1.0 Introduction

Western Area Power Administration (Western), a power marketing administration within the United States (U.S.) Department of Energy (DOE), is proposing to rebuild and upgrade two 115-kilovolt (kV) single-circuit transmission lines between Flatiron Substation west of Flatiron Reservoir and the intersection of Mall Road and U.S. Highway 36 in Estes Park, Larimer County, Colorado (hereafter defined as the Project). The Project is subject to the environmental review process mandated under the National Environmental Policy Act (NEPA) of 1969.

This Environmental Impact Statement (EIS) analyzes the environmental consequences of seven action alternatives to rebuild and upgrade the existing 115-kV transmission lines, and the no-action alternative. Western is the lead Federal agency for the NEPA document. The U.S. Forest Service (USFS) has jurisdiction over National Forest System lands crossed by the transmission lines, is a cooperating agency for the EIS, and will be basing its own decision on this EIS.

This EIS has been prepared in accordance with the NEPA of 1969, as amended (42 United States Code [U.S.C.] Section 4321 et seq.*)*, the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), and DOE and USFS NEPA procedures (10 CFR Parts 1021 and 1022, and 36 CFR Part 220).

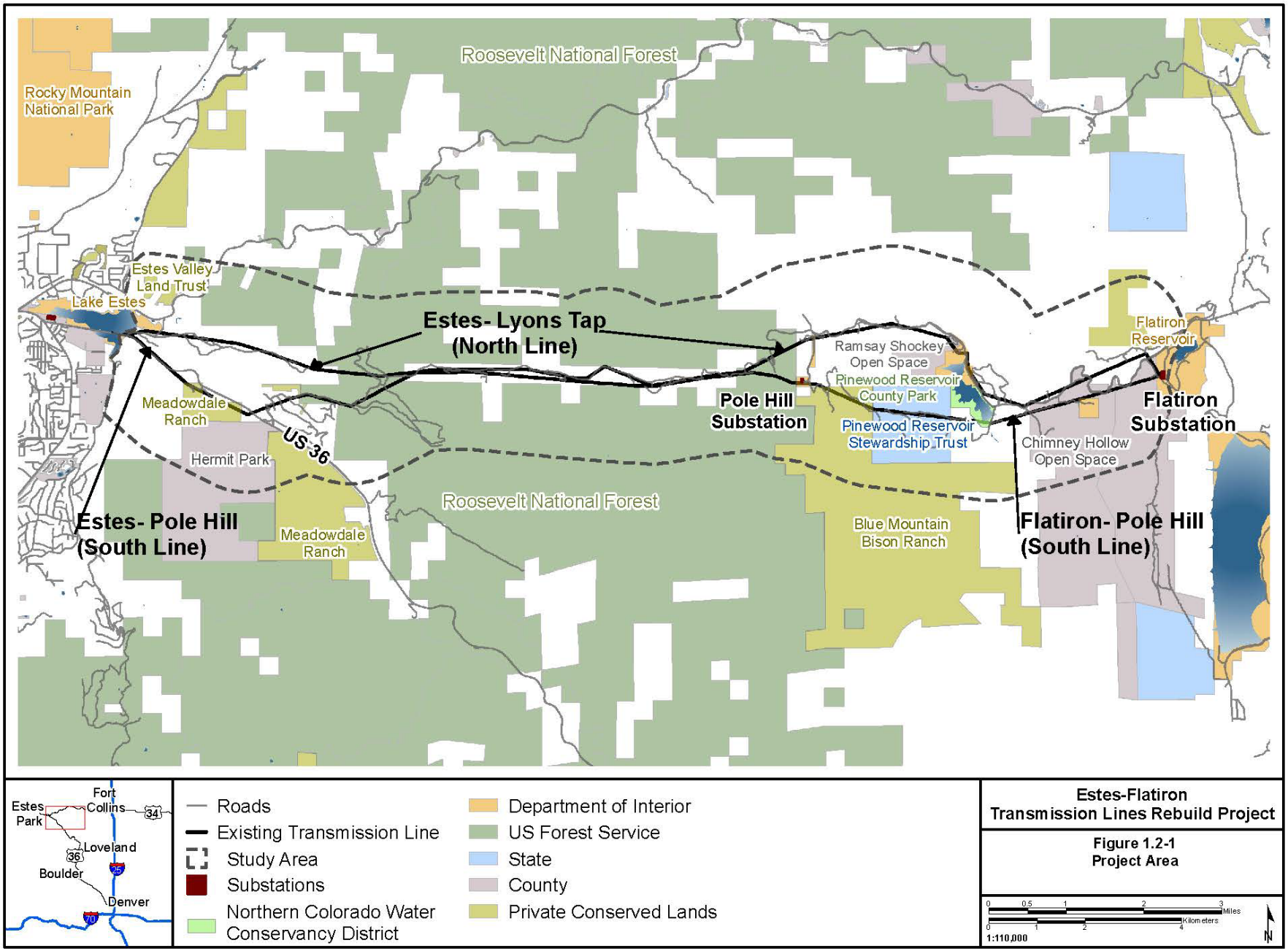
1.1 Project Location

The Project is located in Larimer County, Colorado, and extends between Lake Estes on the east side of Estes Park and Western's Flatiron Substation, west of Flatiron Reservoir. The Project area is situated east of the community of Estes Park and west of the Town of Loveland. Major transportation corridors are U.S. Highways 36 and 34, which provide access between Front Range communities to the east and Rocky Mountain National Park to the west of the Project area. The Project area includes private lands in Larimer County, and public lands administered by the U.S. Department of the Interior (DOI), USFS, the Colorado State Land Board, Northern Colorado Water Conservancy District (NCWCD) and Larimer County. **Figure 1.2-1** shows the general location of the Project.

1.2 Background

Western's mission is to market and deliver renewable, reliable, cost-based Federal hydroelectric power and related services. Western undertakes a variety of construction projects, either on its own or in partnership with other utilities or power customers. Western owns, operates, and maintains two single-circuit transmission lines between the Estes Park and Flatiron Substations. Prior to the formation of the DOE, the DOI's Bureau of Reclamation (BOR) constructed and maintained the two existing transmission lines as part of the Colorado-Big Thompson (CBT) project. The lines were constructed to transmit electricity from hydropower generation sources within the CBT project. After the formation of the DOE and Western in 1977, ownership, operation, and maintenance of the transmission lines transferred from the BOR to Western.

The Estes-Lyons Tap (E-LS) is the more northern of the two lines and will be referred to in the remainder of this document as the North Line, except where the acronym gives historical context. The second, more southerly line consists of the Estes-Pole Hill (E-PH) and Flatiron-Pole Hill (F-PH) lines which connect the Pole Hill Substation to Estes Park and the Flatiron Substation, respectively (**Figure 1.2-1**). The two south segments will be referred to in this document as the South Line, except where the acronym gives historical context. Both existing transmission lines are 115-kV single-circuit lines constructed on wood pole H-frame structures. The South Line is 14.5 miles in length and the North Line is 14.1 miles long. Western's project only encompasses the single-circuit wood-pole transmission lines from the east side of the Estes causeway and does not involve the portions of the double-circuit transmission lines located on steel lattice structures along the Estes causeway.


Roosevelt National Forest
Rocky Mountain National Park
Estes Valley Land Trust
Lake Estes
Estes- Lyons Tap (North Line)
Ramsay Shockey Open Space
Pinewood Reservoir County Park
Flatiron Reservoir
Meadowdale Ranch
US 36
Pole Hill Substation
Pinewood Reservoir Stewardship Trust
Flatiron Substation
Chimney Hollow Open Space
Hermit Park
Roosevelt National Forest
Estes- Pole Hill (South Line)
Meadowdale Ranch
Blue Mountain Bison Ranch
Flatiron- Pole Hill (South Line)
Estes Park
Fort Collins
34
Loveland
36
Boulder
25
Denver
70
Roads
Existing Transmission Line
Study Area
Substations
Northern Colorado Water Conservancy District
Department of Interior
US Forest Service
State
County
Private Conserved Lands
Estes-Flatiron Transmission Lines Rebuild Project
Figure 1.2-1 Project Area
Miles
Kilometers
1:110,000
N

The North Line was built in 1938 and the South Line in 1953. Most of the wood pole H-frame structures on the two lines are original and date from the time of construction. A single-mode fiber optic communication cable used by BOR, Western, and the Platte River Power Authority is part of the two lines. Although the majority of the existing rights-of-way (ROWs) are located on privately owned land, portions of both are located on public lands administered by the USFS, State Land Board, Larimer County Natural Resources Department, and BOR. Both of the existing lines are located within a designated utility corridor as defined in the 1984 Forest Plan for Arapaho and Roosevelt National Forests and Pawnee National Grassland (ARP) and the 1997 Revision (USFS 2012a).

1.3 Proposed Project

Western is proposing to rebuild the existing 115-kV system between Flatiron Substation and the intersection of Mall Road and U.S. Highway 36 in Estes Park. The Project would remove the existing 115-kV single-circuit transmission lines and wood structures and replace them with the following potential options: 1) a new double-circuit 115-kV transmission line on steel monopoles within a single ROW, potentially using a combination of two existing ROWs; 2) a new double circuit 115-kV transmission line on steel monopoles within a single ROW with a western portion buried in concrete cable trenches for about 2.6 miles; 3) both lines rebuilt as single-circuit transmission lines on wood-pole H-frame structures on separate ROWs, or 4) the No Action Alternative, which would keep the existing lines in place and continue established maintenance activities. The USFS action is to issue an authorization for the portion of the transmission line(s) rebuild that crosses National Forest System lands. The Project would improve access to the transmission lines for maintenance, increase the ability to restore outages more quickly, widen the ROWs where the existing ROW is inadequate, and implement an integrated vegetation management approach within the ROWs to ensure electrical clearance requirements are met and maintained for the life of the project. A detailed description of the alternatives, including the agency preferred alternative (APA) is provided in Chapter 2.0.

1.4 Purpose and Need

1.4.1 Western's Purpose and Need

Transmission systems in the U.S. are planned, operated, and maintained to meet North American Electric Reliability Corporation (NERC) reliability standards and National Electrical Safety Code (NESC) safety requirements. These organizations establish reliability, safety, and other standards for the bulk power system in the U.S. To fulfill its statutory mission, meet NERC and NESC standards, and comply with relevant legal requirements, Western must ensure its facilities meet current standards, are readily accessible for maintenance and emergencies (including vegetation maintenance), are resistant to wildfire, and are cost-effective for its customers. Through field inspections and maintenance records, Western has determined that the existing lines need to be upgraded and rebuilt.

1.4.1.1 Existing Structure Conditions

The existing wood structures are in poor condition and continue to deteriorate due to both age and the type of material with which they were constructed. Many of the existing structures on both lines suffer from core rot and cracking, and have reached or are reaching the end of their anticipated facility life. The majority of wood structures will need replacing in the near future to meet the strength and safety requirements found in NESC standards.

1.4.1.2 Existing Access Conditions

The transmission structures along the existing ROWs had access to them at one time for construction and maintenance. However, in the 60 to 75 years since the transmission lines were built, access has deteriorated at many locations. Portions of the existing lines are marginally accessible or not accessible at all, for routine maintenance and structure replacement. Inaccessible areas include sections of the existing transmission lines that span canyons, are located on steep cliff or rocky

slopes, or require crossing the Pole Hill penstock (the water pipelines between Pinewood and Flatiron reservoirs).

1.4.1.3 Existing ROW Conditions

Portions of the existing transmission lines run parallel to each other in relatively close proximity. Each line has a separate ROW. The North Line has a ROW width of only 20 to 30 feet at most locations, which is inadequate to meet reliability and safety standards. The South Line has ROW widths that range from 75 feet to 130 feet for most of its length. Western would need to widen those portions of the ROW on both lines that have an easement width of less than 110 feet. The area crossed by the transmission lines is susceptible to mountain pine beetle infestation and currently has heavy fuel loads. Where ROWs have insufficient width and heavy fuel loading, they are more vulnerable to a large wildfire event. This level of risk does not meet applicable standards or Western's commitment to its customers to provide reliable and safe power.

In many cases, ROW maintenance has been limited to removal of hazard trees. This practice typically does not address the encroaching vegetation until it becomes a threat that requires immediate attention to ensure no adverse effect to the transmission line or to avoid a fire caused by a transmission line. This reactive approach to hazardous vegetation maintenance is not conducive to ensuring the level of operating reliability that is required by today's NERC standards, nor is it efficient or cost effective. Today's stricter maintenance standards require a more proactive approach to vegetation management, with the goals of ensuring that there will be no tree-caused transmission line outages and minimizing the risk for wildfires. See Chapter 2.0 for further discussion of NERC standards and proposed vegetation management procedures.

1.4.2 Forest Service Purpose and Need

The USFS purpose and need is to determine whether to issue a special use permit for the proposed transmission lines upgrade and rebuild. In conjunction with the issuance, the USFS would bring Western's facilities under a current authorization with a defined ROW and an Operation and Maintenance Plan. The USFS would use the EIS to determine if the Project requires an amendment to the current Forest Plan.

1.5 Decision to Prepare an EIS

Western initially began preparation of an environmental assessment (EA) for the Project. Western's Project is under a class of actions in the DOE NEPA Implementing Procedures (10 CFR Part 1021) that normally requires the preparation of an EA. Subsequent to the EA determination, Western held public meetings and received numerous written and oral comments from the public and agencies on the Project during the scoping period. The public expressed concerns regarding the impacts of the Project and some of the stakeholders requested evaluation of additional alternatives. In response to input received during the initial EA scoping process, Western determined that an EIS would be the more appropriate level of NEPA review.

1.6 Public Involvement

1.6.1 Scoping

Potential issues were identified through an expanded public involvement process that included agency discussions, two sets of public scoping meetings, and scoping comments received during two formal scoping periods. The first round of public meetings was held in Estes Park and Loveland, Colorado, on November 29 and 30, 2011. At that time, Western anticipated preparing an EA for the Project. The scoping period for the EA extended from November 29 through January 31, 2012. Additional comments were received through May 2012.

Subsequent to the initial EA scoping period, Western determined that an EIS was the appropriate level of analysis for this Project. A Notice of Intent (NOI) was issued on April 17, 2012 (77 Federal Register [FR] 22774; **Appendix A**). The NOI invited public participation in the EIS scoping process and solicited public comments on the scope of the EIS during a 90-day scoping period initially set to expire on July 16, 2012. An extension of the scoping period to August 31, 2012, was subsequently announced on the project website, through a press release, email notification, and direct mailing of a project newsletter. EIS scoping meetings were held on August 6, 2012, in Loveland, Colorado, and August 7, 2012, in Estes Park, Colorado. Both meetings utilized an open house format with exhibits and opportunities for interaction with Western and USFS representatives. In response to public requests to extend the scoping period beyond the August 31, 2012, deadline, Western further extended the scoping period to October 19, 2012.

In total, more than 660 comment letters, forms and emails were received during the two scoping periods for the EA and the EIS. Both the EA and EIS Scoping Summary Reports are available for download from the project website located at:
https://www.wapa.gov/transmission/EnvironmentalReviewNEPA/Pages/estes-flatiron.aspx.

1.6.2 Alternative Development Workshops

Western implemented an expanded public involvement process for the Estes to Flatiron Transmission Lines Rebuild Project EIS. The expanded public involvement process included three public alternatives workshops held in Estes Park and Loveland during the public scoping period. The purpose of alternatives workshops was to solicit public input on route options and design features to be considered during the alternatives development process for the EIS. Workshops were held on October 2, 2012, in Loveland, and on October 3 and October 4, 2012, in Estes Park.

Alternatives workshops utilized an open house format, and sought to engage meeting attendees in interactive exercises to identify route options. Large-format informational displays provided information about the public involvement process, transmission line siting considerations, and context-sensitive design options. Maps depicting steep slopes, park and open space parcel boundaries, and viewsheds were on display, as well as large-format composite opportunity and constraint maps, to assist meeting participants with making informed suggestions on potential route options. Map booklets also provided detailed maps showing existing and proposed ROW in relation to parcel boundaries. Transmission structure options also were available for public review. A total of 49 meeting attendees signed in at the public alternatives workshops, including 27 at the meeting in Loveland, and 22 at the meetings in Estes Park.

1.6.3 Areas of Controversy

Rebuilding the transmission line on either the North Line or the South Line is controversial with the public. Neighborhood groups in proximity to the South Line expressed a strong preference for rebuilding the transmission line on the North ROW while neighborhood groups and residential uses in proximity to the North Line expressed a strong preference for rebuilding the transmission line on the South ROW. It should be noted that most, but not all, of the existing housing development construction occurred after the transmission lines were constructed. Homes within the oldest subdivision along the west region of the North Line were built starting in 1938 and into the 1940s. Homes adjacent to the South Line were first constructed in the early 1960s. A primary goal of alternatives development was to develop alternatives that responded to this conflicting input received from the public during scoping and the alternatives development workshops.

1.6.4 Issue Identification

Issues were defined as concerns about the potential effects of the Project. The range of issues was determined through agency, stakeholder, and public scoping, as well as through internal scoping between Western and the USFS. Each potential issue was evaluated to determine its relevance to the

Project. If the issue was determined to be a substantial concern, Western, in consultation with the USFS, evaluated whether it should be considered a “Key Issue” during the alternative development process. Western and the USFS cooperatively documented Key Issues. Key and other issues identified through scoping for the EIS are described in Sections 1.6.4.1 and 1.6.4.2 below.

1.6.4.1 Key Issues

Key Issues and other scoping inputs were used to guide the development of alternatives and compare the differences between the alternatives analyzed in detail. Key Issues underlined during the alternatives development include:

- Effects of new ROW acquisition on land uses, property owners, and Western's customers.
- Effects of the Project on scenic travel corridors (e.g., U.S. Highway 36), residential, and recreational viewsheds in the vicinity of Estes Park, residential developments, such as Meadowdale Hills and Newell Lake View subdivisions, and on National Forest System lands.
- Effects of new road construction in inaccessible areas with steep topography.
- Effects of the Project on recreational uses and experiences in the vicinity of Estes Park and Pinewood Reservoir, and on National Forest System lands accessed by USFS Road 122 (Pole Hill Road).
- Effects of the Project on protected areas, including county open space, lands protected by conservation easement, lands within the Stewardship Trust Program, and State Wildlife Areas. No protected areas have been identified on National Forest System lands.
- Effects of ROW expansion or new ROW acquisition on existing infrastructure (e.g., Upper Thompson Sanitation District’s treatment plant) and other structures.

1.6.4.2 Other Issues Selected for Detailed Analysis

Other issues define project effects that should be analyzed in detail in the EIS, but that have not driven alternatives development to the extent of the Key Issues. Other issues identified for detailed analysis include:

- Effects of the Project on property values and sources of revenue from tourism and outdoor recreation that Front Range communities and the regional economy rely upon.
- Effects of the Project (ground disturbance for access, pole removal, and new structure installation) on cultural resources.
- Effects of ROW clearing and road construction, road reconstruction, road reconditioning and ongoing maintenance on wetlands, soils, and water quality.
- Potential effects of electric and magnetic fields (EMFs) from high-voltage power lines on human health.
- Effects of the Project on wildlife; plants; fisheries; threatened, endangered and USFS sensitive species; management indicator species; and general species of wildlife, plants (vegetation) and fish.
- Effects of increased traffic on resources due to West Pole Hill Road improvement under Alternatives C and C1.

1.6.4.3 Issues Considered but Not Analyzed Further

The following issues were considered but not analyzed further:

- Comments that Western should replace the lattice structures along the causeway of Lake Estes as part of this Project. The lattice structures are already double-circuit and are not part of the scope of this Project.
- Comments that the E-PH transmission line is not within the USFS designated utility corridor as outlined in the ARP Forest Plan, and that consolidating the two lines on the South Line would not be in compliance with the ARP Forest Plan. The USFS has stated that the designated utility corridor includes both the transmission line ROWs (USFS 2012a).
- Comments that the Project is a “waste of taxpayer funds” were determined to be outside the scope of the EIS.
- A request that Western complete a socio-economic analysis of tourist and recreation based economies in Denver, Fort Collins, Boulder, and other Front Range cities supported by the Roosevelt National Forest. This issue is analyzed in the EIS; however, because socioeconomic effects of rebuilding the transmission would not extend beyond the immediate project vicinity, the analysis area is limited to the Town of Estes Park and Loveland.
- A request that Western expand notification during scoping and publish notices in papers in Denver, Boulder, and Longmont. Newspaper notices have been targeted for those communities where there is the greatest interest and potential for effects. Residents of Estes Park and Loveland would experience the greatest effects, and represent approximately 50 percent of the mailing addresses in the Project mailing list. Therefore, newspaper notices have been published in the Estes Park Trail-Gazette and Loveland Reporter-Herald. The USFS also published notices in their Newspaper of Record, which is the Fort Collins Coloradoan. Direct mailings, press releases, and website updates are the primary means to communicate project updates to individuals that have shown an interest in the Project and reside outside Estes Park and Loveland.
- Comments expressing general support for, or opposition to, the Project without supporting rationale were determined to be outside the scope of the EIS.

1.7 Decisions Framework

Western and the USFS prepared the EIS as the lead and cooperating Federal agencies, respectively. The results of the analysis are presented in this EIS and will form the basis for decisions regarding the Project.

Following the Draft EIS review and comment period, Western and the USFS considered comments submitted by the public, interested organizations and government agencies. Responses to all substantive comments are found in Chapter 9.0. Based on the Draft EIS and public input, Western and the USFS designated their APA and provided rationale in Sections 2.2.1.9 and 2.8. Public notice of the APA was released on Western’s Project website as well as to interested parties December 2016. Western will issue a Record of Decision (ROD) no sooner than 30 days following the issuance of this Final EIS. Western may combine elements of alternatives considered in the EIS in the ROD.

As a cooperating agency, the USFS will prepare its own ROD in accordance with its respective policies and guidelines. The USFS is required to comply with all laws (National Forest Management Act [NFMA], NEPA, Section 7 of the Endangered Species Act [ESA], National Historic Preservation Act [NHPA], etc.), regulations, and policies for the portion of the Project on lands under its jurisdiction.

Instrumental to the decisions will be the consideration of measureable indicators that have been defined to measure the effects of the different alternatives with regard to key and other issues. The measurable indicators used to compare the alternatives are presented in Chapter 2.0, **Tables 2.9-1**,

2.9-2, and **2.9-3**. The USFS decision will be subject to a pre-decisional objection process. In order to have standing to object to the USFS decision, a person(s) or organization must have submitted specific written comments during the 45-day public comment period on the Draft EIS. These comments are addressed in the Final EIS in Chapter 9.0. The Final EIS and USFS draft ROD will be made available to the public. The 45-day Objection Period will begin with publication of a legal notice in the USFS newspaper of record, the Fort Collins Coloradoan. This objection process is provided in compliance with the Consolidated Appropriations Act of 2012.

1.8 Regulatory Framework

The Project would need to comply with applicable regulatory requirements, including statutes, regulations, executive orders, DOE orders and guidance, and permit requirements. Applicable requirements may include, but are not limited to, those listed below.

1.8.1 Statutes

- Antiquities Act of 1906 (54 USC §§ 320301-320303)
- Archaeological and Historic Preservation Act of 1960 (54 USC §§ 312501-312508), as amended
- Archaeological Resources Protection Act of 1979 (16 U.S.C. §§ 470aa-mm), as amended
- Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668-668d), as amended
- Clean Air Act (CAA) of 1970 (42 U.S.C. §§ 7401 et seq.), as amended
- ESA of 1973 (7 U.S.C. § 136; 16 U.S.C. §§ 1531 et seq.), as amended
- Farmland Protection Policy Act of 1981 (7 U.S.C. §§ 4201-4209)
- Federal Water Pollution Control Act (Clean Water Act [CWA]) of 1972 (33 U.S.C. §§ 1251 et seq.), as amended
- Federal Noxious Weed Act of 1974, as amended (7 U.S.C. §§ 2814 et seq.)
- Historic Sites Act of 1935 (54 USC §320101)
- Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712), as amended
- NEPA of 1969 (42 U.S.C. §§ 4321 et seq.)
- NFMA of 1976 (16 U.S.C. §§ 1600-1614)
- NHPA 1966 (54 USC §§ 300101 et seq)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001 et seq.)
- Occupational Safety and Health Act of 1970 (29 U.S.C. § 1A651), as amended

1.8.2 Regulations

- CEQ Regulations for Implementing NEPA, 40 CFR Parts 1500-1508
- Determining Conformity of General Federal Actions to State or Federal Implementation Plans, 40 CFR Part 93, Subpart B
- Interagency Cooperation, ESA of 1973, as amended, 50 CFR Part 402
- U.S. Environmental Protection Agency (USEPA) Administered Permit Programs: the National Pollutant Discharge Elimination System (NPDES), 40 CFR Part 122
- Federal Hazardous Materials Transportation Regulations, 49 CFR Parts 171–180
- Hazardous Waste Management Regulations, 40 CFR Parts 260–270

- National Emission Standards for Hazardous Air Pollutants, 40 CFR Part 61
- National Register of Historic Places (NRHP), 36 CFR Part 60
- Occupational Safety and Health Standards and Regulations, 29 CFR Parts 1910 and 1926
- Protection of Historic Properties, 36 CFR Part 800
- U.S. Army Corps of Engineers (USACE) Regulatory Program Regulations, 33 CFR Parts 320-331.
- DOE NEPA Implementing Procedures, 10 CFR Part 1021
- DOE Compliance with Floodplain/Wetlands Environmental Review Requirements, 10 CFR Part 1022
- USFS NEPA Implementing Regulations, 36 CFR Part 220

1.8.3 Executive Orders

- Executive Order (EO) 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971
- 11988, *Floodplain Management*, May 24, 1977
- EO 11990, *Protection of Wetlands*, May 24, 1977
- EO 12875, Enhancing the Intergovernmental Partnership, October 26, 1983
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994
- EO 13084, Consultation and Coordination with Indian Tribal Governments, May 14, 1998
- EO 13112, Invasive Species, February 3, 1999
- EO 13175, Consultation and Coordination with Indian Tribal Governments, November 6, 2000
- EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001
- EO 28357, Actions to Expedite Energy-Related Projects, May 18, 2001
- EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management, 2007; and
- EO 13604, Improving Performance of Federal Permitting and Review of Infrastructure Projects, 2012.

1.8.4 DOE Orders and Guidance

- DOE Order 450.1, Environmental Protection Program
- DOE Order 451.1B, NEPA Compliance Program
- Office of NEPA Policy and Assistance, *Environmental Impact Statement Checklist*, November 12, 1997
- Office of NEPA Policy and Assistance, *Environmental Impact Statement Summary*, September 29, 1998
- Office of NEPA Policy and Compliance, *The EIS Comment-Response Process*, October 8, 2004
- Office of NEPA Policy and Compliance, Recommendations for the Preparation of EAs and EISs, Second Edition (the Green Book), December 23, 2004
- Office of NEPA Policy and Compliance, *EIS Distribution*, June 15, 2006

- Office of NEPA Policy and Compliance, Need to Consider Intentional Destructive Acts in NEPA Documents, December 1, 2006
- Office of NEPA Policy and Compliance, Procedures for Submitting Documents for Posting on the DOE NEPA Website, August 2008

1.8.5 Forest Service Directives

The USFS Directive System consists of the USFS manual and handbooks, which codify the agency's policy, practice, and procedure. The system serves as the primary basis for the internal management and control of all programs and the primary source of administrative direction to USFS employees. The Forest Service Manual (FSM) contains legal authorities, objectives, policies, responsibilities, instructions, and guidance needed on a continuing basis by USFS line officers and primary staff to plan and execute programs and activities. Forest Service Handbooks (FSH) are the principal source of specialized guidance and instruction for carrying out the direction issued in the FSM. Applicable USFS directives may include, but are not limited to, those listed below.

- FSM 1950, Environmental Policy and Procedures
- FSH 1909.15, Environmental Policy and Procedures Handbook
- FSM 2330, Publicly Managed Recreation Opportunities
- FSM 2520, Watershed Protection and Management
- FSH 2509.25, Watershed Conservation Practices Handbook
- FSM 2550, Soil Management
- FSH 2509.18, Soil Management Handbook
- FSM 2630, Management of Wildlife and Fish Habitat
- FSM 2670, Threatened, Endangered and Sensitive Plants and Animals
- FSH 2609.13, Wildlife and Fisheries Program Management Handbook
- FSM 2710, Special Use Authorizations
- FSH 2709.11, Special Uses Handbook
- FSH 701, Landscape Aesthetics, a Handbook for Scenery Management

1.8.6 State and Local Requirements

Federal agencies are not required to comply with the regulatory requirements of state or local land use regulations. Nevertheless, Western would plan, design, construct, and operate the Project in accordance with the substantive requirements of state and local plans and policies, whenever practicable.

1.9 Permits and Approvals

Permits and approvals that may be required for project implementation are summarized in **Table 1.9-1**.

Table 1.9-1 Permits and Approvals

Permit or Approval	Description	Statute or Regulation	Administrative Authority
Special-Use Authorization	A special-use authorization is a legal document such as a permit, term permit, lease, or easement, which allows occupancy, use, rights or privileges on National Forest System lands. The authorization is granted for a specific use of land for a specific period of time.	36 CFR Part 251	USFS
CWA § 401 Water Quality Certification	§ 401 of the CWA requires that federally permitted actions be reviewed for compliance with state water quality standards, if those actions may result in the discharge of pollutants to waters of the U.S within the state. State approval is granted via the § 401 Water Quality Certification.	§ 401 of CWA (33 U.S.C. §§1251 et seq.)	CDPHE
CWA § 402 NPDES Permit(s)	§ 402 of the CWA establishes the NPDES program regulating the discharge of pollutants to waters of the U.S. NPDES permits are required to authorize discharges of storm water associated with construction activities and discharges of construction dewatering effluent.	§ 402 of CWA (33 U.S.C. §§1251 et seq.)	CDPHE
CWA § 404 Department of the Army Permit	§ 404 of the CWA regulates the discharge of dredge and fill material into waters of the U.S. Regulated activities include most earthmoving activities in and along streams below the ordinary high water mark (OHWM), and within jurisdictional wetlands.	§ 404 of CWA (33 U.S.C. §§1251 et seq.)	USACE
ESA Section 7 Consultation	Required for all Federal actions to ensure minimization of adverse impacts to federally listed species. In 2017, Western initiated informal consultation with the USFWS to identify species and habitats of concern. A Biological Assessment was prepared for the Project.	ESA (16 U.S.C. §§ 1531 et seq.)	USFWS
NHPA Section 106 Consultation	Federal agencies are required to consult with the State Historic Preservation Office (SHPO) to seek ways to avoid, minimize, or mitigate adverse effects of a Federal action on historic properties.	NHPA (16 U.S.C. §§ 470 et seq.); 36 CFR Part 800	Colorado Office of Archaeology and Historic Preservation

CDPHE = Colorado Department of Public Health and Environment; NPDES = National Pollutant Discharge Elimination System; USFWS = U.S. Fish and Wildlife Service; USACE = U.S. Army Corps of Engineers.

1.10 Document Organization

The contents of each chapter of the EIS are as follows:

- Chapter 1.0 provides background information on the Project, states the purpose and need for the Project, and summarizes public involvement activities conducted in support of the EIS.
- Chapter 2.0 describes all alternatives considered in the EIS. It describes common features of transmission line design, construction, operation, and maintenance; discusses standard

construction processes (SCPs) and environmental protection measures (EPMs) to prevent or mitigate potential effects; and includes the APA definition and rationale, as well as a summary comparison of the environmental effects of the APA and alternatives.

- Chapter 3.0 describes the affected environment of resources that the alternatives could affect. Resources discussed include air quality; geology and paleontology; soils; water resources and floodplains; wetlands; vegetation; wildlife; special status and sensitive species; fuels and fire; land use and recreation; visual resources; socioeconomics, community resources and environmental justice; electrical effects and human health; cultural resources; and transportation.
- Chapter 4.0 describes the potential environmental effects of the alternatives. The chapter identifies the direct and indirect, short-term and long-term, beneficial and adverse effects, residual impacts, the relationship between short-term uses and long-term productivity, and irreversible and irretrievable commitments of resources for each resource identified in Chapter 3.0.
- Chapter 5.0 identifies the potential cumulative effects of the alternatives to each resource identified in Chapter 3.0. Cumulative impact is the impact on the environment that results from the incremental impact of the Project when added to the other past, present, and reasonably foreseeable future actions regardless of who undertakes the other actions.
- Chapter 6.0 provides a list of preparers, a contractor disclosure statement, and the distribution list for the Final EIS.
- Chapter 7.0 provides a list of references used in the document.
- Chapter 8.0 provides an index for the document.
- Chapter 9.0 provides the comments received on the Draft EIS from the public and agencies, and the responses to those comments.

2.0 Alternatives

2.1 Introduction

This chapter describes the range of alternatives considered to meet the identified Purpose and Need described in Chapter 1.0, including the No Action Alternative. The action alternatives include rebuilding the two separate transmission lines as a single double-circuit line using alternate alignments and designs, including underground construction for selected segments. An additional alternative would rebuild the two lines using structures very similar to those currently in use and generally located along the two existing ROWs. A double-circuit transmission line would carry six conductors on a single-pole structure within one ROW, while a single-circuit line would carry only three conductors on a single H-frame structure within one ROW. The existing ROWs would be expanded as needed and minor adjustments made to the alignments where necessary to comply with NERC and NESC requirements. The USFS action would be to issue a special use permit for the ROW of the Project that crosses USFS managed lands. USFS also would provide input on an Operation and Maintenance Plan for the portion of the transmission line rebuild Project that crosses National Forest System lands.

As described in Chapter 1.0, Western owns, operates, and maintains two transmission lines between the Flatiron Substation and the intersection of Mall Road and U.S. Highway 36 in Estes Park. Both lines begin as two distinct individual single-circuit lines at the Flatiron Substation near Loveland. The lines combine to a double-circuit line at the lattice structure located on Mall Road near Estes Park. This Project area ends where the lines become double-circuit at the easternmost lattice structure. The E-LT line is the more northern of the two lines and will be referred to in the remainder of this document as the North Line. The second, more southerly line, consisting of the E-PH and the F-PH lines will be referred to in this document as the South Line. Both existing transmission lines are 115-kV single-circuit lines constructed on wood pole H-frame structures.

Following public review of the Draft EIS, Western and the USFS, which is a cooperating agency on this Project, identified the APA in early December, 2016. All of the alternatives, and portions thereof described in detail were under consideration as well as the No Action Alternative. The APA is comprised of a combination of action alternatives analyzed in detail in the Draft EIS. See Sections 2.2 and 2.8 for further detail.

2.2 Alternatives Considered in Detail

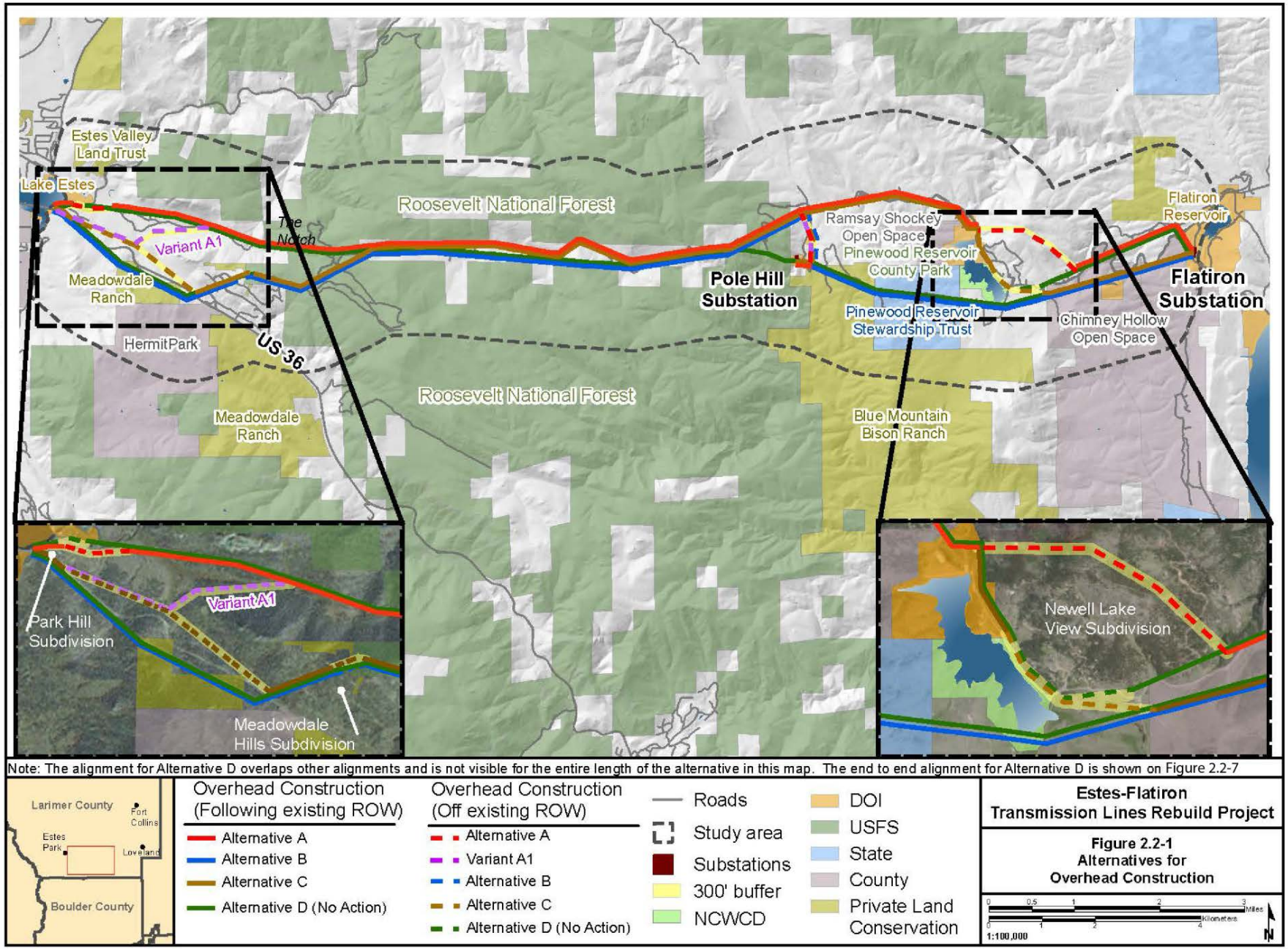
The development of a reasonable range of alternatives is an essential element of an EIS. As stated in the CEQ regulations for implementing NEPA, an EIS must rigorously explore and objectively evaluate all reasonable alternatives (40 CFR 1502.14a). NEPA also requires that a No Action Alternative be evaluated in addition to the action alternatives to establish a baseline for analysis, and to analyze the consequences of not implementing the Project.

Alternatives Development Workshop

A range of reasonable alternatives for the Project was identified by evaluating routing opportunities and constraints, engineering design standards, public comments, and environmental resources that occur within the Project area. The objective was to identify alternatives that address public, environmental, and social concerns while meeting the Project purpose and need and engineering criteria for the transmission line rebuild Project. This process is subsequently described more in Section 2.2.1, and it resulted in a set of action alternatives evaluated in detail in the Draft EIS.

In the Draft EIS, seven full-length action alternatives to rebuild and upgrade the existing 115-kV transmission lines were identified for detailed analysis in addition to the No Action Alternative. These alternatives are described briefly below, and in greater detail in Sections 2.2.1.1 through 2.2.1.8. In this document "variant" alternatives refer to routing variations of the main alternative, whereas "reroutes" are any section of the alignment that is off existing ROW. The alignments of alternatives and routing variations using overhead construction methods are shown on **Figure 2.2-1**. The alignments of routing variations using underground construction methods are shown on **Figure 2.2-2**.

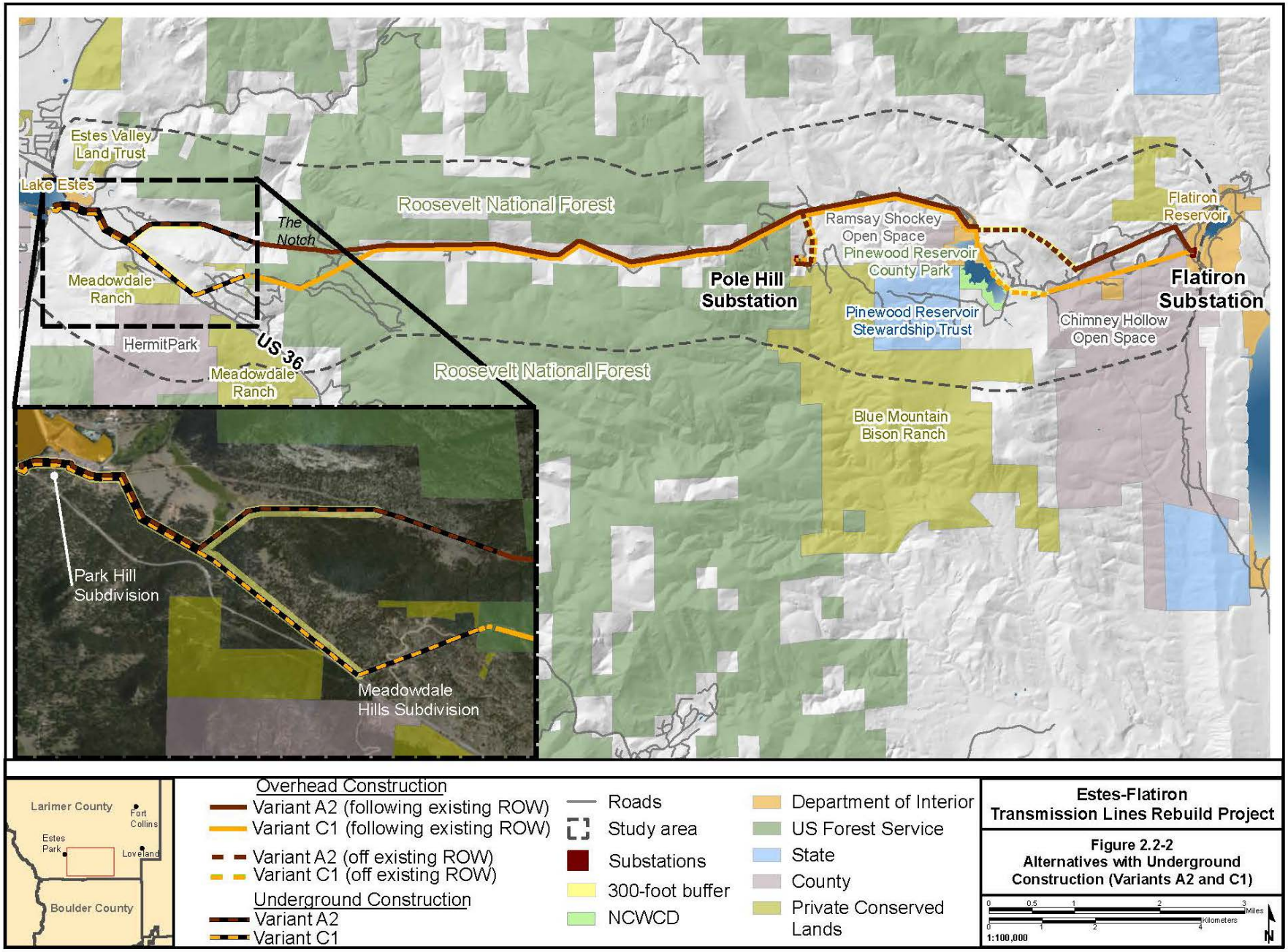
- **No Action Alternative** – Keep the existing transmission lines in service through continuing structure replacement and maintenance. The existing ROWs would be expanded as needed and minor adjustments made to the alignments where necessary in order to comply with NERC and NESC requirements. A segment through the Newell Lake View subdivision would be relocated and a new ROW acquired if necessary (see **Figure 2.2-1**).
- **Alternative A** – Rebuild and consolidate the transmission lines primarily on the existing North transmission line ROW. This alternative includes a reroute to the north and northeast of Newell Lake View subdivision and along Mall Road in Estes Park (see **Figure 2.2-3** in Section 2.2.1 subsequently).
  - **Variant A1** – Variant A1 is identical to Alternative A for all but the westernmost segment (see **Figure 2.2-4** in Section 2.2.1 subsequently). At a point in the valley between Mount Olympus and Mount Pisgah, this routing variation would depart from the alignment of the existing North Line and traverse along the base of Mount Pisgah before turning to the northwest and generally following an alignment parallel to U.S. Highway 36 for the remaining distance to the existing steel lattice double-circuit structure at the intersection of U.S. Highway 36 and Mall Road.
  - **Variant A2** – Variant A2 follows an alignment similar to Variant A1 except, the westernmost 2.7 miles of the transmission line would be constructed underground (**Figure 2.2-2**).
- **Alternative B** – Rebuild and consolidate the transmission lines, primarily on the existing South Line ROW. This alternative includes a 0.25-mile reroute along Pole Hill Road on National Forest System lands, and a 0.75-mile reroute to the North Line on new ROW in the vicinity of Pole Hill Substation (see **Figure 2.2-5** in Section 2.2.1 subsequently).
- **Alternative C** – Rebuild and consolidate the transmission lines along an alignment that utilizes a combination of the existing North and South line ROWs. This alternative includes reroutes off existing transmission line ROW east of Pinewood Reservoir, along Pole Hill Road on National Forest System lands, and on privately held land on the west end of the Project area (see **Figure 2.2-6** in Section 2.2.1 subsequently).
  - **Variant C1** – Rebuild and consolidate the transmission lines along an alignment that utilizes a combination of the existing North and South line ROWs. This alternative follows an alignment similar to Alternative C; except that the westernmost 2.7 miles of the transmission line would be constructed underground (**Figure 2.2-2**).
- **Alternative D** – Rebuild the two existing transmission lines in-kind as single-circuit lines located on separate ROWs. This alternative would utilize structures very similar to those currently in use, although structure height may increase by 5 to 10 feet. The existing ROWs would be expanded as needed and minor adjustments made to the alignments where necessary to comply with NERC and NESC requirements. This alignment includes a reroute to Pole Hill Road where there is inadequate ROW through Newell Lake View subdivision and relocation of one structure on the north side of the Upper Thompson Sanitation District parcel in Estes Park, to accommodate future expansion of their facility (see **Figure 2.2-7** in Section 2.2.1 subsequently).



Note: The alignment for Alternative D overlaps other alignments and is not visible for the entire length of the alternative in this map. The end to end alignment for Alternative D is shown on Figure 2.2-7

Estes-Flatiron Transmission Lines Rebuild Project

Figure 2.2-1 Alternatives for Overhead Construction



Estes-Flatiron Transmission Lines Rebuild Project

Figure 2.2-2
Alternatives with Underground Construction (Variants A2 and C1)

Each of these alternatives is described in detail in the remainder of this chapter, starting with a discussion of the alignments that were utilized and the process used to develop those alignments. Other elements of the alternatives are described in subsequent sections, including construction methods, design considerations and other Project features. Many of these elements are discussed under the heading Activities Common to All Action Alternatives (Section 2.3).

The detailed analysis of the seven full-length alternatives and the No Action Alternative supported Western's selection of an APA that grew out of the analysis and incorporated parts of several full-length alternatives. Linking portions of these analyzed alternatives would allow Western to further reduce expected environmental impacts while meeting the purpose and need objectives for the Project. The APA is described in Sections 2.2.1.9 and 2.8.1, and is depicted subsequently in **Figure 2.2-8**. The rationale for the selection is presented in Section 2.8.2.

2.2.1 Development of Alternative Alignments

To develop the range of alternatives considered, an evaluation of routing constraints and opportunities was completed focusing on an area generally 2 to 3 miles in width and extending between the Flatiron Substation and the Project terminus on the east side of Lake Estes. The 2- to 3-mile-wide study area was generated by mapping a 1-mile-wide buffer around all existing ROWs that have been in place for the last 60 to 75 years. This approach reflects Western's need to maximize use of existing ROW to reduce environmental impacts and ROW acquisition costs, avoid burdening new landowners who bought homes or land with no indication of a utility ROW near them when the property was acquired, and stay on existing disturbed ROW on USFS lands.

The initial step in this evaluation was to compile resource information within the study area. Using this information, an initial constraint/opportunity analysis was completed. The following constraint and opportunity criteria were incorporated into the analysis to address engineering and construction considerations (particularly access) as well as public scoping comments.

- Steep Slopes, which were defined as areas with slopes 30 percent or greater and no existing access.
- Visual Considerations, including those areas that would be highly visible from residences, recreation areas, and highways.
- Buildings, for which a 55-foot buffer was defined around existing buildings.
- Protected areas, including county open space, lands protected by conservation easement, lands within the Stewardship Trust Program, and State Wildlife Areas.

The results of this analysis were then used to create a composite map by highlighting areas with overlapping constraints. Varying tones were used to depict areas that ranged from no constraints to three overlapping constraints. This information was then used to assist in the identification of alternative alignments, which were subsequently incorporated into a series of overall alternatives.

A key step in the process was a series of alternatives development workshops that were held at the Estes Park Museum and the Bison Visitor Center near Flatiron Reservoir over a 3-day period in early October 2012. Workshop objectives included:

- Present opportunities, constraints, and other considerations that may influence potential transmission line routes.
- Suggest, review, and refine route options and design features.
- Provide a forum for the public to comment on or ask questions about the alternatives screening process.

In preparation for the alternatives workshops, Western compiled map data showing key siting considerations in the Project area. Mapped resource data were available for public review and comment and the public was invited to identify route options. Input on transmission line design features, such as structure type and finish, and method of construction also was requested. The workshops were attended by approximately 50 local residents and other interested parties and the input was considered in developing the alternatives described in this chapter.

The resulting alternatives are shown in **Figure 2.2-1** and **Figure 2.2-2**, and described in the remainder of this section. Additional potential alignments also were identified; these are discussed later in Section 2.7, Alternatives Considered but Dismissed. In all cases, the alternatives follow some portion of the existing transmission line alignments and the ROWs they utilize.

2.2.1.1 No Action Alternative

Consideration of the No Action Alternative is a required element of an EIS (40 CFR 1502.14(d)). Under the No Action Alternative, Western would leave in place both existing transmission lines from Mall Road in Estes to Flatiron Substation and replace structures at their current locations as they deteriorated. Maintenance requirements on the existing lines increase as the lines continue to age. The lines become difficult to keep in service in the very near term due to their age, deteriorating condition, and poor access. Western would need to replace deteriorating structures with increasing frequency. Approximately 70 to 80 percent of all structures will need replacement in the near future. Replacements of cross arms and other hardware would be required to keep the lines reliable and to ensure public and worker safety.

The No Action Alternative would require access to the existing transmission line ROWs to maintain the lines and replace deteriorated structures. See Section 2.3.2 for a discussion of the type and level of access required. In addition to maintenance and disturbance of the two ROWs and associated access roads, the No Action Alternative would involve the acquisition of additional ROW on private lands at locations where an adequate ROW had not been previously acquired. ROW widths along the existing transmission lines range from 20 to 130 feet. At locations with limited ROW width, it is difficult to maintain appropriate vegetation clearances and compliance with applicable reliability standards per, for example, NERC Standard FAC-003-1, Transmission Vegetation Management Program (NERC 2006). To comply with applicable standards and maintain an acceptable level of reliability, Western would require additional ROW at all locations on private land where the current ROW width is less than 75 feet. Depending on maintenance requirements, additional ROW would be required at some locations where the existing ROW width is less than 110 feet.

For much of the North Line, this would require acquisition of an additional 45 to 55 feet of ROW width over nearly its entire length, the only exceptions being short segments near Mall Road in Estes and near the Flatiron Substation. The South Line has sufficient ROW for the transmission line, with no new ROW expected to be needed except for some formal access. In one segment through the Newell Lake View subdivision, the existing line would be relocated for all alternatives. New ROW would be acquired where necessary. This is because several homes were built immediately adjacent to the existing transmission line ROW, thus creating an inadequate buffer that is not in compliance with Western's current ROW requirements.,

A basic difference between the action alternatives and No Action is that activities required to remove and replace deteriorated structures and other access improvements required for maintenance activities would occur incrementally over a longer period of time instead of within a specified construction schedule. Ultimately, the No Action Alternative would be similar to Alternative D in terms of activities required to maintain the lines in service and the amount of area disturbed. Western would coordinate with the USFS regarding pole replacement on National Forest System land and would not seek authorization to expand its ROW for the South Line. However, additional authorization would be needed for the North Line ROW expansion.

2.2.1.2 Alternative A – Construct a Double-circuit Line on a Consolidated ROW (North)

Alternative A would construct, operate, and maintain a new double-circuit line along the alignment of the existing North Line between the Flatiron Substation and the east shore of Lake Estes at Mall Road and U.S. Highway 36 (**Figure 2.2-3**). The existing structures would be removed and replaced with new double-circuit structures. See **Figure 2.2-9** and **Table 2.2-1** for information on structure design and dimensions for a description of the structure design. The new line would require a 110-foot ROW and generally follow the existing alignment except at two locations, both off National Forest System land. One of these departures from the existing alignment would occur in the vicinity of Newell Lake View subdivision where existing ROW is inadequate. To avoid these impacts, the alignment would depart from the existing ROW at a point approximately 1 mile east of the subdivision. At that point, the new alignment would turn to the northwest, using topography to reduce visibility where possible and traversing through steep and rugged terrain. The alignment would rejoin the existing transmission line alignment just north of Pinewood Lake Dam and continue along that alignment for most of the remaining distance to the intersection with the existing double-circuit line at Mall Road. The second departure from the alignment of the existing transmission line would occur east of Mall Road. Just east of the Upper Thompson Sanitation District's office and Mall Road, the new alignment would jog to the south along Mall Road to avoid a conflict with the Upper Thompson Sanitation District wastewater treatment plant. The reroute is referred as the Mall Road reroute in this document.

As depicted in **Figure 2.2-3** (center inset), another element of Alternative A is a short line segment (0.75 mile) that would extend south to the Pole Hill Substation. This segment would require new ROW and would be built using the same design as the double-circuit line.

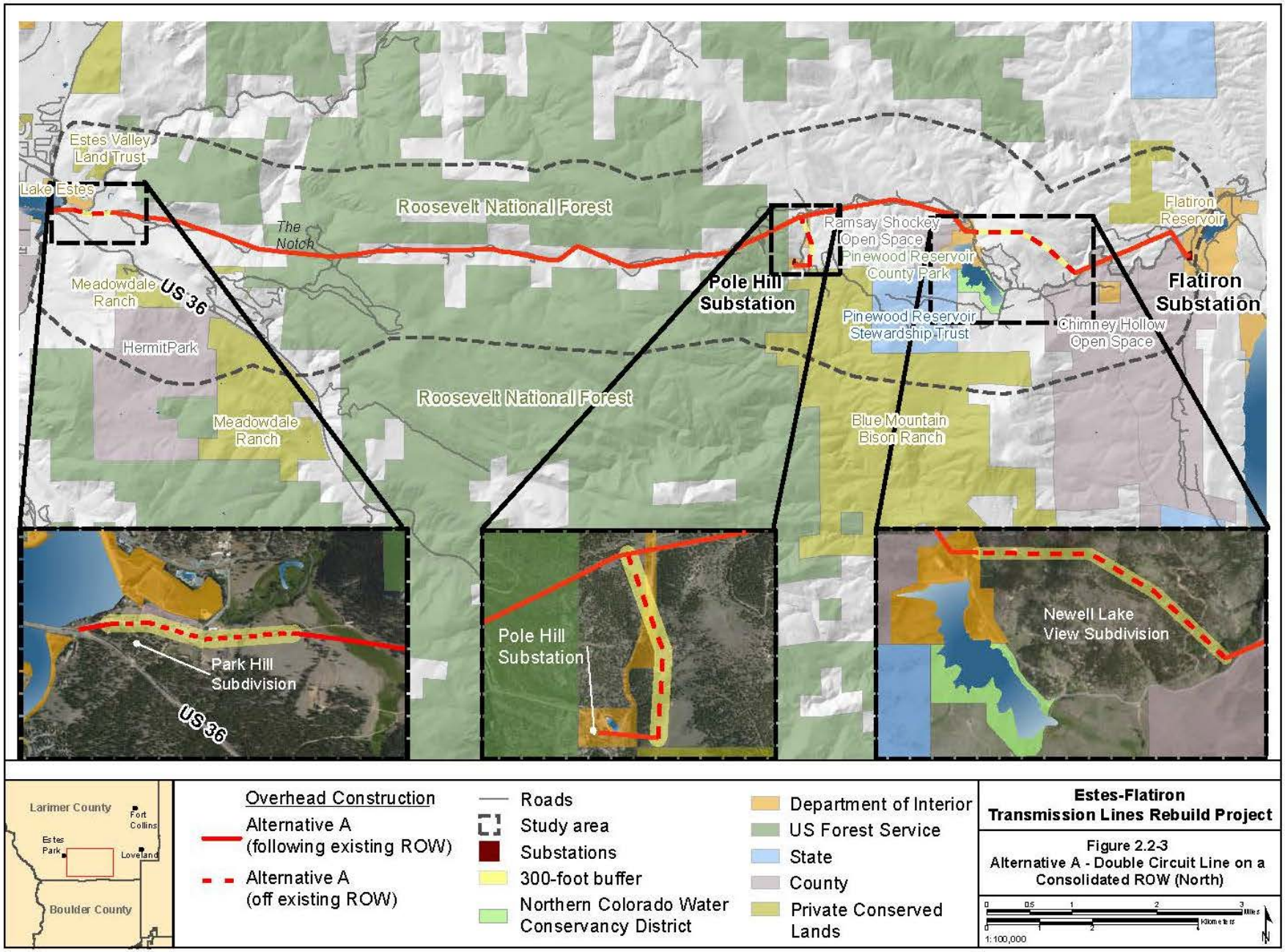
Construction of a double-circuit line along the alignment of Alternative A would allow the existing South Line to be removed and the ROW allowed to return to natural vegetation patterns. See Section 2.3.5 for a discussion of the removal process. Under Alternative A, the western end of Pole Hill Road would not be improved, and the road would retain its challenge for high clearance off road vehicle use (hereafter noted as four-wheel drive use). See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.

2.2.1.3 Variant A1 – Western Alignment Option

Variant A1 is identical to Alternative A for all but the westernmost segment (**Figure 2.2-4**). At a point in the valley between Mount Olympus and Mount Pisgah, this routing variation would depart from the alignment of the existing North Line and traverse along the base of Mount Pisgah before turning to the northwest and generally following an alignment parallel to U.S. Highway 36 for the remaining distance to the intersection with the existing double-circuit line at Mall Road. This segment would require a new ROW for most of its length. Under Variant A1, the western end of Pole Hill Road would not be improved, and the road would retain its challenge for four-wheel drive use. See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.

2.2.1.4 Variant A2 – Underground Construction along a Segment of Alternative A

Variant A2 is identical to Alternative A for all but the westernmost segment. The transmission line would be rebuilt aboveground following Alternative A until intersecting the underground portion of Variant A2. Structure types and construction methods along the aboveground portions of this alternative would be the same as described for Alternative A. The westernmost portion of this variant would be constructed underground following a new alignment as previously shown on **Figure 2.2-2**. Underground construction methods applicable to Variant A2 are described in Section 2.2.4. Under Variant A2, the western end of Pole Hill Road would not be improved, and the road would retain its challenge for four-wheel drive use. See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.


Estes Valley Land Trust
Lake Estes
Roosevelt National Forest
The Notch
Meadowdale Ranch
US 36
HermitPark
Meadowdale Ranch
Roosevelt National Forest
Pole Hill Substation
Ramsay Shockey Open Space
Pinewood Reservoir County Park
Pinewood Reservoir Stewardship Trust
Chimney Hollow Open Space
Flatiron Reservoir
Flatiron Substation
Blue Mountain Bison Ranch
Park Hill Subdivision
US 36
Pole Hill Substation
Newell Lake View Subdivision
Larimer County
Fort Collins
Estes Park
Loveland
Boulder County
Overhead Construction
Alternative A (following existing ROW)
Alternative A (off existing ROW)
Roads
Study area
Substations
300-foot buffer
Northern Colorado Water Conservancy District
Department of Interior
US Forest Service
State
County
Private Conserved Lands
Estes-Flatiron Transmission Lines Rebuild Project
Figure 2.2-3
Alternative A - Double Circuit Line on a Consolidated ROW (North)
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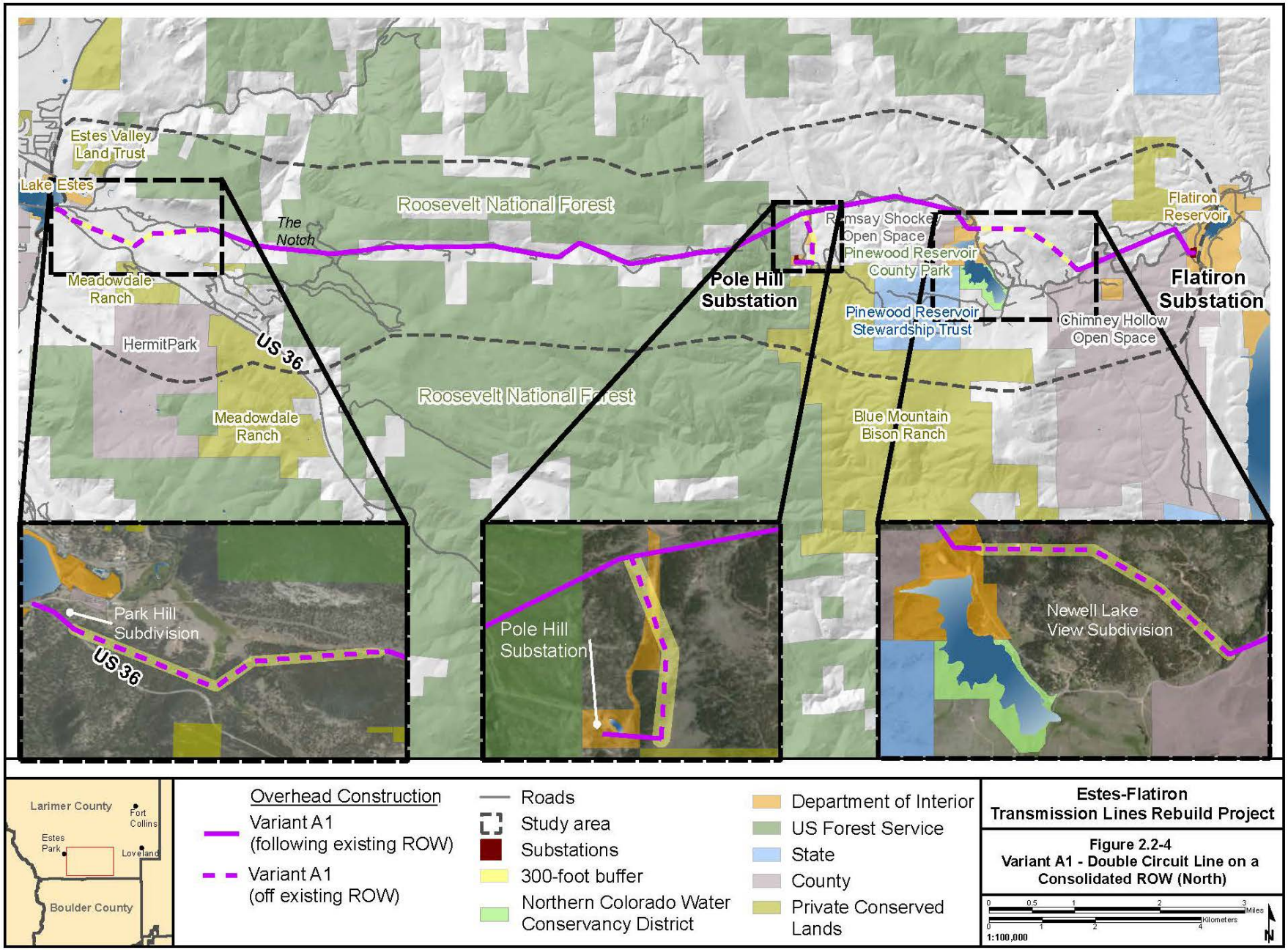
N



Estes-Flatiron Transmission Lines Rebuild Project

Figure 2.2-4
Variant A1 - Double Circuit Line on a Consolidated ROW (North)

2.2.1.5 Alternative B – Construct a Double-circuit Line on a Consolidated ROW (South)

Alternative B would construct, operate, and maintain a new double-circuit line along the alignment of the existing South Line for most of the distance between Flatiron Substation and the intersection of Mall Road and U.S. Highway 36 (refer to **Figure 2.2-5**). The existing structures would be removed and replaced with new double-circuit structures. Refer to **Figure 2.2-9** and **Table 2.2-1** for information on structure design and dimensions. The new line would require a 110-foot ROW and generally follow the existing alignment except at two locations. Just east of the Pole Hill Substation the alignment of Alternative B would turn north and partially parallel Lone Elk Road for 0.75 mile until intersecting the alignment of the existing North Line. A new ROW would be required for this segment. Alternative B diverts to the north at this location to avoid: 1) crossing the Pole Hill Penstock and 2) crossing the steep and rocky terrain located west of the Pole Hill Substation. Both the penstock and the rough terrain west of Pole Hill Substation would make permanent structure access problematic.

Alternative B would then follow the alignment of the existing North Line for approximately 1 mile to a point where the alignments of the two existing lines converge and parallel each other on separate ROWs. West of this point, Alternative B would follow the alignment of the existing South Line. A second 0.25-mile reroute would move the transmission line off the existing ROW to parallel the western end of Pole Hill Road on National Forest System land (see **Figure 2.2-5**).

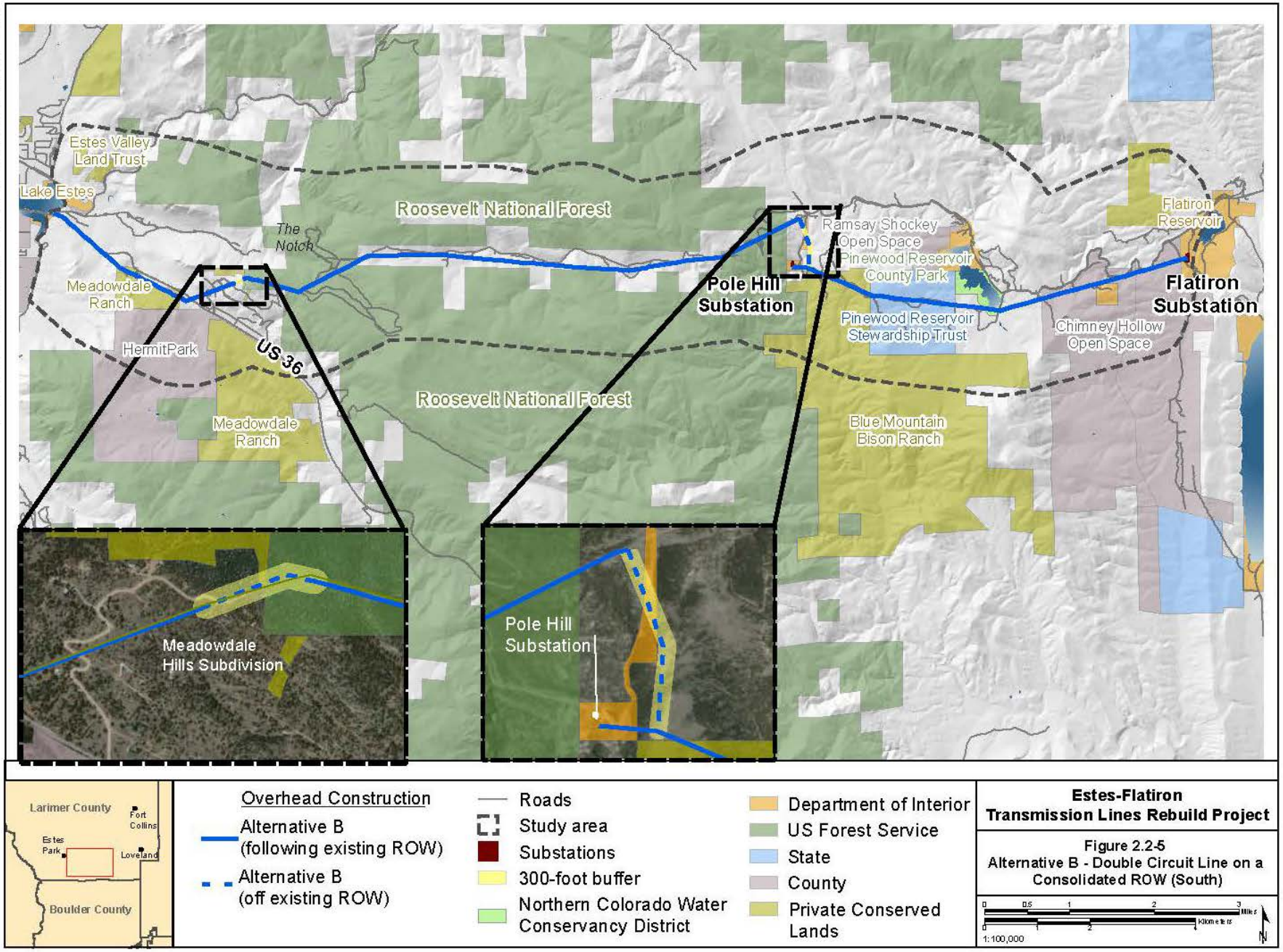
Because Alternative B turns to the north prior to reaching the Pole Hill Substation, a short (less than 0.25-mile) segment of transmission line would have to be constructed to maintain an electrical connection to the substation.

Construction of a double-circuit line along the alignment of Alternative B would allow the existing North Line to be removed and the ROW to return to natural vegetation patterns. See Section 2.3.4 for a discussion of the removal process. However, it would be necessary to leave a portion of the existing structures in place to maintain the existing fiber optic service provided to Pinewood Dam. This would be accomplished by leaving a single pole in place at each existing structure site along the North Line between the dam and the vicinity of the Green Mountain Drive. The remaining single pole at each structure site would be utilized to support the fiber optic line.

Under Alternative B, the western end of Pole Hill Road would not be improved, and the road would retain its challenge for four-wheel drive use. New access would be needed in the west region for construction and maintenance. The previous access road has been closed as a result of flood damage. See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.

2.2.1.6 Alternative C – Construct a Double-circuit Line on a Consolidated ROW Using a Combination of Alignments

Alternative C would build a new double-circuit line between Flatiron Substation and the intersection of Mall Road and U.S. Highway 36 using a combination of alignments, including the alignments of both existing lines as well as new alignments in some locations (**Figure 2.2-6**). See **Figure 2.2-9** and **Table 2.2-1** for information on structure design and dimensions. After leaving the Flatiron Substation, Alternative C would follow the alignment of the existing South Line for a distance of just over 2 miles before turning to the northwest as it approaches Pinewood Lake. Just east of Pinewood Lake, Alternative C would leave the alignment of the existing South Line and follow a new alignment, generally paralleling Pole Hill Road along the south edge of the Newell Lake View subdivision until intersecting with the alignment of the existing North Line near Pinewood Lake Dam. From this point, Alternative C would follow the alignment of the existing North Line to the point where the North and South lines diverge just east of The Notch (**Figure 2.2-6**). Alternative C would then cross over to the alignment of the South Line at the point where the two existing lines separate and continue on existing


Estes Valley Land Trust
Lake Estes
Roosevelt National Forest
The Notch
Meadowdale Ranch
HermitPark
US 36
Meadowdale Ranch
Roosevelt National Forest
Ramsay Shockey Open Space
Pinewood Reservoir County Park
Pole Hill Substation
Pinewood Reservoir Stewardship Trust
Flatiron Reservoir
Flatiron Substation
Chimney Hollow Open Space
Blue Mountain Bison Ranch
Meadowdale Hills Subdivision
Pole Hill Substation
Larimer County
Fort Collins
Estes Park
Loveland
Boulder County
Overhead Construction
Alternative B (following existing ROW)
Alternative B (off existing ROW)
Roads
Study area
Substations
300-foot buffer
Northern Colorado Water Conservancy District
Department of Interior
US Forest Service
State
County
Private Conserved Lands
Estes-Flatiron Transmission Lines Rebuild Project
Figure 2.2-5
Alternative B - Double Circuit Line on a Consolidated ROW (South)
Miles
Kilometers
1:100,000
N

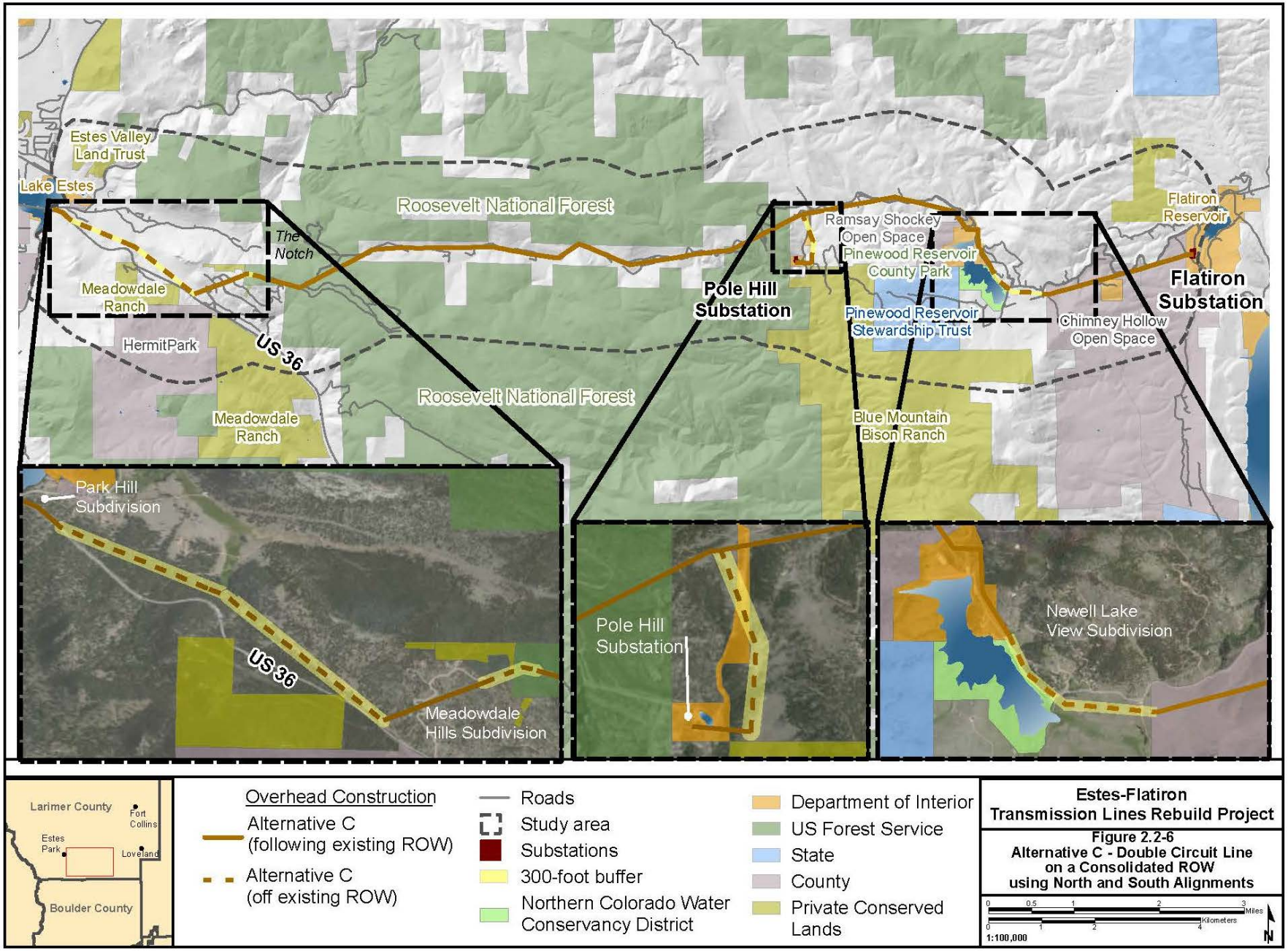


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Figure 2.2-6
Alternative C - Double Circuit Line on a Consolidated ROW using North and South Alignments

ROW and a 0.25-mile reroute to parallel the western end of Pole Hill Road on National Forest System land. The alignment would continue on existing ROW through the Meadowdale Hills subdivision to U.S. Highway 36. Instead of crossing the highway at this location, Alternative C would follow a new alignment generally parallel to U.S. Highway 36 for the remaining distance to the intersection of Mall Road and U.S. Highway 36.

New ROW would be required for this segment, which is intended to reduce visibility from U.S. Highway 36. To further reduce visibility, special design measures would be considered for this segment and Meadowdale Hills subdivision, including the use of structures with a lower height and shorter span. See **Figure 2.2-9** and **Table 2.2-1** for information on structure design and dimensions.

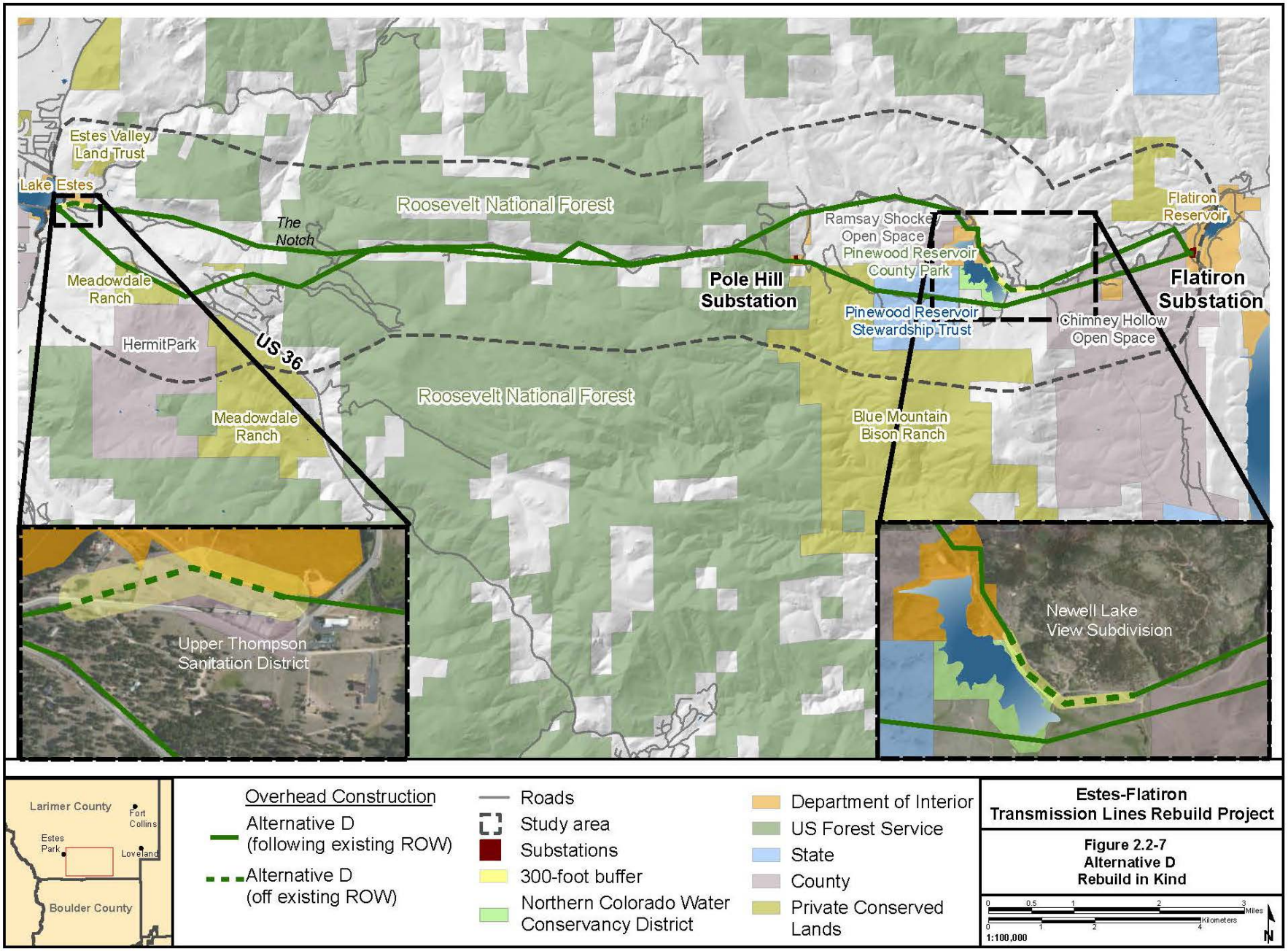
Because Alternative C would turn to the north prior to reaching the Pole Hill Substation, a short (less than 0.25-mile) segment of double-circuit transmission line would have to be constructed to maintain an electrical connection to the substation.

At locations where the Alternative C alignment follows one of the existing transmission lines, the existing structures would be replaced with new double-circuit structures, but exact locations would vary depending on final design. At other locations where the new double-circuit line is not using an existing or expanded ROW, existing structures would be removed and the ROW allowed to return to natural vegetation patterns. See Section 2.3.5 for a discussion of the removal process. Under Alternative C, Pole Hill Road would be reconstructed on National Forest System land to level the grade, removing the challenge for four-wheel drive use. New access would be needed in the west region for construction and maintenance. The previous access road has been closed as a result of flood damage. See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.

2.2.1.7 Variant C1 – Underground Construction along a Segment of Alternative C

Variant C1 is identical to Alternative C for all but the westernmost segment. The transmission line would be rebuilt aboveground following Alternative C until intersecting the USFS boundary near the Meadowdale Hills subdivision. Structure type and construction methods along the aboveground portions of this alternative would be the same as described for Alternative C. The westernmost portion of this alternative, from Mall Road to the USFS boundary adjacent to the Meadowdale Hills subdivision, would be constructed underground following a new alignment as shown previously on **Figure 2.2-2**. Underground construction methods applicable to Variant C1 are described in Section 2.2.4.

Under Variant C1, Pole Hill Road would be reconstructed on National Forest System land to level the grade, removing the challenge for four-wheel drive use. New access would be needed in the west region for construction and maintenance. The previous access road has been closed as a result of flood damage. See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.


Estes Valley Land Trust
Lake Estes
Roosevelt National Forest
The Notch
Meadowdale Ranch
HermitPark
US 36
Meadowdale Ranch
Roosevelt National Forest
Pole Hill Substation
Ramsay Shocker Open Space
Pinewood Reservoir County Park
Pinewood Reservoir Stewardship Trust
Chimney Hollow Open Space
Flatiron Reservoir
Flatiron Substation
Blue Mountain Bison Ranch
Upper Thompson Sanitation District
Newell Lake View Subdivision
Larimer County
Fort Collins
Estes Park
Loveland
Boulder County
Overhead Construction
Alternative D (following existing ROW)
Alternative D (off existing ROW)
Roads
Study area
Substations
300-foot buffer
Northern Colorado Water Conservancy District
Department of Interior
US Forest Service
State
County
Private Conserved Lands
Estes-Flatiron Transmission Lines Rebuild Project
Figure 2.2-7
Alternative D
Rebuild in Kind
Miles
Kilometers
1:100,000
N

2.2.1.8 Alternative D – Rebuild In-kind

Alternative D (**Figure 2.2-7**) would rebuild both the existing North and South lines in-kind as single-circuit lines using structures very similar to those currently in use. Refer to **Figure 2.2-9** and **Table 2.2-1** for information on structure design and dimensions. The existing ROWs would be expanded as needed and minor adjustments would be made to the alignments where necessary for compliance with NERC requirements. Additionally, extensive access road construction would be required to access each structure location. An adjustment to the alignment would occur in the vicinity of the Newell Lake View subdivision where there is inadequate ROW. To avoid these impacts, the alignment would depart from the existing ROW near the east boundary of the subdivision and follow an alignment generally along Pole Hill Road, rejoining the existing ROW just north of Pinewood Lake Dam. The location of one structure on the north side of the Upper Thompson Sanitation District parcel in Estes Park also would be adjusted to accommodate future expansion of their facility (**Figure 2.2-7**).

Under Alternative D, the western end of Pole Hill Road would not be improved, and the road would retain its challenge for four-wheel drive use. See Section 2.3.2.1 for additional information on access requirements under each of the alternatives.

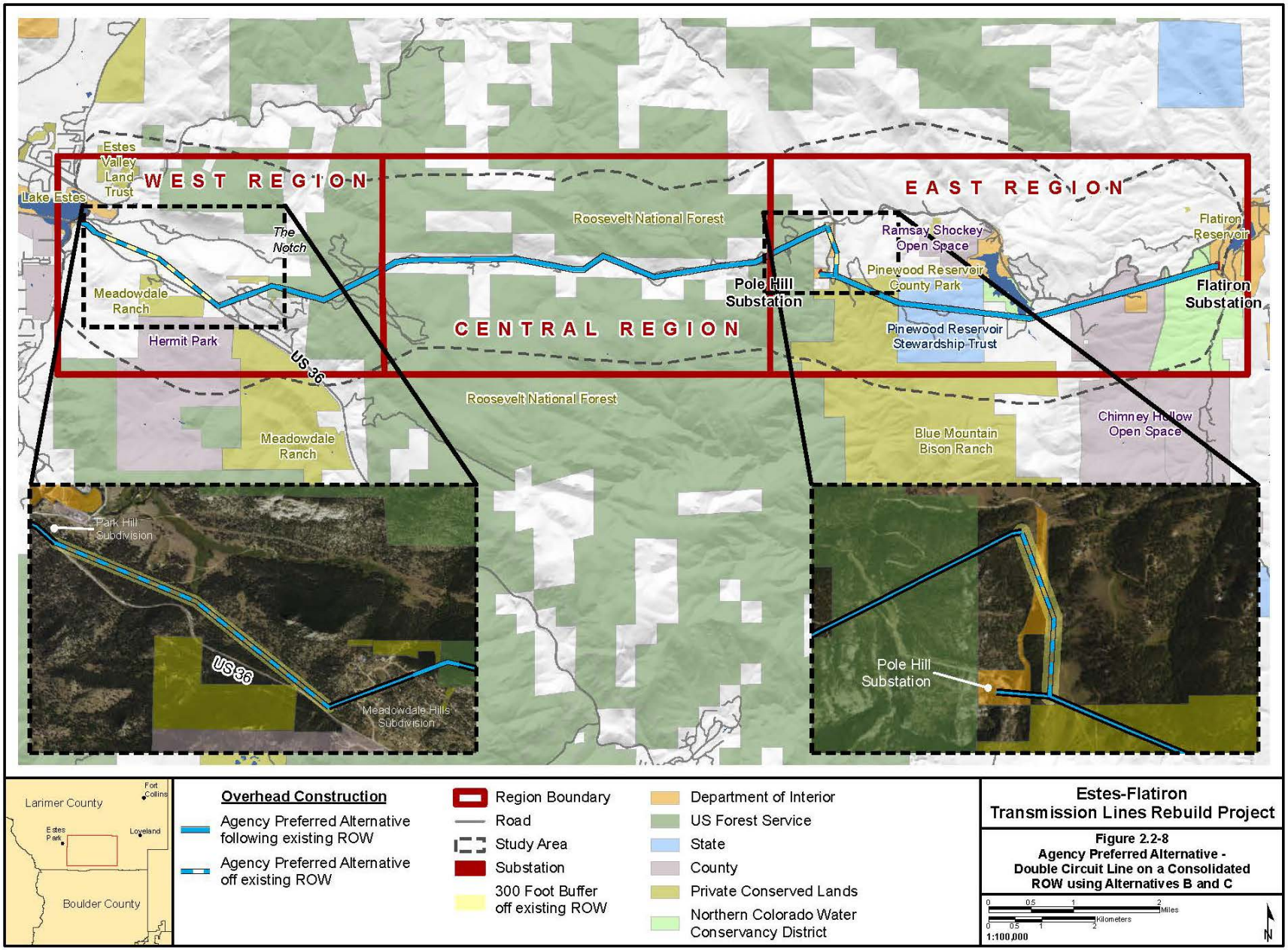
2.2.1.9 Agency Preferred Alternative – Construct a Double-circuit Line on a Consolidated ROW Using a Revised C Alignment with a Portion of Alternative B

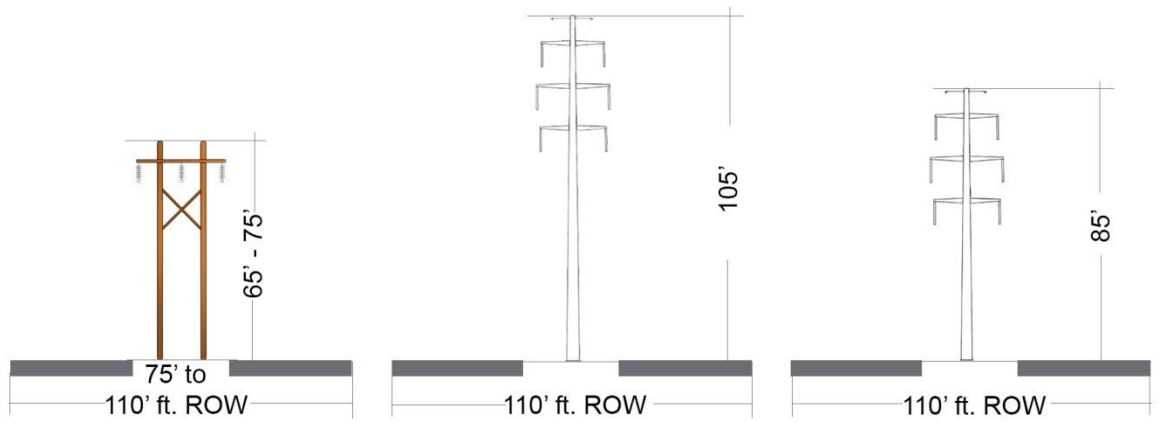
As depicted in **Figure 2.2-8**, the APA would be a new double-circuit line between Flatiron Substation and U.S. Highway 36 at the intersection of Mall Road using Alternative C alignment in the west and primarily Alternative C alignment in the center, and Alternative B alignment in the east.

In the west region, the APA would follow the Alternative C alignment along Pole Hill Road through the Meadowdale Hills subdivision to U.S. Highway 36 (inset, **Figure 2.2-8**). In adapting part of Alternative C for the APA, the four-wheel drive of West Pole Hill Road would not be reconstructed or improved on National Forest System land, retaining the challenge for four-wheel drive use in response to Draft EIS public comments. New access would be needed in the west region for construction and maintenance. The previous access road has been closed as a result of flood damage. In addition, instead of crossing over U.S. Highway 36, the APA would follow the Alternative C alignment for 1.7 miles, generally parallel to and north of U.S. Highway 36 down the valley for the remaining distance to the intersection of Mall Road and U.S. Highway 36.

New ROW would be required for the last segment on the west end of Alternative C to reduce visibility from U.S. Highway 36. Special design measures would be considered for this segment within the Meadowdale Hills subdivision, including the use of structures with a lower height and shorter span, if they provide a lower visual impact. This option could result in a structure-for-structure replacement instead of eliminating some structures entirely. Refer to **Figure 2.2-9** and **Table 2.2-1** for information on structure design and average dimensions.

In the central region on private lands (**Figure 2.2-8**), the APA primarily would follow the North Line, but may shift to the South Line and back again to stay close to Pole Hill Road, thus minimizing the need for access roads and ROW maintenance disturbance.


WEST REGION
CENTRAL REGION
EAST REGION
Estes Valley Land Trust
Lake Estes
The Notch
Meadowdale Ranch
Hermit Park
US 36
Roosevelt National Forest
Pole Hill Substation
Ramsay Shockey Open Space
Pinewood Reservoir County Park
Pinewood Reservoir Stewardship Trust
Flatiron Reservoir
Flatiron Substation
Chimney Hollow Open Space
Blue Mountain Bison Ranch
Park Hill Subdivision
Meadowdale Hills Subdivision
Larimer County
Fort Collins
Estes Park
Loveland
Boulder County
Overhead Construction
Agency Preferred Alternative following existing ROW
Agency Preferred Alternative off existing ROW
Region Boundary
Road
Study Area
Substation
300 Foot Buffer off existing ROW
Department of Interior
US Forest Service
State
County
Private Conserved Lands
Northern Colorado Water Conservancy District
Estes-Flatiron Transmission Lines Rebuild Project
Figure 2.2-8
Agency Preferred Alternative - Double Circuit Line on a Consolidated ROW using Alternatives B and C
Miles
Kilometers
1:100,000
N



Average 115-kV Single-circuit Wood Pole
H-frame Structure
Alternatives D and No Action

Average 115-kV Double-circuit Single-pole Standard Steel Structure
Alternatives A, A1, A2, B, C, C1, APA

Average 115-kV Double-circuit Single-pole Standard Steel Short Structure
Alternatives A, A1, A2, B, C, C1, APA

Figure 2.2-9 Existing 115-kV Single-circuit Wood Pole H-frame Structure and Proposed 115-kV Double-circuit Single-pole Steel Structures

In the east region, from the Flatiron Substation, the APA would follow the Alternative B alignment along the existing South Line to the Pole Hill Substation. Just east of the Pole Hill Substation, the APA would continue to follow the alignment of Alternative B which would turn north and partially parallel Lone Elk Road for 0.75 mile until intersecting the alignment of the existing North Line. A new ROW along existing roads would be required for this short segment, as well as new access spur roads to new structures. Shifting to the North Line at this point would avoid crossing the Pole Hill Penstock and the steep and rocky terrain west of the Pole Hill Substation.

At locations where the APA alignment would follow the existing transmission line routes, the existing structures would be replaced with new double-circuit galvanized steel monopole structures. Individual structure locations could vary depending on final design. Should the same number or fewer steel monopole structures be placed on the existing centerline adjacent to National Forest System roads, a change to Recreation Opportunity Spectrum (ROS) classification would not occur, and would not require a Forest Service Plan Amendment.

On abandoned ROW, existing structures would be removed and the ROW allowed to return to natural vegetation patterns. See Section 2.3.4 for a discussion of the removal process.

2.2.2 Description of Transmission Facilities

Figure 2.2-9 shows a typical single-circuit 115-kV wood H-frame structure, which is the structure type that is utilized along both the existing North and South lines, and a 115-kV double-circuit steel structure. The single-pole double-circuit steel structures would replace the existing single-circuit wood structures and would be utilized for all segments of Alternatives A, B, and C; Variant A1; and overhead sections of Variants A2 and C1. The structures would be set in augered holes with an average depth of 18 feet; however, a maximum depth of up to 30 feet may be required at some locations. Structures located at a point where the alignment makes major angles would have a larger diameter and require a concrete foundation to provide additional support.

Table 2.2-1 Typical Transmission Structures

Description	Alternatives A, A1, A2, B, C, and C1, APA 115-kV Double-circuit Single-pole Standard Steel Structures	Alternatives A, A1, A2, B, C, and C1, APA 115-kV Double-circuit Single-pole Shortened Steel Structures[1]	Alternative D 115-kV Single-circuit Wood-pole H-frame Structures
ROW width	110 feet	110 feet	110 feet
Span between structures (average)	850 feet	450 feet	600 to 700 feet
Span between structures (maximum)	1,300 feet	700 feet	1,300 feet
Number of structures (average)	6 per mile	12 per mile	8 per mile
Height of structure (average)	105 feet	85 feet	65 feet
Height of structure (typical range)	100 to 130 feet	80 to 110 feet	50 to 75 feet
Width of structure cross/davit arm	20 feet at davit arm	20 feet at davit arms	25 feet at cross arm
Width of structure at ground level	4 to 8 feet	3 to 7 feet	12 feet
Structure base area	28 square feet per structure	23 square feet per structure	3.5 square feet per pole
Land disturbed by construction at each structure base	11,350 square feet (0.26 acre) on average	11,350 square feet (0.26 acre) on average	9,500 square feet (0.22 acre) on average
Distance between conductor stringing sites	1.5 to 3 miles	1.5 to 3 miles	1.5 to 3 miles
Land disturbed at each stringing site	0.25 acre 105 feet x 105 feet	0.25 acre 105 feet x 105 feet	0.25 acre 105 feet x 105 feet
Conductor type and size	ACSR 795 kcmil	ACSR 795 kcmil	ACSR 795 kcmil
Circuit conductors configuration	Vertical	Vertical	Horizontal
Minimum ground clearance beneath conductors	22 feet	22 feet	22 feet

[1] Structures with a shorter average height and span would be considered parallel to U.S. Highway 36 or adjacent to residential subdivisions.

kcmil = thousand circular mil.

The steel pole structures would be galvanized steel. In some select western subdivisions and USFS lands, self-weathering steel structures were considered for visual reasons. The latest field experience information from the utility industry on self-weathering structures indicates that ongoing corrosion weakens these structures, therefore shortening their expected service life. For this reason, and the fact the Forest Service prefers dull galvanized steel, self-weathering steel structures would not be used for this Project. Conductor size would be increased from 397.5 Aluminum Conductor Steel-Reinforced (ACSR) to 795 ACSR. The new steel structures would average 105 feet tall, approximately 40 feet taller than the existing 65-foot-tall H-frame structures (**Table 2.2-1**). The additional height is required to accommodate the double-circuit line configuration as the minimum distance between the lower conductors and the ground at mid-span must be maintained. Structure heights would vary depending on site-specific considerations, particularly terrain. At locations where visibility from sensitive viewpoints is a major concern, structures with a shorter average height (85-foot) and shorter average span length could be utilized. For example, structures with a shorter average height and span would be considered parallel to U.S. Highway 36 or adjacent to residential subdivisions, such as Park Hill, Meadowdale Hills, and/or Newell Lake View subdivisions, and on National Forest System lands. However, the visual trade-off with shorter structures is that the shorter design would result in roughly twice the number of structures in a given length of ROW to meet required conductor clearances. The Design Phase of this Project would provide the opportunity for Western to address pole height exceptions for specific locations.

The wood H-frame structure design that would be utilized for Alternative D would be very similar to the design shown in **Figure 2.2-9**. However, the conductor size would be increased to 795 ACSR on each line, resulting in taller structures (5 to 10 feet) than those currently in use. Two overhead groundwires, one of which being fiber optic groundwire, would be added to the top of the structures to replace the existing system that would be removed by reconstruction of the two existing lines. Under the No Action Alternative, the conductor would not be replaced and any poles replaced during routine maintenance of the line would be similar in appearance and dimension to the existing poles.

2.2.3 Comparison of ROW Lengths and Land Ownership Crossed

Table 2.2-2 provides a comparison of alternative ROW lengths and land ownership crossed by alternative ROWs.

2.2.4 Underground Construction

Variants A2 and C1 would build a portion of the new line underground. The locations of the underground segments are shown in **Figure 2.2-2**. The length of underground construction would be 2.67 miles for Variant A2 and 2.74 miles for Variant C1.

Cross-linked polyethylene cable is the proposed type for the underground Variants A2 and C1. Each transmission line circuit would utilize three separate cables, just as three bare conductors are required for aboveground transmission lines. The single duct bank required for the proposed double-circuit North Line and South Line would accommodate six cross-linked polyethylene power cables, two fiber optic communications cables, and two spare conduits. Polyvinyl chloride conduits would be set in a concrete duct bank designed to enclose and protect the conduits, and to dissipate the normal heat generated by the power cables. Installing two circuits underground in a common concrete-encased duct bank entails deep excavation using sloped trenches or trench boxes. The duct bank would be approximately 4 feet in height and 6 feet wide, located at the bottom of a 9-foot-deep trench. The top of the concrete duct bank would be covered with 5 feet native soil backfill (HDR 2013). Photos of typical underground construction methods are provided in **Figure 2.2-10**.

Table 2.2-2 Comparison of Alternative Elements

Alternative	Total Length (miles)	Within Existing ROW (miles)	Within New ROW (miles)	Land Ownership Crossed (miles)					
				County	SLB	NCWCD	USFS	DOI	Private/ Other
No Action	28.6	27.6	1	1.7	1.0	1.5	3.4	0.2	20.8
A	15.1	12.6	2.4	0.6	-	0.4	1.5	0.1	12.5
Variant A1	15.2	11.4	3.7	0.5	-	0.4	1.5	0.1	12.7
Variant A2	15.3	11.3	4.0	0.5	-	0.4	1.5	0.1	12.8
B	14.8	13.8	1.0	1.0	1.0	0.8	2.0	0.1	9.9
C	15.5	12.1	3.4	1.1	-	1.1	2.0	0.1	11.2
Variant C1	15.6	11.7	4.0	1.1	-	1.1	2.0	0.1	11.3
APA	14.9	12.4	2.5	1.0	1.0	0.8	2.0	0.1	10.0
D	28.6	27.6	1	1.7	1.0	1.5	3.4	0.2	20.8

SLB = State Land Board (Colorado), NCWCD = Northern Colorado Water Conservancy District, DOI = U.S. Department of the Interior.

Trench dimensions would be wider and deeper in places where vaults are located. Vaults are large concrete boxes buried at specific intervals along the route centerline to provide permanent access to the conduits for cable installation, and adequate space for installing and securing polymer pre-molded cable splices. Separate vaults would be used for each circuit. The number and spacing of vaults required for an underground transmission line would be dictated by the length of cable that can be transported on a reel, the cable's allowable pulling tension, elevation changes along the route, and the internal cable sidewall pressure encountered as it is installed through bends in the centerline. A 115-kV cross-linked polyethylene cable requires a splice every 900 to 3,500 feet, depending on topography (Public Service Commission of Wisconsin 2011).

The conceptual design for the proposed underground transmission circuits assumes 11 separate splice vaults would be constructed for each circuit, for a total of 22 splice vaults (HDR 2013). Vault dimensions would be approximately 10 feet by 30 feet and 10 feet high. They would have two chimneys constructed with manholes which workers would use to access the vault interior for cable pulling, splice installation, and periodic inspection. Covers for the manholes would be flush with the finished road surface or ground elevation. Vaults would be either prefabricated and transported to the site in two pieces, or constructed onsite (HDR 2013).

Where suitable deep soils occur, backhoes most commonly would be used to dig trenches for the duct bank and vaults. Blasting may be required in shallow, rocky settings. Where the transmission lines would be constructed in unpaved areas, all shrubs and trees would be cleared in the area to be trenched for approximately 25 feet on each side of the centerline. Jack and bore construction would be used in areas where open trench construction is prohibited by major existing features such as railroads, waterways, or other large facilities or utilities. For the route selections studied, no such obstructions are currently anticipated. When bedrock or subsoils primarily consisting of large boulders are encountered, as would be the case for at least some of the proposed sites, blasting would be necessary. Small controlled blasts would fracture the rock, with little to no fly rock rising from the site. The blasts would create a short-term boom (less than 0.5 second), resulting in a short-term localized change in noise levels and ground vibrations.

Cable pulling and splicing would occur after the duct banks and vaults are completed. A typical setup is to position the supply reel trailer at the transition structure, or at one vault and position pulling winch equipment at the next vault. Cables would be individually pulled through the duct bank between vaults, or from the transition structure to the nearest vault. Cables are usually pulled in the direction of higher elevation to lower elevation (Public Service Commission of Wisconsin 2011).

230-kV single-circuit duct bank under construction, Longmont, Colorado

115-kV single-circuit duct and termination structure in open space in Jefferson County, Colorado

Exposed sections of conduits, duct bank, and backfill constructed for 230-kV single-circuit in Longmont, Colorado

Interior of a vault, before cable installation, for 230-kV single-circuit transmission line in Denver, Colorado

Figure 2.2-10 Examples of Underground Transmission Line Construction

The connections between overhead and underground lines would require mounting porcelain cable terminations on special single-pole steel structures, also known as transition structures. These structures would be approximately 100 feet tall and 5 feet wide at the base (HDR 2013). They would each accommodate three cable terminations, with relatively wide separations, to meet the electrical code safety requirements of the overhead line. Two transition structures would be required at each termination site for the proposed double-circuit transmission line. Alternatively, cable terminations may be located in an enclosed, fenced, secured area with two customary single-pole dead-end structures. This approach would reduce the visibility of the cable terminations and yield simpler construction and inspection access.

Disturbed areas would be restored with topsoils that were excavated and stockpiled during construction or with new topsoil. Permanent surface monuments would be installed to mark the easement centerline, and to document the presence of the duct bank beneath. Any infrastructure impacted by the construction Project such as roadways, driveways, curbs, and private utilities would be restored to their previous function, and yards and pastures vegetated as specified in landowner easements. Post-construction, trees, large shrubs, or any woody vegetation would not be allowed within a 75-foot ROW for underground sections of the line. Some herbaceous vegetation and agricultural crops may be allowed to return to the ROW.

2.3 Activities Common to All Action Alternatives

This section describes those activities that would occur with any of the action alternatives, though each alternative would have some differences based on the site-specific conditions encountered (e.g., the type of terrain crossed, vegetation types, and availability of existing access roads). Conventional, aboveground construction methods would be used exclusively under Alternatives A, B, C, D, and Variant A1, and would be used in combination with underground construction methods under Variants A2 and C1. Western would maintain electrical service during construction and also would keep the fiber optic communications system in service.

The transmission line ROW would be both aerially and ground surveyed along its centerline. The survey data would be used during the design phase to determine structure locations and heights needed to meet the transmission line design criteria for conductor clearances.

SCPs would be employed to minimize potential adverse effects during construction activities (see Section 2.5, Standard Construction Practices).

Western's standard construction specification requires the construction contractor to have a Safety and Health Program and to take necessary precautions to protect the safety and health of employees and members of the public, and to prevent damage to public and private property. Prior to the start of construction, the construction contractor would be required to submit its Safety and Health Program to Western for approval. At a minimum, the Safety and Health Program would be required to include designation of an on-site superintendent, safety and health policy statements, provisions for first aid and medical care of any injured employees, provisions for employee training, fire protection, health and sanitation facilities, procedures for specific sequences of work to ensure adequate activity hazard analysis, provisions for use of personal protection equipment, procedures for protecting the public, company policy and procedures for enforcing safety and health regulations, procedures required by Occupational Safety and Health Administration (OSHA) 1926, Subpart D (Occupational Health and Environmental Controls), inspection program, fall protection policy and program, and provisions for line-clearance tree trimming operations per OSHA 1910.269.

The construction contractor would be required to keep roads open without unreasonable delays and to provide and maintain suitable detours. The construction contractor would abide by conditions in the USFS operations and maintenance plan as well as the stipulation within their contract with Western. Protection of the public would be provided as required by OSHA 1926, Subpart G, "Signs, Signals, and

Barricades," by utility industry standards specific to transmission line construction and maintenance, and by the public agency having law enforcement jurisdiction for the roadway.

2.3.1 Acquisition of Land Rights

To access, construct, and maintain the Project, Western would need to obtain easements for some segments of the transmission lines or access roads. In order to select specific structure locations, a combination of aerial and ground surveys, environmental and engineering field studies, and geologic investigations would be necessary. Western would request rights-of-entry from landowners prior to entering areas where it does not have an existing easement. Western would select final sites to minimize effects to the properties crossed and to satisfy design criteria, such as maintaining adequate conductor-to-ground clearance. Western would compensate for or repair any damage to fences or other property caused by the surveys and studies.

Western would negotiate and purchase any additional necessary easements from landowners under Federal property acquisition guidelines (the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and its regulations, located at 42 U.S.C. § 4601 et seq. and 49 CFR Part 24). A qualified real estate appraiser would appraise the easement at fair market value. The appraiser would determine the value of the easement using customary appraisal methods, including analysis of available market data and comparable sales, and by taking into consideration the rights being acquired from the landowner. The appraiser would invite the landowner(s) to accompany him/her during the property inspection. Landowners could then identify any property features and uses believed to be of importance in determining the value of the easement. Western would present landowners with a written offer and a contract to purchase the required easements. Western's realty specialist would explain the contract and discuss the basis for payment. Once the conditions of the agreement are met, the transaction would be processed. Western would make full payment for easements to landowners, and would pay for any title insurance and all recording fees.

If Western and a landowner are unable to agree on purchase of an easement, Federal and state laws enable Western to acquire property rights for facilities to be built in the public interest through eminent domain proceedings. During the proceedings, a court would determine the compensation that Western would pay to the landowner.

When construction on a particular ROW is ready to begin, Western would advise the landowner(s) of the construction schedule. Western would make reasonable attempts to take into account the use and condition of the land to minimize any inconvenience. Western would compensate landowners for crop and property damage that occurs as a result of construction or maintenance of the transmission line. If a landowner believes that damage has occurred and has not been recognized, he or she could contact the Western realty specialist.

The landowner would retain title to the land over which Western's easement crosses, and would be able to continue using that land for activities that do not interfere with Western's use of the ROW. These uses may include parking, cultivation, and livestock grazing, among others. Activities typically not permitted in transmission line ROWs are those that pose a safety risk, reduce ground-to-line clearance, interfere with access to the line for maintenance, or jeopardize the integrity of the support structures. Buildings and structures may not be erected in the ROW because they could impede the safe operation of the transmission line or interfere with access for maintenance. For safety reasons, equipment that can extend higher than 14 feet, such as dump trucks, cranes, derricks, bale wagons, and stack movers, should not be used around transmission structures and lines (per NESC guidelines). Likewise, pumps, wells, and flammables must not be placed in a ROW. Properly grounded and permitted fences are acceptable as long as adequate gates for access have been installed.

2.3.2 Access Considerations

Regardless of the alternative selected, Western would need access to each structure site to construct and maintain the new transmission line and/or remove the existing line. Western would utilize existing access that was developed during the construction of the existing lines to the extent possible. Where existing access is inadequate for line removal or new construction, Western would need to improve existing access or establish new access from the nearest existing road or spur road to each structure site.

At some locations where there are existing roads, improvements may be needed to provide the necessary degree of access. Western would reconstruct or recondition roads only to the extent that it is necessary to provide access for construction equipment. Native material would be the primary source of road fill needed. Aggregate would be used only when needed to reduce further impacts to the road prism or as called for by specific engineering activities (e.g., for culvert installations).

It should be noted that new structures would not be specifically sited until the transmission line is designed following completion of the EIS and issuance of a ROD. After new structure sites are identified, Western would consult with landowners and the USFS on the location of new access routes needed for construction and maintenance. Western would conduct cultural and biological surveys along the access routes identified, and document the results in reports. Western would only authorize construction of new access routes following receipt of appropriate USFS, SHPO, and USFWS approvals or concurrences, as well as obtaining easements for access.

In order to minimize road building, Western would consider overland access where topography, soil, and vegetation conditions support overland travel with minimum disturbance and compaction. In this case, although an access road may not be constructed, an easement access would still be obtained. In most cases, where slopes are less than 15 percent, Western would not need to establish new access roads. Instead, access would be by travel within the ROW from the closest existing access road or spur road, resulting in temporary disturbances. Western would expect vegetation to recover quickly at these locations because it would not be graded or cleared.

For alternatives that propose to consolidate ROWs (Alternatives A, B, and C, the variants, and the APA), permanent access would be needed on the ROW where the consolidated double-circuit transmission line would be rebuilt. Only temporary access would be required to remove the existing single-circuit line from the ROW that would be abandoned. In areas with steep and rough slopes, temporary access to structures that need to be removed would be accomplished by foot, tracked vehicle, or all-terrain vehicle (ATV). Alternative D would rebuild single-circuit lines on both existing ROWs, and permanent access would be needed to each structure on both the North and South lines.

Table 2.3-1 provides estimates of the lengths of temporary and permanent access improvements needed for removal of the existing line and new construction under each of the action alternatives.

Table 2.3-1 Temporary and Permanent Access Requirements by Alternative

Access Type*	A	A1	A2	B	C	C1	APA	D
Temporary access for decommissioning the existing line only (miles)	7.1	7.1	7.1	7.1	8.2	8.2	7.9	0.1
Permanent access for long-term maintenance of rebuilt line (miles)	5.6	5.7	5.9	6.8	5.5	4.8	7.2	11.3

* Estimated mileage is for access spurs from existing state, county, private, or USFS roads.

2.3.3 Access Requirements on National Forest System Land

2.3.3.1 National Forest System Roads

USFS roads that provide access to Western's existing ROWs are all classified as Maintenance Level 2 (ML2). ML2 is assigned to roads open for use by high clearance vehicles where passenger car use is not considered. No change in classification is proposed for any USFS road. However, under Alternative C and Variant C1, Western proposes to reconstruct sections of USFS Road 122, to allow for passage of semi-trailer trucks to structure locations. Under this alternative, grinding, chipping, or blasting could be used to level the grade on the west end of Pole Hill Road. Use of imported aggregate would be limited and would be used only when needed to achieve proper grades for haul. Alternatives A, B, D, and the APA and Variants A1 and A2 propose either no improvements to USFS roads or limited reconditioning to remove ruts post-construction. Western's SCPs would be applied as appropriate (see Section 2.5, Standard Construction Practices).

The length of USFS roads where road reconstruction or limited road reconditioning is proposed is summarized by alternative in **Table 2.3-2**.

Table 2.3-2 National Forest System Road Reconstruction or Reconditioning

Road Category	A, A1, and A2	B	C and C1	APA	D
Unimproved system road (miles)	1.4	0.4	0.0	0.4	0.4
Limited reconditioning of existing ML2 system road post-construction (miles)	2.2	3.2	0.2	3.8	3.2
Reconstruction of existing ML2 system road for construction (miles)	0	0	3.4	0	0

2.3.3.2 Permanent Access

Permanent access between USFS roads and structure sites is needed to reach the rebuilt line on either one ROW (Alternatives A, B, C, and variants) or two ROWs (Alternative D). The roads Western currently uses for access to the transmission lines would continue to be used to the extent feasible. Where existing access is inadequate or does not reach new proposed structure locations, new permanent access roads are proposed. Permanent access roads are proposed to be classified as ML2 and Traffic Service Level “C.” Western would recondition/reconstruct roads only to the extent that it is necessary to provide access for construction and maintenance equipment. The proposed designation is for administrative use only. During the design phase, Western would consult with the USFS on access road alignments, the potential use of gates or other means to prevent unauthorized access, and conduct biological, wetland and cultural surveys for any new roads not previously surveyed. If necessary, Western would obtain the appropriate permits from the USACE.

2.3.3.3 Temporary Access

Temporary access for line decommissioning on National Forest System land would utilize Western's existing access roads, existing non-system two-track, and overland travel, wherever possible for each of the alternatives. New temporary access roads would have a design width of 10 feet, and Western would construct temporary access roads only to the extent that it is necessary to provide access for four-wheel drive trucks. After implementation is complete, new temporary access roads would be obliterated and revegetated as needed.

2.3.3.4 Road Decommissioning

Alternatives A, B, C, and the variants propose to rebuild the transmission line as a double-circuit line on one of two existing ROWs. The other ROW would be decommissioned by removing structures, insulator bundles and crossarms, and conductors, and revegetating the ROW as needed. After the ROW is decommissioned, Western's existing or temporary access to that ROW on National Forest System land also would be decommissioned. Access decommissioning may consist of providing for proper drainage and allowing the access route to naturally revegetate. It also may involve more active restoration methods such as scarification and reseeding, depending on local site conditions. Additionally, blocking access to unauthorized travel also would be considered, as negotiated with the USFS.

2.3.3.5 Access by Alternative

The miles of permanent and temporary access on National Forest System lands for line removal and new construction under each of the action alternatives and variants are summarized in **Table 2.3-3** below.

Table 2.3-3 Access on National Forest System Lands by Alternative

Road Category	A, A1, and A2	B	C and C1	APA	D
Permanent Access (Administrative Designation)					
Existing Western access designated for administrative use (miles)	0.4	0.2	0.2	0.2	0.6
New administrative road for permanent access (miles)	0.9	0.6	0.6	0.6	1.9
Temporary Access					
New temporary road for line decommissioning (miles)	0.4	0.9	0.9	0.9	0.0
Temporary access by non-system two-track (miles)	0.6	0.5	0.5	0.5	0.0
Temporary access by overland travel (miles)	0.3	0.3	0.3	0.3	0.0
Decommissioning					
Existing Western access to be decommissioned (miles)	0.2	0.3	0.3	0.3	0.0

2.3.4 Construction Staging Areas on all Lands

Existing substations and their immediate surroundings would be used to the extent possible for equipment staging, material laydown, and storage facilities. This would apply to all lands and alternatives. Additionally, Western anticipates that two 62,500-square-foot temporary staging areas (approximately 3 acres, combined) would be necessary to support implementation of any action alternative. The location of staging areas would be determined by the construction contractor during the construction phase; staging areas would be sited in accordance with Western's SCPs (see **Table 2.5-1**) and would be located at sites previously disturbed where practical and not on USFS land. Existing or portable concrete batch plants would be used to supply poured concrete for

foundations for transmission line structures. In accordance with the SCPs, staging areas would be surveyed, as necessary, for cultural and other resources prior to disturbance.

2.3.5 Existing Line Removal on all Lands

The construction contractor would determine how to remove existing structures. Landowners would be consulted to determine if structures would be cut off at ground level or completely removed. Generally, structures would be lowered to the ground and stripped of hardware, arms, and braces. The conductor would be removed and coiled up prior to “laying” down existing structures or coiled up after the structures have been removed from the ROW. Pulling sites may be needed to pull the conductors. The construction contractor would have the option to remove guy anchors or cut them off 30 inches below ground level. In areas with steep topography or poor access, wood-pole structures may be dropped and given to the landowners or left in place, removed by dragging with a drag line, or removed by other means. If poles are left in place, they would be flush cut at ground and left on-site in the ROW in long sections or bucked up.

Construction waste materials would be collected, hauled away, and recycled or disposed of at approved sites. Often old utility poles are offered to landowners for their use. All disturbed areas not returned to agricultural cultivation would be reseeded to minimize erosion and the invasion of noxious weeds. All disturbance areas would be restored to their original condition as feasible. Damaged roads, gates, fences, or landscaping would be repaired.

The contractor would be required to prepare and implement a safety program in compliance with appropriate Federal, state, and local safety standards and requirements, and as approved by Western.

2.3.6 Clearing and Grading on all Lands

Crews would remove trees and shrubs from the structure location and along the ROW as necessary to provide access for construction equipment and activities. Methods for vegetation clearing and debris disposal are described in detail in **Appendix B**. Vegetation removal for ROW maintenance is described in Section 2.6.

2.3.7 Structure and Conductor Installation on all Lands

Direct embedded single-pole steel structures are proposed for Alternative A, Variant A1, Alternatives B, C, and the APA. A truck-mounted or track-mounted auger would be used to excavate holes for the structures. The steel poles would be assembled at the pole sites, or portions of the poles may be assembled at the staging areas and then hauled to the sites. The structures would be lifted into place with cranes or helicopter and held in place while concrete trucks backfill the excavation, filling the hole around the structure.

If site conditions or design requirements indicate a need, single-pole structures that bolt to a foundation would be used. The foundations would be constructed by installing rebar cages and anchor bolt cages in the excavated holes. Concrete would then be poured into the formed foundation to secure these cages in place. The fully assembled steel poles would then be bolted to the foundation anchor bolts. Excess soil would be spread evenly around the base of the poles and revegetated or removed from the site.

For Alternative D, which involves wood pole structure replacement, holes would be augered for new structure poles. Approximately 10 percent of the total structure height plus an additional 2 feet of each structure would be placed underground (e.g., a 70-foot-tall structure would have approximately 9 feet underground). Construction crews would assemble new structures within the ROW, and then position the structures into augered holes using cranes. Dirt from the excavations would be used to backfill around the new poles and to fill in the holes from the removed structures. Excess dirt would be spread near the pole and leveled with existing topography or removed from the site.

Assembly of transmission line structures would occur on site where insulators, braces, and other equipment would be attached to the structures while they are still on the ground. Boom trucks and cranes would be used to raise the structures into the foundation bore holes.

The Project would require level sites approximately every 2 to 3 miles along the transmission line to house reels of transmission cable and to serve as staging areas for wire-pulling. Western would try to avoid locations that require grading or removal of vegetation. The conductor pulling, sagging, and clipping operations would take place after the structures are in place. The conductor would not touch the ground during stringing or tensioning. Pulleys would be attached to the insulators to string the conductors, which then would be pulled to the appropriate tension. Contractors would use either a ground vehicle or helicopter to install the pulling cable. Where necessary, traffic would be slowed or alerted while activities are occurring that could affect public safety.

Conductor pulling is limited by reel size; typically, a conductor of the required diameter can be loaded onto reels in 10,000- to 15,000-foot segments. Most disturbance during this phase of construction would occur within the existing or expanded ROW. However, at some locations (e.g., at pulling and tensioning sites near an angle in the alignment) areas outside the ROW may be disturbed during construction.

2.3.8 Site Cleanup and Restoration on all Lands

Crews would remove construction debris and other materials from construction sites following construction and dispose of it in a certified private, public, or construction and demolition landfill, as appropriate. Where appropriate, usually areas with compactive soil types or where compaction would cause a problem, crews would loosen and level disturbed soil areas with harrowing or disking to approximate preconstruction contours. Ruts and scars that would interfere with overland travel would be filled or recontoured. Disturbed areas would be reseeded and mulched, as needed, using an approved mix as soon as practical after construction activities are completed in any given area. On National Forest System lands, an approved seed mix would be used for restoration. In some areas, mulching, netting, or turf reinforcement mats may be necessary to protect seeded areas from erosion. If used, mulching would consist of weed-free hay or other approved material. Private lands would be reseeded in consultation with private landowners. Periodically, crews would monitor disturbed or revegetated areas for erosion and to determine if site restoration is adequate. Areas may be reseeded as necessary to establish cover.

Drainage structures and other improvements not needed for permanent maintenance of the transmission lines would be removed. Similarly, access roads or trails that are not needed for ongoing maintenance access would be blocked and reclaimed, as negotiated with the USFS or private landowners.

2.3.9 Workforce on all Lands

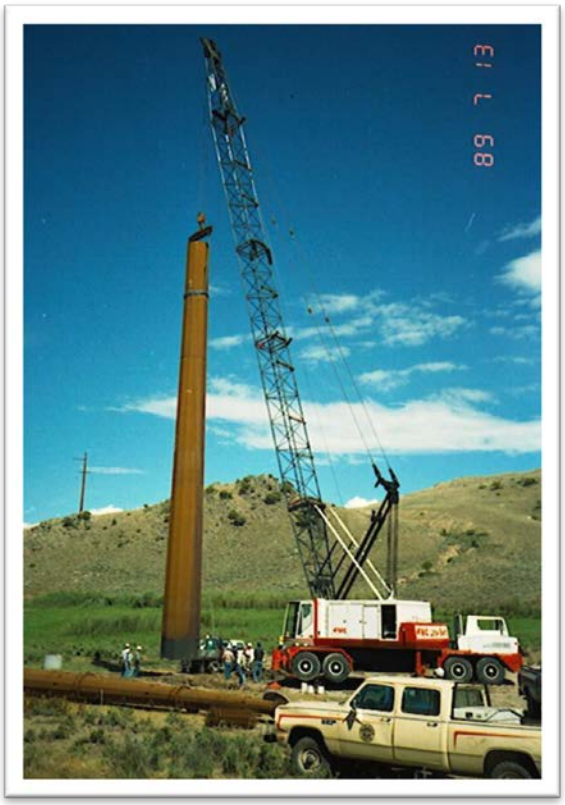
The workforce would typically be a combination of local labor acquired by contractors, and a mobile labor workforce that specializes in transmission line construction and temporarily relocates to the area where the work necessitates. Construction would be accomplished by two or three crews of five to six persons each. The construction contractor would determine the nature and make-up of the workforce.

2.3.10 Construction Sequencing on all Lands

The transmission line rebuild is expected to take eight to twelve months to complete. **Table 2.3-4** lists the typical sequence of construction activities for overhead transmission line and the equipment needed for each task. Photos of typical overhead construction methods are provided in **Figure 2.3-1**. Underground construction methods applicable to Variant A2 and Variant C1 are described in Section 2.2.4.

Hauling structure on an access road

Auger drilling for structure base



Setting a structure base

Setting the top of a structure

Figure 2.3-1 Examples of Overhead Transmission Line Construction

Table 2.3-4 Construction Activities and Equipment

Task	Equipment
Surveying	Utility vehicles, pickups, ATVs
Access	Graders, caterpillars, dump trucks, water trucks
ROW Clearing	Brush hogs, mowers, chain saws, skidders, bulldozers
Staging	Flatbeds with cranes, delivery trucks, pickups
Excavation	Backhoes, rotary drilling rigs, augers, cement mixers, pickups, ATVs, portable compressors
Structure Assembly	Cranes, material trucks, carryalls, pickups
Structure Placement	Cranes, boom trucks, pickups, semi-trailer trucks, helicopters
Cable Pulling	Boom trucks/man lifts, reel trailers, hydraulic tensioning equipment, pickups, helicopters
Cleanup	Flatbeds, dump trucks, pickups
Restoration	Seeding equipment, hand-seeding equipment, caterpillars, backhoes, flatbeds, pickups

2.3.11 Construction Disturbance and Monitoring on all Lands

During construction, a construction inspector (Western employee or hired independent contractor) would be present in the field to ensure implementation of SCPs and Project-specific design criteria (Section 2.5.2). An estimate of short-term disturbance areas associated with transmission line construction and access routes are provided in **Tables 2.3-5** and **2.3-6**. Long-term disturbance for structure bases would be less than 0.1 acre for any alternative.

Table 2.3-5 Summary of Short-term Disturbance for Transmission Line Construction by Alternative

Project Component	Disturbance Area		Short-term Disturbance by Alternative (acres)					
		A/A1	A2	B	C	C1	APA	D
Structure installation	11,350 square feet per structure	18 - 24	15 - 20	20 - 26	19 - 25	15 - 21	19-26	56 - 65
Conductor stringing sites	0.25 acre per site	1 - 3	1 - 2	1 - 3	1 - 3	1 - 2	1-3	2 - 5
Staging areas	2-3 sites; 5 acres per site	10 - 15	10 - 15	10 - 15	10 - 15	10 - 15	10-15	10 - 15
Removal of existing H-frame structures	9,500 square feet per structure	45	44	45	45	44	45	41
Pulling sites for line removal	0.25 acre per site	1 - 3	1 - 2	1 - 3	1 - 3	1 - 2	1-3	2 - 5
Underground construction	9 acres per mile	NA	24	NA	NA	25	NA	NA
Total		75 - 90	95 - 108	77 - 92	75 - 90	96 - 108	76-91	112 -132

NA = not applicable.

Table 2.3-6 Summary of Short-term and Long-term Surface Disturbance for Access Routes

Disturbance Type	A	A1	A2	B	C	C1	APA	D
Short-term disturbance for temporary access (acres)	7	7	7	7	8	8	8	0
Long-term disturbance for permanent access (acres)	10	10	11	13	10	9	13	21

* Assumes 8-foot-wide access route for temporary access and 15-foot-wide access route for permanent access.

2.3.12 Operation and Maintenance Activities Common to All Alternatives

Operation and maintenance of the lines would be the responsibility of Western. Throughout the life of the Project, Western would conduct the following operation and maintenance activities:

- Routine aerial inspections of the integrity and condition of the transmission lines, and after wind, ice, and lightning events that cause forced outages. Aerial line patrol is recognized as the most efficient and cost effective method to customers for maintaining the electric power grid. Western maintains and operates their helicopters under Federal Aviation Regulations Parts 135, 133, and 91 as is applicable to the mission being flown.
- Ground inspections once per year, and as needed after weather events, to identify any repair or routine maintenance needs. Maintenance activities would include repairing damaged conductors, insulators, or structure components. Western could conduct climbing inspections on transmission line structures if aerial or ground inspections find problems.
- Maintenance of access roads for Western's use, including surfacing, adequate drainage to reduce erosion damage, and removing downed trees and/or branches.
- Removal of trees and brush that create access, safety, or clearance problems for operation of the transmission lines, and noxious weed control as described in Section 2.6 below.

2.4 Comparison of Alternative Costs

A comparison of estimated life-cycle costs for the nine end-to-end alternatives by region is provided in **Table 2.4-1** below. The west, east, and central regions are portrayed in **Figure 2.2-8**. Estimated construction costs take into account the terrain, construction difficulty, length of line, and escalation for projected construction date. Estimated construction costs do not include costs for planning, lands and rights, environmental surveys and compliance, geologic investigations, designs and specifications, or construction supervision. The number of acres of land to be acquired for new or expanded ROWs is subsequently estimated in **Tables 2.8-1**, **2.8-2**, and **2.8-3**. Land acquisition costs in **Table 2.4-1** are based on a market analysis completed by Western to determine landowner compensation and land acquisition costs, including: acquisition labor costs, surveys, legal review, title policies, appraisals, and possible condemnations.

Table 2.4-1 Preliminary Transmission Line Cost Estimates by Alternative[1,2,3,4,5]

	Alternative ($ millions)								
West Region	**A**	**A1**	**A2**	**B**	**C**	**C1**	**APA**	**D**	**No Action**
80-year construction cost	5.6	5.9	32.1	6.1	5.6	31.0	5.6	17.6	19.2
80-year maintenance cost	0.3	0.3	0.2	0.3	0.3	0.1	0.3	1.0	1.0

Table 2.4-1 Preliminary Transmission Line Cost Estimates by Alternative[1,2,3,4,5]

West Region	**Alternative ($ millions)**								
80-year vegetation management cost	0.4	0.4	0.2	0.6	0.5	0.2	0.5	0.9	0.9
Total 80-year life cycle cost	6.4	6.6	32.5	7.0	6.4	31.3	6.4	19.5	21.1
Easement acquisition cost	1.1	0.8	0.8	0.0	0.0	0.6	0.0	0.9	0.9
Total	**7.5**	**7.4**	**33.2**	**7.0**	**6.4**	**32.0**	**6.4**	**20.5**	**22.0**

	Alternative ($ millions)					
Central Region	**A, A1, A2**	**B**	**C, C1**	**APA**	**D**	**No Action**
80-year construction cost	5.8	5.8	5.8	5.8	17.6	19.3
80-year maintenance cost	0.4	0.4	0.4	0.4	1.0	1.0
80-year vegetation management cost	0.6	0.6	0.6	0.6	1.1	1.1
Total 80-year life cycle cost	6.7	6.7	6.7	6.7	19.6	21.4
Easement acquisition cost	0.3	0.3	0.3	0.3	0.3	0.3
Total	**7.0**	**7.0**	**7.0**	**7.0**	**19.9**	**21.7**

	Alternative ($ millions)					
East Region	**A, A1, A2**	**B**	**C, C1**	**APA**	**D**	**No Action**
80-year construction cost	7.5	5.2	5.8	5.2	16.6	18.4
80-year maintenance cost	0.5	0.4	0.5	0.4	1.1	1.1
80-year vegetation management cost	0.6	0.6	0.7	0.6	1.2	1.2
Total 80-year life cycle cost	8.6	6.2	7.0	6.2	18.9	20.7
Easement acquisition cost	0.5	0.1	0.5	0.1	0.5	0.5
Total	**9.0**	**6.3**	**7.5**	**6.3**	**19.4**	**21.2**

[1] 80-year costs include maintenance and replacement costs.

[2] 80-year overhead transmission line costs for Alternative D includes replacement costs after 40 years due to use of wood structures.

[3] 80-year underground cost estimates include replacement cost of the dielectric cables after 40 years.

[4] No Action construction costs include construction costs associated with moving sections of the North Line off onto new ROW as described in Section 2.2.1.1.

[5] No Action construction costs include construction cost for line rebuild within the next 10 years due to existing status of aging wood structures, in addition to replacement costs after 40 years due to use of wood structures.

2.5 Environmental Project Safeguards

Standard construction practices, project design criteria, and environmental protection measures are requirements for the construction, maintenance, and decommissioning activities regardless of which alternative is chosen and presented in the ROD. These actions all were developed or mandated to avoid or reduce impacts to resources, and they are required for implementation of the Project on USFS lands.

2.5.1 Standard Construction Practices

Western has SCPs, including standard operation and maintenance practices that avoid or minimize impacts to the environment to the greatest extent practicable. Design criteria are actions or measures integrated into the Project design to avoid, minimize, reduce, or eliminate adverse effects as a result of implementing the action alternatives. For the Estes-Flatiron transmission lines rebuild, Western's SCPs identified in **Table 2.5-1** would be implemented for the construction of any action alternative. These measures are part of Western's Project and are incorporated into all impact assessments in this EIS. Maintenance activities under the No Action Alternative may be performed by a Western maintenance crew, rather than by a construction contractor; however, SCPs would still apply.

Table 2.5-1 Western's Standard Construction Practices

Ref. #	Standard Construction Practices
SCP 1	The contractor shall limit the movement of its crews and equipment to the ROW, including access routes. The contractor shall limit movement on the ROW to minimize damage to grazing land, crops, or property, and shall avoid unnecessary land disturbance.
SCP 2	When weather and ground conditions permit, the contractor shall obliterate contractor-caused deep ruts that are hazardous to farming operations and to movement of equipment. Such ruts shall be leveled, filled, and graded, or otherwise eliminated in an approved manner. In hay meadows, alfalfa fields, pastures, and cultivated productive lands, ruts, scars, and compacted soils shall have the soil loosened and leveled by scarifying, harrowing, discing, or other approved methods. Damage to ditches, tile drains, terraces, roads, and other features of the land shall be corrected. Before final acceptance of the work in these agricultural areas, ruts shall be obliterated, and trails and areas that are hard-packed as a result of contractor operations shall be loosened, leveled, and reseeded. The land and facilities shall be restored as nearly as practicable to their original conditions.
SCP 3	Water bars or small terraces shall be constructed across ROW and access roads when needed to prevent water erosion and to facilitate natural revegetation.
SCP 4	The contractor shall comply with applicable Federal, state, and local environmental laws, orders, and regulations. Prior to construction, supervisory construction personnel and heavy equipment operators will be instructed on the protection of cultural and ecological resources.
SCP 5	The contractor shall exercise care to preserve the natural landscape, and shall conduct its construction operations to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, construction roads, or excavation operations, trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage by the contractor's construction operations and equipment. To the extent practicable considering the need to protect transmission lines from encroaching vegetation and vegetation hazards (especially trees) edges of clearings and cuts through tree, shrubbery, or other vegetation would be irregularly shaped to soften the visual impact of straight lines within the ROW.

Table 2.5-1 Western's Standard Construction Practices

Ref. #	Standard Construction Practices
SCP 6	On completion of the work, work areas shall be scarified or left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion. The contractor would repair damages resulting from the contractor's operations. Newly created access roads will be left to revegetate to height that still allows vehicle passage.
SCP 7	Construction staging areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Staging areas will not be placed within wetlands, including fen wetlands, riparian communities, or in proximity to surface waters. On abandonment, storage and construction buildings, including concrete footings and slabs, and construction materials and debris shall be removed from the site. The area shall be regraded as required so that surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.
SCP 8	Borrow pits shall be excavated so that water will not collect and stand. Before being abandoned, the sides of borrow pits shall be brought to stable slopes, with slope intersections shaped to carry the natural contour of adjacent undisturbed terrain into the pit or borrow area, giving a natural appearance. Waste piles shall be shaped to provide a natural appearance. No waste piles will occur on National Forest System lands.
SCP 9	Construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter contaminants, debris, other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Pollutants and waste include, but are not restricted to refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.
SCP 10	Dewatering work for structure foundations or earthwork operations adjacent to, or encroaching on, streams or watercourses, shall be conducted in a manner to prevent muddy water and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means. Dewatering shall comply with applicable state requirements.
SCP 11	Excavated material or other construction materials shall not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff, or can encroach upon the actual watercourse itself.
SCP 12	Waste waters from construction operations shall not enter streams, watercourses, or other surface waters without the appropriate permits and proper implementation of applicable permit conditions, including but not limited to use of turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes, or other approved methods. Waste waters discharged into surface waters shall be essentially free of settleable material. For the purpose of these practices, settleable material is defined as material that will settle from the water by gravity during a 1-hour quiescent detention period.
SCP 13	The contractor shall use practicable methods and devices that are reasonably available to control, prevent, and otherwise minimize discharges of air contaminants.
SCP 14	The emission of dust into the air will not be permitted during the handling and storage of concrete aggregate, and the contractor shall use methods and equipment as necessary for the collection and disposal, or prevention, of dust. The contractor's methods of storing and handling cement and pozzolans shall include means of controlling air discharges of dust.
SCP 15	Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or inefficient operating conditions, shall not be operated until repairs or adjustments are made.

Table 2.5-1 Western's Standard Construction Practices

Ref. #	Standard Construction Practices
SCP 16	The contractor shall prevent nuisance to persons or damage to crops, cultivated fields, and dwellings from dust originating from his operations. Oil and other petroleum derivatives shall not be used for dust control. Speed limits shall be enforced, based on road conditions, to reduce dust problems.
SCP 17	To avoid nuisance conditions due to construction noise, internal combustion engines shall be fitted with an approved muffler and spark arrester.
SCP 18	Burning or burying waste materials on the ROW or at the construction site will be permitted if allowed by local regulations. The contractor shall remove all other waste materials from the construction area. All materials resulting from the contractor's clearing operations shall be removed from the ROW. No waste materials can be buried on National Forest System lands.
SCP 19	The contractor shall make necessary provisions in conformance with safety requirements for maintaining the flow of public traffic, and shall conduct its construction operations to offer the least possible obstruction and inconvenience to public traffic.
SCP 20	Western will apply necessary mitigation to eliminate problems of induced currents and voltages onto conductive objects sharing a ROW, to the mutual satisfaction of the parties involved.
SCP 21	Structures will be carefully located to avoid sensitive vegetative conditions, including wetlands. If roads would cross wetlands, crossings occur at a feasible location for the construction contractor and in an area where the least amount of damage would occur to the wetland community. If necessary, Western would obtain the appropriate permits from the USACE.
SCP 22	No disturbance of vegetation will occur within 100 feet of a stream, except for hazard trees. No fueling, staging or storage areas would be placed within 100 feet of wetlands, streams or riparian areas. Where possible, vehicles should avoid crossing hydric soils.
SCP 25*	Disturbed areas not needed for maintenance access will be reseeded using mixes approved by the land management agency.
SCP 26	Erosion control measures will be implemented on disturbed areas, including areas that must be used for maintenance operations (access ways and areas around structures).
SCP 27	The minimum area will be used for access ways (generally 12 to 16 feet wide, except where roadless construction is used).
SCP 28	Leveling and benching of structure sites will be the minimum necessary to allow structure assembly, erection, and maintenance.
SCP 29	ROW will be located to use the least steep terrain.
SCP 30	Careful structure location will ensure spanning of narrow flood prone areas.
SCP 31	Structures will not be sited on potentially active faults.
SCP 32	Structure sites and other disturbed areas will be located at least 100 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes, and reservoirs.
SCP 33	New access ways will be located at least 100 feet, where practical, from rivers, ponds, lakes, and reservoirs.
SCP 34	At crossings of perennial streams by new access ways, culverts of adequate size to accommodate the estimated peak flow of the stream will be installed. Construction areas will minimize disturbance of the stream banks and beds during construction. The mitigation measures listed for soil/vegetation resources will be performed on areas disturbed during culvert construction.

Table 2.5-1 Western's Standard Construction Practices

Ref. #	Standard Construction Practices
SCP 35	If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts will be installed using the same measures as for culverts on perennial streams, and the applicable USACE permits would be obtained.
SCP 37*	Power line structures will be located, where practical, to span small occurrences of sensitive land uses, such as cultivated areas. Where practicable, construction access ways will be located to avoid sensitive conditions.
SCP 38	ROW will be purchased at fair market value and payment will be made of full value for crop damages or other property damage during construction or maintenance.
SCP 39	The power line will be designed to minimize noise and other effects from energized conductors.
SCP 42*	Before construction, Western will perform a Class III (pedestrian) cultural survey on areas to be disturbed, including structure sites and new access ways. These surveys will be coordinated with the appropriate landowner or land management agency, the SHPO and Indian tribe if on tribal lands. The survey reports and recommendations will be reviewed with the SHPOs and other appropriate agencies. Western's Standard Operating Procedure is to avoid all culturally sensitive sites. If not possible, specific mitigation measures necessary for each site or resource will be determined. Mitigation may include careful relocation of access ways, structure sites, and other disturbed areas to avoid cultural sites that should not be disturbed, or data recovery.
SCP 43	The contractor will be informed of the need to cease work in the location if cultural resource items are discovered.
SCP 44	Construction activities will be monitored or sites flagged to prevent inadvertent destruction of cultural resource for which the agreed mitigation was avoidance.
SCP 45	Construction crews will be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance.
SCP 46	If cultural resources that were not discovered during the Class III survey are encountered during construction, ground disturbance activities at that location will be suspended until the provisions of the NHPA have been carried out.
SCP 47	Construction activities will be monitored or significant locations flagged to prevent inadvertent destruction of paleontological resource for which the agreed mitigation was avoidance.
SCP 48	Clearing for the access road will be limited to that necessary to permit the passage of equipment, and the safe construction, operation and maintenance of the line.
SCP 49	The access road will follow the lay of the land rather than a straight line along the ROW where steep topography would result in a higher disturbance.
SCP 50	For any water withdrawals and uses totaling over 1/10th (0.10) acre-foot in the South Platte River drainage, the construction contractor shall ensure that water needed for the project (for dust control, concrete mixing, etc.) will be supplied from an already-permitted existing depletion source, or the contractor shall successfully complete the appropriate consultation process with the U.S. Fish and Wildlife Service.

* Western's SCPs 23, 24, 36, 40, and 41 are not applicable to this Project and are not included in this table.

2.5.2 Project-specific Design Criteria or Construction Practices

The design criteria below were developed to minimize or avoid impacts to avian species, special status wildlife and plants, and minimize visual effects of vegetation management. The following Project-specific design criteria apply to all action alternatives:

2.5.2.1 Avian Wildlife

- Western will design and construct the transmission line in conformance with the Suggested Practices for Avian Protection on Power Lines (Avian Power Line Interaction Committee [APLIC] 2006).
- The siting of structure locations and/or timing of construction related activities will adhere to Colorado Parks and Wildlife (CPW) 2008 *Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors*. When distance buffers are not possible because of Project proximity, seasonal restrictions will be implemented.
- Avian nesting surveys will be conducted prior to construction to ensure ground disturbing activities do not result in the “take” of an active nest or migratory bird protected under the MBTA. If construction occurs during the avian breeding season (roughly between March 15 and September 1), surveys will be conducted no earlier than 72 hours prior to any ground disturbing activities to ensure the Project complies with the MBTA.

2.5.2.2 Visual Resources

- Clumps or islands of trees will be left in openings created by danger tree removal (where sagging lines and ground clearance are not a concern) to break sight distance and to maintain natural-appearing landscape mosaic pattern.
- Western will limit the use of foliar application of herbicide to reduce creation of large areas of browned vegetation.
- At road crossings, highway or visual overlooks, Western will leave sufficient vegetation, where possible, to screen views of the ROW.
- Additional vegetation management information is located in **Appendix B**.
- Western will treat unnatural-appearing soil disturbances by smoothing piles of soil created by machinery or any other soil disturbance from machine piling within 100 feet of areas requiring Partial Retention Visual Quality Objective/Moderate Scenic Integrity Objective or higher. Areas may include scenic byways, hiking or multi-use trails, camping areas, other areas of moderate to high use recreation, or any other areas of visual significance.
- At locations where visibility from sensitive viewpoints is a major concern, structures with a shorter average height (85-foot) and shorter span length could be utilized. The shorter design would result in roughly twice the number of structures in a given length of ROW in order to meet required conductor clearances. The feasibility of using shorter structures, and the location of these structures and spans will be determined during the design phase of the Project.

2.5.2.3 Special Status Wildlife and Plants

- Prior to Project implementation, Western would conduct pre-construction surveys along portions of its preferred alternative, including access roads not previously surveyed, to identify sensitive species habitat or populations, and occurrences of noxious weeds. If special status individuals or populations are discovered, Western would develop mitigation to minimize effects in consultation with the USFS and appropriate natural resource agencies.

2.5.3 Project-specific Environmental Protection Measures

In addition to Western's SCP's and Project-specific design criteria, the following EPMs are integrated into the Project. The following EPMs apply to all action alternatives:

- During construction, a construction inspector (Western employee or hired independent contractor) would be present in the field to ensure implementation of SCPs and Project-specific design criteria (Section 2.5).
- Noxious weed surveys would be conducted prior to Project implementation on new proposed alignments along the APA that were not surveyed in 2011. Survey information collected during pre-construction surveys per the specific design criteria would include species name, Global Positioning System (GPS) location of weed infestations, percent cover, and approximate size of weed infestations.
- Western has committed to additional plant surveys and appropriate consultation for all applicable species with the USFWS and USFS along the selected alternative prior to construction.
- A noxious weed management plan would be developed to specify general weed prevention and control methods to be implemented pre-, during, and post-construction. Techniques would include education of construction and operation personnel, and post-construction monitoring. Control of noxious and invasive species would include, as needed, selective herbicide spraying or other chemical, physical, and biological methods consistent with the State of Colorado, Larimer County, and USFS regulations and guidance.
- Where permanent facilities or structures would be located, the entire topsoil horizon (layer) would be salvaged for use in reclamation, prior to greater surface disturbance. Additionally, prior to any trenching, the topsoil would be salvaged and stockpiled separately from subsoil, for later use in reclamation.
- Construction, excavation, or re-spreading with frozen or saturated soils would be prohibited or minimized to the greatest extent practicable. Implementation of this measure would avoid or reduce impacts to soils due from uneven settling, compacted surfaces, and physical crusts that would reduce water infiltration.
- Roads would be inspected as part of routine line inspections and remediation / restoration conducted as needed based on those inspections.
- During reclamation and decommissioning, compacted areas (typically any area that received repeated traffic or three or more passes by heavy equipment) would be decompacted by subsoiling, paraplowing, or ripping along the contour to the depth of compaction. Soils would be decompacted only where needed, and where decompaction would result in greater net benefits to helping seedbed preparation, encouraging infiltration, and reducing accelerated erosion than would occur without it. Scarification would only be used on shallow soils.
- To protect stored or stockpiled soils from losses to wind and water erosion, soil piles left in place for more than one week would be protected using the appropriate best management practices (mulch, tackifier, cover crop, etc.).
- As site-specific planning and design proceed, Western would locate foundations to avoid domestic water supply and septic systems. Western would ascertain the need for blasting to construct foundations in areas where hard, near-surface bedrock occurs alongside domestic water supply and septic systems. Where blasting would be required under such conditions, Project structure foundations would be located as far from domestic infrastructure as possible, and a blasting control plan would be developed and implemented to minimize adverse effects on underground water systems. Western would address any damage claims appropriately, verifying damages and restoring the function of individual or local water supply or septic systems, as needed.

- As part of final design and engineering, wetland surveys would be conducted along the selected alternative ROW to identify any potential wetlands and fens located on site. Where potential wetland features are identified within the ROW, survey information collected would include wetland type, type and cover of hydrophytic and riparian vegetation species present, site hydrology, GPS location of the wetland boundaries and adjacent ROW footprint, and associated information required to determine jurisdictional status through consultation with the USACE. If wetlands or fens are identified on National Forest System lands, in addition to the consultation with the USACE as described in SCP 21, appropriate USFS wetlands staff would be consulted.
- If wetlands are identified within the selected alternative ROW, boundaries of avoidable features would be staked in the field to guide construction activities. Where wetland features cannot be avoided through site design, wetland construction techniques would be applied for any construction within wetlands. Wetland construction techniques could include: not removing existing structures in wetlands and riparian areas, cutting off existing structures at the base; or the use of timber mats, erosion controls, and the placement of equipment outside of the wetland and waters of the U.S. boundaries. Wetland construction techniques and best management practices would be reviewed and approved by the USACE.
- Western proposes to conduct additional plant surveys as described in the Project-specific design criteria (Sections 2.5.1.3, Special Status Wildlife and Plants) above. If known federally listed plant species or USFS-identified sensitive plant species are encountered, an avoidance plan would be created and implemented in consultation with a USFS Botany Representative to avoid or minimize impacts, as appropriate.
- Rocks, brush, and woody debris will be salvaged to the extent practicable and replaced to approximate pre-Project visual conditions on graded structure pads, staging areas, and temporary access routes that are decommissioned post-construction. This would re-establish the pre-disturbance surface character following construction and accelerate long-term reclamation of graded pads, staging areas, and temporary access routes.
- To the extent possible, Western will utilize non-specular conductors and non-reflective coatings on insulators. This would reduce glare from transmission conductors and insulators.
- Appropriate color treatments will be used for steel monopole transmission towers to the extent practicable. Similarly, surface treatments for transmission structures will repeat and/or blend with the existing colors of the surrounding landscape to the extent practicable. This measure describes two such examples.1) Grey galvanized steel will be utilized east of Bald Mountain to Flatiron substation where they will be seen against an olive-colored sagebrush and mountain mahogany backdrop. 2) Where transmission structures will be silhouetted against the sky from most viewpoints (such as above The Notch), galvanized structures will be selected to minimize color contrasts. Such galvanized steel monopoles poles and davit arms will receive a non-specular treatment to dull their reflectivity and reduce glare. [Note: Since the publication of the Draft EIS, Western has determined that it would use dulled galvanized steel structures for the entire project. The latest field experience information from the utility industry on self-weathering structures indicates that ongoing corrosion weakens these structures, therefore shortening their expected service life. For this reason, and the fact the Forest Service prefers dull galvanized steel, self-weathering steel structures would not be used for this project.]
- If at any time during this Project, possible human remains are discovered, Western's Archaeologist and the USFS Arapaho-Roosevelt National Forest (USFS) Archaeologist will be notified immediately (no later than 24 hours after the discovery) by telephone and email. Work of all types will halt immediately within 300 feet of the remains and reasonable protective measures will be employed until such time as appropriate agency personnel, the Colorado State Archaeologist, the Larimer County Sheriff, and/or the Larimer County Coroner can be notified and are able to determine the nature and significance of the remains.

2.6 Vegetation Management

Vegetation management practices to be implemented under the No Action and rebuild alternatives are described below. Additional information is provided in **Appendix B**.

2.6.1 No Action Alternative

Under the No Action Alternative, Western would continue its infrastructure, ROW, and access road maintenance practices as they are currently defined under existing authorizations and other agreements. Due to increasingly more stringent NERC standards, Western must pursue ROW acquisition to allow for maintaining vegetation. Some of the existing transmission line ROWs do not have adequate space to maintain vegetation clearance distances and, therefore, do not comply with current NERC compliance standards.

The current management approach to controlling vegetation, ensuring access, and maintaining equipment is largely reactive and responds to maintenance problems when they occur. Methods to control vegetation are manual, mechanical, and chemical (herbicides).

Under the No Action Alternative, Western would continue its management approach for ROW, access, and transmission line maintenance. Because Western currently addresses routine vegetation maintenance and danger trees as defined in its authorization, it must survey the ROWs at least once a year to determine if new vegetation issues (including danger trees) have appeared and address them if needed. This focus requires annual re-entries, and in some areas more frequent re-entries, into the ROW to address vegetation problems that were identified during periodic line patrols. Western manages vegetation in transmission line and access route ROWs only, and would not authorize activities outside the ROW; however, removal of danger trees outside of the ROW is permitted if they pose an impending danger to the lines. The No Action Alternative includes the practice of spot application of approved herbicides, as do the action alternatives discussed below (see **Appendix B**). Western also performs access route repairs as needed. Transmission system maintenance activities would consist of regular aerial and ground patrols to find problems, schedule and perform repairs, and conduct preventative maintenance.

2.6.2 Proposed Vegetation Management for All Rebuild Alternatives

As part of the Estes-Flatiron Transmission Lines Rebuild, Western proposes to change the way it manages vegetation in the ROWs to a more proactive approach. This applies to each action alternative for the proposed transmission lines rebuild Project. Western proposes to manage its transmission line ROWs to better ensure the reliability and safety of the transmission lines, ensure adequate access for maintenance, protect the public, promote worker safety, and manage risk from fire, all while improving the protection of environmental resources.

For National Forest System lands, Western proposes to acquire new authorization along with the development of a new operation and maintenance plan to include a more proactive approach for managing vegetation along Western ROWs on National Forest System lands using an integrated vegetation management approach. This approach is based on the American National Standard Institute (ANSI) Tree, Shrub and Other Woody Plant Maintenance-Standard Practices (Integrated Vegetation Management, a. Electric Utility ROW (ANSI A300 (Part 7)-2006 IVM)). Western would proactively control vegetation growth and fuel conditions that threaten its transmission lines.

For private lands where new easements are needed, Western proposes to include provisions that would implement the more proactive approach for managing vegetation using an integrated vegetation management approach. Depending on the rebuild alternative and where existing easements are adequate for proposed transmission line rebuild, Western would implement the more proactive approach for managing vegetation within the ROW to the extent allowed by any restrictions included

with the existing easements. Western's proposed approach to vegetation management is summarized below. A more detailed description is provided in **Appendix B**.

2.6.3 Categories of ROW Conditions and Vegetation Treatment Methods

Various vegetation management conditions and fuel loading are found along the existing transmission lines. For example, there are areas that need relatively little treatment, areas that need significant treatment to bring them to a desirable condition that could then be managed efficiently, and areas with mixed conditions. This is the result of a variety of past actions, including the extent of vegetation clearing along the ROWs when transmission lines were constructed; how these areas were subsequently managed over the years; maintenance practices over many years in a variety of vegetation types that could have contributed to excessive fuel loading in the ROWs; past danger-tree cutting; site conditions (e.g., slope, aspect, soil types, rainfall, pine beetle and other insect attacks, and diseases); tree species distribution; topography; and other variables.

Western has identified six broad categories of ROW conditions along the existing transmission lines. **Table 2.6-1** lists the six categories of ROW conditions and proposed treatment methods during initial construction as well as for ongoing maintenance. Photos illustrating typical ROW conditions associated with each category along the existing transmission lines are provided in **Appendix B**.

Table 2.6-1 Categories of ROW Conditions and Vegetation Treatment Methods

Category	Vegetation	Frequency of Treatment	Treatment Methods
1	ROW vegetation is compatible with the transmission line based on topography and/or presence of natural, stable, low-growing vegetation communities.	None expected, but ROW monitoring would be needed to ensure conditions have not changed.	None expected.
2	Fast-growing incompatible species that are not acceptable; over the long term, the vegetation is likely to include incompatible vegetation types that would require monitoring and treatment.	Initial treatment would occur with construction of the line. Maintenance treatments are expected to be relatively frequent (expected 2- to 6-year return intervals).	Accessible sites would favor use of mechanized equipment and removal of salvageable material. Inaccessible sites would favor use of hand felling.
3	Fast growing incompatible species of trees that are in an acceptable condition, but over the long term, Western would need to treat incompatible vegetation.	Initial treatment would occur with construction of the line. Maintenance treatments are expected to be relatively frequent (expected 2- to 6-year return intervals, but this would vary depending on site conditions).	Accessible sites would favor mechanized equipment, with removal of salvageable material. Inaccessible sites would favor use of hand felling.

Table 2.6-1 Categories of ROW Conditions and Vegetation Treatment Methods

Category	Vegetation	Frequency of Treatment	Treatment Methods
4	Slow-growing incompatible species of mature vegetation that is not acceptable, and in the long-term incompatible; vegetation treatments would be needed to control re-growth.	Initial treatment would occur with construction of the line. Maintenance treatments are expected to be relatively infrequent on sites with incompatible species with slow growth rates, perhaps 5 or more years, depending on site conditions.	On sites with good access, mechanized equipment would be favored and salvageable material would be removed. On sites with poor access, hand felling and other manual methods would typically be used.
5	These sites have slow-growing incompatible species, and the ROW condition is acceptable. However, over the long term, Western would need to monitor and treat the incompatible species.	Initial treatment would occur with construction of the line. Maintenance treatments are expected to be relatively infrequent, perhaps 5 years or longer, depending on site conditions.	On sites with good access, mechanized equipment would be favored and salvageable material would be removed. On sites with poor access, hand felling and other manual methods would typically be used.
6	Treatments in these areas of ROW are driven largely by the conditions of the fuel load. Typically, they include areas with low-growing vegetation types characterized by having high fuel loads. Sites are characterized by dense, woody vegetation capable of high-intensity fire, with transmission lines having relatively low conductor-to-ground clearances.	Initial treatment would occur with construction of the line. This could include mechanical removal of vegetation near structures and from areas of the ROW. Maintenance treatments as needed. Need is determined from ROW monitoring.	In areas with good access, mechanized treatment such as mowing would be favored. In areas with poor access, manual treatments would typically be used.

2.6.4 Establishing the Desired ROW Vegetation Condition During Construction

Western would assess current conditions in the ROW to identify areas that need initial treatments during construction based on the categories described above. Treatment of ROW vegetation during construction of new line would emphasize the following activities:

- Cut danger trees if any are present;
- Manage slash that has built up in the ROW to reduce fuels density;
- Grind or crush regeneration that has grown in the ROW to reduce the density of live, green fuels;
- Cut all Category 2, 3, and 4 incompatible species; and

- Allow small, slow growth tree species to remain in the ROW unless anticipated growth would threaten safe, reliable transmission line operation before the next maintenance period.

During construction of the transmission line, Western proposes to remove undesirable vegetation (typically trees) that would interfere with transmission line safety and reliability. The desired condition would be a ROW dominated by grasses, forbs, shrubs, and lower-growth tree species that would not interfere with the transmission line.

2.6.5 Maintaining Desired ROW Condition

Western's proposal includes monitoring and retreating ROW areas at appropriate intervals based on the results of reviews of ROW conditions during line patrols. In ROW areas with relatively low conductor-to-ground clearances, Western would typically retain lower-growth native plant species to maintain the desired vegetation condition. Western would do this through active management to remove tall-growth species. Depending on the specific site conditions, desirable native species could include grasses, forbs, and shrubs, and appropriately sized small or lower-growing tree species. Generally, more selective control methods can be used to maintain this condition along the ROW. ROW maintenance activities and treatment intervals would vary in the ROW depending on the success of previous treatments, vegetation type, rates of vegetation re-growth, environmental protection requirements, and risks to the transmission line.

An important component of ROW maintenance is fuels management to mitigate the risk of wildfires. Western would evaluate the risk to transmission line operations and security from wildfire and manage fuels in the ROWs. ROW fuel loads associated with vegetation re-growth or control treatments must be evaluated and controlled as needed. All vegetation (dead or live) can be considered fuel because it can contribute to fire intensity and duration. In addition to reducing the risk of incompatible vegetation in a ROW, Western's proposed ROW reclamation and long-term maintenance strategies would address areas where accumulated fuel poses an unacceptable risk. Western would reduce fuel density in ROWs using mechanical and manual treatment approaches, as described below.

There could be areas along the existing transmission lines that need no or minimal vegetation management – for example, some areas in canyons and drainages or other steep topography in which trees might not grow to heights or densities that would threaten the transmission line that crosses high above (see Category 1). In some of these areas, few if any control methods would be needed for years. In other vegetation communities, occasional removal of vegetation around structures could be needed to ensure access to the structures and to reduce the risk of fire to the transmission line structures. Regardless, Western would need to monitor all ROWs and access roads to continuously evaluate vegetation conditions and ensure they meet the management requirements, and that changed conditions have not resulted in unacceptable threats.

2.6.5.1 Vegetation Control Methods

Western proposes several general control methods, individually or in combination, to manage vegetation. These methods include a variety of control methods utilities typically use to manage their ROWs. Western would use the techniques to alter the vegetation condition so that it can be maintained more efficiently and effectively. The following paragraphs describe the general vegetation-control methods.

2.6.5.2 Manual Control Methods

Manual vegetation control includes the use of hand-operated powered tools and non-powered hand tools. Manual techniques—mainly using chainsaws—can be used where equipment access is limited by terrain, soil conditions, or other environmental conditions. One or two trucks carrying equipment and workers would drive along the access road to the appropriate site. Crews of two or more with chainsaws would then hike along the ROW and cut target vegetation. Crews often use ATVs instead of trucks. Crew sizes for this type of activity usually range from two to four.

2.6.5.3 Mechanical Control Methods

Mechanical vegetation control uses machine platforms with various interchangeable treatment-head attachments to remove or control target vegetation along transmission line and authorized access route ROWs. Rubber-tired mechanical equipment platforms are generally limited to operating on slopes less than 30 to 35 percent. Specialized tracked equipment platforms, with articulating control cabins, would be typically used on slopes up to 60 percent. Both types of specialized equipment platforms can operate with very low ground pressures. However, site-specific obstacles such as rocks or other extreme terrain conditions can reduce their efficiency. Mechanical operations would usually involve a crew of two to three.

2.6.5.4 Herbicides

Western would use spot application of herbicides approved for use to treat undesirable, mostly herbaceous vegetation, especially invasive species. Herbicides would be applied directly to the vegetation using a hand or powered sprayer. Herbicides would be used on incompatible vegetation that sprouts after initial treatment by cutting or mowing. Herbicide applications typically involve a crew of one to two.

Western uses herbicides that are approved for use in ROW maintenance and by the USFS. Herbicides would only be used in partnership with the USFS when on USFS lands. Western would use USEPA and state-registered herbicides, and appropriately licensed or certified applicators would apply the herbicides following the label requirements.

Herbicides can be applied in different ways, depending on the targeted plants, vegetation density, and site circumstances. Western proposes herbicide treatment either by spot application or localized (site-specific) application.

When making decisions about the use of these methods, Western considers the area being treated, the presence of sensitive plants and other environmental resources, the herbicide label requirements, and whether the method is cost effective and efficient.

2.6.5.5 Site-specific Herbicide Application

Site-specific or localized herbicide application is the treatment of individual or small groupings of plants. Western typically uses this application method only in areas of low to medium target-plant density. The application techniques include, but are not limited to, basal treatment, low-volume foliar treatment, and cut stump treatment.

2.6.5.6 Debris Disposal

Managing vegetation includes cleanup – the treatment of slash and debris disposal. Methods of disposing of vegetation debris generated when vegetation is cut include logging, chipping, lopping and scattering, and mulching. Pile burning would not occur on USFS lands. Methods of debris disposal on private lands would be in accordance with state guidelines. Where the lop and scatter method is employed, all debris created would be left on site and dispersed such that the depth does not exceed 24 inches in height, in order to reduce the fuel load. Each of these methods is described further in **Appendix B**.

2.6.5.7 Mechanical Fuel Reduction Methods

Western would reduce existing fuel loads through mechanical thinning, mowing, chipping, and debris removal. Western would use site-specific treatments to reduce potential impacts from wildfire on the transmission line ROW by reducing the likely intensity and duration of fires in the ROW. Western would use a range of mechanical and manual methods, depending on site conditions. These include tree removals, mechanical and hand thinning of small-diameter trees to reduce ladder fuels,

mechanical mastication (e.g., grinding and chipping), and hand and mechanical piling. Hand or mechanical piling would not be conducted on USFS lands. Fuel reduction methods on private lands would be in accordance with state guidelines. The target fuels of these treatments include downed trees, slash, debris from past treatments, green fuels such as regenerated lodgepole pine, and brush such as Gambel oak.

Western would use prescribed burning on non-National Forest system lands and only under optimum conditions, such as during periods of minimal wind speeds or high moisture content in fuels, to reduce the risk of fire escape and impacts from smoke. Prescribed fire treatments could include mechanical piling and burning and broadcast burns to reduce surface fuels over larger areas. Large pockets of dead and down woody material and slash generated from mechanical treatments would be broadcast burned or piled and burned to further reduce fuel loadings.

2.7 Alternatives Considered but Dismissed

2.7.1 Alternative Alignments

In addition to the alignments carried forward for detailed analysis in the Draft EIS, several additional routing alternatives were identified and considered. Some of these potential alternatives emerged through a series of public workshops held in October 2012 that were intended to review the constraint/opportunity criteria and to solicit public comment on potential alternative alignments. Through this process, a wide range of potential routing alternatives were considered. Some of the potential routing alternatives were carried forward for detailed analysis, while others were eliminated following an initial consideration of their feasibility. Alternative alignments considered but eliminated, including the reasons for their elimination, are summarized in **Table 2.7-1** below.

Table 2.7-1 Alternative Alignments Dismissed from Detailed Analysis

Potential Reroute	Reason for Dismissal
U.S. Highway 34 and U.S. Highway 36 reroutes	Proposals to reroute the transmission line along U.S. Highways 34 and 36 would not use existing transmission line ROWs and would instead follow existing transportation ROWs. These proposals were not carried forward because they would greatly increase visual impacts, an important consideration in this area. These proposals would not resolve the issues raised during scoping, but simply displace impacts to new landowners and may require constructing an additional length of transmission line. Locating the lines along these routes also adds flooding as another possible major catastrophic future event that may affect the transmission lines.
Reroute west of Meadowdale Hills subdivision, on the east slope of Mount Pisgah	This potential route crosses steep, rocky slopes without any existing access roads, and would be difficult and costly to construct, and would result in substantial erosion risks as well as increased maintenance costs. Access road construction across this topography would require excessive cut and fill and increase visual impacts, and would potentially result in heightened safety concerns to maintenance crews.
Reroute to the south side of the North Line, below The Notch	This potential route is located in an area with steep slopes and poor access; it also follows a riparian corridor. Western's SCPs direct that structure sites, access ways, and other disturbance areas will be located at least 100 feet, where practical, from rivers and streams (including ephemeral streams). Because this route would be in difficult terrain and follows a riparian corridor it was not considered suitable for siting the transmission line.

Table 2.7-1 Alternative Alignments Dismissed from Detailed Analysis

Potential Reroute	Reason for Dismissal
Reroutes far to the south of the South Line in the vicinity of Pinewood Reservoir Stewardship Trust and Blue Mountain Bison Ranch	This routing strategy was suggested during workshops to reduce effects to recreational and residential viewsheds at Pinewood Reservoir. These reroutes were dismissed because they crossed protected lands, did not fully address the visual resource issue, and displaced existing impacts to new landowners. Some area residents suggested a reroute around the north side of Newell Lake View subdivision to reduce visual impacts to their community, and a routing option was identified and carried forward for detailed analysis (Alternative A).
A reroute that followed a gas pipeline between the North and South line on the east end of the Project area, between the access road to the Bald Mountain radio facility and the intersection of Pole Hill Road and Chimney Hollow Road	This reroute was suggested as a means to co-locate linear infrastructure. However, the reroute fails to effectively address other scoping issues related to visual impacts and would require new ROW acquisition resulting in new acquisition costs and subsequent new surface disturbance, as well as displacement of impacts to new landowners. There also may be additional mitigation required by the gas utility, if Western were to site a transmission line parallel to an existing gas line.
Reroute following Flatiron Penstocks (CBT Project)	In an effort to further consolidate linear facilities, consideration was given to an alignment that paralleled the penstocks that descend Bald Mountain to Flatiron Reservoir. The penstocks emerge aboveground well below the summit of Bald Mountain and follow an alignment that is prominent in the viewshed from Flatiron Reservoir, one that doesn't take advantage of the opportunities for concealment provided by the surrounding terrain. Steep and rocky terrain also would contribute to access concerns. Further, the penstocks are facilities that date to the 1940s and have a degree of historic significance.
Reroute along Cottonwood Creek	This reroute would extend from the vicinity of Flatiron Reservoir and follow an alignment to the northwest generally along Cottonwood Creek, rejoining the ROW of the existing North Line near Pinewood Lake Dam. This alternative would require several miles of construction through steep terrain with poor access. It was dropped in favor of Alternative A that avoided the Pinewood Lake viewshed and the adjacent subdivision in a more direct and effective manner.

2.7.2 Alternative Structure Types

In addition to routing options, alternative Project designs were considered and presented during the public workshops held in October 2012. Other structure types considered included lattice steel structures and double-circuit wood H-frame structures. Double-circuit wood H-frame structures are unconventional and rarely used by Western for reliability reasons. Western does not currently consider lattice steel structures or double-circuit wood H-frame structures a viable option. Neither the lattice nor double-circuit H-frame designs were carried forward for further analysis.

2.7.3 Other Alternatives

Other alternatives also considered but dismissed are discussed below.

2.7.3.1 Use of Olympus Tunnel

The Olympus Tunnel begins below Lake Estes and extends to the east through Mount Olympus, eventually meeting up with the Pole Hill Tunnel and other CBT Project facilities that extend all the way to Flatiron Reservoir. The possibility of placing an underground cable system within the Olympus Tunnel and other below ground facilities was identified as a potential opportunity, one that would reduce or eliminate visual impacts and other identified concerns. Although such systems have been installed in other water conveyance tunnels, including the Adams Tunnel through Rocky Mountain National Park, they are only feasible when the facility is specifically designed to accommodate the cables and splices at the time of its initial construction. Placing a cable within a tunnel not designed and constructed to accommodate one would diminish the capacity of the facility to deliver water and function as designed, and would also create considerable operational, scheduling, and maintenance challenges. As an example, water delivery would have to be suspended and the tunnel drained for any kind of cable maintenance. For these reasons, this alternative was not considered feasible, and it was dropped from further consideration.

2.7.3.2 Underground Construction near Pinewood Reservoir

Due to the sensitivity of the viewshed south of Pinewood Reservoir, underground construction was considered for a segment of the Project through this area, following the alignment of Alternative B. As discussed in Sections 2.2.4 and 2.4, underground construction presents a number of challenges, including greatly higher costs than conventional aboveground construction. The increase in cost needs to be weighed against the expected benefits, in this case an incremental decrease in visual impacts. Western also does not currently maintain any underground lines and therefore does not have the expertise, equipment, or replacement material to maintain an underground line. Any maintenance or repair would need to be contracted out, potentially resulting in longer outages. Alternative A would avoid the viewshed south of Pinewood Lake, providing an alternative that would eliminate these impacts at a much lower cost. For these reasons, underground construction at this location was dropped from further consideration.

2.7.3.3 Underground Construction on National Forest System Lands

Variant C1 would rebuild the transmission line underground from Mall Road east to the Roosevelt Forest boundary near the north end of the Meadowdale Hills subdivision. Western considered extending Variant C1 further east onto National Forest System lands, but dismissed that potential option based on the following technical reasons.

- Extending Variant C1 further east along the proposed alignment for Alternative C would involve costly trenching within a rocky rough section of Pole Hill Road that is noted for its recreational value to four-wheel drive users. Restoring Pole Hill Road to previous conditions following installation of cable trenches would not be possible, unless the cable trenches were buried deeper. Continued use of Pole Hill Road would impact the integrity of cable trenches.
- Terminating the underground section on National Forest System lands would require an underground service vault. This vault could not be located on Pole Hill Road and would require that the vault be located off the road. The installation of the vault would require the clearing of a large forested area to accommodate the vault installation and future access.
- Extending Alternative C1 along the existing South Line route would require extensive clearing within a mixed coniferous forest. The width of the clearing would need to accommodate the trench, a spoil pile, and a service road to accommodate the installation of the cable trench and service vault.

2.8 Agency Preferred Alternative

2.8.1 Determination of the Agency Preferred Alternative

After reviewing all of the material developed during the EIS process, including the summary of Western's purpose and need objectives, the impacts of the alternatives on Key Issues, and other environmental resource impacts, Western selected its preliminary APA and presented it to USFS representatives, who concurred. Western used a composite of alternative selections to create a complete APA. The APA and its corresponding regions as discussed below are depicted in **Figures 2.2-8** and **2.8 1**.

2.8.1.1 West Region

In the west region, Western selected Alternative C, a modification of the South Line, as the APA. Alternative C best meets Western's purpose and need objectives, and it generally minimizes impacts to the Key Issues.

Specifically, Alternative C both maximizes the use of adequate and accessible ROW while decommissioning the inadequate ROW and ROW on difficult terrain. Although this alternative would have visual impacts, on the whole Alternative C would offer the best visual resource advantages while also being the most cost effective.

The west region required more tradeoffs among Western objectives, Key Issues, natural resource impacts, and interested public preferences than the east or central regions. Underground alternatives were considered, and ultimately rejected primarily on the basis of cost effectiveness and total 80-year life cycle cost as compared to the expected incremental improvement to visual resources. Additionally, underground construction costs could increase by a factor of 2 or 3 depending on the time, equipment, and manpower to trench through rock formations. The absence of structures and overhead lines would be offset by a completely woody vegetation-free ROW above the buried lines. Depending on the viewer's location, either aboveground or underground could be considered better visually. Resource values directly related to visual impacts also were considered, including economic effects.

North Line alternatives (Alternatives A, A1, and A2) on the western end were not selected for the APA principally because all would need to get through the very difficult terrain in the vicinity of The Notch and Mount Olympus (though Variants A1 and A2 avoid Mount Olympus, those routes still pass through The Notch). While technically feasible, construction in this steep and rocky area would not meet Western's access, maintenance, reliability, cost, or safety goals. In addition, construction of access to structure sites in this area would require more miles of access roads in difficult terrain, resulting in more disturbance to natural resources, increased visual impact, ongoing raised risks of erosion and resource damage, and long-term expanded access road maintenance requirements. The possibility of moving from the South Line to the North Line west of The Notch was considered, but the South Line is high on a ridge by this point and crossing over to the North Line raised similar issues as constructing through The Notch. Additionally, any such route west of The Notch would have to cross the entire valley on a north-south axis in order to get to the North Line, directly across the views back to the east from Estes Park and Rocky Mountain National Park.

The remaining South Line alternatives were B or C. Western selected Alternative C, with its relocation away from and lower than U.S. Highway 36, to reduce the visual impact of the line as it approached its western terminus. Constructing the line south of U.S. Highway 36 (Alternative B) would require two line crossings of the highway and construction on steeper terrain, with more difficult and visually apparent access to each structure. Alternatives B and C would both traverse established neighborhoods, and the residents along these alternatives have been very clear that they would like to see the Project constructed elsewhere. However, Alternative C would make use of existing ROW that residential development was designed around, and no additional ROW in the residential areas would be required. West of the residential areas Alternative C would require new ROW in order to avoid

crossing U.S. Highway 36 and eliminate the existing structures adjacent to the road. Other alternatives on both the North and South Lines would impact area residents as well. While Western would like to accommodate all interests and resources, inherent conflicts among them make tradeoffs and hard decisions inevitable.

2.8.1.2 Central Region

In the central region, Western generally selected the North Line, or Alternative C. Alternative C is usually the closest route to the existing Pole Hill Road in this area, and would minimize the amount of access road construction and related Project disturbance, and thus minimize impacts to natural resources. It also would consolidate the linear development in the central region. Due to topography, Pole Hill Road traverses back and forth, often crossing under one or both lines (Alternatives B and C). During design and engineering, the proposed APA route may take advantage of opportunities to reduce access road construction and/or reduce environmental impacts by switching from the North Line to the South and back where the lines are close together, and close to Pole Hill Road. Many landowners in the central region have expressed a preference for locating the line as close to Pole Hill Road as possible. The final decision on the actual transmission line route and pole locations would be made after initial design and engineering, and after discussions with land owners along the ROW.

The visual impact of the new single-pole, double-circuit transmission line would increase incrementally, but this would not be a new impact as there are two transmission lines present already. The portions of the North and South line ROWs not retained for the new line would be abandoned, offsetting the Project's overall visual impact. The North Line, Alternative C, would require the acquisition of more new transmission line ROW, while the South Line, Alternative B, has sufficient 110-foot-wide ROW. However, use of the South Line in certain locations may require more or longer access roads and associated ROW. The ability to move back and forth between the two existing line routes and ROWs to stay closer to Pole Hill Road would help reduce the need for new access roads.

Acquiring more access road or transmission line ROW is recognized as an impact to landowners. Western determined that the impact of acquiring new ROW along the North Line would be more than offset by the reduction in ground disturbance and related environmental impacts, shorter/better access roads, less need for new access road ROW, and the abandonment of existing South Line ROW. In those areas where portions of the South Line ROW would be used, impacts to both resources and landowners should result in less impact as compared with staying entirely on the North Line in the central region.

The transition point between the North and South lines on the east end is just east of Pole Hill Substation, where the APA would turn north from Alternative B or the South Line and head north to connect to Alternative C. On the west end the APA would transition from the North Line to the South Line just east of the western USFS boundary where the two existing lines start to diverge.

2.8.1.3 East Region

Western selected the South Line, Alternative B, for its APA on the east end of the Project. Alternative B both best meets Western's purpose and need, and avoids or minimizes impacts to Key Issues and environmental resources. The existing North Line would be removed on the east end and the ROW would be abandoned to revegetate or be used for the landowners' purposes. While the existing transmission line would be removed from the Newell Lake View subdivision, the ROW and one pole of the existing wood pole H-frame structures would be left in place to retain the fiber optic communications connection to Pinewood Reservoir Dam.

2.8.2 Rationale of the Agency Preferred Alternative

To select an APA, Western looked to the factors within its purpose and need statement that an alternative would have to satisfy (Section 1.4.1). Ideally, the selected APA best meets the purpose and need while having the least impact on the human environment. Alternatives that met the basic purpose and need

requirements, but had less impact than an alternative that better met the purpose and need, were carefully considered for selection as the APA. However, alternatives that clearly did not meet purpose and need requirements were not considered for selection.

In addition to Western's purpose and need, Key Issues were developed in coordination with the Forest Service and as a result of public comment to compare the differences between the alternatives analyzed in detail. The Key Issues are described in Section 1.6.4.1 and include the following:

- Effects of new ROW acquisition;
- Effects of the Project on scenic travel corridors
- Effects of new road construction in areas with steep topography;
- Effects on recreational uses and experiences;
- Effects on protected areas; and
- Effects on existing infrastructure.

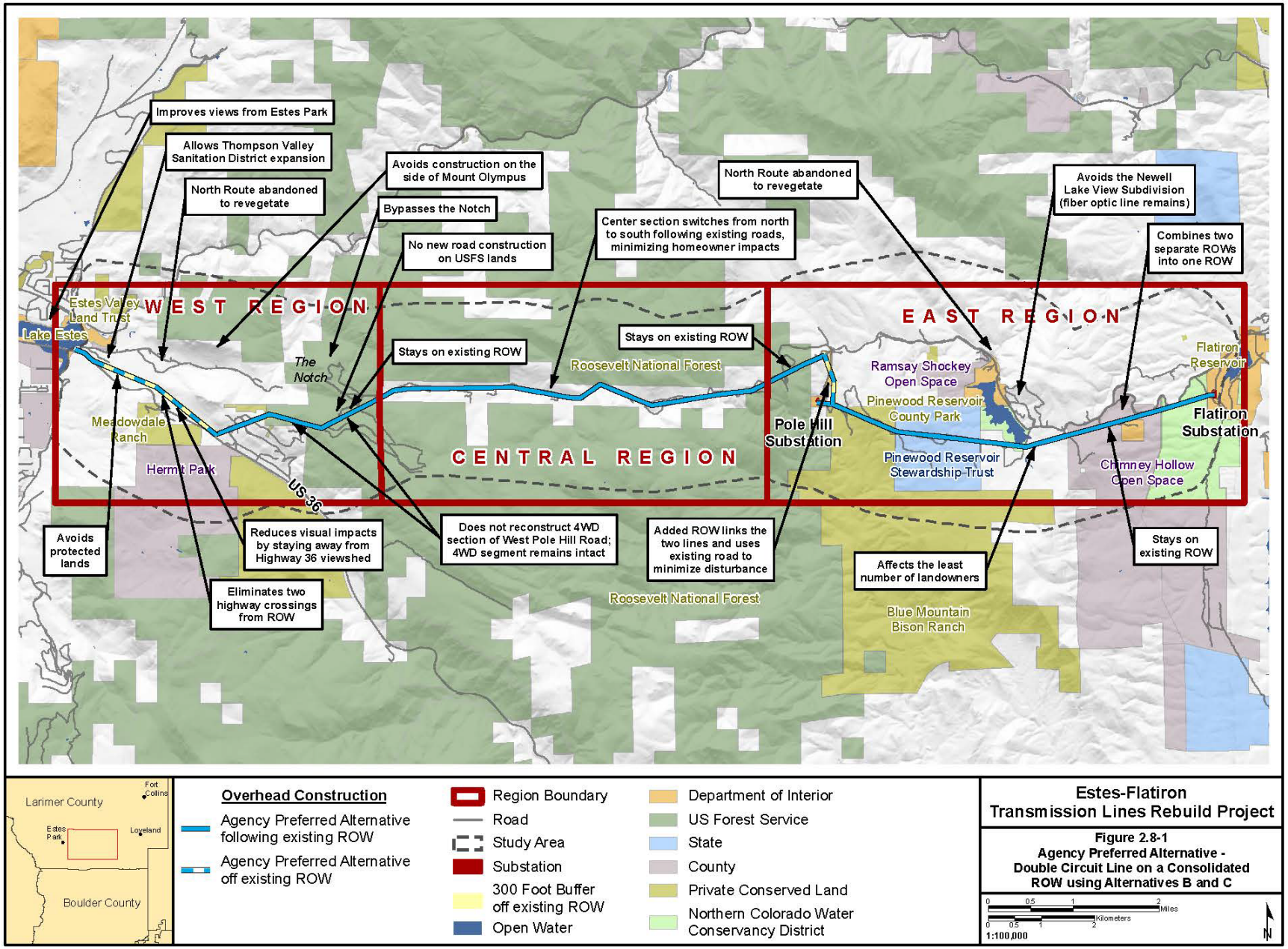
Key Issues and other issues are described below, each with a review of which alternatives best minimize effects. Western has in fact used portions of both existing routes and several analyzed alternatives to create the APA. Impact analysis based on Key Issues is portrayed for the full APA as well as the other alternatives in **Table 2.9-1**; however, in response to public comments, new summary impact tables were created for the Final EIS (**Tables 2.9-2** and **2.9-3**), which describe and compare the impacts at both ends of the Project separately without the influence of data from the rest of the line. The central region is the strip of private land in the middle of the Project area. The west region starts at the boundary of the Forest Service land and the west end of the private land in the central region. Similarly, the east region boundary is the east end of the private land in the central region where it abuts Forest Service. These boundaries closely match the locations where the North and South lines converge to transit the private land in the center of the Project Area, and diverge again once out of the central region (see **Figure 2.8-1**). This division of the data for end-to-end alternatives allows residents to compare localized data, and helped Western select the APA. Western believes the APA accomplishes Western's purpose and need while also considering public and agency comments and resource impacts along with other relevant factors.

The factors discussed below are all part of Western's purpose and need for the Project.

2.8.2.1 Western's Purpose and Need Factors

<u>Reliability, including NERC Requirements</u>

Western needs to replace the aging wood-pole lines that are increasingly at risk of failure. Poles and cross arms have been weakened by age, weathering, rot, and damage over the past 65 to 75 years of use. The conductors and hardware also are worn and in need of replacement. The existing lines are vulnerable to extreme weather and fire hazards. Western's need also includes being in compliance with NERC reliability standards. These standards include maintaining conductor clearances and safety through vegetation management and removal of "hazard trees." These are trees that could fall or grow into the line and take down conductors, contact conductors and cause an outage, or come close enough to energized conductors to cause arcing. Should an outage occur because Western was not in compliance with standards, Western could be subject to penalties, and potentially be liable for damages to landowners and utilities affected by the outage. Therefore, any alternative that does not allow for full compliance with NERC reliability standards would not be selected as the APA. Any alternative that would substantially increase the difficulty in achieving full compliance also would be less likely to be selected unless there were major offsetting purpose and need advantages and/or environmental benefits.


Improves views from Estes Park
Allows Thompson Valley Sanitation District expansion
North Route abandoned to revegetate
Avoids construction on the side of Mount Olympus
Bypasses the Notch
No new road construction on USFS lands
Center section switches from north to south following existing roads, minimizing homeowner impacts
North Route abandoned to revegetate
Avoids the Newell Lake View Subdivision (fiber optic line remains)
Combines two separate ROWs into one ROW
WEST REGION
CENTRAL REGION
EAST REGION
Estes Valley Land Trust
Lake Estes
The Notch
Stays on existing ROW
Stays on existing ROW
Roosevelt National Forest
Ramsay Shockey Open Space
Pinewood Reservoir County Park
Flatiron Reservoir
Meadowdale Ranch
Hermit Park
US 36
Pole Hill Substation
Flatiron Substation
Pinewood Reservoir Stewardship Trust
Chimney Hollow Open Space
Avoids protected lands
Reduces visual impacts by staying away from Highway 36 viewshed
Eliminates two highway crossings from ROW
Does not reconstruct 4WD section of West Pole Hill Road; 4WD segment remains intact
Added ROW links the two lines and uses existing road to minimize disturbance
Affects the least number of landowners
Stays on existing ROW
Roosevelt National Forest
Blue Mountain Bison Ranch
Larimer County
Fort Collins
Estes Park
Loveland
Boulder County
Overhead Construction
Agency Preferred Alternative following existing ROW
Agency Preferred Alternative off existing ROW
Region Boundary
Road
Study Area
Substation
300 Foot Buffer off existing ROW
Open Water
Department of Interior
US Forest Service
State
County
Private Conserved Land
Northern Colorado Water Conservancy District
Estes-Flatiron Transmission Lines Rebuild Project
Figure 2.8-1
Agency Preferred Alternative - Double Circuit Line on a Consolidated ROW using Alternatives B and C
Miles
Kilometers
1:100,000
N

Underground transmission lines have a very different outage profile from aboveground transmission lines: initially the risk of outage would be low, because these facilities are not subject to severe weather or vegetation-related outages. However, the risk of conductor failure in underground facilities increases over time and any outages are more difficult and time consuming to repair. Therefore, underground outage times when they do occur are much greater than most aboveground outages. Extended outages have greater hardship and financial impacts to consumers and businesses; most overhead line outages can be repaired in a matter of hours, while underground outages could last days or weeks. Western does not currently maintain any underground lines and therefore does not have the expertise, equipment, or replacement material to repair an underground line. Furthermore, any maintenance or repair would need to be contracted out for these alternatives, potentially resulting in longer outages.

All alternatives except the No Action Alternative would increase reliability. Alternative D, replacing both existing lines with in-kind new wood-pole structures, would be more reliable than the status quo, but the wood pole structures would still be at risk from wildfires. The rest of the alternatives, using steel monopoles, would be fire resistant (wildfires could still cause these lines to be de-energized due to the risk of flashover from conductive smoke), and would be designed to withstand the most severe weather conditions anticipated in the area.

In the west region, the underground portion of Alternatives A2 and C1 would be less susceptible to storm damage or vegetation-caused outages. However, in the event of an outage or cable failure, extended out-of-service outages would be required. In addition, extended outages also would be required while cables are pulled and replaced at approximately 40 and 80 years of service. Since Alternatives A and A1 would follow the North Line through the very difficult terrain in the area of The Notch and Mount Olympus, they would be much more difficult to access for repair of outages, maintenance, and vegetation management. Therefore, these aboveground alternatives in the west region of the Project would generally be less reliable due to access difficulties and length of outages; resulting in Alternatives B or C as the most reliable for the APA. Damage to overhead lines can be more quickly identified and repaired following outages on Alternatives B or C in the west.

In the east region, all alternatives except D or No Action would have similar reliability, although Alternative B would be preferable for the APA as a result of less steep terrain and easier access for repair of outages and for maintenance.

ROW Clearing and Vegetation Management

Vegetation management activities have been conducted along the existing lines since they were constructed. Western needs to improve vegetation management on the ROW, including dealing with hazard trees, to remain in compliance with more stringent recent NERC requirements and to reduce the number of vegetation management cycles and related costs and impacts of more frequent maintenance activities. Western's goal is a vegetation maintenance cycle of no less than 5 years (see **Appendix B** for specific practices). Constructing transmission lines in forested areas results in a more noticeable ROW due to clearing and increases the risk of danger trees falling into the line from outside of the ROW. ROW through shrub lands and grasslands is preferred to reduce those clearing and maintenance impacts. The existing North Line (Alternative A) has a ROW of only 20 to 30 feet which is inadequate for maintaining current line clearances. Alternatives that would be located through ponderosa pine and mixed conifer forest vegetation would require more ROW clearing and active vegetation management, as well as removal of danger trees outside of the ROW. Vegetation management is directly related to Maintenance and Access, as more favorable conditions for these two Western purpose and need factors also make vegetation management activities safer and easier to conduct. Alternative D and the No Action Alternative would require approximately double the miles of line and associated access road ROWs that would need to be treated and maintained, in addition to added clearing needed to expand the North Line ROW to 110 feet. Therefore, Alternative D and the No Action Alternative are the least desirable from the ROW clearing and maintenance perspective.

Any portion of Alternative A would require additional ROW to reach a 110-foot width, and thus more initial clearing.

On the west end of the line, the No Action Alternative and Alternatives D and Variant A1 would have the highest amount of acreage to be cleared or maintained. There is little difference between the remaining alternatives, including the APA. Alternative A, Variant A1, and Alternatives B, C, Variant C1, and the APA would require relatively the smallest acreage of trees to be cleared or maintained (**Table 2.9-3**).

In the east region , Alternative B would have the least number of acres of ponderosa pine vegetation that would need to be cleared or maintained; Alternatives B and C would have no acres of mixed conifer that would need to be cleared or maintained (**Table 2.9-2**). Alternative B on the east would be more favorable for the APA, with the smallest acreage of trees to be cleared or maintained.

Maintenance

One of Western's goals is to improve the maintenance profile of the transmission lines. The existing aging wood pole lines require an inordinate amount of maintenance, which is labor-intensive, expensive, and requires frequent access to the lines. Work includes repairing or replacing structures and hardware, vegetation management, and maintaining access. Western needs to reduce the amount of maintenance time and funds required to maintain the existing lines. Avoidance of sensitive soils (low revegetation potential, compaction-prone, and highly erodible by wind or water) would be preferred to minimize long-term maintenance requirements and reduce potential environmental impact. Avoidance of steep slopes and rocky areas to the extent practicable also would be beneficial by reducing the need for difficult access construction and maintenance on steep slopes and rock and the potential for erosion and related environmental impacts.

Alternatives with the least total miles and least new miles of access roads would be more advantageous, as more road miles are usually associated with the alternatives that minimize crossing steep slopes. However, miles alone can be misleading and actual steep and rocky areas need to be individually assessed.

Alternative D and the No Action Alternative would least meet the maintenance objective for the APA. Both alternatives would have twice as many line miles as other alternatives using double-circuit structures on one ROW. Alternative D would retain wood pole structures, and the No Action Alternative would require that old structures be replaced piecemeal or after storm or fire events. Both alternatives would remain on existing ROWs and would not improve existing maintenance conditions.

In the west region, Alternatives A, A1, and A2 all pass through very steep and rocky terrain, especially near The Notch and Mount Olympus, with difficult access and challenges to maintenance activities, making these alternatives undesirable. Alternative B also crosses steep and difficult terrain south of U.S. Highway 36. Alternative C on the west would be most efficient to maintain for the APA and would best meet Western's purpose and need.

In the east region, all Alternatives except D and the No Action would be similarly efficient to maintain. Alternative B on the east would be easiest to maintain for the APA because it crosses the least amount of sensitive soils which would reduce long-term access road maintenance requirements (**Table 2.9-2**).

Access

Access is closely related to maintenance; maintenance is facilitated by good access to transmission lines, and maintenance also is required to keep access roads in useable condition, and to minimize erosion. Presently, access is generally poor and vehicle access to many of the structures is not possible. Parts of both lines are almost inaccessible. Difficult access increases outage times if there is a problem on the lines. Western needs to improve access to each structure as part of the Project.

Alternatives that provide access to each structure while avoiding inaccessible areas, steep slopes, rocky areas, and compaction prone or erodible soils to the extent practicable would be favored over other alternatives. Other factors favoring selection for the APA include alternatives requiring the least miles of new and/or improved road, and those that avoid surface water or wetlands and other areas problematic for construction and maintenance.

The No Action Alternative and Alternative D would both require retaining existing ROWs and access to structures on both lines, and new access in some areas. These would be the least desirable alternatives as the amount of access needed would be far greater than the other alternatives (**Table 2.3-1**), and require more resources to maintain over the life of the Project.

In the west region, Alternatives C and C1 would be the most accessible, requiring the least miles of new administrative roads on National Forest System lands for permanent access (**Table 2.9-3**). Alternative C on the west end also would avoid difficult access and steep terrain crossed by Alternatives A, A1, A2, and B.

In the east region, all alternatives except D and the No Action would have no new Forest Service roads needed for permanent access. Additionally, on the east end of the line, Alternative B would be easiest to access because it crosses the least amount of sensitive soils (**Table 2.9-2**). This makes it more favorable for the APA.

Safety

Safety is interrelated with Maintenance and Access. Safety risk increases with steep and/or rocky terrain, difficult access, deteriorated structures, and climbing versus man-lift procedures. Longer lines have a higher safety risk than shorter ones, due to the greater number of structures and larger workload. Maintenance activities that are more challenging and more frequent, and that require more man-hours of activity, would increase safety risks to maintenance personnel. Difficult access to the lines and the need for more access maintenance also increase the safety risk to field personnel. Any alternative that would reduce the difficulty of either maintenance or access would improve safety and lower the risk of injuries.

The No Action Alternative would be the least desirable alternative for safety concerns, because existing access is poor in some areas and many structures are badly deteriorated and require replacement. The segment of the North Line through the Newell Lake View subdivision would be relocated regardless of alternative, thus improving safety for residents; however, one pole of each structure would be left to carry the fiber optic communication service connection to Pinewood Reservoir Dam. Widening the ROW on the North Line would meet current safety standards and improve safety for both residents and maintenance personnel.

Alternative D would require more maintenance over time compared to other action alternatives because the new structures would be of the wood pole type, and there would be approximately twice as many of them. Wood pole lines also would increase the risk of both fire ignition and damage from fire, with attendant increase in safety risk to residents and fire crews. Alternatives using double-circuit monopoles would need far less maintenance over the life of the Project, and so would be substantially safer than either No Action or Alternative D. However, the steel pole alternatives would differ somewhat in safety risk, with alternatives crossing steep terrain and/or requiring more challenging access having a higher level of risk. The risk of fire ignition or damage from fire would be greatly reduced compared to wood pole lines, and the taller steel poles would be further from vegetation and much stronger and more resistant to adverse weather events.

Underground Alternatives A2 and C1 would presumably require little maintenance until cable replacement was needed at 40 and 80 years. Maintenance personnel would not be familiar with underground cable replacement, so there could be a slight increase in safety risk during those replacement events.

In the west region, Alternative D and No Action would have the highest safety risks resulting from a combination of difficult access, increased length of the line, and wood pole structures that are more susceptible to fire and damage than steel poles. Additionally, steep terrain associated with Alternatives A, A1, A2, and B would contribute to increased safety risks. Alternative C on the west end would be the shortest in length when compared to the No Action and remaining action alternatives (with the exception of Alternative B) and would generally avoid steep terrain, resulting in the lower worker maintenance and safety risk, making it more suitable for the APA.

In the east region, Alternative D and No Action would have higher safety risks resulting from a combination of difficult access, increased length of the line, and wood pole structures that are more susceptible to fire than steel poles. Alternative A would cross through difficult terrain causing safety concerns during maintenance. Alternatives B or C would be better alternatives on the east end in terms of reducing safety risks for the APA by avoiding difficult terrain and lessening the amount of man-hours required for maintenance.

Wildfire

Wildfire has two components: the risk to the transmission lines from wildfires, and the risk of the transmission line initiating a wildfire. Western needs to minimize the risk of both components. For example, in September 2010, the Reservoir Road Fire put the L-LT 115-kV transmission line in danger; wooden poles were damaged, and the line had to be de-energized twice over several days during firefighting operations. From the perspective of initiating fires, utilities that do not maintain NERC reliability standards and cause a wildfire are increasingly being held liable for resulting damages.

Wood-pole transmission lines are vulnerable to wildfire because fires can damage or burn down the structures and cause an outage. They also are more likely to fail from severe weather and cause ignition of a fire, especially as they age and deteriorate. Alternatives that utilize steel pole structures would greatly reduce the risk of damage from wildfires and risk of initiating wildfires.

The No Action Alternative with its old wood-pole structures would be the worst alternative for reducing wildfire risks. Alternative D would replace the structures on both lines, reducing the risk of structure failure and ignition, but the new wood pole structures would still be subject to damage during a wildfire. All steel pole double-circuit alternatives would have superior resistance to damage from severe weather or age, would minimize the potential fire ignition, and would have the greatest protection from wildfires. The underground Alternatives A2 and C1 would be the least affected by wildfires, and would not pose an ignition hazard except at the transition structures at either end.

In the west region, the No Action Alternative would have the highest risk of damage from wildfires, and of causing wildfires through structure failure and possible ignition. Alternative D would have the next highest risk. Alternatives utilizing steel monopoles would all have low wildfire risks, as would the underground Variants A2 and C1. Additionally, Alternatives A, A1, A2, and B, all pass through very steep terrain with difficult access causing challenges to responding to wildfires, making these alternatives less desirable. Alternative C would be the better alternative on the west end.

In the east region, the No Action Alternative would have the highest risk of damage from wildfires, and of causing wildfires through structure failure and possible ignition. Alternative D would have the next highest risk. Alternatives utilizing steel monopoles would all have low wildfire risks. Alternative A could have a slightly higher risk than the other steel monopole lines only because of the more difficult access. Alternatives B and C would be the better alternatives on the east end.

Cost Effectiveness

The cost of Western's projects and operations are almost entirely supported by power revenues and customer funding, not taxpayer dollars. However, Western has a responsibility to its customers and their retail consumers to minimize costs. These costs are passed through to customers and ultimately borne

by the consumers. Several factors must be considered to determine which alternative would be most cost-effective. It may be intuitive that the shortest route with the least miles of access roads should be the least expensive. However, if the shortest route traverses solid rock, or if access roads are in steep areas, this may not be the case. Long-term maintenance costs also have to be considered. For example, it may be more cost efficient in the long run to have more miles of access roads on flatter ground than fewer miles on steeper ground. Similarly, it may be initially more expensive to install steel poles than wood, but the extended life span and reduced maintenance costs could show steel poles to be the best investment.

In the case of this Project, for Alternative D both existing wood pole lines would need to be reconstructed, doubling the line miles of construction costs and maintenance. While often less expensive to construct, wood pole lines require more maintenance as they age than do steel pole lines.

ROW purchase costs also have to be considered. It is less expensive to remain on existing easements than to widen or purchase new easements. Existing easements also typically have existing access, which limits the need to construct new access roads and purchase their related easements. To calculate the anticipated costs the alternatives must first be identified, and then analyzed for cost of construction and maintenance based on the factors that influence costs. Alternatives B and C (South Line) are superior from the ROW cost perspective, as sufficient ROW easements are already in place along those routes. Alternative A (North Line) has only a 20- to 30-foot ROW, and would require additional easements to reach the needed 110-foot ROW width. Segments requiring entirely new ROW and access would be the most expensive.

The underground alternatives were analyzed for cost effectiveness and other purpose and need factors. Underground construction is typically used in congested urban areas where ROW is constrained and/or overhead construction conflicts with existing development. Construction costs would be much higher, as shown in **Table 2.4-1**, which summarizes the costs for the west end of the Project. Maintenance activities also are much different for underground transmission lines; Western maintains no underground lines in its 18,000-mile power system, and the agency has no personnel trained in underground line maintenance or the specialized maintenance equipment or replacement parts. Partial public funding to subsidize underground transmission line construction would be complicated by regulations governing acceptance of funds from the public by a Federal agency; specific legislation would likely be required. Lacking public or appropriated funding from Congress, the additional costs forthe underground alternatives would be included in the Loveland Area Projects wholesale power rate and ultimately passed on to Loveland Area Projects retail electrical consumers.

Alternative D and No Action would not be cost effective when comparing the extensive maintenance costs of two wood structure lines relative to a single ROW steel structure double-circuit line (**Table 2.4-1**).

In the west region, Alternative C would be the most cost effective as part of the APA. In the east region, Alternative B would be the most cost effective (**Table 2.4-1**).

Total 80-year Lifecycle Cost

Lifecycle costs are related to cost effectiveness and incorporate all costs over the entire life of the Project (**Table 2.4-1**). As discussed above, cost minimization is an important element of the Project purpose and need. The total costs among alternatives may change after the entire life of the Project is analyzed.

Underground options would require a conductor change-out at 40 years, and another one at the end of 80 years, whereas a conductor on an overhead line would still be in service at the end of 80 years. The conductor change-outs would occur only in the middle of the life-cycle and at the end if the line is kept in service, but would represent considerable maintenance costs during those two periods. While the wood poles proposed in Alternative D would be less expensive than steel poles for initial construction, both lines would need to be rebuilt and maintenance costs would increase after the first few years and would be the highest total costs as the wood pole lines reached 80 years in age. Twice the line miles would

result in substantially higher total 80-year lifecycle costs when compared with the aboveground alternatives.

Any alternative using steel pole double-circuits would have better lifecycle costs than underground Variant A2 or C1, or Alternative D and the No Action Alternative (**Table 2.4-1**).

For the APA on the west end of the line, Alternative C would have the lowest total 80-year lifecycle cost. On the east end of the line, Alternative B would have the lowest total 80-year lifecycle cost (**Table 2.4-1**).

2.8.2.2 Environmental Factors

ROW Acquisition

For all resources, the least amount of new ROW acquisition would be most desirable. The adverse impact of securing new ROW would be considered higher than the beneficial effects of decommissioning existing ROW. The least ROW impacts on private lands also would be the most desirable environmental outcome. Minimal ROW acquisition would result in the least encumbrance on landowners; the least new environmental disturbance; the least change from the status quo; and the lowest Project cost for ROW. Decommissioning the greatest number of ROWs crossing private lands also would be preferable.

Alternative A would require additional ROW for its entire length as the existing ROW is only 20 to 30 feet, with portions that are 75 feet on the west end. Alternatives B and C would maximize the use of existing adequate ROW and require the least new ROW. All alternatives other than D and the No Action would result in the abandonment of the existing ROW for one entire line, and thus would be preferable.

In the west region, Alternative B would require the least amount of new ROW on private lands. Alternative A1 would decommission 43 more acres of ROW than Alternative B, but would require the acquisition of 36 more acres of new ROW (**Table 2.9-3**).

In the east region, Alternative B would require the least amount of new ROW on private lands, less than half of Alternatives C, D, or No Action, and about a fifth of Alternative A. Although Alternatives A and C would decommission over twice as many acres (61 and 52) of land as Alternative B (25 acres), they also would require more (53 and 25 acres) new ROW outside National Forest System lands than Alternative B (11 acres) (**Table 2.9-2**).

Effects on Visual Resources

The primary reason to consider underground transmission Variants A2 and C1 on the west end of the Project was to reduce visual impacts. Comparison of expected impacts to visual resources from overhead lines yielded mixed results. The proposed steel double-circuit structures would be 30 feet taller on average than the existing wood pole structures and would be more visible over forest screening. There would be fewer structures though, because the steel structures allow for longer spans and fewer structures per mile when compared with wood pole structures. Approximately 15 feet shorter steel structures could be used to decrease the vertical visual impact in residential areas, with the tradeoff of more structures per mile to retain required mid-span conductor clearances. Given the highly personal and local nature of perceived visual impacts, it is not clear which option would be considered advantageous. However, a combination of structure heights, including shorter structures, would likely be placed in the same locations as the existing ones. Offsetting the increased impact of the double-circuit structures is the fact that one entire ROW would be vacated and allowed to return to natural vegetation, yielding a substantial visual benefit to the Project area.

Because of pole length and strength limitations, double-circuit wood pole structures would not be utilized. The only viable wood pole alternative would be to rebuild both lines as single-circuit lines (Alternative D).

This option would be more expensive and more visually impacting than a single steel pole double-circuit alternative because both existing lines would have to be rebuilt and no ROW would be abandoned.

Western believes that any double-circuit alternative that results in the abandonment of one ROW to be overall superior to the existing visual situation on either end of the line. Alternative D would essentially be no change except for additional clearing around the lines to comply with NERC standards, especially on the North Line where additional ROW would be needed. Alternative D would, therefore, likely have more visual impact than the existing situation, but compliance with NERC clearance requirements would mean No Action would have similar visual effects.

While underground construction would eliminate the need for transmission line structures and conductors, Alternatives A2 and C1 would still result in substantial visual impacts. Access vaults would be required every 900 to 3,500 feet and a pair of large steel monopole three-phase transition structures would be needed at either end of the underground section. ROWs for underground lines need to be completely cleared of woody vegetation for a minimum width of 50 feet, as compared to overhead lines that allow lower-growing shrubs and small trees in the ROW, and no clearing at all in ravines that would be spanned. At a distance, structures tend to blend in and the cleared ROW becomes the dominant visual impact, as demonstrated in the visual simulations in **Appendix C**. With overhead transmission lines, woody vegetation in the ROW breaks up the clearing somewhat and blends colors with the surrounding vegetation. In comparison, the completely cleared ROW for the underground variants would result in a different dominant color and be more visible from many angles than an overhead line ROW. It is acknowledged that at any given location and orientation to Alternatives A2 and C1, it could be demonstrated that one option or the other would be better at that specific location. Western has to consider the bigger picture, including considering visual impacts in conjunction with other resource impacts and the purpose and need for the Project. Western concludes that for this Project, from an overall standpoint, underground construction does not necessarily offer a clear advantage to overhead lines, and an underground option was not selected as part of the APA.

Although Alternative A2 in the west region would have the least visual impact in terms of proximity to the fewest residences and roads, and the most non-forest vegetation clearing, Western believes that given overall considerations, Alternative C would offer the best visual advantages in the west region. Under Alternative C, the ROW would be approximately 0.1 mile downslope of U.S. Highway 36. Most of the ROW would be screened by trees and the highway embankment as U.S. Highway 36 enters Estes Park; additionally, existing structures immediately adjacent to U.S. Highway 36 would be removed, a substantial improvement in visual impacts compared with existing conditions.

In the east region, Alternative B on the whole would be expected to have the least visual impact. Alternative B would be further away from residences near the Newell Lake View Subdivision and also is the alternative that contains the least amount of roads within 0.5 mile, resulting in less visual impacts to road viewers in the Project area. Alternative B also would result in a relatively low amount of forest clearing, further lessening visual impacts.

Forest Road Construction/Reconstruction

Western's decision not to upgrade the four-wheel drive section of Pole Hill Road would leave access and forest recreation use unchanged for the APA. This decision alleviated many concerns that the Forest Service had about increased public access and related potential resource effects. Existing access to structures is poor overall, and would need to be upgraded for any alternative. New or improved access roads to structures would be needed on the forest, but generally only to one ROW (except for Alternatives D and No Action). For most alternatives, access to fewer structures would be needed. The Forest Service would prefer the least amount of road construction/reconstruction on the forest. The Forest Service Special Use Permit would likely address road gating or other means to address unauthorized use.

In the west region, Alternatives B, C, and C1 would have the least miles of new administrative roads on Forest Service lands for permanent access (**Table 2.9-2**).

In the east region, all alternatives except D and the No Action would have no new Forest Service roads needed for permanent access (**Table 2.9-3**).

Recreational Uses and Experiences

By being permanently closed off to discourage unauthorized use, all abandoned ROW or access roads to it would gradually revert to natural conditions and signs of human presence would diminish. Leaving the four-wheel drive section of Pole Hill Road unimproved in the APA would leave that barrier to public access unchanged, so no increase in public access and related recreational use would occur as a result. This may be viewed as positive by the Forest Service and four-wheel drive operators, but negatively by the general public wanting increased access to public lands. In identifying the APA, it was noted that all alternatives would require development of new access roads to reach structures for maintenance. Access roads can be used by recreational users, which may be detrimental from the land manager perspective due to potential increased use, increased erosion, introduction of weedy species, etc. Gates or other means restricting use may be employed to control public or unauthorized use of Project access roads, as desired by the landowner. Alternatives using double-circuit steel monopoles would have taller structures than the existing lines, but they would be located largely on existing ROWs except for areas where changes in location have been proposed to lessen potential impacts. Visual impacts are closely related to recreational user experiences as well, and thus also can influence recreational impacts.

All alternatives on both ends of the line other than D and No Action would result in the removal of one existing transmission line and the abandonment of the ROW, thus improving the naturalness and potential recreational experiences of the area. With respect to APA considerations, Alternative B on both ends of the line would require the least amount of new access road construction, and thus would have the least impact on these factors. Alternative C would have the next fewest acres of new access road construction on either end of the line.

Protected Lands

Protected lands include those lands designated as open space, parks, preserves, conservation areas, etc. When routing new transmission lines, these areas would normally be treated as exclusion areas and avoided if possible. In the case of this Project, the existing lines were in place before the protected lands were designated. When rebuilding existing transmission lines, Western looked for opportunities to reroute lines to avoid protected lands if possible. In the east region, the designated lands are quite extensive, and re-routing the alternatives to avoid them would both substantially increase the length of the lines and displace the impacts of the lines onto private landowners that are not presently affected. Additional line length also translates to additional impacts on environmental resources as well as Project costs, and would require new ROW and access on private lands. In view of these considerations, and recognizing that the existing lines have been in place for many decades and have long been part of the developed landscape, new alternatives moving the existing lines off protected landscapes were not developed.

With respect to considerations for the APA, in the west region, no protected lands would be crossed by any of the alternatives (**Table 2.9-2**). In the east region, Alternatives A and C would cross the least number of protected lands, but the differences between Alternatives A, B, and C are fairly small (**Table 2.9-3**).

Effects on Infrastructure

Impacts on existing developed infrastructure were not a large consideration in selecting an APA because such potential conflicts would be minimal and could be accommodated through careful micro-siting in those areas. For all alternatives, the portion of the existing North Line that passes through the Newell Lake View subdivision would be relocated because of existing conflicts with development, although one

pole of each structure would be left in place to retain the fiber optic communications connection to Pinewood Reservoir Dam. In other areas, alternatives are either located away from development, or would be on existing ROW in or near residential developments.

In the west region, the No Action Alternative would limit future expansion of the Upper Big Thompson Sanitation District facility because the existing ROW would be maintained (**Table 2.9-2**).

In the east region, the CBT Pole Hill Penstocks are located approximately 600 feet south of Alternatives A, B, and C and would not be an access barrier. Alternative D and the No Action Alternative would be located on both sides of the penstocks. While the penstocks themselves would not be disturbed by the Project (**Table 2.9-3**), they would be access barriers for Alternative D or the No Action.

Property Values and Economic Effects

Potential effects on property values and other economic considerations are always important issues with property owners. In general, accepted peer-reviewed studies from the realty field have shown a range of property value effects ranging from negligible to moderate in the short term. There have been several alternative routes studied in the EIS. All involve resource trade-offs, and most include the removal of one of the two existing lines, and abandonment of the ROW. This would result in an improvement to the existing visual setting, and the abandonment of ROW would remove encumbrances on the properties crossed. Residential developments in the Project area have been designed around the existing transmission line ROWs; new ROWs impact properties that have not been developed around existing easements. In the end, the rebuilt transmission line has to go somewhere. As detailed in Section 4.13, many of the residences along the alternative routes have property values that would have already taken into account the existing transmission lines. Over a short period of time, any observed decreases in property values tend to fade as people become accustomed to the presence of the new infrastructure.

While landowners may feel their property values would be irreparably harmed by a ROW easement or structures within their viewshed, landowners would be compensated for any additional easements on their property while retaining ownership and use of the ROW within certain restrictions. Safety considerations require that no buildings or structures that would reduce line clearances be constructed on the ROW, and utilities must control vegetation to meet reliability standards and have access to structure sites. However, ROWs would not be fenced and landowners may continue to have use of the ROW except for buildings and other structures that could reduce ground clearance and cause safety issues or block the ROW.

The impacts of a new easement on a landowner that does not have an existing easement would be considered to be higher. Alternatives that maximize the use of existing ROWs are considered to have the least economic impacts. Any influence on property values from the Project would already be factored into the current existing valuation due to the presence of the existing transmission line; the easement is already an encumbrance on the property. Therefore, the replacement of an existing line with a new one should not have a substantial effect on a given property. It is Western's goal to have the least possible effect to individual landowners, subdivisions as a whole, and businesses while still meeting purpose and need objectives. Additionally, Western desires to create the least amount of new ROW (both mileage and acreage) while also decommissioning the greatest amount of ROW as possible.

With respect to APA considerations on the west end of the line, Alternative B would not affect any new landowners with new ROW requirements, but would impact one landowner with expanded ROW. Alternative C would require 22 acres of new ROW impacting two landowners, and expanded ROW on another landowner. Alternative C1 would require 23 acres of new ROW, but would decommission 40 acres. The other alternatives (A, A1, A2, D, and No Action) would impact a larger number of landowners with new ROW, but would have more landowners (18 to 22) with decommissioned ROW. For the APA on the west, Alternatives B and C affect the least number of owners by both new ROW and

expanded ROW (**Table 2.9-2**). On the east end of the line, Alternative B would affect the least number of landowners with both new and expanded ROW needs (**Table 2.9-3**).

In addition, ROW decommissioning was taken in to account by Western in selecting the APA. Alternatives that maximize ROW decommissioning are favorable for reducing overall visual impacts and minimizing maintenance activity and disturbance to the area. All alternatives except D and the No Action Alternative decommission ROW.

In the west region, Alternative A1 would decommission lands for the largest number of landowners (**Table 2.9-2**). In the east region, Alternative B would decommission lands for the most landowners (**Table 2.9-3**).

Cultural Resources

Very few cultural sites were located in the area of the Project (**Tables 2.9-1, 2.9-2,** and **2.9-3**). Those sites would be easily avoided by overhead transmission lines, structures, and access roads. Avoidance is Western's preferred means of preventing impact to potentially eligible or eligible cultural resources sites. Because of the few sites and the fact that sites can be avoided regardless of the alternative selected, cultural resources did not play a role in selecting an APA for this Project.

Water Resources, Floodplains, and Wetlands

The terrain crossed by the Project ranges from hilly to mountainous over most of its length. Stream courses are in low areas with relatively narrow floodplains, and can be easily spanned by the transmission line whose structures would be mainly located on higher points where structures can be shorter while still maintaining conductor clearances. Access roads to structure sites can approach structure locations from either side of the stream course, or can utilize existing road crossings or cross at advantageous locations with the least environmental impact. The largest potential floodplain and wet meadow area is found on the west end along Alternatives A and A1. Waterbodies and wetlands are considered 'crossed' if any portion of them extends into the study area for the route, which is 110 feet wide. As described in Section 4.6, it is believed that all wetlands would be avoided or spanned. Additional wetland delineations would be conducted once final design and engineering is completed and the placement of structures and access roads are confirmed (see Section 2.5).

Based on preliminary information, subject to change after final siting of roads and structures, in the west region , Alternatives C and C1 would have the least number of waterbodies crossed while Alternative C1 would have the least number of waters of the U.S. crossed and Alternatives B and C1 would have the least number of wetlands crossed (**Table 2.9-2**). For APA considerations, Alternatives B, C, and C1 have the least numbers of combined water resource features on the west end of the line.

Based on preliminary information, subject to change after final siting of roads and structures, in the east region, Alternative A would cross the least number of waterbodies and Alternative A and would cross the least Waters of the U.S.; Alternative B would cross the least number of wetlands (**Table 2.9-3**). For APA considerations, Alternatives A and B have the fewest numbers of combined water resource features on the east end of the line (**Table 2.9-3**).

Electric and Magnetic Fields

EMF has been a concern of the public since the issue first surfaced in the early 1970s. Despite 40 years of research, no link has been demonstrated between EMF exposure and human health issues. Some studies have indicated a relationship, but none have been replicated and any correlation has been just above the level of statistical significance (the threshold level where the results of a study or analysis cannot be explained as occurring purely by chance). The double-circuit transmission lines would be designed to minimize EMF and would produce electric fields that would be 70 percent less at the edge of a 110-foot-wide ROW (55 feet from the centerline) than the existing lines. Additionally, the new double-circuit line would reduce magnetic field levels to less than the existing H-frame line within

the 110-foot ROW. The Colorado Public Utilities Commission states that magnetic fields of less than 150 milligauss (mG) at the edge of the ROW are reasonable; anticipated levels for this Project would be 1.8 to 5.2 at maximum load. As detailed in Section 4.14.3.5, the maximum induced electrical field of any of the proposed alternatives is estimated at 0.5 kilovolt per meter (kV/m), well below the estimated interference threshold of 3.4-kV/m. Therefore, with operation at 115-kV capacity, the Project would not pose a risk to pacemaker wearers.

The No Action Alternative and Alternative D would have the highest EMF values because they would be single-circuit lines with no double-circuit cancellation, and conductors would be in a horizontal configuration. All alternatives using double-circuit steel monopole construction would have the same lower EMF values as they would have the double-circuit cancellation effect and also would have four of the six conductors further from the ground.

In the west region, the underground Alternatives A2 and C1 would have no electric fields, but would have higher magnetic fields as burial does not diminish magnetic fields and the conductors would be closer to persons in or at the edge of the ROW (**Table 2.9-2**).

In the east region, all alternatives, including the No Action, would remove the section of transmission line through the Newell Lake View subdivision due to encroachments and safety concerns. However, one pole of each structure would be left to carry the fiber optic needed for communication with Pinewood Reservoir dam. The fiber optic line would generate no EMF (**Table 2.9-3**).

Effects on Plants, Wildlife, and Fish

The alternatives were not found to have any discrimination among them for listed or sensitive species, so there is no alternative that offers less potential impact than the others. There are some differences in the amount of elk, mule deer, and moose winter range. However, since most of the alternatives remain on existing ROW, any effects would be slight in any case, and largely limited to construction activities during the winter months, if any. A route with the least acreage of overlap with big game winter range would be preferred. No fish habitat would be impacted.

From an environmental resources and ecological viewpoint, there is an argument for choosing an alternative in an already developed area over one that has little or no development. Choosing an alternative that would require construction or reconstruction and long-term maintenance in areas with no other large infrastructure is less desirable than choosing an alternative where there is already human infrastructure in place. The removal of a large industrial facility such as a transmission line from an area with no other infrastructure would allow natural vegetation, animal use, and other ecosystems succession to progress. The placement of a transmission facility in an area that already has human development such as an existing ROW, highways, well-travelled roads, higher human habitation, etc. would in the long term have the least negative effect on the overall natural environment of Project area.

As with several other resources, Alternatives D and the No Action would be the least desirable because they would continue to use both ROWs, and construction and periodic maintenance activities would be required along both ROWs over the life of the Project. Alternatives using existing ROW on the South Line would have the least effect on plants and wildlife since the existing maintained ROW would be used. North Line alternatives would require expansion of ROW to 150 feet, with incremental impacts compared to the existing line. Compared to steel lines, wood pole lines would require relatively more maintenance, especially as they age. The total clearing of all woody vegetation for a minimum of 50 feet over the underground Alternatives A2 and C1 would create a more pronounced edge effect to wildlife, and increase the potential for habitat fragmentation effects.

With respect to the APA on the west end, Alternatives A and C differ by about an acre of big game range (**Table 2.9-2**). Alternative A would cross the least amount of big game habitat; however, Alternatives B and C have fairly similar extents (20 to 23 acres is the range) (**Table 2.9-3**). Similarly, on the east end, Alternative B would cross the least amount of big game habitat (**Table 2.9-3**).

No alternatives would be likely to adversely affect listed species. There would be only slight differences in potential impacts to special status or Forest Service management indicator species among alternatives.

2.9 Comparison of Effects from Alternatives

Tables 2.9-1, **2.9-2**, and **2.9-3** compare the alternatives and APA using measurable indicators with regard to Key Issues and other issues identified in Section 1.6.3. **Table 2.9-1** compares the alternatives over their full lengths. Based on public input, additional summary impact tables were produced (**Tables 2.9-2** and **2.9-3**) which compare the impacts at both ends of the Project (west region and east region, see **Figure 2.2-8**). **Table 2.9-4** provides a summary comparison of environmental effects by resource and alternative. Data presented in these tables were based on additional information regarding the specific effects of each alternative to each resource and can be found in Chapter 4.0. Data presented in **Tables 2.9-1** through **2.9-3** have been modified slightly compared to what was presented in the Draft EIS to take advantage of new data availability and revised ROW acquisition needs, as well as to include the APA.

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Table 2.9-1 Measurement Indicators for Key and Other Issues, Full-Length Alternatives

Measurement Indicators for Issues	Alternative A	Variant A1	Variant A2	Alternative B	Alternative C	Variant C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Issue: ROW acquisition									
Acres of new ROW acquisition [1]	140	144	137	42	101	102	120	87	120
Acres of new ROW acquisition (National Forest System lands) [1]	14	14	14	10	10	10	14	10	14
Acres of ROW to be decommissioned [1]	154	159	158	57	132	131	2	105	2
Linear miles of ROW to be decommissioned[1]	15	16	16	14	16	16	1	15	1
Miles of land ownership crossed	Private - 12.5 USFS - 1.5 DOI - 0.1 SLB - 0.0 NCWCD - 0.4 County - 0.6	Private - 12.7 USFS - 1.5 DOI - 0.1 SLB - 0.0 NCWCD - 0.4 County - 0.5	Private - 12.8 USFS - 1.5 DOI - 0.1 SLB - 0.0 NCWCD - 0.4 County - 0.5	Private - 9.9 USFS - 2.0 DOI - 0.1 SLB - 1.0 NCWCD - 0.8 County - 1.0	Private - 11.2 USFS - 2.0 DOI - 0.1 SLB - 0.0 NCWCD - 1.1 County - 1.1	Private - 11.3 USFS - 2.0 DOI - 0.1 SLB - 0.0 NCWCD - 1.1 County - 1.1	Private - 20.8 USFS - 3.4 DOI - 0.2 SLB - 1.0 NCWCD - 1.5 County - 1.7	Private - 10.0 USFS – 2.0 DOI – 0.1 SLB – 1.0 NCWCD - 0.8 County – 1.0	Private - 20.8 USFS - 3.4 DOI - 0.2 SLB - 1.0 NCWCD - 1.5 County - 1.7
Issue: effects on visual resources									
Existing Scenic Integrity Objective (SIO) (National Forest System lands)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Resulting SIO (National Forest System lands)	Very Low[2]	Very Low[2]	Very Low[2]	Very Low[2]	Very Low[2]	Very Low[2]	Moderate	Very Low[2]	Moderate
Issue: Forest road construction/reconstruction [3]									
Miles of new administrative road on National Forest System land for permanent access	0.9	0.9	0.9	0.6	0.6	0.6	2.0	0.6	2.0
Reconstruction of existing ML2 system road on National Forest System lands (miles)	0	0	0	0	0	0	0	0	0
Limited reconditioning of existing ML2 system road post-construction (miles)	2.5	2.5	2.5	3.4	3.8	3.8	3.4	3.8	3.4
Issue: recreational uses and experiences									
Long-term changes in recreation opportunities on National Forest System lands	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	Significant adverse impacts to four-wheel drive opportunities due to west Pole Hill Road upgrade; increased opportunities for dispersed recreation.	Significant adverse impacts to four-wheel opportunities due to west Pole Hill Road upgrade; increased opportunities for dispersed recreation.	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]
Issue: protected lands									
No. protected lands crossed [5]	4	4	4	5	4	4	6	5	6
Issue: effects on infrastructure									
Conflicts with Upper Thompson Sanitation District	No	No	No	No	No	No	No	No	Limits facility expansion
CB Pole Hill Penstocks[8]	No	No	No	No	No	No	No	No	No
Issue: property values and economic effects									
No. of landowners affected by ROW acquisition [1]	59	49	60	23	51	74	61	24	61
New ROW	17	12	23	3	14	37	13	4	13
Expanded ROW	42	37	37	20	37	37	48	20	48

Table 2.9-1 Measurement Indicators for Key and Other Issues, Full-Length Alternatives

Measurement Indicators for Issues	Alternative A	Variant A1	Variant A2	Alternative B	Alternative C	Variant C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
No. of landowners affected by both new ROW and expanded ROW acquisition [1]	53	46	56	21	47	69	55	23	55
Subdivisions affected by ROW acquisition (new or expanded ROW)	Park Hill Newell Lake	Park Hill Newell Lake	Park Hill Newell Lake	Park Hill	Park Hill Newell Lake	Park Hill Newell Lake	Park Hill Newell Lake	Park Hill	Park Hill Newell Lake
No. of landowners with ROW to be decommissioned	58	61	60	61	50	48	17	62	17
Businesses directly affected	NA	NA	NA	NA	Four-wheel drive tour operator	Four-wheel drive tour operator	NA	NA	NA
Issue: cultural resources									
Number of NRHP-eligible historic sites potentially impacted	4	5	4	3	5	4	5	5	5
Issue: water resources, floodplains, and wetlands [6]									
Waterbodies Crossed	44	41	41	34	42	42	67	38	66
Wetlands Present	15	14	15	9	14	13	21	12	20
Waters of the U.S.	20	18	20	14	22	20	29	20	29
Issue: ROW clearing and maintenance									
Soil types in Analysis Area [7]									
Soils with shallow bedrock (within 60 inches of soil surface) (acres)	279	326	266	316	320	271	521	285	515
Low revegetation potential (acres)	32	97	37	101	68	26	144	68	144
Compaction prone (acres)	123	123	122	71	173	161	207	120	200
Water erodible (acres)	164	172	160	114	114	111	215	94	217
Vegetation types in ROW [8]									
Ponderosa pine woodland (acres)	136	145	139	103	128	124	210	118	210
Mixed conifer forest (acres)	9	13	9	34	17	17	42	17	42
Mountain shrub mosaic (acres)	29	25	28	28	34	35	63	31	63
Upland meadow, or upland meadow/wetland mosaic (acres)	16	10	15	17	16	20	39	17	39
Issue: electric and magnetic fields									
Electric fields at ROW edge (kilovolt per meter [kV/m]) [9]	0.12	0.12	0	0.12	0.12	0	0.34	0.12	0.34
Magnetic fields at each ROW edge (milligauss [mG]) [10]	5.2/1.8	5.2/1.8	0.05	5.2/1.8	5.2/1.8	0.05	5.2/5.3	5.2/1.8	5.2/5.3
Issue: effects on plants, wildlife, and fish									
Special Status Plants [11]									
Threatened and endangered	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sensitive species	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII
Species of local concern	LP	LP	LP	LP	LP	LP	LP	LP	LP
Big Game [12]									
Elk and Mule Deer Winter Range (acres)	83	84	97	84	82	103	122	81	122
Moose Winter Range (acres)	35	36	39	38	36	42	56	36	56

Table 2.9-1 Measurement Indicators for Key and Other Issues, Full-Length Alternatives

Measurement Indicators for Issues	Alternative A	Variant A1	Variant A2	Alternative B	Alternative C	Variant C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Special Status Wildlife [13]									
Threatened and endangered	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sensitive species	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII
Management indicator species	NC	NC	NC	NC	NC	NC	NC	NC	NC

[1] The transmission line ROW acquisition footprint was revised based on a June 11, 2015 call between Carey Ashton (Western) and Steve Ensley (AECOM). Transmission ROW acreage does not include access roads.

[2] Would require lowering of SIO and documentation of change of SIO in MA 8.3 - Utility Corridor for this Project area, in accordance with Forest Plan Standard 154 and also documentation in the USFS ROD.

[3] All construction and reconstruction analyses were calculated with Western provided shapefiles. Forest road construction and reconstruction analysis does not include transmission line ROW acreage.

[4] The Project would not change existing public road systems, access to recreational opportunities, or the four-wheel drive section of West Pole Hill Road. Therefore, the Project would have no effect on recreational uses and experiences.

[5] Protected lands include the Flatiron Reservoir County Park, Chimney Hollow Open Space, Pinewood Reservoir County Park, Ramsay Shockey Open Space, Blue Mountain Bison Ranch, and a SLB Stewardship Trust parcel.

[6] Wetlands and waterbodies were determined from desktop analysis (USGS NHD data) and augmented with survey data where available. Ground surveys were completed early in the NEPA process during initial EA alternative development. Therefore, survey data were not collected for the full suite of alternatives. A full delineation of wetlands and waterbodies will be performed on the APA during final design and prior to construction. “Waterbodies” encompasses both perennial and intermittent streams.

[7] The soils analysis was based on a corridor of 200 feet for existing transmission lines centered on the ROW, 300 feet for new routing options, and 75 feet for underground variants. Some locations may have more than one soil characteristic.

[8] Data were determined based on a 110-foot width centered on the anticipated line and 75 feet for underground variants. Data also are based on ESRI landcover data/Southwest Regional Gap Analysis Project (SWReGAP).

[9] New steel pole line has a lower electric field signature than the existing H-frame line because of taller structures and the cancelation effect of the double-circuit line.

[10] Magnetic fields of new steel pole line would be similar at the edge of the ROW compared to the existing H-frame line, but less when within the ROW. Additionally, magnetic fields differ on either side of the aboveground structures.

[11] Determinations based on analyses identified in Section 4.8.

[12] Acreage is based on the overlap of elk and mule deer winter range over the estimated construction surface disturbance within the ROW.

[13] Determinations based on analyses identified in Section 4.10.

Abbreviations:

NA = not applicable or effects would not occur.

LP = low probability of species presence.

MAII = may adversely impact individuals, but not likely to result in a loss of viability on the Planning area, or cause a trend to federal listing.

NLAA = may affect, not likely to adversely affect.

NC = no change in population trend.

Table 2.9-2 Measurement Indicators for Key and Other Issues, West Region Portions of Alternatives

Measurement Indicators for Issues	West Region, Alternative A	Variant A1	Variant A2	West Region Alternative B	West Region Alternative C	Variant C1	West Region Alternative D	West Region Only, Agency-Preferred Alternative (APA)	West Region No Action Alternative
Issue: ROW acquisition									
Acres of new ROW acquisition [1]	36	40	33	4	26	27	35	26	35
Acres of new ROW acquisition (National Forest System lands) [1]	8	8	8	4	4	4	8	4	8
Acres of ROW to be decommissioned [1]	51	57	56	14	40	39	1	40	1
Linear miles of ROW to be decommissioned[1]	4	6	6	4	5	5	0	5	0
Miles of land ownership crossed	Private - 2.7 USFS - 0.9 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.1	Private - 2.9 USFS - 0.9 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.0	Private - 3.0 USFS - 0.9 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.0	Private - 2.6 USFS - 1.4 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.0	Private - 2.6 USFS 1.4 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.0	Private - 2.7 USFS - 1.4 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.0	Private - 5.3 USFS - 2.3 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.1	Private - 2.6 USFS - 1.4 DOI - 0.0 SLB - 0.0 NCWCD – 0.0 County - 0.0	Private - 5.3 USFS - 2.3 DOI - 0.0 SLB - 0.0 NCWCD - 0.0 County - 0.1
Issue: effects on visual resources									
Existing SIO (National Forest System lands)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Resulting SIO (National Forest System lands)	Very Low[2]	Very Low[2]	Very Low[2]	Very Low[2]	Very Low[2]	Very Low[2]	Moderate	Very Low[2]	Moderate
Issue: Forest road construction/reconstruction [3]									
Miles of new administrative road on National Forest System land for permanent access	0.8	0.8	0.8	0.5	0.5	0.5	1.4	0.5	1.4
Reconstruction of existing ML2 system road on National Forest System lands (miles)	0	0	0	0	0	0	0	0.0	0
Limited reconditioning of existing ML2 system road post-construction (miles)	0.7	0.7	0.7	1.6	2	2	1.6	2	1.6
Issue: recreational uses and experiences									
Long-term changes in recreation opportunities on National Forest System lands	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	Changes to four-wheel drive opportunities	Changes to four-wheel drive opportunities	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]
Issue: protected lands									
No. protected lands crossed [5]	0	0	0	0	0	0	0	0	0
Issue: effects on infrastructure									
Conflicts with Upper Thompson Sanitation District	No	No	No	No	No	No	No	No	Limits facility expansion
CB Pole Hill Penstocks[8]	No	No	No	No	No	No	No	No	No
Issue: property values and economic effects									
No. of landowners affected by ROW acquisition [1]	16	6	17	1	3	26	12	3	12
New ROW	9	4	15	0	2	25	3	2	3
Expanded ROW	7	2	2	1	1	1	9	1	9
No. of landowners affected by both new ROW and expanded ROW acquisition [1]	12	5	15	1	3	25	9	3	9
Subdivisions affected by ROW acquisition (new or expanded ROW)	Park Hill	Park Hill	Park Hill	Park Hill	Park Hill	Park Hill	Park Hill	Park Hill	Park Hill
No. of landowners with ROW to be decommissioned	18	22	20	9	10	8	3	10	3

Table 2.9-2 Measurement Indicators for Key and Other Issues, West Region Portions of Alternatives

Measurement Indicators for Issues	West Region, Alternative A	Variant A1	Variant A2	West Region Alternative B	West Region Alternative C	Variant C1	West Region Alternative D	West Region Only, Agency-Preferred Alternative (APA)	West Region No Action Alternative
Businesses directly affected	NA	NA	NA	NA	NA: Four-wheel drive tour operator would not be affected, due to a Project Design Change	NA: Four-wheel drive tour operator would not be affected, due to a Project Design Change	NA	NA	NA
Issue: cultural resources									
Number of NRHP-eligible historic sites potentially impacted	0	1	0	0	1	0	0	1	0
Issue: water resources, floodplains, and wetlands [6]									
Waterbodies Crossed	13	10	10	5	4	4	16	4	16
Wetlands Present	4	3	4	2	3	2	7	3	7
Waters of the U.S.	5	3	4	3	3	1	8	3	8
Issue: ROW clearing and maintenance									
Soil types in Analysis Area [7]									
Soils with shallow bedrock (within 60 inches of soil surface) (acres)	51	98	38	96	97	48	147	97	147
Low revegetation potential (acres)	27	92	32	63	63	21	89	63	89
Compaction prone (acres)	6	6	5	1	19	7	6	19	6
Water erodible (acres)	19	27	15	17	12	9	36	12	36
Vegetation types in ROW [8]									
Ponderosa pine woodland (acres)	29	38	32	31	34	30	61	34	61
Mixed conifer forest (acres)	4	8	4	20	14	14	24	14	24
Mountain shrub mosaic (acres)	7	3	6	1	3	4	8	3	8
Upland meadow, or upland meadow/wetland mosaic (acres)	7	1	6	1	1	5	6	1	6
Issue: electric and magnetic fields									
Electric fields at ROW edge (kilovolt per meter [kV/m]) [9]	0.12	0.12	0	0.12	0.12	0	0.34	0.12	0.34
Magnetic fields at each ROW edge (milligauss [mG]) [10]	5.2/1.8	5.2/1.8	0.05	5.2/1.8	5.2/1.8	0.05	5.2/5.3	5.2/1.8	5.2/5.3
Issue: effects on plants, wildlife, and fish									
Special Status Plants [11]									
Threatened and endangered	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sensitive species	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII
Species of local concern	LP	LP	LP	LP	LP	LP	LP	LP	LP
Big Game [12]									
Elk and Mule Deer Winter Range (acres)	20	21	21	23	21	23	33	21	33
Moose Winter Range (acres)	20	21	21	23	21	23	33	21	33

Table 2.9-2 Measurement Indicators for Key and Other Issues, West Region Portions of Alternatives

Measurement Indicators for Issues	West Region, Alternative A	Variant A1	Variant A2	West Region Alternative B	West Region Alternative C	Variant C1	West Region Alternative D	West Region Only, Agency-Preferred Alternative (APA)	West Region No Action Alternative
Special Status Wildlife [13]									
Threatened and endangered	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sensitive species	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII	MAII
Management indicator species	NC	NC	NC	NC	NC	NC	NC	NC	NC

[1] The transmission line ROW acquisition footprint was revised based on a June 11, 2015 call between Carey Ashton (Western) and Steve Ensley (AECOM). Transmission ROW acreage does not include access roads.

[2] Would require lowering of SIO and documentation of change of SIO in MA 8.3 - Utility Corridor for this Project area, in accordance with Forest Plan Standard 154 and also documentation in the USFS ROD.

[3] All construction and reconstruction analyses were calculated with Western provided shapefiles. Forest road construction and reconstruction analysis does not include transmission line ROW acreage.

[4] The Project would not change existing public road systems, access to recreational opportunities, or the four-wheel drive section of West Pole Hill Road. Therefore, the Project would have no effect on recreational uses and experiences.

[5] Protected lands include the Flatiron Reservoir County Park, Chimney Hollow Open Space, Pinewood Reservoir County Park, Ramsay Shockey Open Space, Blue Mountain Bison Ranch, and a SLB Stewardship Trust parcel.

[6] Wetlands and waterbodies were determined from desktop analysis (USGS NHD data) and augmented with survey data where available. Ground surveys were completed early in the NEPA process during initial EA alternative development. Therefore, survey data were not collected for the full suite of alternatives. A full delineation of wetlands and waterbodies will be performed on the APA during final design and prior to construction. “Waterbodies” encompasses both perennial and intermittent streams.

[7] The soils analysis was based on a corridor of 200 feet for existing transmission lines centered on the ROW, 300 feet for new routing options, and 75 feet for underground variants. Some locations may have more than one soil characteristic.

[8] Data were determined based on a 110-foot width centered on the anticipated line and 75 feet for underground variants. Data also are based on ESRI landcover data/SWReGAP.

[9] New steel pole line has a lower electric field signature than the existing H-frame line because of taller structures and the cancelation effect of the double-circuit line.

[10] Magnetic fields of new steel pole line would be similar at the edge of the ROW compared to the existing H-frame line, but less when within the ROW. Additionally, magnetic fields differ on either side of the aboveground structures.

[11] Determinations based on analyses identified in Section 4.8.

[12] Acreage is based on the overlap of elk and mule deer winter range over the estimated construction surface disturbance within the ROW.

[13] Determinations based on analyses identified in Section 4.10.

Abbreviations:
NA = not applicable or effects would not occur.
LP = low probability of species presence.
MAII = may adversely impact individuals, but not likely to result in a loss of viability on the Planning area, or cause a trend to federal listing.
NLAA = may affect, not likely to adversely affect.
NC = no change in population trend.

Table 2.9-3 Measurement Indicators for Key and Other Issues, East Region Portions of Alternatives

Measurement Indicators for Issues	East Region, Alternative A	East Region, Alternative B	East Region, Alternative C	East Region, Alternative D	East Region, Agency-Preferred Alternative (APA)	East Region, No Action Alternative
Issue: ROW acquisition						
Acres of new ROW acquisition [1]	59	17	31	40	17	40
Acres of new ROW acquisition (National Forest System lands) [1]	6	6	6	6	6	6
Acres of ROW to be decommissioned [1]	61	25	52	1	25	1
Linear miles of ROW to be decommissioned[1]	6	5	6	0	5	0
Miles of land ownership crossed	Private - 5.1 USFS - 0.6 DOI - 0.1 SLB - 0.0 NCWCD - 0.4 County - 0.5	Private - 2.7 USFS - 0.6 DOI - 0.1 SLB - 1.0 NCWCD - 0.8 County - 1.0	Private - 3.9 USFS - 0.6 DOI - 0.1 SLB - 0.0 NCWCD - 1.1 County - 1.1	Private - 6.2 USFS - 1.1 DOI - 0.2 SLB - 1.0 NCWCD - 1.5 County - 1.6	Private - 2.7 USFS - 0.6 DOI - 0.1 SLB - 1.0 NCWCD - 0.8 County - 1.0	Private - 6.2 USFS - 1.1 DOI - 0.2 SLB - 1.0 NCWCD - 1.5 County - 1.6
Issue: effects on visual resources						
Existing SIO (National Forest System lands)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Resulting SIO (National Forest System lands)	Very Low[2]	Very Low[2]	Very Low[2]	Moderate	Very Low[2]	Moderate
Issue: Forest road construction/reconstruction [3]						
Miles of new administrative road on National Forest System land for permanent access	0.0	0.0	0.0	0.5	0.0	0.5
Reconstruction of existing ML2 system road on National Forest System lands (miles)	0	0	0	0	0	0
Limited reconditioning of existing ML2 system road post-construction (miles)	1.4	1.4	1.4	1.4	1.4	1.4
Issue: recreational uses and experiences						
Long-term changes in recreation opportunities on National Forest System lands	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]	No Changes due to Project[4]
Issue: protected lands						
No. protected lands crossed [5]	4	5	4	6	5	6
Issue: effects on infrastructure						
Conflicts with Upper Thompson Sanitation District	No	No	No	No	No	No
CB Pole Hill Penstocks[8]	No	No	No	No	No	No
Issue: property values and economic effects						
No. of landowners affected by ROW acquisition [1]	28	6	33	34	6	34
New ROW	8	2	12	10	2	10
Expanded ROW	20	4	21	24	4	24
No. of landowners affected by both new ROW and expanded ROW acquisition [1]	26	5	29	31	5	31
Subdivisions affected by ROW acquisition (new or expanded ROW)	Newell Lake	NA	Newell Lake	Newell Lake	NA	Newell Lake
No. of landowners with ROW to be decommissioned	26	38	26	14	38	14
Businesses directly affected	NA	NA	NA	NA	NA	NA

Table 2.9-3 Measurement Indicators for Key and Other Issues, East Region Portions of Alternatives

Measurement Indicators for Issues	East Region, Alternative A	East Region, Alternative B	East Region, Alternative C	East Region, Alternative D	East Region, Agency-Preferred Alternative (APA)	East Region, No Action Alternative
Issue: cultural resources						
Number of NRHP-eligible historic sites potentially impacted	3	3	3	4	3	4
Issue: water resources, floodplains, and wetlands [6]						
Waterbodies Crossed	13	16	20	27	16	26
Wetlands Present	5	3	5	7	3	6
Waters of the U.S.	5	7	9	11	7	11
Issue: ROW clearing and maintenance						
Soil types in Analysis Area [7]						
Soils with shallow bedrock (within 60 inches of soil surface) (acres)	176	136	171	255	136	249
Low revegetation potential (acres)	1	1	1	14	1	14
Compaction prone (acres)	62	46	99	126	46	119
Water erodible (acres)	134	71	91	141	71	143
Vegetation types in ROW [8]						
Ponderosa pine woodland (acres)	58	36	46	67	36	67
Mixed conifer forest (acres)	3	0	0	1	0	1
Mountain shrub mosaic (acres)	18	23	26	47	23	47
Upland meadow, or upland meadow/wetland mosaic (acres)	9	16	15	33	16	33
Issue: electric and magnetic fields						
Electric fields at ROW edge (kilovolt per meter [kV/m]) [9]	0.12	0.12	0.12	0.34	0.12	0.34
Magnetic fields at each ROW edge (milligauss [mG]) [10]	5.2/1.8	5.2/1.8	5.2/1.8	5.2/5.3	5.2/1.8	5.2/5.3
Issue: effects on plants, wildlife, and fish						
Special Status Plants [11]						
Threatened and endangered	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sensitive species	MAII	MAII	MAII	MAII	MAII	MAII
Species of local concern	LP	LP	LP	LP	LP	LP
Big Game [12]						
Elk and Mule Deer Winter Range (acres)	37	35	36	50	35	50
Moose Winter Range (acres)	0	0	0	0	0	0

Table 2.9-3 Measurement Indicators for Key and Other Issues, East Region Portions of Alternatives

Measurement Indicators for Issues	East Region, Alternative A	East Region, Alternative B	East Region, Alternative C	East Region, Alternative D	East Region, Agency-Preferred Alternative (APA)	East Region, No Action Alternative
Special Status Wildlife [13]						
Threatened and endangered	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Sensitive species	MAII	MAII	MAII	MAII	MAII	MAII
Management indicator species	NC	NC	NC	NC	NC	NC

[1] The transmission line ROW acquisition footprint was revised based on a June 11, 2015 call between Carey Ashton (Western) and Steve Ensley (AECOM). Transmission ROW acreage does not include access roads.

[2] Would require lowering of SIO and documentation of change of SIO in MA 8.3 - Utility Corridor for this Project area, in accordance with Forest Plan Standard 154 and also documentation in the USFS ROD.

[3] All construction and reconstruction analyses were calculated with Western provided shapefiles. Forest road construction and reconstruction analysis does not include transmission line ROW acreage.

[4] The Project would not change existing public road systems, access to recreational opportunities, or the four-wheel drive section of West Pole Hill Road. Therefore, the Project would have no effect on recreational uses and experiences.

[5] Protected lands include the Flatiron Reservoir County Park, Chimney Hollow Open Space, Pinewood Reservoir County Park, Ramsay Shockey Open Space, Blue Mountain Bison Ranch, and a SLB Stewardship Trust parcel.

[6] Wetlands and waterbodies were determined from desktop analysis (USGS NHD data) and augmented with survey data where available. Ground surveys were completed early in the NEPA process during initial EA alternative development. Therefore, survey data were not collected for the full suite of alternatives. A full delineation of wetlands and waterbodies will be performed on APA during design and prior to construction. “Waterbodies” encompasses both perennial and intermittent streams.

[7] The soils analysis was based on a corridor of 200 feet for existing transmission lines centered on the ROW, 300 feet for new routing options, and 75 feet for underground variants. Some locations may have more than one soil characteristic.

[8] Data were determined based on a 110-foot width centered on the anticipated line and 75 feet for underground variants. Data also are based on ESRI landcover data/SWReGAP.

[9] New steel pole line has a lower electric field signature than the existing H-frame line because of taller structures and the cancelation effect of the double-circuit line.

[10] Magnetic fields of new steel pole line would be similar at the edge of the ROW compared to the existing H-frame line, but less when within the ROW. Additionally, magnetic fields differ on either side of the aboveground structures.

[11] Determinations based on analyses identified in Section 4.8.

[12] Acreage is based on the overlap of elk and mule deer winter range over the estimated construction surface disturbance within the ROW.

[13] Determinations based on analyses identified in Section 4.10.

Abbreviations:
NA = not applicable or effects would not occur.
LP = low probability of species presence.
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NLAA = may affect, not likely to adversely affect.
NC = no change in population trend.

Table 2.9-4 Comparison of Alternative Effects [1]

Resource	Alternative A	Alternative A1	Alternative A2	Alternative B	Alternative C	Alternative C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Soils	Potential impacts to soils include compaction and traffic ruts, erosion, and contamination. Compaction and erosion impacts would be minimized through SCPs. Soil contamination would be avoided or mitigated through adherence to SCPs and applicable permit requirements.	Potential impacts would be the same as Alternative A. Acres of impacted soil types would be the same as Alternative A.	The nature of potential impacts would be the same as Alternative A. Fewer acres would be affected than Alternative A. More soil disturbance would result from trenching, possibly reducing soil productivity.	Potential impact factors would be the same as Alternative A. Acres of impacted soil types would be the same as Alternative A2.	The nature of potential impacts would be similar to Alternative A. More acres of bedrock would be affected. Reconstruction along Pole Hill Road would reduce erosion associated with this ML2 road and have long-term beneficial effects for soils on National Forest System lands.	Potential impact factors would be the same as Alternative A. Soil disturbance acreages would be similar to Alternative C. More soil disturbance would result from trenching, possibly reducing soil productivity. Reconstruction along Pole Hill Road would reduce erosion associated with this ML2 road and have long-term beneficial effects for soils on National Forest System lands.	Potential impact factors would be the same as Alternative A. The greatest acreage of soils and bedrock would be affected under Alternative D.	Potential impact factors would be the same as Alternative A. Soils having low revegetation potential would be more extensive than Alternative A, the same as Alternative C, and less than Alternatives B and D. The extent of compaction-prone or water-erodible soils would be much less than Alternatives A, C, or D. Less newly acquired ROW would be needed than for Alternatives A, C, or D, reducing the potential for new soil impacts.	Natural causes and human activities would continue to affect soil resources at current levels. Impact characteristics associated with relocation of the line in part of the Newell Lake View development would be similar to Alternative A.
Water Resources and Floodplains	Impacts to surface water quantity and quality would be minor to negligible due to implementation of SCPs and compliance with permit provisions. Impacts to groundwater resources would be negligible. Measurable effects would be avoided within the Federal Emergency Management Agency (FEMA)-designated floodplain.	Compared with Alternative A, further potential for changes in runoff rates, flow turbidity and sedimentation, and spills or leaks would occur in areas of new access roads and ROW construction. Impacts to surface water quantity and quality or groundwater resources would be minor to negligible due to implementation of SCPs and compliance with permit provisions. Measurable effects would be avoided within the FEMA-designated floodplain.	Variant A2 would have impacts similar to Variant A1. In addition, construction for the underground portion of the ROW may encounter groundwater; if this occurred, it would be addressed in compliance with state permit approvals.	Potential impacts would generally be of the same type as Alternative A. Additional potential for impacts to existing runoff conditions, or flow turbidity and sedimentation would occur in the steep terrain near Meadowdale Ranch and Ravencrest areas. Potential impacts would be minor to negligible, and would be addressed similar to Alternative A. The FEMA-designated floodplain would be avoided.	Potential impacts would generally be the same as Alternative B. An area that may have shallow groundwater occurs along Alternative C at the east side of Pinewood Reservoir. Impacts to surface water or groundwater quantity and quality would be minor to negligible through implementation of SCPs and compliance with permit provisions.	Potential impacts would be the same as for Alternative C. Shallow groundwater also may be encountered where deeper excavation could occur for underground construction along the western 2.7 miles of the ROW.	The potential for impacts from ROW use and construction would be similar to Alternatives A and B. The reroute in the vicinity of Pinewood Reservoir would have the potential for shallow groundwater impacts similar to Alternative C. Implementation of SCPs and compliance with permit provisions would reduce impacts to minor or negligible levels.	Impacts to water resources quantity and quality would be minor to negligible due to implementation of SCPs and compliance with permit provisions. This alternative would cross fewer waterbodies and wetlands than any alternative except Alternative B. Areas of potential shallow groundwater in the Pinewood Reservoir locale would be avoided. The least amount of new transmission line ROW acquisition would occur; reducing the potential for increased runoff, flow turbidity, sedimentation, or impacts from spills during new disturbance.	Potential impacts to surface or groundwater quantity and quality would be similar to Alternatives A, B, and D, but would be spread out in space and time. Implementation of SCPs and compliance with permit provisions would limit impacts to minor or negligible levels. Negligible impacts to floodplains would occur.

Table 2.9-4 Comparison of Alternative Effects [1]

Resource	Alternative A	Alternative A1	Alternative A2	Alternative B	Alternative C	Alternative C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Wetlands and Waters of the U.S.	Agency policy is to avoid these sensitive areas where possible. Where disturbance cannot be avoided, impacts to drainage, adapted vegetation, and scarce habitats could occur. These effects would be avoided or mitigated by implementation of SCPs and EPMs.	The nature of impacts, their potential extent, and corresponding agency practices would be similar to Alternative A.	The nature of impacts and corresponding agency practices would be similar to Alternative A. Depending on underground construction techniques through wetlands and Waters of the U.S., the extent of impacts could be somewhat more or less than Alternative A.	The nature of impacts and corresponding agency practices would be similar to Alternative A. The potential for disturbing wetlands or Waters of the U.S. would be much less for Alternative B than Alternative A.	The nature of impacts and corresponding agency practices would be similar to Alternative A. The potential for disturbing wetlands or Waters of the U.S. would be similar to Alternative A.	The nature of impacts and corresponding agency practices would be similar to Alternative A. Depending on underground construction techniques through wetlands and Waters of the U.S., the extent of impacts could be somewhat more or less than Alternative A.	The nature of impacts and corresponding agency practices would be similar to Alternative A. The potential for disturbing wetlands or Waters of the U.S. would be much greater for Alternative D than Alternative A.	The nature of impacts and corresponding agency practices would be similar to Alternative A. The potential for disturbing wetlands or Waters of the U.S. would be slightly less than Alternative A. It is expected that all wetlands would be avoided by the final design.	The nature of impacts and corresponding agency practices would be similar to Alternative A. Fewer impacts would be anticipated than for other alternatives because of decreased construction disturbance.
Vegetation	Ponderosa pine, mixed conifer forest, mountain shrub mosaic, and upland meadow communities would be impacted by Project disturbance. Effects would include vegetation trampling, removal, or incidental disturbance. Approximately 70 percent of disturbance would occur in ponderosa pine communities.	The nature and extent of potential impacts to vegetation types would be the same as Alternative A. Slightly more disturbance would occur in the ponderosa pine community.	Potential impacts to vegetation types would be similar to Alternative A.	Potential impacts to vegetation types would be similar to Alternative A, but slightly less extensive. Fewer ponderosa pine woodlands would be affected (approximately 55 percent) and more mixed conifer forest, mountain shrub mosaic, and upland meadows would be affected.	Potential impacts to vegetation types would be similar to Alternative A, although slightly less ponderosa pine woodlands would be affected and more mixed conifer forest, mountain shrub mosaic, and upland meadows would be affected.	Potential impacts to vegetation types would be similar to Alternative A, although slightly less ponderosa pine woodlands and mixed conifer forest would be affected and more mountain shrub mosaic and upland meadows would be affected.	The nature of potential impacts to vegetation types would be similar to Alternatives A, B, and C, but the overall acreage of potential impacts would be much more extensive. Approximately 60 percent of the greater disturbance area would occur in ponderosa pine woodlands.	Potential impacts to vegetation types would be similar to Alternative A but slightly less extensive. Of the smaller acreage, fewer ponderosa pine woodlands would be affected (approximately 65 percent) and more mixed conifer forest, mountain shrub mosaic, and upland meadows would be affected.	Potential impacts to all vegetation types would be similar to Alternative D.
Special Status and Sensitive Plant Species	No federally listed species are found along Alternative A. Due to limited distribution of federally listed species and low quality of habitat, no impacts to these species would be expected. Potential impacts to sensitive plant species and species of concern would be minor and short-term due to limited surface disturbance in the ROW, and reclamation of disturbed areas.	Potential impacts would be the same as Alternative A.	Potential impacts would be the same as Alternative A.	Due to limited distribution of federally listed species and low quality of habitat, no impacts to these species would be expected. Potential impacts to sensitive plant species and species of concern would be minor and short-term due to limited surface disturbance in the ROW, and reclamation of disturbed areas.	Potential impacts would be the same as Alternative A.	Potential impacts would be the same as Alternative A.	Due to limited distribution of federally listed species and low quality of habitat, no impacts to these species would be expected. Potential impacts to sensitive plant species and species of concern would be minor and short-term due to limited surface disturbance in the ROW, and reclamation of disturbed areas.	Due to limited distribution of federally listed species and low quality of habitat, no impacts to these species would be expected. Potential impacts to sensitive plant species and species of concern would be minor and short-term due to limited surface disturbance in the ROW, and reclamation of disturbed areas.	Due to low quality of habitat and reduced surface disturbance, no impacts to federally listed species would be anticipated. Potential impacts to sensitive plant species and species of concern would be minor and short-term due to limited surface disturbance in the ROW, and reclamation of disturbed areas.
Wildlife Habitat	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative. The extent of impacts due would be somewhat greater than Alternative A.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative. The nature and extent of impacts would be similar to Alternative A.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative. The nature and extent of impacts would be similar to Alternatives A and B.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative. The extent of impacts would be somewhat greater than Alternative A.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative. The extent of impacts would be much greater than Alternatives A, B, or C.	Elk and mule deer winter range, and moose winter range habitat would be affected by this alternative. The nature and extent of impacts would be similar to Alternatives A, B, and C.	Acres of big-game habitat impacted would be similar to Alternative D.

Table 2.9-4 Comparison of Alternative Effects [1]

Resource	Alternative A	Alternative A1	Alternative A2	Alternative B	Alternative C	Alternative C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Raptors and Other Birds	Implementation of EPMs, as well as seasonal restrictions to prevent impacts to raptors and migratory birds potentially would minimize direct impacts. Additionally, based on conductor placement and orientation, electrocution would not pose a hazard to bird species. Remaining impacts (e.g., loss of habitat) are anticipated to be minor.	Potential impacts would be the same as Alternative A. There would be no risk of raptor collisions where the transmission line would be constructed underground.	Potential impacts would be the same as Alternative A. There would be no risk of raptor collisions where the transmission line would be constructed underground.	Potential impacts would be the same as Alternative A.	Potential impacts would be the same as Alternative A.	Potential impacts would be the same as Alternative A. There would be reduced risk of raptor collisions where the transmission line would be constructed underground.	Potential impacts would be the same as Alternative A.	Potential impacts would be the same as Alternatives A, B, and C.	Displacement of upland game birds, raptors, and other birds as a result of increased human activity during maintenance activities would be short-term and minor. Relocation of the line would result in potential impacts similar to Alternative A.
Special Status and Sensitive Wildlife Species Habitat Disturbance	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected.	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected at the same level as Alternative A	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected at approximately the same level as Alternative A.	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected at a greater level than Alternative A.	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected at approximately the same level as Alternative A.	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected at approximately the same level as Alternative A.	Much greater extent of vegetation communities in the ROW that support special status and sensitive wildlife species would be affected than any other alternative.	Vegetation communities in the ROW that support special status and sensitive wildlife species would be affected at approximately the same level as Alternative A	Fewer acres of vegetation communities in the ROW that support special status and sensitive wildlife species would be affected than any action alternative.
Land Use and Recreation Land Use	Long-term adverse impacts to land use from the acquisition of new or expanded ROW would range from negligible to moderate depending on the location and ownership of the acquired ROW. Beneficial effects where existing ROW would be decommissioned.	Impacts are similar to A; however, Variant A1 would require slightly more acres of new ROW.	Impacts are similar to A; however, Variant A2 would require slightly less acres of new ROW.	Impacts are similar to A; however, Alternative B requires the fewest acres of ROW acquisition.	Impacts are similar to A; however, Variant A1 would require less acres of new ROW.	Impacts are similar to A; however, Variant C1 would require less acres of new ROW.	The nature of potential impacts would be similar to Alternative A; however, Alternative D would maintain two ROWs and therefore requires the most ROW acquisition. The beneficial effects of ROW consolidation would not be realized under this alternative.	The APA would require much less acquisition of new ROW than any other alternative except Alternative B. The number of landowners with ROW to be decommissioned would be slightly greater than Alternatives A or B, and much greater than Alternatives C, D, or the No Action.	Existing ROWs would be expanded to a minimum width of 75 feet. New ROW would be acquired to relocate the line from Newell Lake View subdivision (through which there is inadequate ROW). The beneficial effects of ROW consolidation would not be realized.

Table 2.9-4 Comparison of Alternative Effects [1]

Resource	Alternative A	Alternative A1	Alternative A2	Alternative B	Alternative C	Alternative C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Recreation	Potential short- and long-term impacts to recreation from access roads, staging areas, and construction and maintenance activities would range from negligible to moderate depending on the location and timing of activities. The long-term recreational experience would be enhanced in areas where existing transmission line would be decommissioned.	Potential impacts would be the same as Alternative A.	Potential impacts would be the same as Alternative A.	Short-term recreation opportunities on the Besant Point Trail could be affected depending on the timing of construction. Long-term impacts would include effects to the four-wheel drive recreational setting on West Pole Hill Road caused by the steel structures. Any potential change to the ROS classification resulting from the new structures would result in a Forest Service Plan Amendment. Other potential impacts to recreation would be similar to Alternative A.	Moderate short- and long-term impact to the recreation setting and recreation facilities along the east side of Pinewood Reservoir County Park. Other potential impacts to recreation would be similar to Alternative A. Four-wheel drive recreation opportunities would be significantly adversely impacted on sections of USFS Road 122 that would be reconstructed. Reconstruction on sections of USFS Road 122 also would result in adverse and beneficial effects to dispersed recreation.	Moderate short- and long-term impact to the recreation setting and recreation facilities along the east side of Pinewood Reservoir County Park. Other potential impacts to recreation would be similar to Alternative A. Four-wheel drive recreation opportunities would be significantly adversely impacted on sections of USFS Road 122 that would be reconstructed. Reconstruction on sections of USFS Road 122 also would result in adverse and beneficial effects to dispersed recreation.	Moderate short- and long-term impact to the recreation settings would occur along the east side of Pinewood Reservoir County Park. Other potential impacts to recreation would be similar to Alternative A. The beneficial effects of ROW consolidation would not be realized under this alternative.	Potential impacts to recreation would be similar to Alternative A. Under the APA, the four-wheel drive portion of USFS Road 122 would not be reconstructed resulting in no significant adverse impacts to recreation resources.	Moderate short- and long-term impact to recreation settings along would occur on the east side of Pinewood Reservoir County Park. Negligible to minor adverse effects to recreation settings would occur where additional ROW would need to be acquired. The beneficial effects of ROW consolidation would not be realized under this alternative.
Visual Resources	New, taller structures and associated disturbance would result in short- and long-term adverse effects ranging from minor to moderate with localized strong visual changes. Long-term beneficial effects would occur where the South Line would be removed, such as within the Newell Lake View subdivision. Moderate adverse effects would occur from new access roads and vegetation management	Potential impacts would be the same as Alternative A, except for along 0.5 mile of U.S. Highway 36 where the adverse effect would be greater.	Potential impacts would be the same as Alternative A, except for the underground segment near Estes Park which would result in no overhead transmission line structures, but may produce a more visually noticeable cleared ROW.	Incremental adverse effects would occur to Chimney Hollow Open Space, Pinewood Lake, Meadowdale Hills and Ravencrest subdivisions, and U.S. Highway 36. Conversely, beneficial effects would occur to the Newell Lake View subdivision and the valley between Mount Pisgah and Mount Olympus as seen from the Estes Valley as a result of abandonment of an entire ROW. Other potential impacts to scenic resources would be similar to Alternative A.	Incremental adverse effects would occur to Chimney Hollow Open Space, and Meadowdale Hills and Ravencrest subdivisions, and along 0.75 mile of U.S. Highway 36. Conversely, beneficial effects would occur to the Newell Lake View subdivision and the valley between Mount Pisgah and Mount Olympus as seen from the Estes Valley as a result of abandonment of an entire ROW. Other potential impacts to scenic resources would be similar to Alternative A.	Potential impacts would be the same as Alternative C, except for the underground segment near Estes Park which would result in no overhead transmission line structures, but may produce a more visually noticeable cleared ROW.	Potential long-term impacts would be the similar as the No Action Alternative. Beneficial changes would result within the Newell Lake View subdivision. Moderate adverse effects would occur from new access roads and vegetation management similar to Alternative A.	Incremental adverse effects would occur to Chimney Hollow Open Space, Pinewood Lake, Meadowdale Hills and Ravencrest subdivisions, and along U.S. Highway 36. Conversely, beneficial effects would occur to the Newell Lake View subdivision and the valley between Mount Pisgah and Mount Olympus as seen from the Estes Valley as a result of abandonment of an entire ROW. Other potential impacts to scenic resources would be similar to Alternative A.	Minor adverse to moderate impacts from visible portions of the two existing transmission lines and ongoing structure replacement and vegetation maintenance activities would continue similar to existing conditions. Beneficial changes would result within the Newell Lake View subdivision.

Table 2.9-4 Comparison of Alternative Effects [1]

Resource	Alternative A	Alternative A1	Alternative A2	Alternative B	Alternative C	Alternative C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Socioeconomics and Community Resources	Beneficial effects associated with job opportunities and to the economic base would be temporary and minor. Some potential for minor, short-term decreases in property values as a result of taller structures, and conversely minor increases in property values where structures would be removed. No environmental justice concerns were identified.	Potential impacts would be the same as Alternative A.	Estimated 80-year life cycle costs would increase approximately 120 percent relative to Alternative A. Some potential for minor, short-term decreases in property values as a result of taller structures, and conversely minor increases in property values where structures would be removed. Residences near the underground portion of the variant may experience a minor increase in property values. No environmental justice concerns were identified.	Potential impacts would be the same as Alternative A. Estimated 80-year life cycle costs would be reduced to approximately 92 percent of Alternative A. Some potential for minor, short-term decreases in property values as a result of taller structures, and conversely minor increases in property values where structures would be removed. No environmental justice concerns were identified.	Potential 80-year life cycle costs would be similar to Alternative A. Reconstruction of Pole Hill Road would result in significant short-term and long-term effects to a USFS permittee that leads four-wheel drive tours in the West Pole Hill area. Some potential for minor, short-term decreases in property values as a result of taller structures, and conversely minor increases in property values where structures would be removed. No environmental justice concerns were identified.	Estimated 80-year life cycle costs would increase approximately 108 percent relative to Alternative A. Reconstruction of Pole Hill Road would result in significant short-term and long-term effects to a USFS permittee that leads four-wheel drive tours in the West Pole Hill area. Some potential for minor, short-term decreases in property values as a result of taller structures, and conversely minor increases in property values where structures would be removed. Residences near the underground portion of the variant may experience a minor increase in property values. No environmental justice concerns were identified.	Beneficial effects associated with job opportunities and to the economic base would be temporary and minor. Minor decreases in property values as a result of taller structures. Alternative D would maintain two ROWs and the beneficial effects to property values from ROW decommissioning would not be realized, except where the line would be relocated from Newell Lake View subdivision to Pole Hill Road. Estimated 80-year life cycle costs would increase approximately 170 percent relative to Alternative A. No environmental justice concerns were identified.	Potential impacts would be similar to Alternative A. Estimated 80-year life cycle costs would be reduced to approximately 89 percent of Alternative A. Some potential for minor, short-term decreases in property values as a result of taller structures, and conversely minor increases in property values where structures would be removed. No environmental justice concerns were identified.	Potential impacts include increased maintenance costs as existing lines age and require more maintenance. The No Action Alternative would maintain two ROWs and the beneficial effects to property values from ROW decommissioning would not be realized, except where the line would be relocated from Newell Lake View subdivision to Pole Hill Road. Estimated 80-year life cycle costs would increase approximately 190 percent relative to Alternative A. No environmental justice concerns were identified.
Electrical Effects and Human Health	Effects associated with noise, radio and television interference, and induced current and voltage, as well as effects to cardiac pacemakers would be negligible; SCPs would further minimize noise and induced current and voltage. EMF levels would be less than the existing transmission lines. Health effects would be similar to or less than existing lines.	Potential effects would be the same as Alternative A.	Potential effects would be the same as Alternative A, except that electrical fields would be blocked by the soil where the transmission line is constructed underground and would not be a concern. Additionally, magnetic fields would be higher than those produced by aboveground lines, but would still represent a negligible impact.	Potential effects would be the same as Alternative A.	Potential effects would be the same as Alternative A.	Potential effects would be the same as Alternative A, except that electrical fields would be blocked by the soil where the transmission line is constructed underground and would not be a concern. Additionally, magnetic fields would be higher than those produced by aboveground lines, but would still represent a negligible impact.	Potential effects would be the same as Alternative A.	Potential effects would be the same as Alternative A.	Electric fields at the ROW edge, and magnetic fields within the ROW, would be higher than for action alternatives, although the potential effects would be the similar to Alternative A.

Table 2.9-4 Comparison of Alternative Effects [1]

Resource	Alternative A	Alternative A1	Alternative A2	Alternative B	Alternative C	Alternative C1	Alternative D	Agency-Preferred Alternative (APA)	No Action Alternative
Cultural Resources	A total of 6 historic properties, 2 contributing elements of the CBT Project Historic District, and 2 unevaluated sites have been documented along this alternative. Unavoidable adverse effects would be minimized through a treatment plan, and through implementation of SCPs.	A total of 6 historic properties, 2 contributing elements of the CBT Project Historic District, and 2 unevaluated sites have been documented along this alternative. Minimization of adverse effects would be the same as Alternative A.	A total of 6 historic properties, 2 contributing elements of the CBT Project Historic District, and 2 unevaluated sites have been documented along this alternative. Minimization of adverse effects would be the same as Alternative A.	A total of 8 historic properties and 2 contributing elements of the CBT Project Historic District have been documented along this alternative. Minimization of adverse effects would be the same as Alternative A.	A total of 9 historic properties and 2 contributing elements of the CBT Project Historic District have been documented along this alternative. Minimization of adverse effects would be the same as Alternative A.	A total of 9 historic properties and 2 contributing elements of the CBT Project Historic District have been documented along this alternative. Minimization of adverse effects would be the same as Alternative A.	A total of 12 historic properties, 4 contributing elements of the CBT Project Historic District, and 2 unevaluated sites have been documented along this alternative. Minimization of adverse effects would be the same as Alternative A.	Potential impacts would be similar to Alternatives B and C. Minimization of adverse effects would be the same as Alternative A.	A total of 12 historic properties, 4 contributing elements of the CBT Project Historic District, and 1 unevaluated site have been documented along this alternative. At this time, no inventories have been conducted along the line that would be relocated.
Transportation	Potential direct and indirect impacts would be less than significant due to low levels of Project-generated traffic. This alternative requires 1.3 miles of temporary access and 1.3 miles of permanent access on National Forest System land.	Potential impacts would be similar to Alternative A.	Potential impacts would be similar to Alternative A.	Potential direct and indirect impacts would be less than significant due to low levels of Project-generated traffic. This alternative requires 1.7 miles of temporary access and 0.8 mile of permanent access on National Forest System land.	Potential direct and indirect impacts would potentially be significant due to creation of road conditions that would require frequent and recurring roadway repair and maintenance. This alternative requires 1.7 miles of temporary access and 0.8 mile of permanent access on National Forest System land. Increased recreational traffic on Pole Hill Road under Alternative C resulting from the reconstruction of USFS Road 122 would potentially create road conditions that would require frequent and recurring roadway repair and maintenance, causing significant adverse impacts to transportation.	Potential direct and indirect impacts would potentially be significant due to creation of road conditions that would require frequent and recurring roadway repair and maintenance. This alternative requires 1.7 miles of temporary access and 0.8 mile of permanent access on National Forest System land. Increased recreational traffic on Pole Hill Road under Alternative C1 resulting from the reconstruction of USFS Road 122 would potentially create road conditions that would require frequent and recurring roadway repair and maintenance, causing significant adverse impacts to transportation.	Potential direct and indirect impacts would be less than significant due to low levels of Project-generated traffic. This alternative requires 2.5 miles of permanent access on National Forest System land.	Potential impacts from miles of temporary and permanent access on National Forest System land would be similar to Alternatives B and C; however, under the APA, the four-wheel drive portion of USFS Road 122 would not be reconstructed resulting in no significant adverse impacts.	Potential direct and indirect impacts would be less than significant due to low levels of Project-generated traffic. There would be no new temporary or permanent access authorized on National Forest System lands.

[1] Note: Impacts summarized in this Chapter 2.0 table were determined as described in Chapter 4.0 with implementation of design criteria, SCPs, and EPMs.

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