

Table of Contents

Summary	S-1
S.1 Purpose of and Need for Action	S-1
S.1.1 Background	S-1
S.1.2 Need for Action	S-1
S.1.3 Public Involvement	S-3
S.2 Project Overview	S-4
S.2.1 Proposed Action Alternatives	S-5
S.2.2 No Action Alternative	S-9
S.3 Environmental Impacts	S-9
S.3.1 Land	S-10
S.3.2 Recreation	S-19
S.3.3 Visual Resources	S-24
S.3.4 Electric and Magnetic Fields	S-28
S.3.5 Noise	S-29
S.3.6 Health and Safety	S-31
S.3.7 Socioeconomics	S-33
S.3.8 Transportation	S-40
S.3.9 Cultural Resources	S-43
S.3.10 Geology and Soils	S-46
S.3.11 Water	S-51
S.3.12 Wetlands	S-57
S.3.13 Vegetation	S-60
S.3.14 Wildlife	S-67
S.3.15 Fish	S-76
S.3.16 Climate	S-81
S.3.17 Air Quality	S-82
S.3.18 Greenhouse Gases	S-83
S.3.19 Cumulative Impacts	S-84
Chapter 1 Purpose of and Need for Action	1-1
1.1 Background	1-1
1.1.1 About BPA	1-1
1.1.2 BPA’s Transmission System	1-2
1.1.3 Planning for Transmission Additions in the I-5 Corridor	1-10
1.2 Need for Action	1-12
1.3 Purposes	1-13
1.4 Transmission System Benefits	1-13
1.5 Agency Roles	1-13
1.5.1 Lead and Cooperating Agencies	1-13
1.5.2 Other Agencies That May Use this EIS	1-14
1.6 Public Involvement and Major Issues	1-15
1.6.1 EIS Scoping Outreach	1-15
1.6.2 Public Scoping Meetings	1-15
1.6.3 EIS Scoping Comment Summary	1-16
1.6.4 Post-Scoping BPA Public Meetings	1-17

Table of Contents

1.6.5	Post Scoping Outreach and Public Comments.....	1-18
1.6.6	Draft EIS Release, Outreach and Public Comments.....	1-19
1.6.7	Draft EIS Drop-in Sessions and Public Meetings.....	1-20
1.6.8	Draft EIS Comment Summary.....	1-21
1.6.9	Additional Outreach.....	1-24
1.7	Issues Outside the Scope of the I-5 Project or this EIS.....	1-25
1.7.1	Regional Generation Development.....	1-25
1.7.2	Regional Transmission Development.....	1-26
1.8	Organization of this EIS.....	1-26
Chapter 2	Facility Siting, Route Segments, and Action Alternatives.....	2-1
2.1	Facility Siting.....	2-1
2.2	Developing Route Segments and Substation Sites.....	2-4
2.2.1	Transmission Line Route Segments.....	2-8
2.2.2	Substation Sites.....	2-8
2.3	Creating Alternatives from Route Segments.....	2-9
2.3.1	West Alternative and Options.....	2-10
2.3.2	Central Alternative and Options.....	2-11
2.3.3	East Alternative and Options.....	2-12
2.3.4	Crossover Alternative and Options.....	2-13
Chapter 3	Project Components and Construction, Operation, and Maintenance Activities.....	3-1
3.1	Easements and Land Purchases.....	3-1
3.2	Transmission Towers.....	3-2
3.2.1	Tower Types.....	3-2
3.2.2	Tower Footings.....	3-6
3.2.3	Tower Disturbance Areas.....	3-6
3.2.4	Tower Construction, Columbia River Crossing.....	3-7
3.3	Conductors.....	3-8
3.4	Overhead Ground Wire and Counterpoise.....	3-8
3.5	Communications and Control Equipment.....	3-10
3.6	Pulling and Tensioning Sites.....	3-11
3.7	Obstruction Lighting and Marking.....	3-12
3.8	Substations.....	3-14
3.9	Access Roads.....	3-15
3.10	Staging Areas and Helicopter Fly Yards.....	3-17
3.11	Vegetation Clearing.....	3-17
3.12	Mitigation Measures.....	3-18
3.13	Final Project Design and Construction Process.....	3-19
3.14	Construction Schedule and Work Crews.....	3-21
3.15	Maintenance.....	3-22
Chapter 4	Proposed Action and Alternatives.....	4-1
4.1	Proposed Action Alternatives.....	4-1

4.2	West Alternative	4-3
4.2.1	West Option 1	4-5
4.2.2	West Option 2	4-6
4.2.3	West Option 3	4-6
4.2.4	Substation Sites.....	4-7
4.2.5	Access Roads.....	4-12
4.2.6	Communications and Control Equipment	4-12
4.3	Central Alternative.....	4-12
4.3.1	Central Option 1.....	4-15
4.3.2	Central Option 2.....	4-15
4.3.3	Central Option 3.....	4-15
4.3.4	Substation Sites.....	4-16
4.3.5	Access Roads.....	4-20
4.3.6	Communications and Control Equipment	4-20
4.4	East Alternative.....	4-20
4.4.1	East Option 1.....	4-21
4.4.2	East Option 2.....	4-22
4.4.3	East Option 3.....	4-22
4.4.4	Substation Sites.....	4-22
4.4.5	Access Roads.....	4-22
4.4.6	Communications and Control Equipment	4-23
4.5	Crossover Alternative.....	4-23
4.5.1	Crossover Option 1	4-24
4.5.2	Crossover Option 2	4-24
4.5.3	Crossover Option 3	4-24
4.5.4	Substation Sites.....	4-24
4.5.5	Access Roads.....	4-24
4.5.6	Communications and Control Equipment	4-25
4.6	No Action Alternative.....	4-25
4.7	Alternatives Considered but Eliminated from Detailed Study.....	4-26
4.7.1	Non-Wires Alternative	4-26
4.7.2	Transmission Line Routing Alternatives.....	4-28
4.7.3	Lower Voltage Line Upgrades	4-34
4.7.4	Reynolds Aluminum Plant Facilities.....	4-34
4.7.5	High Voltage Direct Current (HVDC) Technology.....	4-34
4.7.6	Columbia River Underwater Alternative	4-34
4.7.7	Undergrounding the Transmission Line.....	4-35
4.7.8	Double-circuiting the I-5/Ross-Lexington Transmission Lines	4-36
4.8	Comparison of Alternatives	4-37
4.9	Preferred Alternative	4-37
Chapter 5	Land	5-1
5.1	Affected Environment.....	5-1
5.1.1	Land Ownership.....	5-1
5.1.2	Land Use	5-1
5.1.3	General Land Ownership and Use—West Alternative and Options	5-5

5.1.4	General Land Ownership and Use—Central Alternative and Options	5-6
5.1.5	General Land Ownership and Use—East Alternative and Options	5-8
5.1.6	General Land Ownership and Use—Crossover Alternative and Options	5-9
5.2	Environmental Consequences	5-10
5.2.1	Impact Levels	5-10
5.2.2	Impacts Common to Action Alternatives	5-11
5.2.3	Castle Rock Substation Sites	5-17
5.2.4	West Alternative	5-18
5.2.5	Central Alternative	5-26
5.2.6	East Alternative	5-32
5.2.7	Crossover Alternative	5-35
5.2.8	Recommended Mitigation Measures	5-39
5.2.9	Unavoidable Impacts	5-40
5.2.10	No Action Alternative	5-40
Chapter 6	Recreation	6-1
6.1	Affected Environment	6-1
6.1.1	Parks and Recreation Facilities	6-12
6.1.2	Sightseeing	6-12
6.1.3	Non-Motorized Trails	6-13
6.1.4	Motorized Trails	6-13
6.1.5	Hunting	6-13
6.1.6	Campgrounds	6-14
6.1.7	Water-Based Recreation	6-14
6.1.8	Dispersed Recreation	6-14
6.2	Environmental Consequences	6-15
6.2.1	Impact Levels	6-15
6.2.2	Impacts Common to Action Alternatives	6-15
6.2.3	Castle Rock Substation Sites	6-18
6.2.4	West Alternative	6-18
6.2.5	Central Alternative	6-23
6.2.6	East Alternative	6-27
6.2.7	Crossover Alternative	6-31
6.2.8	Recommended Mitigation Measures	6-34
6.2.9	Unavoidable Impacts	6-34
6.2.10	No Action Alternative	6-34
Chapter 7	Visual Resources	7-1
7.1	Methodology	7-1
7.1.1	Landscape Rating Determination	7-1
7.1.2	Visual Resource Impact Determination	7-4
7.2	Affected Environment	7-5
7.2.1	West Alternative and Options	7-7
7.2.2	Central Alternative and Options	7-8
7.2.3	East Alternative and Options	7-9
7.2.4	Crossover Alternative and Options	7-10
7.2.5	Substation Sites	7-11
7.3	Environmental Consequences	7-12

7.3.1	Impact Levels	7-12
7.3.2	Impacts Common to Action Alternatives	7-13
7.3.3	Castle Rock Substation Sites	7-15
7.3.4	West Alternative	7-15
7.3.5	Central Alternative	7-29
7.3.6	East Alternative	7-41
7.3.7	Crossover Alternative	7-43
7.3.8	Recommended Mitigation Measures	7-45
7.3.9	Unavoidable Impacts	7-46
7.3.10	No Action Alternative	7-46
Chapter 8	Electric and Magnetic Fields	8-1
8.1	Affected Environment	8-1
8.1.1	Electric Fields	8-1
8.1.2	Magnetic Fields	8-2
8.1.3	Electromagnetic Interference	8-3
8.2	Environmental Consequences	8-3
8.2.1	Impact Levels	8-3
8.2.2	Impacts Common to Action Alternatives	8-4
8.2.3	EMF Calculations	8-8
8.2.4	West Alternative and Options	8-10
8.2.5	Central Alternative and Options	8-12
8.2.6	East Alternative and Options	8-15
8.2.7	Crossover Alternative and Options	8-17
8.2.8	Recommended Mitigation Measures	8-19
8.2.9	Unavoidable Impacts	8-19
8.2.10	No Action Alternative	8-19
Chapter 9	Noise	9-1
9.1	Affected Environment	9-1
9.1.1	Noise Definitions and Limits	9-1
9.1.2	Existing Noise	9-2
9.2	Environmental Consequences	9-2
9.2.1	Impact Levels	9-3
9.2.2	Impacts Common to Action Alternatives	9-3
9.2.3	Castle Rock Substation Sites	9-6
9.2.4	West Alternative and Options	9-7
9.2.5	Central Alternative and Options	9-9
9.2.6	East Alternative and Options	9-10
9.2.7	Crossover Alternative and Options	9-11
9.2.8	Recommended Mitigation Measures	9-12
9.2.9	Unavoidable Impacts	9-12
9.2.10	No Action Alternative	9-12
Chapter 10	Health and Safety	10-1
10.1	Affected Environment	10-1
10.1.1	Public Health and Safety	10-1

Table of Contents

10.1.2	Toxic and Hazardous Substances	10-1
10.1.3	Fire.....	10-8
10.1.4	Air and Water Transportation	10-8
10.1.5	Acts of Vandalism, Sabotage, and Terrorism	10-8
10.1.6	Vegetation Management	10-9
10.2	Environmental Consequences	10-9
10.2.1	Impact Levels.....	10-9
10.2.2	Impacts Common to Action Alternatives	10-10
10.2.3	Castle Rock Substation Sites.....	10-17
10.2.4	West Alternative and Options	10-17
10.2.5	Central Alternative and Options.....	10-17
10.2.6	East and Crossover Alternative and Options.....	10-17
10.3.	Recommended Mitigation Measures	10-18
10.3.1	Unavoidable Impacts.....	10-18
10.3.2	No Action Alternative	10-18
Chapter 11 Socioeconomics.....		11-1
11.1	Affected Environment.....	11-1
11.1.1	Population and Housing	11-1
11.1.2	Employment and Income	11-2
11.1.3	Public Services and Infrastructure.....	11-3
11.1.4	Government Revenue	11-3
11.1.5	Property Value.....	11-6
11.1.6	Agricultural Production	11-6
11.1.7	Private Timber Production	11-7
11.1.8	Community Values	11-7
11.1.9	Environmental Justice	11-10
11.2	Environmental Consequences	11-15
11.2.1	Impact Levels.....	11-15
11.2.2	Impacts Common to Action Alternatives	11-16
11.2.3	Castle Rock Substation Sites.....	11-32
11.2.4	West Alternative and Options	11-34
11.2.5	Central Alternative and Options.....	11-44
11.2.6	East Alternative and Options.....	11-46
11.2.7	Crossover Alternative and Options	11-48
11.2.8	Recommended Mitigation Measures.....	11-50
11.2.9	Unavoidable Impacts.....	11-51
11.2.10	No Action Alternative	11-51
Chapter 12 Transportation.....		12-1
12.1	Affected Environment.....	12-1
12.1.1	Highways, State Routes, and Local Roads.....	12-1
12.1.2	Public Transit	12-2
12.1.3	Railroads.....	12-2
12.1.4	Airports.....	12-2
12.1.5	Marine Traffic	12-3
12.2	Environmental Consequences	12-3
12.2.1	Impact Levels.....	12-3

12.2.2	Impacts Common to Action Alternatives	12-4
12.2.3	Castle Rock Substation Sites.....	12-7
12.2.4	West Alternative.....	12-8
12.2.5	Central Alternative	12-11
12.2.6	East Alternative	12-12
12.2.7	Crossover Alternative	12-13
12.2.8	Recommended Mitigation Measures.....	12-14
12.2.9	Unavoidable Impacts.....	12-14
12.2.10	No Action Alternative	12-14
Chapter 13	Cultural Resources	13-1
13.1	Affected Environment.....	13-1
13.1.1	Area of Potential Effect	13-3
13.1.2	Pre-Contact and Historic Archaeological Sites	13-3
13.1.3	Traditional Cultural Properties	13-4
13.1.4	Historic Resources	13-5
13.2	Environmental Consequences	13-6
13.2.1	Impact Levels.....	13-6
13.2.2	Impacts Common to Action Alternatives	13-6
13.2.3	Castle Rock Substation Sites.....	13-9
13.2.4	West Alternative and Options	13-9
13.2.5	Central Alternative and Options.....	13-10
13.2.6	East Alternative and Options.....	13-11
13.2.7	Crossover Alternative and Options	13-12
13.3	Recommended Mitigation Measures	13-12
13.4	Unavoidable Impacts	13-13
13.5	No Action Alternative.....	13-13
Chapter 14	Geology and Soils.....	14-1
14.1	Affected Environment.....	14-1
14.1.1	Geology.....	14-1
14.1.2	Soils.....	14-3
14.2	Environmental Consequences	14-4
14.2.1	Impact Levels.....	14-4
14.2.2	Impacts Common to Action Alternatives	14-4
14.2.3	Castle Rock Substation Sites.....	14-7
14.2.4	West Alternative.....	14-9
14.2.5	Central Alternative	14-12
14.2.6	East Alternative	14-14
14.2.7	Crossover Alternative	14-15
14.2.8	Recommended Mitigation Measures.....	14-17
14.2.9	Unavoidable Impacts.....	14-18
14.2.10	No Action Alternative	14-18
Chapter 15	Water.....	15-1
15.1	Affected Environment.....	15-1
15.1.1	Watersheds	15-1

Table of Contents

15.1.2	Riparian Buffers	15-2
15.1.3	Floodplains	15-2
15.1.4	Surface Water	15-2
15.1.5	Groundwater	15-3
15.2	Environmental Consequences	15-5
15.2.1	Impact Levels	15-5
15.2.2	Impacts Common to Action Alternatives	15-6
15.2.3	Castle Rock Substation Sites	15-12
15.2.4	West Alternative	15-14
15.2.5	Central Alternative	15-18
15.2.6	East Alternative	15-20
15.2.7	Crossover Alternative	15-22
15.2.8	Recommended Mitigation Measures	15-23
15.2.9	Unavoidable Impacts	15-24
15.2.10	No Action Alternative	15-25
Chapter 16 Wetlands		16-1
16.1	Affected Environment	16-1
16.1.1	West Alternative and Options	16-4
16.1.2	Central Alternative and Options	16-5
16.1.3	East Alternative and Options	16-6
16.1.4	Crossover Alternative and Options	16-7
16.1.5	Sundial Substation	16-7
16.1.6	Castle Rock Substation Sites	16-7
16.2	Environmental Consequences	16-8
16.2.1	Impact Levels	16-8
16.2.2	Impacts Common to Action Alternatives	16-9
16.2.3	Castle Rock Substation Sites	16-10
16.2.4	West Alternative	16-11
16.2.5	Central Alternative	16-15
16.2.6	East Alternative	16-16
16.2.7	Crossover Alternative	16-18
16.2.8	Recommended Mitigation Measures	16-19
16.2.9	Unavoidable Impacts	16-19
16.2.10	No Action Alternative	16-19
Chapter 17 Vegetation		17-1
17.1	Affected Environment	17-1
17.1.1	General Vegetation Types	17-1
17.1.2	Special-Status Plant Habitats	17-7
17.1.3	Special-Status Species	17-12
17.1.4	Weeds	17-19
17.2	Environmental Consequences	17-21
17.2.1	Impact Levels	17-21
17.2.2	Impacts Common to Action Alternatives	17-22
17.2.3	Castle Rock Substation Sites	17-26
17.2.4	West Alternative	17-27
17.2.5	Central Alternative	17-33

17.2.6	East Alternative	17-35
17.2.7	Crossover Alternative	17-36
17.2.8	Recommended Mitigation Measures	17-38
17.2.9	Unavoidable Impacts	17-39
17.2.10	No Action Alternative	17-39
Chapter 18	Wildlife	18-1
18.1	Affected Environment	18-1
18.1.1	Wildlife Habitats and Species	18-2
18.1.2	WDFW Priority Habitats	18-5
18.1.3	ODFW Strategy Habitats	18-11
18.1.4	Special-Status Wildlife	18-11
18.2	Environmental Consequences	18-24
18.2.1	Impact Levels	18-24
18.2.2	Impacts Common to Action Alternatives	18-25
18.2.3	Castle Rock Substation Sites	18-33
18.2.4	West Alternative	18-34
18.2.5	Central Alternative	18-52
18.2.6	East Alternative	18-61
18.2.7	Crossover Alternative	18-72
18.2.8	Recommended Mitigation Measures	18-83
18.2.9	Unavoidable Impacts	18-84
18.2.10	No Action Alternative	18-84
Chapter 19	Fish	19-1
19.1	Affected Environment	19-1
19.1.1	Special-Status Species	19-1
19.1.2	Fish Habitat	19-11
19.2	Environmental Consequences	19-11
19.2.1	Impact Levels	19-12
19.2.2	Impacts Common to Action Alternatives	19-13
19.2.3	Castle Rock Substation Sites	19-18
19.2.4	West Alternative	19-19
19.2.5	Central Alternative	19-24
19.2.6	East Alternative	19-27
19.2.7	Crossover Alternative	19-29
19.2.8	Recommended Mitigation Measures	19-31
19.2.9	Unavoidable Impacts	19-32
19.2.10	No Action Alternative	19-32
Chapter 20	Climate	20-1
20.1	Affected Environment	20-1
20.2	Environmental Consequences	20-3
20.2.1	Impact Levels	20-3
20.2.2	Impacts Common to Action Alternatives	20-3
20.2.3	Recommended Mitigation Measures	20-4
20.2.4	Unavoidable Impacts	20-4
20.2.5	No Action Alternative	20-4

Chapter 21	Air Quality	21-1
21.1	Affected Environment.....	21-1
21.2	Environmental Consequences	21-2
21.2.1	Impact Levels.....	21-2
21.2.2	Impacts Common to Action Alternatives	21-2
21.2.3	Recommended Mitigation Measures.....	21-4
21.2.4	Unavoidable Impacts.....	21-4
21.2.5	No Action Alternative	21-4
Chapter 22	Greenhouse Gases	22-1
22.1	Affected Environment.....	22-1
22.2	Environmental Consequences	22-3
22.2.1	Impact Levels.....	22-3
22.2.2	Impacts Common to Action Alternatives	22-3
22.2.3	Recommended Mitigation Measures.....	22-8
22.2.4	Unavoidable Impacts.....	22-9
22.2.5	No Action Alternative	22-9
Chapter 23	Intentional Destructive Acts	23-1
Chapter 24	Short-Term Uses versus Long-Term Productivity	24-1
24.1	Soil Productivity	24-1
24.2	Hydrological Productivity.....	24-1
24.3	Biological Productivity.....	24-2
24.4	Economic Productivity	24-3
Chapter 25	Irreversible or Irretrievable Commitment of Resources	25-1
25.1	Project Materials.....	25-1
25.2	Geology and Soils.....	25-1
25.3	Biological Resources.....	25-1
25.4	Cultural Resources	25-2
25.5	Land Clearing and Use.....	25-2
25.6	Greenhouse Gases	25-2
Chapter 26	Cumulative Impacts	26-1
26.1	Affected Resources and Resource Boundaries	26-1
26.2	Cumulative Actions	26-2
26.2.1	Past and Present Actions.....	26-2
26.2.2	Reasonably Foreseeable Future Actions	26-7
26.3	Cumulative Impacts Analysis	26-84
26.3.1	Land	26-84
26.3.2	Recreation	26-85
26.3.3	Visual Resources.....	26-86
26.3.4	Electric and Magnetic Fields.....	26-87
26.3.5	Noise.....	26-88
26.3.6	Public Health and Safety.....	26-88
26.3.7	Socioeconomics.....	26-89

26.3.8	Transportation.....	26-91
26.3.9	Cultural Resources.....	26-92
26.3.10	Geology and Soils	26-92
26.3.11	Water.....	26-94
26.3.12	Wetlands	26-95
26.3.13	Vegetation	26-96
26.3.14	Wildlife	26-97
26.3.15	Fish.....	26-99
26.3.16	Air Quality.....	26-101
26.3.17	Greenhouse Gases.....	26-101
26.3.18	Climate.....	26-103
Chapter 27 Consultation, Review, and Permit Requirements		27-1
27.1	National Environmental Policy Act	27-1
27.2	Endangered Species Act of 1973.....	27-1
27.3	Fish and Wildlife Conservation Act of 1980	27-3
27.4	Magnuson-Stevens Fishery Conservation and Management Act.....	27-3
27.5	Migratory Bird Treaty Act of 1918	27-3
27.6	Bald and Golden Eagle Protection Act of 1940.....	27-4
27.7	Federal Noxious Weed Act.....	27-4
27.8	Clean Air Act.....	27-4
27.9	Greenhouse Gases	27-5
27.10	Clean Water Act	27-6
27.10.1	Section 404.....	27-6
27.10.2	Section 401.....	27-9
27.10.3	Section 402.....	27-9
27.10.4	Section 303d.....	27-9
27.11	Floodplains and Wetlands (Executive Orders 11988 and 11990).....	27-10
27.12	Rivers and Harbors Act of 1899	27-11
27.13	Coastal Zone Management Act.....	27-11
27.14	Hazardous Materials	27-12
27.14.1	Resource Conservation and Recovery Act.....	27-12
27.14.2	Toxic Substances Control Act	27-12
27.14.3	Federal Insecticide, Fungicide and Rodenticide Act.....	27-12
27.15	Cultural Resources	27-13
27.16	Tribal Consultation.....	27-14
27.17	Federal Aviation Administration	27-15
27.18	National Trails System Act	27-15
27.19	Lewis and Clark National Historic Trail.....	27-15
27.20	Oregon National Historic Trail	27-16
27.21	Noise Control Act	27-16
27.22	Environmental Justice	27-16
27.23	Federal Communications Commission Regulations.....	27-17

27.24	Farmland Protection Policy Act.....	27-17
27.25	National Scenic Byways Program.....	27-18
27.26	State, Area-Wide, and Local Plan and Program Consistency.....	27-18
27.26.1	Washington and Oregon Statewide Plans and Programs	27-19
27.26.2	Washington Local Plans and Programs	27-23
27.26.3	Oregon Local Plans and Programs.....	27-34
Chapter 28 Consistency with State Substantive Standards.....		28-1
28.1	Washington EFSEC Standards	28-2
28.1.1	Natural Environment—Energy and Natural Resources.....	28-2
28.1.2	Transportation.....	28-3
28.1.3	Socioeconomic.....	28-4
28.1.4	Land Use and Zoning	28-6
28.1.5	Site Restoration and Preservation.....	28-6
28.1.6	Geology and Soils	28-6
28.1.7	Water Quality	28-7
28.1.8	Wetlands	28-7
28.1.9	Fish and Wildlife	28-7
28.1.10	Air Quality.....	28-8
28.1.11	Public Health and Safety.....	28-8
28.2	Washington State Department of Natural Resources Standards	28-9
28.2.1	Compliance and Cooperation with other State and Federal Laws.....	28-10
28.2.2	Geology and Soils	28-10
28.2.3	Water Quality	28-11
28.2.4	Biological Resources	28-11
28.2.5	Cultural Resources.....	28-12
28.2.6	Land Use and Socioeconomics	28-12
28.2.7	Fish and Wildlife	28-13
28.2.8	Transportation and Access	28-13
28.2.9	Washington’s Forest Practices Act and Rules	28-14
28.2.10	State-Owned Aquatic Lands	28-14
28.2.11	Public Health and Safety.....	28-15
28.3	Washington Department of Fish and Wildlife Standards	28-16
28.3.1	Wildlife	28-16
28.4	Washington State Department of Ecology Standards	28-18
28.4.1	Shorelines and Wetlands.....	28-18
28.4.2	Water Quality	28-21
28.4.3	Air Quality.....	28-21
28.5	Washington State Dept. of Archaeology and Historic Preservation Standards.....	28-22
28.6	Oregon Department of Energy.....	28-22
28.6.1	Soil and Geologic Resources.....	28-23
28.6.2	Land Use	28-23
28.6.3	Fish and Wildlife Habitat	28-23
28.6.4	Visual Resources.....	28-24
28.6.5	Historic, Cultural, and Archaeological Resources.....	28-24
28.6.6	Recreation	28-24
28.6.7	Socioeconomics.....	28-24

28.6.8	Public Health and Safety.....	28-25
28.6.9	Air Quality.....	28-25
28.6.10	Water Resources	28-25
Chapter 29	References.....	29-1
29.1	Works Cited.....	29-1
29.2	Additional Works Consulted	29-39
Chapter 30	List of Preparers.....	30-1
Chapter 31	Agencies, Organizations, and Persons Receiving this EIS.....	31-1
31.1	Federal Agencies	31-1
31.2	Tribes or Tribal Groups	31-1
31.3	State Agencies, Oregon.....	31-1
31.4	State Agencies, Washington	31-2
31.5	Public Officials, Oregon.....	31-2
31.6	Public Officials, Washington	31-2
31.7	Regional Government	31-3
31.8	Local Governments, Oregon	31-3
31.9	Local Governments, Washington.....	31-3
31.10	Businesses	31-3
31.11	Utilities	31-8
31.12	Interest Groups	31-9
31.12.1	Neighborhood Associations.....	31-9
31.12.2	Homeowners Associations	31-10
31.12.3	Environmental and Outdoor Recreation	31-10
31.12.4	Community	31-11
31.12.5	Schools.....	31-11
31.12.6	Governmental Councils and Committees.....	31-11
31.12.7	Business and Industry.....	31-12
31.13	Media	31-12
31.13.1	Newspapers	31-12
31.13.2	Television.....	31-12
31.13.3	Radio Stations.....	31-12
31.14	Libraries.....	31-13
31.14.1	University Repository Libraries.....	31-13
31.14.2	Public Libraries	31-13
Chapter 32	Glossary and Acronyms	32-1
32.1	Glossary.....	32-1
32.2	Acronyms	32-20
Chapter 33	Index	33-1

List of Appendices

Appendix A Washington Department of Natural Resources Lands Analysis
 Appendix B Right-of-Way Tower Configuration Tables and Figures
 Appendix B1 Right-of-Way Tower Configuration Tables and Figures – Central Alternative using Central Option 1
 Appendix C I-5 Corridor Reinforcement Project Photomap Book
 Appendix C1 I-5 Corridor Reinforcement Project Photomap Book – Central Alternative using Central Option 1
 Appendix D Underground Route Study
 Appendix D1 Underground Route Study – Castle Rock, Washougal, and Camas areas
 Appendix E Visual Assessment
 Appendix F Electrical Effects
 Appendix F1 Electrical Effects – Central Alternative using Central Option 1 (Preferred Alternative)
 Appendix G Research on Extremely Low Frequency Electric and Magnetic Fields and Health
 Appendix G1 EMF Research Updates
 Appendix H Environmental Justice Tables
 Appendix I Cultural Resource Sensitivity Scores
 Appendix J Geologic Assessment – Geologic Hazards, Soil and Slope Gradient, Geology, Shallow Bedrock, Shallow Groundwater
 Appendix K Fish Habitat and Fish Population Impacts
 Appendix L Wetland Modeling
 Appendix M Noxious Weed List
 Appendix N NEPA Disclosure Forms
 Appendix O Shoreline Management Act and Critical Area Ordinance Consistency

List of Tables

Table 1-1 Public Scoping Meetings..... 1-17
 Table 1-2 Post-Scoping Public Meetings 1-18
 Table 1-3 Draft EIS Drop-in Sessions 1-20
 Table 1-4 Draft EIS Public Meetings 1-21
 Table 2-1 Project Components..... 2-1
 Table 2-2 West Alternative and Options 2-10
 Table 2-3 Central Alternative and Options..... 2-11
 Table 2-4 East Alternative and Options..... 2-12
 Table 2-5 Crossover Alternative and Options 2-13
 Table 3-1 Typical Transmission Tower Estimated Disturbance Areas (Acres) 3-7
 Table 3-2 Mitigation Measures Included as Part of the Project 3-24
 Table 4-1 West Alternative and Options—Line Lengths (Miles) 4-5
 Table 4-2 West Alternative and Options—Access Road Lengths (Miles)..... 4-12
 Table 4-3 Central Alternative and Options—Lengths (Miles) 4-14
 Table 4-4 Central Alternative and Options—Access Road Lengths (Miles) 4-20
 Table 4-5 East Alternative and Options—Line Lengths (Miles)..... 4-21
 Table 4-6 East Alternative and Options—Access Road Lengths (Miles) 4-23
 Table 4-7 Crossover Alternative and Options—Line Lengths (Miles) 4-23
 Table 4-8 Crossover Alternative and Options—Access Road Lengths (Miles) 4-25
 Table 4-9 Comparison of Alternatives to Project Purposes 4-38
 Table 4-10 Summary of Environmental Impacts by Alternative 4-39
 Table 5-1 Numbers of Homes from the Edge of the Right-of-Way..... 5-19

Table 5-2	New Easements Required on Public and Private Land (Acres)	5-21
Table 5-3	Land Use (Acres).....	5-22
Table 6-1	Existing Recreation Resources and Activities	6-3
Table 6-2	Planned Recreation Resources and Activities	6-10
Table 6-3	West Alternative and Options—Permanent Impacts on Parks and Trails	6-20
Table 6-4	Central Alternative and Options—Permanent Impacts on Parks and Trails	6-26
Table 6-5	East Alternative and Options—Permanent Impacts on Parks and Trails	6-29
Table 6-6	Crossover Alternative and Options—Permanent Impacts on Parks and Trails	6-33
Table 7-1	Landscape Rating.....	7-4
Table 7-2	Visual Impact Rating.....	7-5
Table 7-3	Visual Impact Summary.....	7-25
Table 8-1	Typical Magnetic Field Levels	8-2
Table 8-2	West Alternative and Options—Length-Weighted Average Electric and Magnetic Field Levels	8-11
Table 8-3	Central Alternative and Options—Length-Weighted Average Electric and Magnetic Field Levels	8-14
Table 8-4	East Alternative and Options—Length-Weighted Average Electric and Magnetic Field Levels	8-16
Table 8-5	Crossover Alternative and Options—Length-Weighted Average Electric and Magnetic Field Levels	8-19
Table 9-1	Common Noise Levels	9-1
Table 9-2	Construction Equipment Noise Levels	9-4
Table 9-3	Construction Equipment Noise Levels by Distance from Construction Site	9-4
Table 9-4	Summary of Length-Weighted L_{50} Foul Weather Audible Noise Levels.....	9-8
Table 11-1	Populations of Counties, Cities, and Towns, 2013	11-1
Table 11-2	Washington State Trust Land Beneficiaries, Acres, and Timber Sales Statewide, 2014.....	11-5
Table 11-3	Race and Ethnicity by Aggregated Block Groups, County, and State.....	11-12
Table 11-4	Income and Poverty Status by Census Tract, County, and State	11-14
Table 11-5	Value of Timber Cleared From State Trust Lands (in 2014 dollars)	11-35
Table 11-6	Net Present Value of Revenue from Future Timber Harvests that Would Have Occurred on State Trust Lands but for the Project (in 2014 dollars)	11-36
Table 11-7	Value of Tax Revenue from Timber Cleared from Private Timberlands (in 2014 dollars).....	11-37
Table 11-8	Net Present Value of Tax Revenue From Future Timber Harvests that Would Have Occurred on Private Timberlands but for the Project (in 2014 dollars).....	11-38
Table 11-9	Value of Crops Removed from Production During Construction (in 2014 dollars).....	11-39
Table 11-10	Net Present Value of Revenue from Crops that Farmers Would Have Grown but for the Project (in 2014 dollars).....	11-40
Table 11-11	Value of Timber Cleared from Private and Non-WDNR Public Timberlands (in 2014 Dollars)	11-42
Table 11-12	Net Present Value of Revenue from Future Timber Harvests that Would Have Occurred on Private and non-WDNR Public Timberlands but for the Project (in 2014 dollars)	11-43
Table 12-1	Length of New and Improved Access Roads	12-9

Table of Contents

Table 12-2	Existing Roads That Could Be Used for Construction	12-10
Table 13-1	Identified Archaeological Resources within the APE for the Central Alternative using Central Option 1.....	13-4
Table 13-2	Identified Historic Resources along the Central Alternative using Central Option 1.....	13-5
Table 13-3	Cultural Resource Sensitivity Scores	13-8
Table 14-1	Potential Soil Impacts.....	14-10
Table 15-1	Summary of Groundwater Supply Sources and Protection Areas	15-10
Table 15-2	Potential Water-related Impacts.....	15-15
Table 16-1	Potential Impacts to Wetlands.....	16-13
Table 17-1	Special-Status Plant Species with the Potential to Occur in the Study Area	17-13
Table 17-2	General Vegetation Types Impacted by Right-of-Way Clearing (Acres)	17-30
Table 17-3	General Vegetation Types Converted to Towers, Access Roads, and Substations (Acres).....	17-31
Table 18-1	Wildlife Habitats and Corresponding Vegetation Types	18-1
Table 18-2	Special-Status Wildlife Species with the Potential to Occur in the Study Area	18-12
Table 18-3	General Wildlife Habitats Impacted by Right-of-Way Clearing (Acres) and Transmission Line Crossing (Miles)	18-36
Table 18-4	General Wildlife Habitat Converted to Towers, Access Roads, and Substations (Acres).....	18-37
Table 18-5	WDFW Priority Habitats Impacted by Right-of-Way Clearing (Acres) and Transmission Line Crossing (Miles)	18-43
Table 18-6	WDFW Priority Habitat Converted to Towers, Access Roads, and Substations (Acres).....	18-44
Table 19-1	Special-Status Fish Species in the Project Area.....	19-2
Table 19-2	Potential Impacts on Fish and Stream Habitat.....	19-20
Table 19-3	Potential Impacts on Fish Habitat Restoration Projects	19-23
Table 22-1	Estimated Greenhouse Gas Emissions from Construction Activities	22-5
Table 22-2	Estimated Greenhouse Gas Emissions from Operation and Maintenance.....	22-6
Table 22-3	Estimated Greenhouse Gas Storage Potential of Removed Trees	22-8
Table 26-1	Existing Port Facilities in the Project Vicinity (River Mile).....	26-6
Table 26-2	Status of Reasonably Foreseeable Future Actions Identified in the Draft EIS .	26-9
Table 26-3	Additional Reasonably Foreseeable Actions Identified after the Draft EIS Publication.....	26-32
Table 26-4	Estimated Annual CO ₂ Emissions for Each State in BPA’s Service Territory.	26-102
Table 27-1	Relative Percentages of Wetland, Stream, and Buffer Impact by Watershed for the Preferred Alternative	27-8
Table 27-2	Local Zoning Codes and Project Consistency	27-29
Table 28-1	Noise Limitations.....	28-9

List of Figures

Figure 1-1	Typical Power Flows	1-4
Figure 2-1	Schematic Location of Existing Transmission Lines and Substations	2-7
Figure 3-1	Existing and Proposed BPA Structure and Tower Types	3-4
Figure 3-2	500-kV Suspension and Dead-End Towers.....	3-5
Figure 3-3	Conductor, Insulator, Ground Wire and Fiber Optic Cable Positions on a Typical 500-kV Tower	3-9

Figure 3-4	Typical Counterpoise Placement.....	3-10
Figure 3-5	Typical Snub Placement	3-12
Figure 3-6	Example of Beacon and Waist Lighting for a Typical 500-kV Tower	3-13
Figure 3-7	Typical Transmission Line Construction Process.....	3-20
Figure 4-1	Monahan Creek Substation.....	4-7
Figure 4-2A	Sundial Substation Site—Lot 11 Option	4-10
Figure 4-2B	Sundial Substation Site—Lot 12 Option	4-11
Figure 4-3	Baxter Road Substation—Segment C	4-17
Figure 4-4	Baxter Road Substation—Segment B and D.....	4-17
Figure 4-5	Casey Road Substation	4-19
Figure 7-1	Scenic Quality Illustration.....	7-1
Figure 7-2	Viewpoint 25-1: Looking North from NE Salmon Creek Avenue, Salmon Creek (West Alternative).....	7-18
Figure 7-3	Viewpoint 25-2: Looking North-Northeast from NE 76th Avenue, Walnut Grove (West Alternative)	7-19
Figure 7-4	Viewpoint 25-3: Looking East from WSU Campus, Vancouver (West Alternative).....	7-20
Figure 7-5	Viewpoint 41-1: Looking Northwest from NE 28th Street (West Alternative).....	7-21
Figure 7-6	Viewpoint 50-1: Looking Northwest from NE 3rd Street, North of Camas (West Alternative and Crossover Option 1)	7-22
Figure 7-7	Viewpoint 40-1: Looking East-Southeast from Lacamas Heritage Trail Parking Area (West Option 1).....	7-23
Figure 7-8	Viewpoint 52-1: Looking North-Northeast from Lewis and Clark Highway, Camas (All Action Alternatives).....	7-24
Figure 7-9	Viewpoint 48-1: Looking West-Southwest from NE 267th Avenue (West Option 2, Crossover Option 2).....	7-27
Figure 7-10	Viewpoint 51-1: Looking South from NE Zeek Road, Washougal (Central, East, and Crossover Alternatives, and West Options 2 and 3).....	7-28
Figure 7-11	Viewpoint F-15: Looking North along Westside Highway near Castle Rock (Central and East Alternatives.....	7-31
Figure 7-12	Viewpoint F-21N: Looking North along Spirit Lake Memorial Highway near Castle Rock (Central and East Alternatives)	7-32
Figure 7-13	Viewpoint F-21S: Looking South along Spirit Lake Memorial Highway near Castle Rock (Central and East Alternatives)	7-33
Figure 7-14	Viewpoint M-1: Looking South near Swimming Beach on Lake Merwin, Ariel (Central and Crossover Alternatives).....	7-34
Figure 7-15	Viewpoint L-3: Looking East from Parking Area near Merwin Hatchery, Ariel (Central and Crossover Alternatives)	7-35
Figure 7-16	Viewpoint 52-8: Looking North near SE 2 nd Avenue, Camas (All Action Alternatives)	7-36
Figure 7-17	Viewpoint 52-4: Looking Southeast on W 5 th Street towards Mt. Hood near Lookout Ridge, Washougal (All Action Alternatives).....	7-37
Figure 7-18	Viewpoint 52-5: Looking South over Columbia River on W 5 th Street near Lookout Ridge, Washougal (All Action Alternatives).....	7-38
Figure 7-19	Viewpoint 52-12: Looking South over Columbia River on W Empress Street near Lookout Ridge, Washougal (All Action Alternatives).....	7-39
Figure 7-20	Viewpoint K-1: Looking E-SE from Yale Bridge Rd, Ariel (East Alternative).....	7-42

Table of Contents

Figure 8-1 Single-Circuit Tower Design to Reduce EMF 8-7
Figure 8-2 Double-Circuit Tower Design to Reduce EMF 8-7
Figure 8-3 Electric Fields Surrounding the Transmission Line on New Right-of-Way 8-9
Figure 8-4 Magnetic Fields Surrounding the Transmission Line on New Right-of-Way.... 8-10
Figure 10-1 BPA Ross Complex 10-3
Figure 10-2A Reynolds Metal Company Site using Sundial Substation Site—Lot 11 10-6
Figure 10-2B Reynolds Metal Company Site using Sundial Substation Site—Lot 12 10-7
Figure 17-1 Proposed/Existing Rights-of-Way through the Lacamas Prairie NAP/NRCA.. 17-10
Figure 20-1 Elevation Comparison of the Action Alternatives 20-2

List of Maps

Map S-1 Alternatives and Options..... follows page S-2
Map 1-1 Alternatives and Options..... follows page 1-2
Map 1-2 Regional System Map follows page 1-2
Map 2-1 Route Segment and Substation Site Development follows page 2-4
Map 2-2 Project Map November 2010 follows page 2-8
Map 2-3 West Alternative and Options follows page 2-10
Map 2-4 Central Alternative and Options follows page 2-10
Map 2-5 East Alternative and Options follows page 2-10
Map 2-6 Crossover Alternative and Options follows page 2-10
Maps 5-1A through 5-1D Land Ownership follow page 5-2
Maps 5-2A through 5-2D Land Use follow page 5-2
Maps 6-1A through 6-1D Recreation follow page 6-2
Map 6-1E Recreation Insert Maps for Maps 6-1C and 6-1D follows page 6-2
Map 7-1 Viewpoints follows page 7-12
Maps 12-1A through 12-1D Transportation Resources follow page 12-2
Maps 14-1A through 14-1D Mapped Landslides and Landslide Potential..... follow page 14-2
Maps 14-2A through 14-2D Soil Erosion Hazard Potential follow page 14-4
Map 15-1 Watersheds follows page 15-2
Maps 15-2A through 15-2D Surface Water Resources follow page 15-2
Map 15-3 Groundwater Resources..... follows page 15-4
Map 15-4 Well and Wellhead Protection Areas follows page 15-4
Maps 16-1A through 16-1D Wetlands follow page 16-2
Maps 16-2A through 16-2D Wetland Quality follow page 16-4
Maps 17-1A through 17-1D Vegetation follow page 17-2
Maps 18-1A through 18-1D High Value Native Wildlife Habitats follow page 18-6
Maps 19-1A through 19-1D Fish follow page 19-2
Map 26-1 Reasonably Foreseeable Future Projects follows page 26-8
Maps 26-2A through 26-2D Reasonably Foreseeable Actions since Draft EIS follows page 26-8

Volume 3 Comments and Responses

Volume 3A: Comments and Responses (Communications 14093 – 14379)
Volume 3B: Comments and Responses (Communications 14380 – 14600)
Volume 3C: Comments and Responses (Communications 14601 – 14701)
Volume 3D: Comments and Responses (Communications 14702 – 14746)
Volume 3E: Comments and Responses (Communications 14747 – 14798)
Volume 3F: Comments and Responses (Communications 14799 – 14827)
Volume 3G: Comments and Responses (Communications 14828 – 14843)
Volume 3H: Comments and Responses (Communications 14844 – 14919)