

CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This chapter provides a detailed description of the alternatives considered to meet the objectives for the T-O-RC 230 kV Transmission Project. The alternatives evaluated in detail include the No Action alternative (Alternative 1), the Proposed Action (Alternative 2), and the Proposed Action with route modifications (Alternative 3) that includes route modifications in seven locations which modify the Proposed Action route to address identified issues in these specific areas. These seven route modifications include the Fiddler route (Modification 3a), the Mountain View route (Modification 3b), the Clinton route (Modification 3c), the Edelweiss route (Modification 3d), the Pactola route (Modification 3e), the Pactola South route (Modification 3f), and the Hidden Valley route (Modification 3g). Descriptions and maps of the route modifications are provided below and detailed maps of the alternatives are in Appendix F of this document. The Agencies have identified Alternative 3 with the inclusion of route modifications 3a, 3b, 3c, 3d, 3f and 3g as the preferred alternative.

This chapter presents each alternative comparatively by both describing and displaying the quantitative and qualitative differences between each alternative. The intent of Chapter 2 is to provide the public and decision maker a basis for choice among management options when considering the environmental consequences (effects) of implementing each alternative as disclosed in Chapter 3 of this EIS.

Following the descriptions of the three alternatives considered in detail in this EIS, a brief overview of those alternatives that were considered but eliminated from detailed development and study is presented. The last section of this chapter contains comparative tabular summaries that describe each alternative and displays the quantitative and/or qualitative effects of implementing each alternative relative to the key issues presented in Chapter 1.

2.2 ALTERNATIVES CONSIDERED IN DETAIL

This chapter describes and compares the alternatives considered for the T-O-RC Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

2.2.1 Alternative 1 – No Action

NEPA requires the study of the No Action Alternative and to use it as a basis for comparing the effects of the Proposed Action and other alternatives. The No Action Alternative assumes that

no implementation of any elements of the Proposed Action (no authorization of ROWs and no construction of the transmission line) would occur in the Project area within the next 10 to 15 years. This alternative does not actively respond to the purpose and need for action or address the issues, concerns, or comments identified during scoping for this Project.

The purpose of the T-O-RC Project described in Chapter 1 would not be met with the No Action Alternative.

2.2.2 Alternative 2 – Proposed Action

The Proposed Action was developed as a response to the purpose and need for action and it represents the USFS Proposed Action (see description of the purpose and need plus the Proposed Action in Chapter 1 of this EIS). The USFS developed and released the proposal for public review and comment in August 2011.

The Proposed Action is a single-circuit 230 kV transmission line that begins at the existing Teckla substation, approximately 67 miles north of Douglas, Wyoming in Campbell County, Wyoming and travels west approximately three miles along an existing transmission line route, then north approximately 19 miles. Here it turns east and follows county road and section lines before turning northeast for approximately six miles. The route then angles east to parallel an existing three phase electrical distribution line before heading straight east along section lines to Wyoming State Highway 116 where it would parallel highway ROW north for approximately seven miles. At this point, the route would generally travel east on section lines to the existing Osage substation located in Weston County, Wyoming about 13 miles northwest of Newcastle. From the Osage substation, the Proposed Action travels east and north into Pennington County, South Dakota, using approximately 47 miles of currently unused transmission line ROW to the Pactola substation west of Rapid City. The currently unused ROW has a cleared width of approximately 40 to 50 feet, which would be widened to 100 feet to accommodate the needed ROW for the new transmission line. From the Pactola substation area, the route continues east paralleling an existing transmission line for approximately five and one-half miles, and then travels north and east approximately ten miles to terminate at the Lange substation in Rapid City, South Dakota.

Figure 2-1 provides an overview of the Proposed Action.

Pending final design, the Proposed Action would cross the land ownership and jurisdictions shown in **Table 2-1**.

TABLE 2-1 - LAND OWNERSHIP / JURISDICTION CROSSED BY PROPOSED ACTION	
Ownership/Jurisdiction	Approximate Mileage
Black Hills National Forest	36.3 miles
Thunder Basin National Grassland	4.7 miles
Bureau of Land Management	2.6 miles
State of Wyoming	10.3 miles
Privately Owned Lands	90 miles

The Proposed Action would be approximately 144 miles long. For planning purposes, existing environmental conditions were described within a project analysis area centered on the proposed route for the transmission line. The width of this project analysis area varies from one mile to six miles depending on the resource and the geographic extent where direct and indirect impacts to that resource could occur. The project analysis area width is designed to ensure that impacts are analyzed within an appropriate distance from the proposed transmission line and to allow the flexibility to make relatively minor route adjustments for the proposed transmission line ROW to respond to resource concerns and issues that may be identified along the proposed route. A 100-foot ROW width for the proposed transmission line route was used to develop the analysis of impacts that would result from the construction and operation of the new transmission line.

As discussed above, the proposed route for the transmission line would use approximately 47 miles of a currently unused transmission line ROW, reducing the amount of tree clearing and associated disturbance required for construction. This cleared ROW once accommodated a BHP 69 kV transmission line that has been removed and BHP maintains rights to the easement / ROW. Where the proposed route would be located within the existing unused transmission ROW, the ROW would be expanded and cleared to a 100-foot width from the existing 40-50 feet to accommodate the new higher voltage line.

The design, construction, operation and maintenance of the Project would meet or exceed the requirements of the National Electrical Safety Code (NESC), U.S. Department of Labor, Occupational Safety and Health Standards, Western Electricity Coordinating Council (WECC) Transmission System Performance and Reliability Criteria, and Black Hill Power's (BHP) requirements. Transmission line design would also be consistent with recommendations for reducing negative impacts of power lines on birds found in *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* by Edison Electric Institute and the Avian Power Line Interaction Committee (APLIC, 2006) and *Reducing Avian Collisions with Power Lines* by the U.S. Fish and Wildlife Service and the APLIC (APLIC, 2012).

Typical characteristics of the Proposed Action including the overhead 230 kV transmission line and related facilities are described below. The typical design characteristics of the Proposed Action are listed in **Table 2-2** below. The specifications and activities common to all action alternatives are described in the following sections. The general design criteria and mitigation measures that would be applied to all action alternatives are described in **Appendix B**.

2.2.2.1 TRANSMISSION LINE SPECIFICATIONS COMMON TO ALL ACTION ALTERNATIVES

The discussion below describes the technical components of the Proposed Action with respect to the transmission line and transmission line construction.

2.2.2.1.1 Structures

Three main types of structures would be used for the transmission line. The most common type would consist of wood H-frame structures placed approximately 800-900 feet apart (average

ruling span), with a nominal pole height above ground of approximately 65-75 feet. In some areas where guyed wood H-frames would not work due to obstructions or steep terrain, where water and canyon crossings require a longer span length and/or areas where the transmission line changes direction resulting in a greater angle, the transmission line could be supported by steel H-frame structures. For areas where narrow ROW requires that permanent land disturbance and overall land required be minimized, tubular steel single pole structures may be used. Tubular steel single poles would typically have a nominal pole height above ground of approximately 80-90 feet. Examples of this could be in the Rapid City area. Poles would typically be about two feet to four feet in diameter at ground line depending on design criteria.

TABLE 2-2 - TYPICAL DESIGN CHARACTERISTICS OF THE 230 KV TRANSMISSION LINE	
FEATURE	DESCRIPTION
Line length (approximate miles)	144 miles
Types of structures	Wood or Steel H-Frame, Single-pole steel
Structure height	H-Frame – 65-75 feet, Single-pole steel – 80 to 90 feet
Span length	800-900 feet
Structures per mile on NFS lands	Five to seven
Right-of-way width	100 feet on NFS and BLM lands, 125 feet on private property
LAND TEMPORARILY DISTURBED	
Structure work area	100 x 100 feet per structure
Wire-pulling/tensioning/splicing sites	100 x 300 feet per 2 to 4 miles
Construction yard	Approximately one 20-acre site on NFS lands (BHNF)
Decking yards	Approximately 40 one-half to five-acre sites on NFS lands in SD; none in WY
Access Roads (drive and crush, improve existing, spur, and new) on NFS lands	Improved existing, spur and new roads will be a minimum of 14 feet wide
LAND PERMANENTLY DISTURBED	
Structure base – assume two poles per structure	Typically three and one-half feet per pole
ELECTRICAL PROPERTIES	
Nominal voltage	230 kV AC (alternating current) line to line
Capacity	400 MW
Circuit configuration	Horizontal (most locations)
Minimum ground clearance of conductor	23 feet

Typical pole heights would be approximately 65 to 75 feet above ground, depending on terrain. The poles would be direct embedded into the soil or, if needed, installed on drilled pier concrete foundations to a depth of approximately ten to 25 feet depending on load and soil characteristics. In areas where sloughing or steep rocky slopes exist, underground corrugated steel culverts or Sona Tubes (cylindrical paper forms) may be used to hold excavated walls.

Figure 2-2 shows typical diagrams of the proposed structures.

2.2.2.1.2 Conductors and Associated Hardware

Selection of the conductor's mechanical strength is primarily dictated by the ice and wind loading that can be expected to occur in the territory where the transmission line is built. The

conductor's strength in a steel reinforced stranding is a function of the percentage of steel within the conductor area. The aluminum carries most of the electrical current, and the steel provides tensile strength to support the aluminum strands. There is a risk of extreme icing events and severe weather in Wyoming and South Dakota. Because of this risk, the conductor would be Aluminum Conductor Steel Reinforced (ACSR), which is common for many power lines in these states. The conductor that is being considered for the Project is a 1.068-inch diameter, single conductor (ACSR 45/7 1272 kcmil "Bittern" conductor); which is 45 strands of aluminum and seven strands of steel.

The conductor system would consist of three electrical phases, with a single conductor for each phase. Minimum conductor height above the ground would be approximately 23 feet, based on NESC and BHP's standards. Greater clearances may be required in areas accessible to vehicles or near buildings. Minimum conductor clearance would dictate the exact height of each structure based on topography and safety clearance requirements. Minimum conductor clearances in some instances may be greater based on specific NESC requirements (e.g., minimum clearance above a roadway, trees in forested areas or above farm equipment in agricultural areas).

2.2.2.1.3 Fiber Optics

Either fiber optic ground wire cable (OPGW) for substation-to-substation communication or a 3/8-inch steel static wire for lightning protection would be installed near the top of each structure. If OPGW is used, it would be 48 fibers.

2.2.2.1.4 Right-of-Way

ROW width would be 100 feet on NFS and BLM lands, and 125 feet on private land. In areas where the alignment changes direction, structures may require guying. The guy-wires would increase the structure support where line tension is great on structures. Guy-wires may extend beyond the typical 100 or 125 foot ROW and, if so, would result in a small area of disturbance where the guy wire is anchored to the ground and would require additional ROW. If needed, these areas would be identified during final design.

2.2.2.1.5 Access Roads

The Proposed Action would require some new access roads for access to the ROW and structure locations. However, existing roads and trails would be used wherever feasible for access to minimize new ground disturbance. Portions of existing access roads located outside of the ROW would require improvements. The Proposed Action would use overland access to the greatest extent possible. Overland access would be conducted with tracked or rubber tired equipment and would access a site without substantially modifying the landscape. Vegetation is driven over but not cropped. Soil is compacted, but no surface soil is removed. Even though vegetation may be damaged, this creates vertical mulch upon the surface soil and leaves the seed bank in place. Crushed vegetation provides easier re-vegetation because it typically re-sprouts after temporary use is stopped. To minimize ground disturbance and/or reduce scarring (visual contrast) of the landscape, the alignment of any new access roads or overland routes

would follow the landform contours in designated areas where practicable, providing that such alignment does not impact other resource values additionally.

2.2.2.1.6 Construction Yards/Staging Areas

Temporary construction yards/staging areas, would be required for materials and equipment storage and staging for construction activities. These areas would be located on NFS lands in South Dakota, and would not be located on Federal lands in Wyoming. Vegetation would be disturbed from overland travel and placement of materials on the ground would likely occur, and some cutting may be required based on vegetation type. In areas where soils would not support the all-weather use for staging areas, it may be necessary to strip and stockpile topsoil and lay down gravel to create an all-weather surface. Upon completion of use, these areas would have the gravel removed, be ripped to relieve compaction, top soiled and re-vegetated to the landowners specifications. The construction yards would serve as field offices, reporting locations for workers, parking space for vehicles and equipment or sites for temporary marshaling of construction materials.

2.2.2.1.7 Decking Yards

In areas where trees would need to be removed from the ROW, trees would be skidded and decked at designated decking yards or laydown areas for processing and loading onto trucks for transportation to a sawmill. These areas would be accessible by existing roads or allow for overland travel and are in forested areas.

In South Dakota, several log decking yards approximately one-half to five acres each would be required for the temporary storage, collection, and handling, sorting and/or loading of trees or logs. Yards would be located on NFS-administered lands and on previously disturbed areas, if possible. Logs and/or trees removed from the ROW would be transported to the decking yards by mechanical skidders or helicopter.

2.2.2.1.8 Pulling/Tensioning Sites

Conductors and ground wires would be strung using powered pulling equipment at one end and powered tensioning equipment at the other end of a conductor segment. Sites for tensioning equipment and pulling equipment would be approximately three miles apart. The tensioning site would be an area approximately 100 by 300 feet. Tensioners, line trucks, wire trailers, and tractors needed for stringing and anchoring the ground wire or conductor would be located at this site. The pulling site would require approximately half the area of the tension site. A puller, line trucks, and tractors needed for pulling and temporarily anchoring the counterpoise, ground wire, and conductors would be located at this site.

2.2.2.2 TRANSMISSION LINE CONSTRUCTION ACTIVITIES COMMON TO ALL ACTION ALTERNATIVES

Construction of the 230 kV transmission line on NFS-administered lands would likely start in 2014. The yearly construction window for the majority of the work on the 230 kV transmission line would be limited by climate conditions. Most construction activities would likely occur from

early spring to late fall each year over a two year period. Construction completion and electrification would likely occur in 2016.

The construction of the Proposed Action would follow the sequence of: 1) centerline surveyed and staked; 2) environmental clearance surveys; 3) identifying and constructing access roads; 4) work areas cleared as needed; 5) materials distributed along centerline; 6) pole holes and/or foundations installed, and poles framed and erected; 7) clearing of pulling, tensioning, and splicing sites; 8) OPGW ground wire or static wire and phase conductors installed; and 9) the site would be cleaned-up and reclaimed. Various phases of construction may occur at different locations throughout the construction process. This may require several crews operating at the same time at different locations.

Figure 2-3 shows a graphic of the typical transmission line construction sequence.

2.2.2.2.1 Surveying and Staking

Construction survey work for the Proposed Action consists of determining or refining the centerline location through updated electronic and aerial survey techniques, specific pole locations (also called structure spotting), ROW boundaries, construction work area (storage yard, construction yard) boundaries, and in some areas, access to work areas. Centerline and final alignment design and staking would adhere to the conditions outlined in the USFS SUP, BLM ROW grant, and NESC and BHP policies and specifications.

2.2.2.2.2 Environmental Clearance Surveys

After surveying and staking is completed, needed environmental clearance surveys would be conducted of all areas where disturbance is planned.

2.2.2.2.3 ROW Clearing

Clearing of some vegetation within the ROW would be required. Removal of mature vegetation, under or near the conductors, would be done to provide adequate electrical clearance as required by the NESC and BHP standards and maintain reliability. On federal lands, the ROW would be 100 feet, while it would be 125 feet on private lands. In the portions of the Proposed Action where the proposed route would use the existing unused transmission ROW, the ROW for the new transmission line would be expanded and cleared to a 100foot width from the existing 40-50 feet.

After the ROW boundaries are staked and pole locations are marked, trees within the ROW zone that have the potential to come into contact with the line would be cleared. In addition, trees that are outside of the ROW boundary but have potential to fall into lines or affect lines during wind-induced line swing would be cut down. Dead, dying, or otherwise dangerous trees or tree limbs located near the ROW that could pose a hazard to the transmission line facilities would be identified and removed as part of BHP's routine vegetation management program. The general design criteria and mitigation measures that would be applied to the Proposed Action are described in **Appendix B**.

“Danger trees” are trees or tree limbs, although located off of the transmission line ROW (and thus outside of normal clearing limits), are of such height; condition (e.g., leaning, rotted); location (e.g., side hill, proximity to transmission lines, soil characteristics); and/or species type that they represent a threat to the integrity of the transmission line conductors, pole structures, or other facilities.

The primary method of ROW clearing in steep terrain is manual removal. Manual vegetation removal is defined as application of powered and non-powered handheld tools to remove vegetative growth. The primary benefit of manual methods is selectivity; only unwanted or target vegetation is removed, while other vegetation is not disturbed. The manual vegetation removal techniques employed by BHP are described in detail in the ROW Clearing Plan that would be part of the Project Construction Operation and Maintenance (COM) Plan developed during final design.

The primary method of ROW clearing on gentle to moderately steep terrain would include the use of a mechanized feller/buncher and a grapple skidder or similar equipment. The trees are cut down and bunched with a mechanized feller/buncher, and then a grapple skidder transports to a decking area, where further mechanized delimiters process the logs.

2.2.2.2.4 Access Roads

The area where the Proposed Action would be located has many existing trails and roads in the vicinity of the proposed ROW. However, the existing road network may require upgrading in some locations to allow access of construction equipment to the transmission line ROW. This may involve clearing vegetation, adding additional fill, and overland travel in areas with slopes of less than five percent. Access roads would be developed to the minimum standard that would allow safe use for construction and operation of the transmission line. In construction areas where recontouring is not required, disturbance would be limited to overland travel with tracked or rubber tired equipment, where feasible, to minimize changes in the original contours. Large rocks and vegetation may be moved within these areas to allow vehicle access.

Equipment to build new or improve access roads would include tracked bladed equipment, backhoes, dump trucks, and crew-haul vehicles. Specific best management practices (BMPs) would be implemented to reduce construction impacts. Measures would be taken to minimize impacts such as rutting and soil compaction in specific locations and during certain periods of the year. These impacts could arise during heavy rains.

2.2.2.2.5 Pole Hole Excavation

Excavation for pole holes for the transmission structures would generally be made with power auger or backhoe equipment. If rocky areas are encountered, pole holes may require drilling and blasting. The poles would be direct embedded or installed on drilled pier concrete foundations to a depth of approximately ten to 25 feet depending on load and soil characteristics. For guyed structures such as large angle dead ends for H-frame structures, anchor plates for the supporting guys would be buried underground within the ROW.

Pole holes left open or unguarded would be covered and/or fenced where needed to protect the public, livestock, and wildlife. Soil removed from pole holes would be stockpiled at the localized work site and used to backfill holes. All remaining soil not used for backfilling would be spread on the disturbed work site.

If blasting is required, it would be conducted in strict compliance with safety orders or rules enforced where the operations are required. Appropriate notice of blasting activities would be provided to nearby occupants/landowners. All employees engaged in any operation related to the handling and use of explosives would obtain all certifications required by federal, state, and county management agencies. Accurate accounting for all explosives would be maintained, and any shortages would be reported immediately to the construction manager and public law enforcement authorities. No explosives would be stored on the proposed Project site. Safeguards such as blasting mats would be employed when needed to protect the adjacent property.

At heavy angles and dead-end structures where guying is not permitted or feasible, cast-in-place concrete footings may be installed to support self-supporting structure types designed to bear heavy tension loads. Cast-in-place footings would be installed by placing reinforced steel in excavated foundation holes and encasing it in concrete. Concrete would be delivered to the site in concrete trucks. Concrete trucks would wash their chute debris into a depression in the permanent disturbance area at the pole site and soil from the foundation excavation would be used to cover the chute debris.

2.2.2.2.6 Pole Framing and Assembly

Pole associated hardware would be shipped to each site by truck or carried by helicopter to sites where access is not permitted. Generally poles would be assembled and framed at the work area. Areas need to be large enough to accommodate laying down the entire length of the poles while insulators and cross-arms are mounted. Typically, insulators strings and stringing sheaves are then installed at each conductor and ground wire position while the pole is on the ground. Stringing sheaves are used to guide the conductor during the stringing process for attachment onto the insulator strings. The assembled pole would then be erected into place by a crane or line truck.

2.2.2.2.7 Conductor Installation

Once poles are in place, a “sock-line” would be pulled (strung) from pole to pole and threaded through the stringing sheaves on each pole using all-terrain vehicles or stringing the sock line by hand. A helicopter may be required along more rugged sections of the transmission line to position the sock-line in the stringing sheaves or where it is more efficient. If necessary in longer, high tension stringing sections, a second larger diameter and stronger line would be attached to the sock-line and strung prior to the attachment of the conductor and the ground wires. This process would be repeated until the ground wire and conductor is pulled through all sheaves.

Conductor splicing would be required at the end of a conductor spool during stringing. The work would occur on work areas for the poles or pulling/tensioning sites.

Conductor would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end. For public protection during wire installation, temporary guard structures would be erected over roadways, powerlines, structures, and other obstacles where needed as determined during final design. Guard structures would typically consist of single-pole or wood H-frame poles with cross-arms placed on either side of an obstacle. These structures prevent ground wire, conductor, or equipment from falling on an obstacle. Equipment for erecting guard structures includes augers, line trucks, pole trailers, and cranes. Guard structures may not be required for small roads. On such occasions, other safety measures such as barriers, flagmen, or other traffic control would be used.

Sites for pulling and tensioning equipment are typically areas approximately 100 feet by 300 feet. These sites would be required approximately every two to four miles.

2.2.2.2.8 Construction Waste Disposal

Construction sites, material storage yards, and access roads would be kept in an orderly condition throughout the construction period. Refuse and trash would be removed from the sites and disposed in an approved manner. Oils and fuels would not be dumped along the transmission line route. Oils or chemicals would be hauled to an approved site for disposal. No open burning of construction trash would occur.

2.2.2.2.9 Site Reclamation

Work sites would be reclaimed using: excess material, approved native vegetation and seed mixtures, and topsoil stockpiled for that purpose. The contractor would remove and dispose of excess soil materials, rock, and other objectionable materials that cannot be used in reclamation work in an approved location.

Disturbed areas, with the exception of existing access roads, would be restored, as nearly as possible, to their original contour and reseeded with landowner/ agency approved native seed mixtures where appropriate. Ripping and other surface scarification on existing construction roads or other areas would be done as necessary. In some cases the amount of soil compaction and vegetation destruction may not warrant ripping and reclamation. This would be decided on a case-by-case basis in coordination with the landowner.

2.2.2.3 OPERATION AND MAINTENANCE COMMON TO ALL ACTION ALTERNATIVES

2.2.2.3.1 Permitted Uses

After the transmission line has been energized, land uses compatible with safety regulations, operation, and maintenance would be allowed. BHP would not have exclusive use of the permitted area on federal lands.

2.2.2.3.2 Safety

Safety is a primary concern in the design of this ROW and transmission line. An alternating current (AC) transmission line would be protected with power circuit breakers and related line relay protection equipment. If conductor failure or grounding (tree contact) occurs, power would be automatically removed from the line. Lightning protection would be provided by overhead ground wires along the line. Electrical equipment and fencing at the substation would be grounded. All fences, metal gates, pipelines, etc. that cross or are within the transmission line ROW would be grounded to prevent electrical shock. If applicable, grounding outside the ROW may also occur.

2.2.2.3.3 ROW Maintenance

BHP would maintain the ROW in accordance with federal, state, and private land managers' stipulations. Maintenance would be performed per those stipulations or as needed in the absence of stipulations. When access is required for non-emergency maintenance and repairs, BHP would adhere to the same precautions taken during the original construction and coordinated with the landowners and the federal land management agencies as applicable. Emergency maintenance would involve prompt movement of crews to repair or replace any damage. Crews would be instructed to protect plants, wildlife and other environmental resources.

2.2.3 Alternative 3 – Proposed Action with Route Modifications

Alternative 3 is defined as the Proposed Action with modifications to the proposed route in specific locations to respond to issues identified during scoping. The seven key issues are presented in Chapter 1. The route modifications are labeled 3a through 3g and each are located within one mile either side of the proposed route. The general location of the route modifications are shown in **Figure 2-4**.

The transmission line specifications, construction methods, and operations and maintenance procedures would be the same as those described above for the Proposed Action. The route modifications and key issues they responded to are described below.

Modification 3a - The Fiddler Modification is approximately 7.5 miles south of Upton and nine miles west of Osage, Wyoming. It would be approximately one mile north of the proposed route for a distance of about five miles and was developed to avoid the Upton Fairview and Jessee Greater Sage-Grouse Leaks. This responds to issue number 1.

Modification 3b - The Mountain View Modification is south of Deerfield Road between Williams Draw Road and Gillette Prairie Road in South Dakota. It would be approximately 500 feet north of the proposed route for a distance of about one mile and was developed to avoid existing residences. This responds to issues 4 and 7.

Modification 3c - The Clinton Modification is north of McVey and Deerfield Roads and east of Slate Prairie Road in South Dakota. It would be approximately 1,000 feet north of the proposed

route for about one mile and was developed to avoid existing residences. This responds to issues 4 and 7.

Modification 3d - The Edelweiss Modification is located north of Edelweiss Mountain Road and west of U.S. Route 385 in South Dakota. It would be about 1,000 feet north of the proposed route for less than one mile and was developed to avoid a sensitive wildlife area. This responds to issue number 1.

Modification 3e - The Pactola Modification is east of U.S. Route 385 near the Pactola Reservoir in South Dakota. It would be about 1,500 feet south of the proposed route and would require clearing for the new ROW for approximately one-half mile. This Modification was developed to move the transmission line farther from the Pactola Reservoir, a visually sensitive area identified in the Forest Plan. This responds to issue number 3.

Modification 3f - The Pactola South Modification is also east of U.S. Route 385 near the Pactola Reservoir in South Dakota. It was also developed to avoid the Pactola Reservoir area. It would be located about one mile south of the proposed route and would follow approximately two miles of previously cleared ROW. This responds to issue number 3.

Modification 3g - The Hidden Valley Modification is approximately four miles west of Rapid City, South Dakota. It would be approximately 2,500 feet south of the proposed route for about one and one-half mile and was developed to avoid planned future quarry operations. This responds to issue number 4.

The locations of these Modifications are shown in more detail in **Figures 2-5 through 2-10**.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all potential alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). In developing the proposal, a number of routing options were considered, data was collected, major ground features were evaluated, and agencies and landowners were consulted to identify ways to minimize issues and effects related to implementing the ROW and power line. The process used in identifying and evaluating alternatives while developing the Project is documented in the Teckla-Osage-Rapid City 230kV Transmission Line Routing Report (January, 2011), incorporated here by reference (see administrative record (AR)). Two potential alternative routes were identified and considered by the ID Team (the Northern and Southern Alternatives) and were eliminated from detailed study as described below. Other potential alternatives identified during scoping are also described below.

Additional potential alternatives to the Proposed Action were considered to address issues and concerns expressed during the scoping period and alternative alignments previously studied by BHP. Many scoping comments were supportive of the Proposed Action, but some had recommendations to consider alternative actions as part of the NEPA analysis. Some of the

comments recommended actions that were outside the scope of the purpose and need, some were actions that could be incorporated into design and mitigation measures included in the Proposed Action, or determined to be components that would cause unnecessary environmental harm. The following provides an overview of alternatives that were considered, but eliminated from detailed study. Route distances have been rounded and are therefore described as approximate.

2.3.1 Northern Alternative

This alternative was considered by the ID Team as a northerly alternative to the original proposed route and was referred to as “Alternative A” in early public outreach efforts prior to initiation of the NEPA process. This alternative would be approximately 143 miles long and generally located north of the Proposed Action. From the Teckla substation, this route is the same as the Proposed Action traveling west approximately three miles along an existing transmission line, then north approximately 19 miles. Here it angles northeast for approximately 15 miles. The route then travels east and follows county road and section lines approximately 57 miles to Wyoming State Highway 16 where it parallels highway ROW south three miles to the Osage substation. From Osage substation, the route travels northeast paralleling an existing transmission line ROW for 26 miles. At this point, the route continues in an easterly direction south of the Pennington County line to the Lange Substation.

The Northern Alternative was eliminated from detailed study because as compared with the Proposed Action it:

- Crossed approximately 15 more acres of Greater Sage-Grouse habitat;
- Followed no currently unused transmission line ROW (compared with 47 miles of currently unused transmission ROW followed by the Proposed Action); and
- Had 12 fewer miles of existing access roads available so more new access would have been required.

2.3.2 Southern Alternative

This alternative was considered by the ID Team as a southerly alternative to the original Proposed Route and was referred to as “Alternative C” in early public outreach efforts prior to initiation of the NEPA process. This alternative is 157 miles long and is generally located south of the Proposed Action. From the Teckla substation, this route is the same as the Proposed Action traveling west approximately three miles along an existing transmission line, then north 19 miles. Here it angles northeast for 15 miles. The route then travels east and follows county road and section lines for approximately 57 miles to Wyoming State Highway 16 where it parallels the highway ROW south for three miles to the Osage substation. From the Osage substation, the route travels northeast paralleling an existing transmission line ROW for 26 miles. At this point, the route continues in an easterly direction south of the Pennington County line to the Lange Substation.

The Southern Alternative was eliminated from detailed study because as compared with the Proposed Action it:

- Was approximately 13 miles longer;
- Crossed 14 more acres of Greater Sage-Grouse habitat;
- Crossed seven more miles of mining operations;
- Crossed 68 more forested acres;
- Followed no currently unused transmission line ROW (compared with 47 miles of currently unused transmission ROW followed by the Proposed Action); and
- Had 15 fewer miles of existing access roads available.

2.3.3 Alternative Following Existing Highways

An alternative that would follow major highway ROWs was suggested by members of the public during the scoping process. This alternative would be approximately 190 miles long and from the Teckla Substation would follow Wyoming Highway 59 for approximately 49 miles north to I-90 at Gillette. It would then follow I-90 east for approximately 141 miles to Rapid City.

This alternative was eliminated from detailed study because as compared with the Proposed Action it:

- Is approximately 46 miles longer and therefore would result in greater environmental impacts and would be more costly to construct;
- Would have greater surface disturbance impacts due to the increased route length;
- Would require a longer construction period resulting in greater air quality emissions and potential disruptions to the transportation network; and
- Would add to existing visual impacts along the highways, as it would be more visible to motorists on the highways followed by the transmission line.

2.3.4 Straight-Line Alternative Between Teckla and Osage

This alternative was suggested by the public during the scoping process. This routing option would proceed diagonally in a straight line approximately 58 miles from the Teckla substation to the Osage substation across the TBNG and private property.

This alternative was not considered for detailed study because as compared with the Proposed Action it:

- Does not take into account other existing uses (such as ranching, recreation, and mining) along this route;
- Would affect a greater amount of Greater Sage-Grouse habitat and other sensitive resources such as cultural resources, goshawks and other raptors because it does not actively avoid sensitive areas and does not follow existing roads or transmission line ROWs; and
- Would cross a greater amount of undisturbed lands because it does not follow existing roads or transmission line ROWs.

2.3.5 Alternative Following Existing Transmission Lines

This alternative was suggested by members of the public during the scoping process to follow existing transmission line ROWs.

This alternative was eliminated from detailed study because as compared with the Proposed Action it:

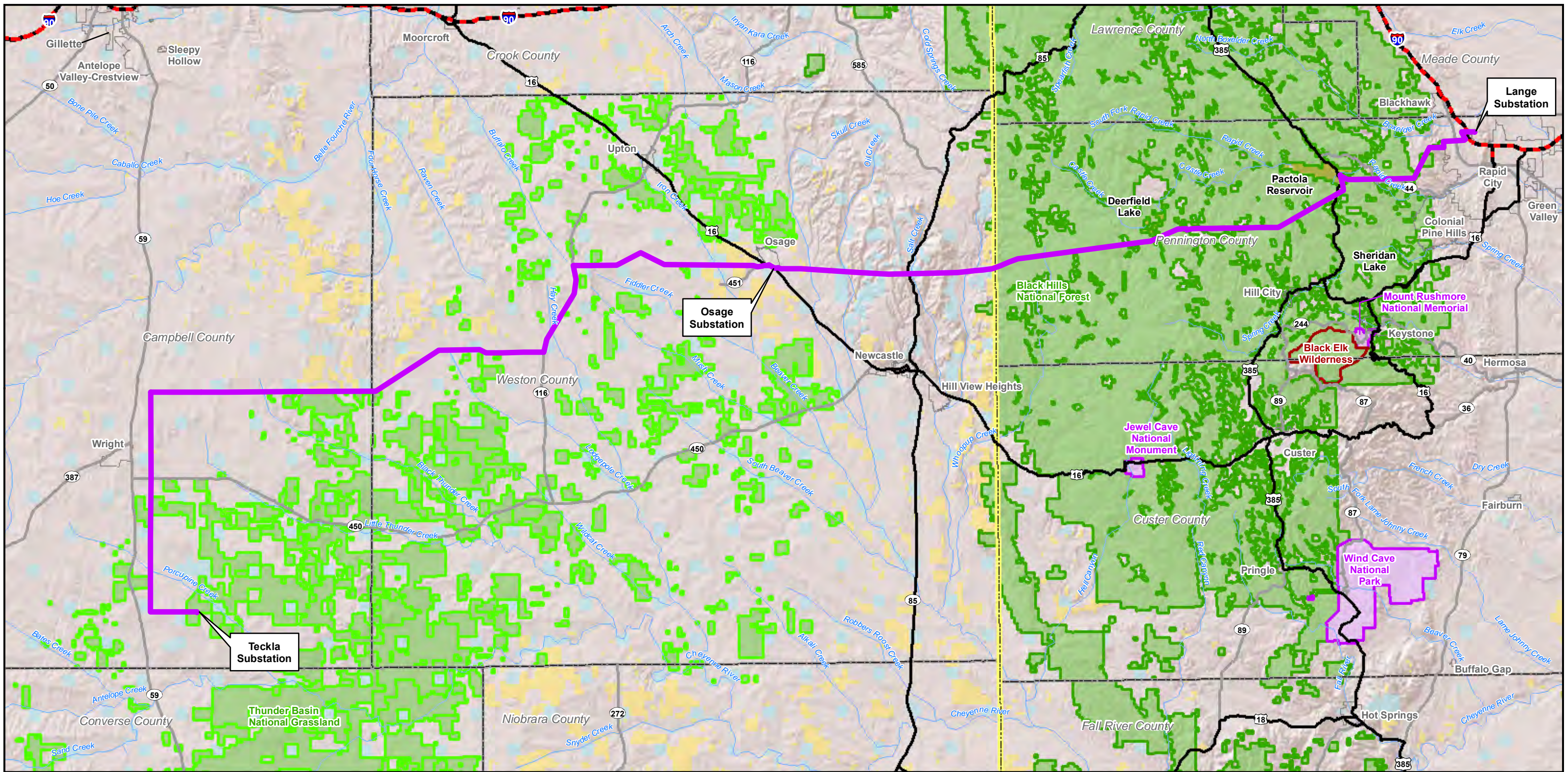
- Would not meet the purpose and need of the Project: By placing multiple transmission lines in the same corridor, the needed system reliability objectives, including the industry standard separation criteria from existing high-voltage transmission lines would not be realized because the possibility of failure of both lines is increased by being collocated.;
- Would not meet a part of the Project's purpose and need for increasing system reliability;
- Would be much longer and therefore would have greater surface disturbance; and
- Would require a longer construction period resulting in greater air emissions.

2.4 COMPARISON OF ALTERNATIVES

This section presents a brief comparison of the nine alternatives given detailed study in this EIS. The alternatives are described and compared in **Table 2-2** relative to the effects each alternative has on key issues described in Chapter 1. The environmental consequences to the resources in the T-O-RC Project analysis area that would result from implementation of the alternatives are more completely described in Chapter 3 of this EIS and information contained in the Administrative Record (AR).

TABLE 2-3 - EFFECTS TO KEY ISSUES BY ALTERNATIVE				
Key Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Proposed Action with Route Modifications	Indicators
Wildlife including sensitive species such as Greater Sage-Grouse, goshawks, and other raptors	No Impact	BA: SD no listed species; WY Greater Sage-Grouse “Not likely to jeopardize” BE: SD “May adversely impact individuals but not likely to result in a loss of viability on BHNF nor lead to Federal listing” for 26 species and “no impact for 2 species” WY “May adversely impact individuals but not likely to result in a loss of viability on TBNG nor lead to Federal listing” for 21 species and “no impact for 5 species”.	Similar to the Proposed Action with the following exceptions: Modification 3a would have less impacts to Greater Sage-Grouse because it would avoid two leks (Upton Fairview and Jessee leks) and Modification 3d would have less impacts to wildlife	Determination of effect made in the biological assessment (BA) and biological evaluation (BE)
Wetlands and Vegetation Communities	No Impact	0 wetlands filled 1,294 acres vegetation within the ROW: 1,156 in SD; 138 in WY	Similar to the Proposed Action with the following exceptions: Modifications 3a and 3c would have potentially greater impacts because of the greater number of wetland acres within the ROW (approximately 4 more acres for 3a and less than 1 acre more for 3c)	Acres of wetland filled or vegetation removed. Acres subject to increased proliferation of noxious weeds
Scenic Integrity and Visual Resources	No Impact	SD: 10.5 miles of high SIO, 14.4 miles of moderate SIO, and 11.4 miles of low SIO. WY: 3.6 miles of low SIO, and 2.6 miles of VRM Class III areas managed by the Newcastle BLM Field Office	Similar to the Proposed Action with the following exceptions: Modification 3e and 3f would result in less visual impacts than the Proposed Action because the line would be further from Pactola Reservoir (approximately 0.15 miles for 3e and 1.0 miles for 3f)	Scenic Integrity Objectives (SIOs). Visual Resource Management (VRM) Objectives.
Private Property including Property Values and Electricity Rates	No Impact	15 residences within 150 feet either side of transmission line: 14 in SD; 1 in WY. Electric rates would not be affected.	Similar to the Proposed Action with the following exceptions: Modification 3a, 3d and 3f would have no residences within 150 feet either side of transmission line (compared to no residences along the comparable portion of the PA); Modification 3b would have two residences within 150 feet either side of transmission line (compared to 8 residences along the comparable portion of the PA); and Modifications 3c, 3e and 3g would each have one residence within 150 feet either side of transmission line (compared to 3, 0 and 0 residences along the comparable portion of the PA, respectively)	Proximity to residential dwellings
Existing and Future ATV/OHV/ Snowmobile Trails	No Impact	SD: ATV and hiking trails crossed 16 times WY: No trails crossed	Similar to PA with the following exceptions: Modifications 3a-e and g: No trails crossed and Modification 3f: Two trails crossed: one hiking; one ATV	Miles of trails closed and miles of trails kept open

TABLE 2-3 - EFFECTS TO KEY ISSUES BY ALTERNATIVE				
Key Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Proposed Action with Route Modifications	Indicators
Tree Removal	No Impact	563 acres: 559 in SD; 4 in WY	Similar to PA with the following exceptions: Modification 3e: Requires tree clearing of approximately one-half mile of forested ROW Modification 3f: Requires less than one acre of additional aspen/birch stands Modification 3g: Would impact a minor amount of BHNF lands dominated by ponderosa pine	Number of acres of tree clearing needed
Health resulting from Electromagnetic Fields (EMF)	No Impact	112 residences within 500 feet either side of transmission line: 102 in SD; 10 in WY	Similar to PA with the following exceptions: Modification 3a, 3d and 3f: Would have no residences within 500 feet either side of transmission line (compared to 0, 0 and 1 residences along the comparable portion of the PA, respectively); Modification 3b: would have nine residences within 500 feet either side of transmission line (compared to 10 residences along the comparable portion of the PA); Modification 3c: would have two residences within 500 feet either side of transmission line (compared to 5 residences along the comparable portion of the PA); Modification 3e: would have one residence within 500 feet either side of transmission line (compared to 1 residences along the comparable portion of the PA); Modification 3g: would have 13 residences within 500 feet either side of transmission line (compared to 1 residences along the comparable portion of the PA).	Proximity to residential dwellings



Proposed Action

Interstate

US Highway

State Highway

Stream

State Boundary

County Boundary

City or Town

Major Water Body

Federal Wilderness Area

National Park Boundary

National Grassland Boundary

National Forest Boundary

Jurisdictional Land Ownership

Bureau of Land Management Land

Bureau of Reclamation Land

U.S. Forest Service Land

National Park Service Land

State Land

03691215

Miles

Universal Transverse Mercator
North American Datum 1983
Zone 13 North, Meters

Teckla – Osage – Rapid City
230 kV Transmission Line

FIGURE 2-1

PROPOSED ACTION

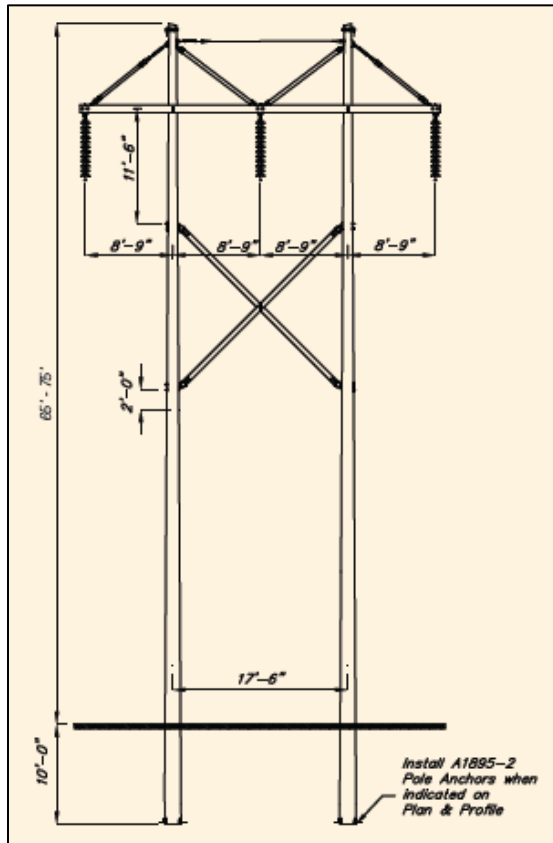
Map Extent: South Dakota and Wyoming

Date: 11-24-13

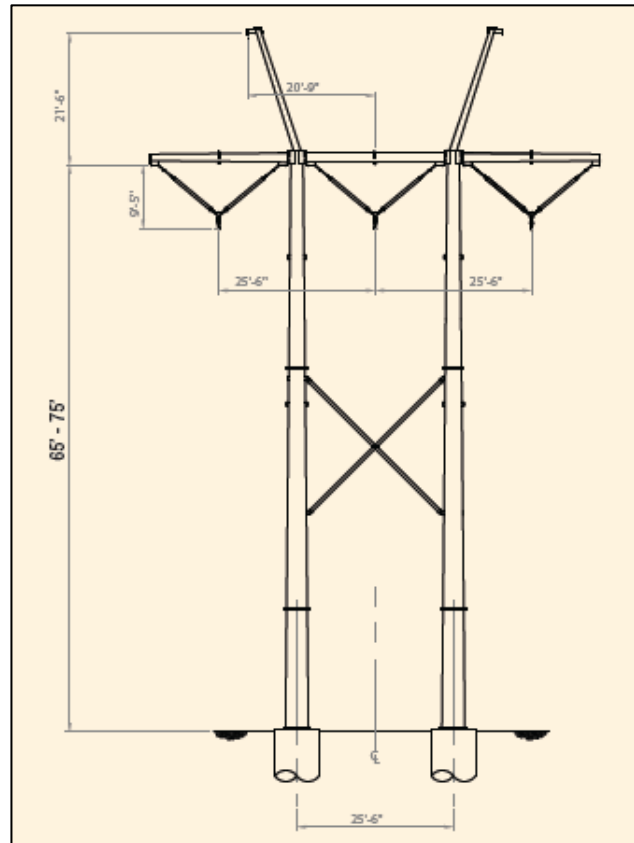
Author: djb

I:\SD-WY\Figure 2-1 Proposed Action 11x17 LRO 112413.mxd

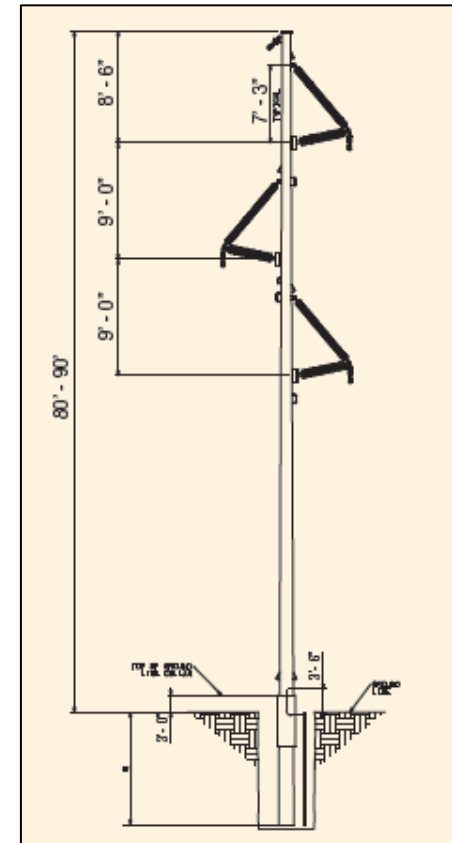
Figure 2-2
Typical Structure Designs



Wooden H-Frame

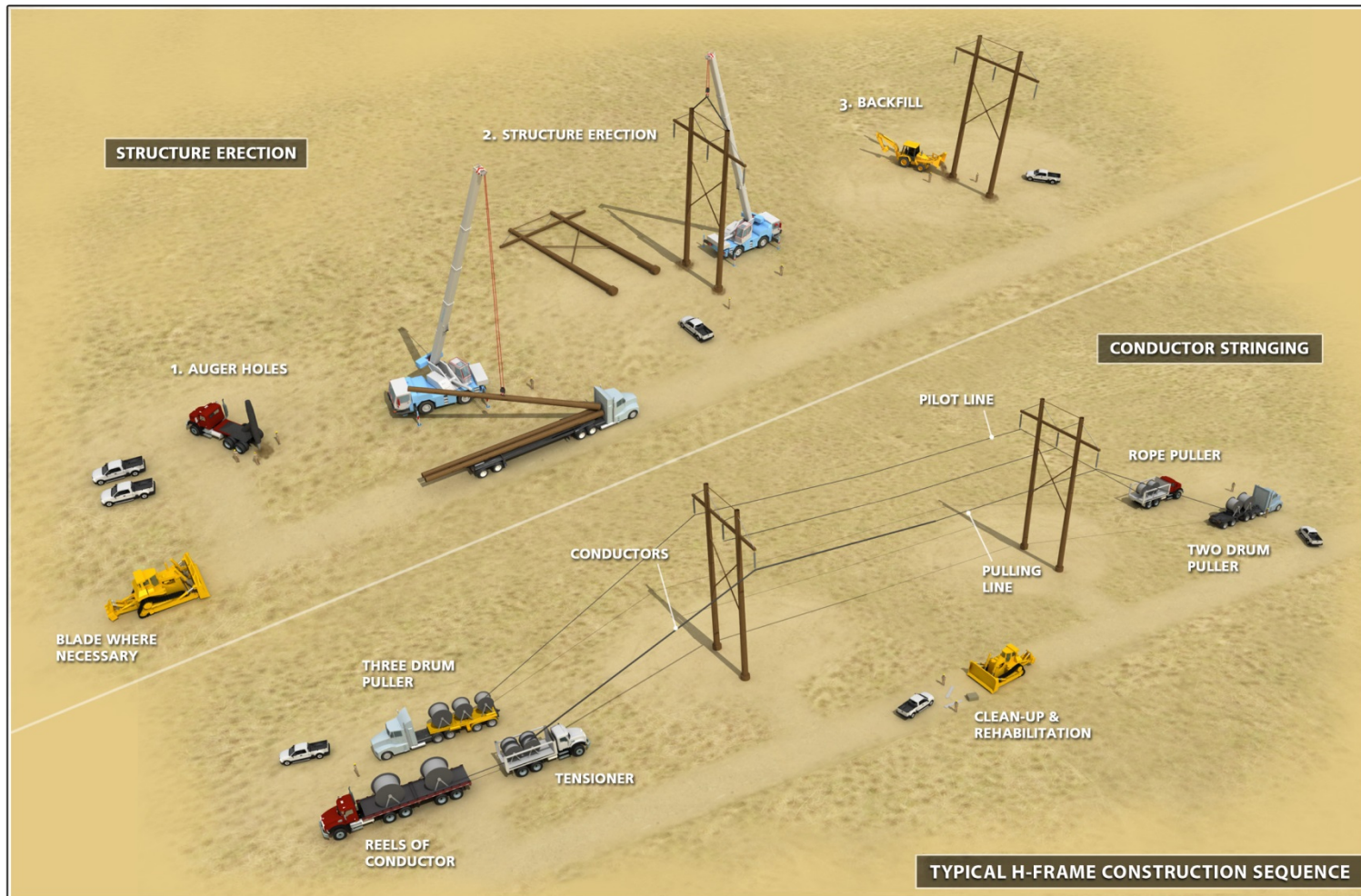


Steel H-Frame

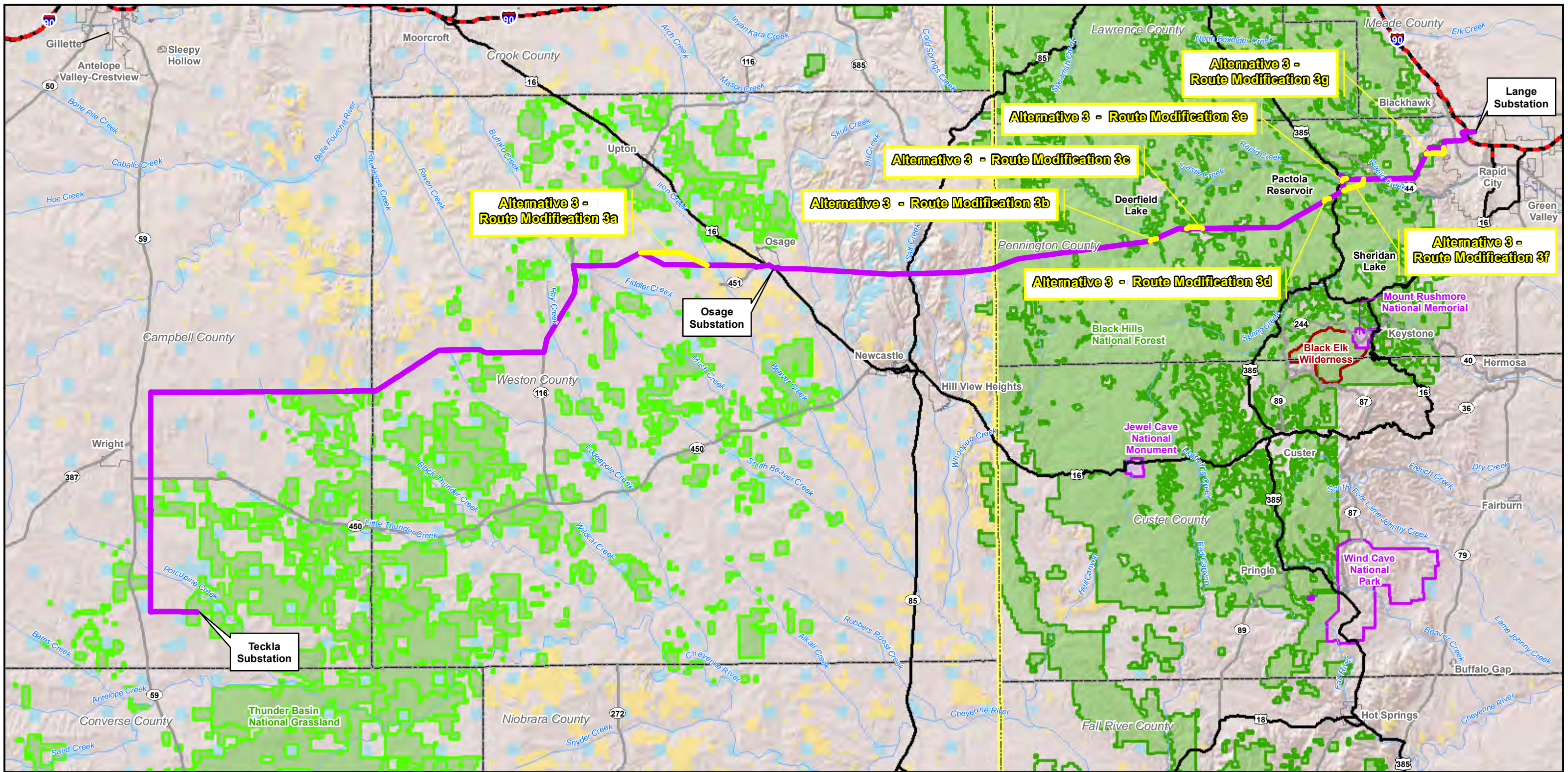


Tubular Steel Single Pole

Figure 2-3
Transmission Construction Process



Source: Power Engineers



Proposed Action

Site-Specific Design Modification

Interstate

US Highway

State Highway

Stream

State Boundary

County Boundary

City or Town

Major Water Body

Federal Wilderness Area

National Park Boundary

National Grassland Boundary

National Forest Boundary

Jurisdictional Land Ownership

Bureau of Land Management Land

Bureau of Reclamation Land

U.S. Forest Service Land

National Park Service Land

State Land

Teckla – Osage – Rapid City
230 kV Transmission Line

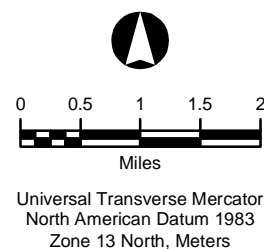
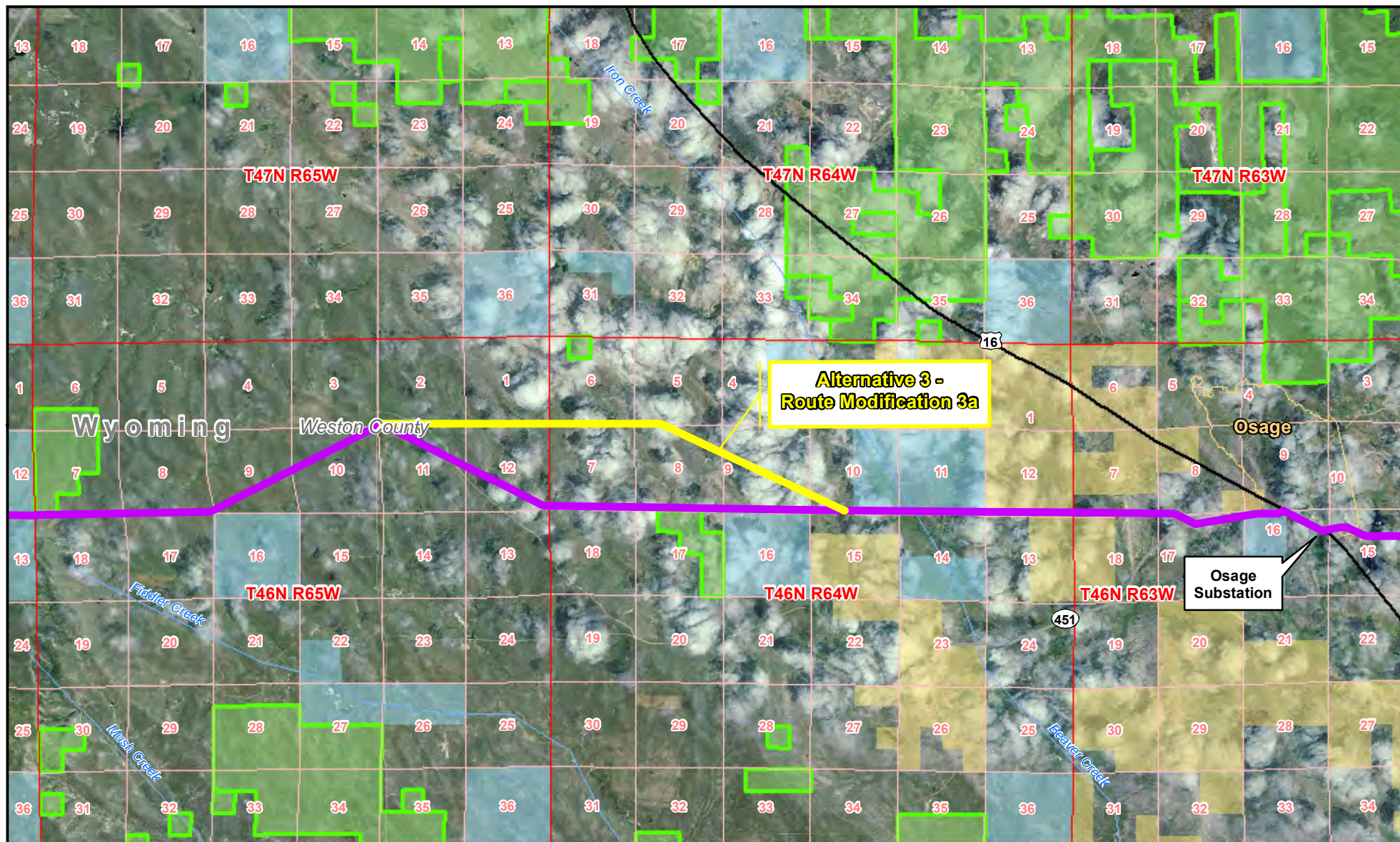
FIGURE 2-4
ALTERNATIVE 3
LOCATIONS OF PROPOSED ROUTE MODIFICATIONS

Map Extent: South Dakota and Wyoming

Date: 11-19-13

Author: djb

I:\SD-WY\Figure 2-4 Alternative 3 Proposed Route Modifications_C-5013.mxd



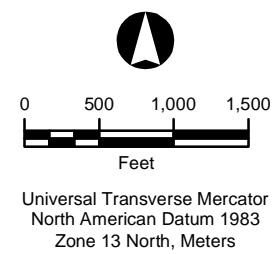
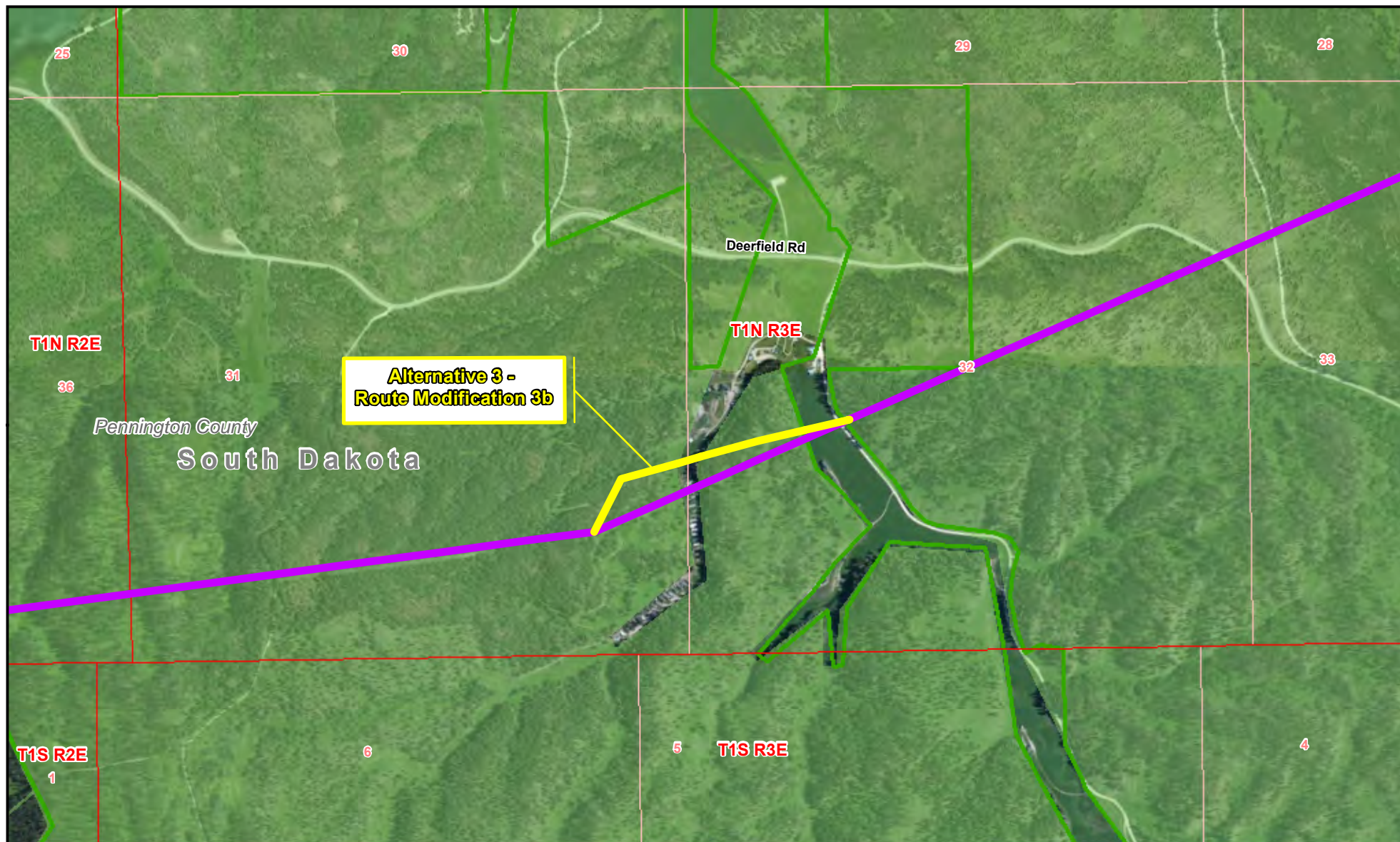
Teckla - Osage - Rapid City 230 kV Transmission Line

**FIGURE 2-5
ALTERNATIVE 3
ROUTE MODIFICATION 3A**

Map Extent: Weston County, Wyoming

Date: 11-19-13 Author: djb

I:\SD-WY\Figure 2-5 Alternative_3_Route Mod. 3A.dwg 11/19/13



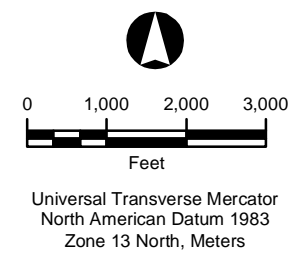
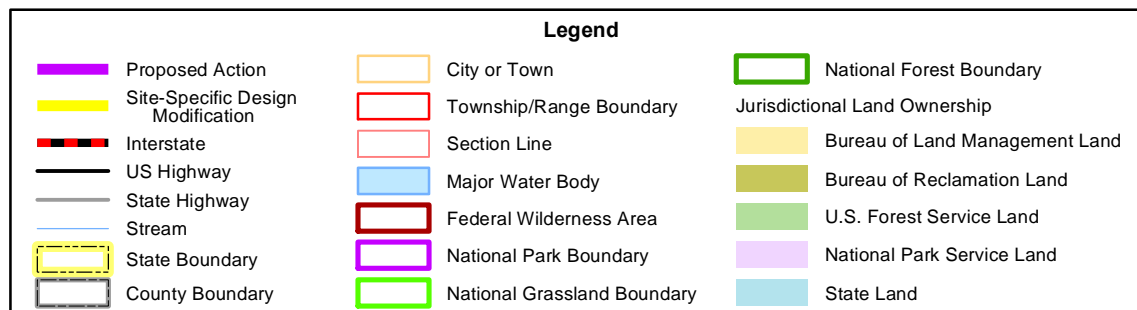
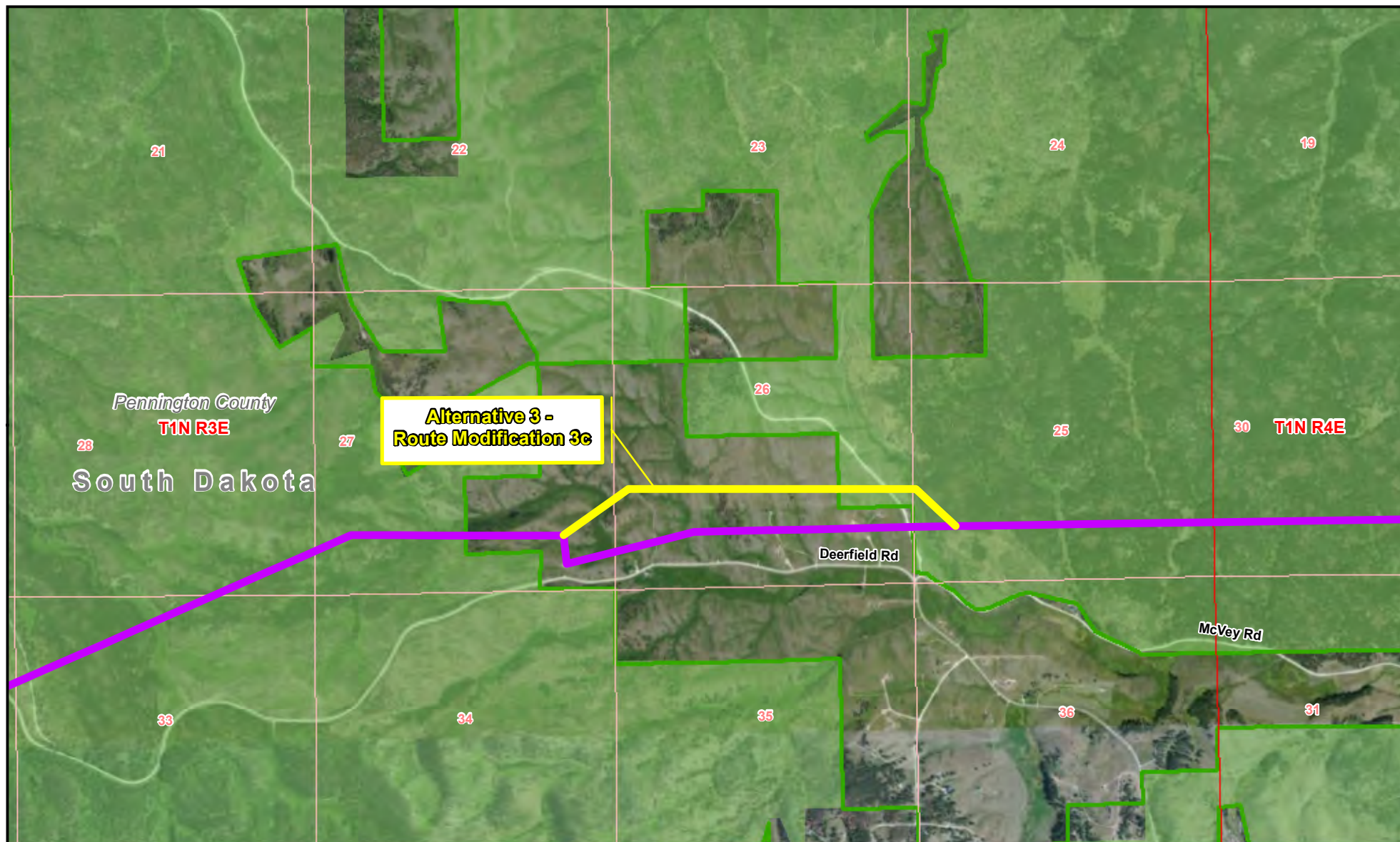
**Teckla – Osage – Rapid City
230 kV Transmission Line**

**FIGURE 2-6
ALTERNATIVE 3
ROUTE MODIFICATION 3B**

Map Extent: Pennington County, South Dakota

Date: 11-19-13		Author: djb
----------------	--	-------------

I:\SD-WY\Figure 2-6 Alternative_3_Route_Mod_3b_C-56_111913.mxd



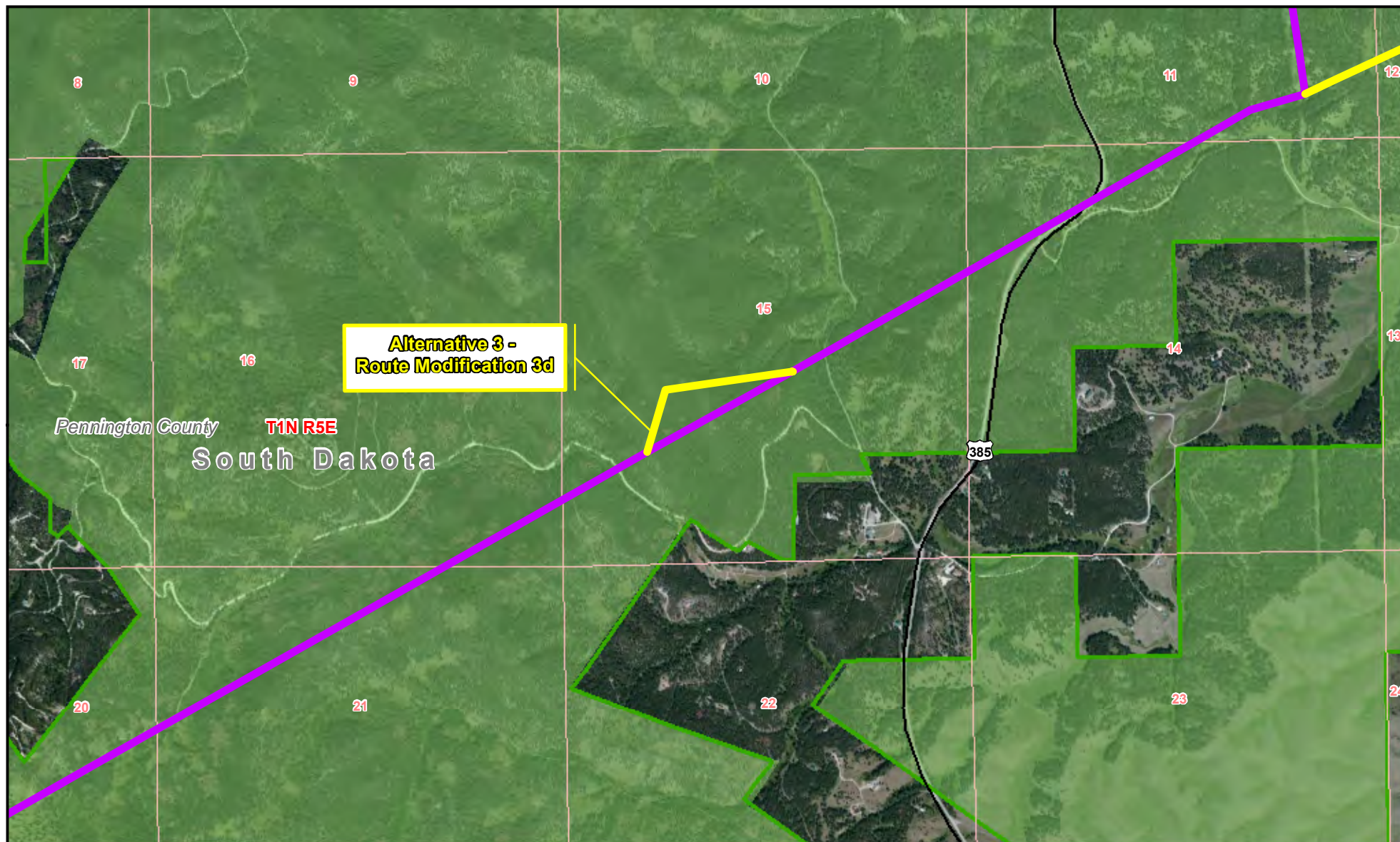
**Teckla – Osage – Rapid City
230 kV Transmission Line**



















**FIGURE 2-7
ALTERNATIVE 3
ROUTE MODIFICATION 3C**

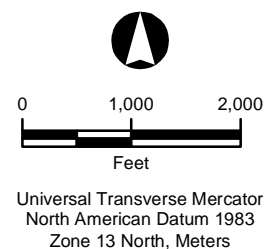
Map Extent: Pennington County, South Dakota

Date: 11-19-13	Author: djb
----------------	-------------

I:\SD-WY\Figure 2-7 Alternative_3_Route_Mod_3c\SW_111913.mxd



Legend					
	Proposed Action		City or Town		National Forest Boundary
	Site-Specific Design Modification		Township/Range Boundary	Jurisdictional Land Ownership	
	Interstate		Section Line		Bureau of Land Management Land
	US Highway		Major Water Body		Bureau of Reclamation Land
	State Highway		Federal Wilderness Area		U.S. Forest Service Land
	Stream		National Park Boundary		National Park Service Land
	State Boundary		National Grassland Boundary		State Land
	County Boundary				



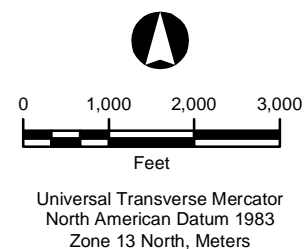
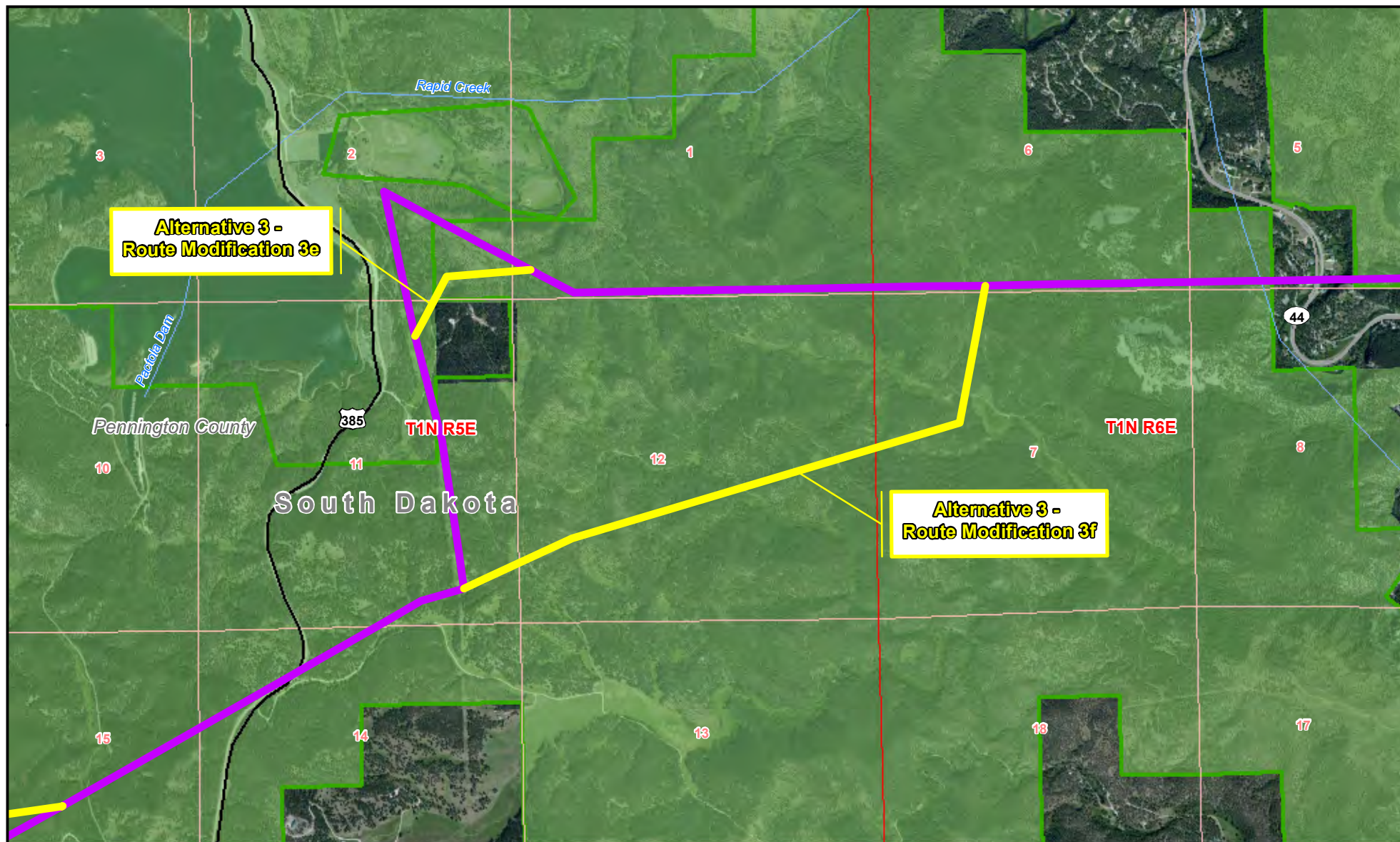
Teckla – Osage – Rapid City 230 kV Transmission Line

**FIGURE 2-8
ALTERNATIVE 3
ROUTE MODIFICATION 3D**

Map Extent: Pennington County, South Dakota

Date: 11-19-13 Author: djb

I:\SD-WY\Figure 2-8 Alternative_3_Route_Mod_3d_C-58_111913.mxd



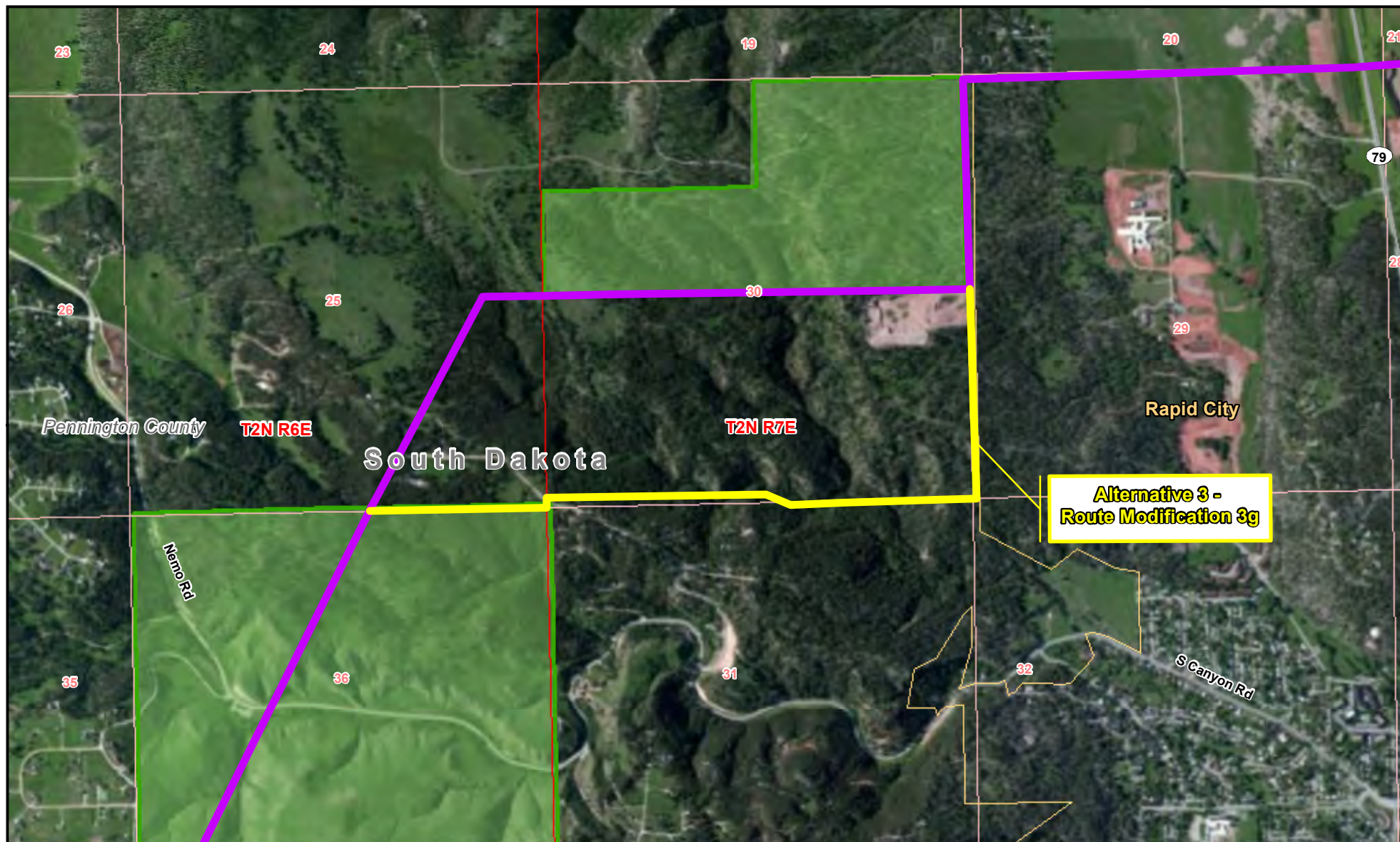
Teckla – Osage – Rapid City 230 kV Transmission Line

**FIGURE 2-9
ALTERNATIVE 3
ROUTE MODIFICATIONS 3E & 3F**

Map Extent: Pennington County, South Dakota

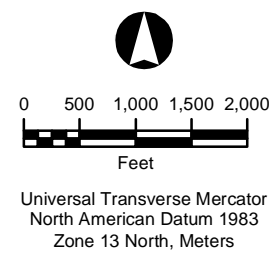
Date: 11-19-13 Author: djb

I:\SD-W\Figure2-9 Alternative_3_Route_Mods_3e&3f_11_111913.mxd



**Alternative 3 -
Route Modification 3g**

Legend			
	Proposed Action		National Forest Boundary
	Site-Specific Design Modification		City or Town
	Interstate		Township/Range Boundary
	US Highway		Section Line
	State Highway		Major Water Body
	Stream		Federal Wilderness Area
	State Boundary		National Park Boundary
	County Boundary		National Grassland Boundary
		Jurisdictional Land Ownership	
			Bureau of Land Management Land
			Bureau of Reclamation Land
			U.S. Forest Service Land
			National Park Service Land
			State Land



Teckla – Osage – Rapid City 230 kV Transmission Line	
FIGURE 2-10 ALTERNATIVE 3 ROUTE MODIFICATION 3G	
Map Extent: Pennington County, South Dakota	
Date: 11-19-13	Author: djb
I:\SD-WY\Figure 2-10 Alternative_3_Route_Mod_3g.mxd	