of new generation.	• Would reduce loading of existing transmission lines west of the Cascades by 140 MW. • Would facilitate the integration of new generation.	• Would not off-load the existing transmission lines west of the Cascades. • Would not facilitate the integration of new generation.
Minimize environmental impacts *(See Table 2.8-1, Summary of Impacts)*	Would create the least environmental impacts of all alternatives. Segment D essentially expands existing ROW, reducing impacts to areas presently unaffected by transmission lines. Cumulative impacts less than constructing new roads in undisturbed areas.	Would create more environmental impacts than the Preferred Alternative. Segment E would cause impacts by establishing a new ROW in the vicinity of, but not directly adjacent to an existing ROW.	Would create a similar level of environmental impacts as Alternative 1A. Segment C would be a new ROW through the YTC causing impacts to plants and wildlife through the disturbance of the shrub-steppe ecosystem.	Would create a similar level of environmental impacts as Alternative 3. Segment F would be a new ROW along the Saddle Mountains causing impacts to plants and wildlife through the disturbance shrub-steppe lands.	Would not cause any construction related environmental impacts.

Purposes	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action Alternative
Minimize costs	Estimated cost of $76,500,000.	Estimated cost of $88,000,000. The increased cost would be due to land costs to purchase of easements across farmland between Vantage and Hanford Substations.	Estimated cost of $67,000,000. This cost does not reflect all costs potentially associated with this alternative. No land costs were added to the estimate for the purchase of easements across the YTC. It is possible that in lieu of an easement payment, BPA would compensate the Army for the loss of the use of land used for maneuvers (i.e., purchasing adjoining land).	Estimated cost of $67,000,000. Segment F avoids much of the agricultural areas and thus reduces land costs.	No costs associated with this alternative.
Provide earliest energization date	Would meet the scheduled energization date of late 2004.	Would be difficult to meet the energization date. Acquiring easements across irrigated agricultural land could potentially delay the schedule. In addition, obtaining easements through Hanford Reach National Monument could also delay the schedule.	Would likely not meet the energization date due to Army reluctance to allow a new ROW to cross the military reservation. This land is also of high concern to the tribes.	Would be difficult to meet energization date. Obtaining easements through Hanford Reach National Monument could potentially delay the schedule.	Not applicable.