DOE-EA -1247

Environmental Assessment
for
Electrical Power System Upgrades
at
Los Alamos National Laboratory

Los Alamos, New Mexico

Final Document

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ACRONYMS AND TERMS

ac	*acre*
ACGIH	*American Conference of Governmental Industrial Hygienists*
ACSR	*aluminum conductors steel reinforced*
AEI	*area of environmental interest*
AN	*Algodones-Norton*
BA	*Bernalillo-Algodones*
BACT	*best available control technology*
BLM	*Bureau of Land Management*
BMPs	*best management practices*
BNM	*Bandelier National Monument*
CEQ	*Council on Environmental Quality*
CFR	*Code of Federal Regulations*
cm	*centimeter*
County	*Los Alamos County*
CWA	*Clean Water Act*
dB	*decibel*
DOE	*Department of Energy*
EA	*environmental assessment*
EIS	*Environmental Impact Statement*
EMF	*electromagnetic fields*
EPA	*Environmental Protection Agency*
EPRI	*Electric Power Research Institute*
ETA	*East Technical Area*
ft	*feet*
ft^2	*square feet*
ft^3	*cubic feet*
gal.	*gallon*
GIS	*geographic information system*
ha	*hectare*
HL	*Hernandez-Los Alamos*
HV	*high voltage*
HVAC	*heating, ventilation, and air conditioning*
Hz	*hertz*
IEEE	*Institute of Electronics and Electrical Engineers*
in.	*inch*
kg	*kilograms*
km	*kilometer*
km^2	*square kilometer*
kV	*kilovolt*
$kV \cdot m^{-1}$	*kilovolt per meter*
L	*liter*
LA	*Laboratory of Anthropology*
LANL	*Los Alamos National Laboratory*
lb	*pound*
m	*meter*
m^2	*square meter*
$mA \cdot m^{-2}$	*milliampere per square meter*
MAP	*mitigation action plan*
mi	*mile*
mi^2	*square mile*
ml	*milliliter*
MVA	*megavolt ampere*
MW	*megawatt*
NAAQS	*National Ambient Air Quality Standards*
NAS	*National Academy of Sciences*
NB	*Norton-Bernalillo*
NEPA	*National Environmental Policy Act*
NH	*Norton-Hernandez*
NHPA	*National Historic Preservation Act*
NL	*Norton-Los Alamos*

NM	*New Mexico*
NPDES	*National Pollutant Discharge Elimination System*
NRHP	*National Register of Historic Places*
NZ	*Norton-Zia*
OLE	*Ojo Line Extension*
oz	*ounces*
Plains Electric	*Plains Electric Generation and Transmission Cooperative, Inc.*
PM	*particulate matter*
PNM	*Public Service Company of New Mexico*
Power Pool	*Los Alamos Power Pool*
PRS	*potential release site*
ROW	*right-of-way*
SDP	*Site Development Plan*
SHPO	*State Historic Preservation Officer*
SO_2	*sulfur dioxide*
STA	*South Technical Area*
SWEIS	*Site-Wide Environmental Impact Statement*
SWPP	*Storm Water Pollution Prevention*
TA	*technical area*
TCPs	*traditional cultural properties*
T&E	*threatened and endangered*
TLV	*threshold limit value*
UC	*University of California*
U.S.	*United States*
USDA	*United States Department of Agriculture*
USFS	*U.S. Forest Service*
USFWS	*U.S. Fish and Wildlife Service*
WTA	*West Technical Area*
yd	*yard*
yd^2	*square yard*
yd^3	*cubic yard*

Measurement and Conversion Table

Multiply	By	To Obtain
Length		
inch (in.)	2.54	centimeters (cm)
feet (ft)	0.3048	meters (m)
yards (yd)	0.9144	meters (m)
miles (mi)	1.60934	kilometers (km)
Area		
acres (ac)	0.40469	hectares (ha)
square feet (ft^2)	0.092903	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.58999	square kilometers (km^2)
Volume		
gallons (gal.)	3.7854	liters (L)
cubic feet (ft^3)	0.028317	cubic meters (m^3)
cubic yards (yd^3)	0.76455	cubic meters (m^3)
Weight		
ounces (oz)	29.574	milliliters (ml)
pounds (lb)	0.45385	kilograms(kg)
All conversions in this document have been rounded to the nearest decimal		

EXPONENTIAL NOTATION: Many values in the text and tables of this document are expressed in exponential notation. An exponent is the power to which the expression, or number, is raised. This form of notation is used to conserve space and to focus attention on comparisons of the order of magnitude of the numbers:

1×10^{4}	=	10,000
1×10^{2}	=	100
1×10^{0}	=	1
1×10^{-2}	=	0.01
1×10^{-4}	=	0.0001

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EXECUTIVE SUMMARY

The United States (U.S.) Department of Energy (DOE) proposes to upgrade the electrical power supply system for Los Alamos National Laboratory (LANL) to increase the reliability of the system to meet current and future needs. The U.S. Department of Agriculture (USDA), Forest Service (USFS), Santa Fe National Forest, Española Ranger District and the U.S. Department of Interior, Bureau of Land Management (BLM), Taos Field Office are two other Federal government agencies that have jurisdiction over lands involved in this proposed project. Both USFS and BLM have participated in the preparation of this Draft Environmental Assessment (EA) as Cooperating Agencies. This EA has been developed in order to assess the environmental effects of the Proposed Action and each alternative considered.

The Proposed Action includes construction of an approximately 19.5-mile (mi) (31-kilometer [km]), 115-kilovolt (kV) power transmission line (i.e., power line) across BLM-, USFS-, and DOE-administered lands; and the uncrossing of two other 115-kV lines within LANL. The Proposed Action includes the operation of a 115-kV power line that would originate at the existing Norton Substation and proceed westerly to its intersection with the existing Reeves Line and then primarily north across the Rio Grande to LANL. The line would then continue northwesterly mostly through the central portion of LANL to the proposed West Technical Area Substation. The first three right-of-way segments would be constructed using 345-kV-type structures, the remaining right-of-way segment would be constructed using 115-kV-type structures. Two short 115-kV line segments needed to extend an interior transmission "loop" from Technical Area 3 and a separate action to uncross two 115-kV lines in another area within LANL are also part of the Proposed Action.

Four alternatives to the Proposed Action were considered.

- Alternative 1 is similar to the Proposed Action except that the first three right-of-way segments would be constructed and operated at 345 kV and an additional substation would need to be constructed.
- Alternative 2 is similar to the Proposed Action except that the entire length of the corridor would be constructed and operated at 115 kV.
- Alternative 3 is the same as the Proposed Action through the first three right-of-way segments; the last right-of-way segment would follow an alternative route through a more northerly right-of-way and parallel to another 115-kV power line within LANL.
- Alternative 4 is the same as the Proposed Action through the first three right-of-way segments; the last right-of-way segment generally would follow a more southerly right-of-way and mostly adjacent to New Mexico Highways 4 and 501. This last segment would also parallel an existing 13.8-kV power line for most of its length.

The No Action Alternative was also considered. Under the No Action Alternative there would be no changes made to the existing electrical power supply system.

Potential visual, health, and environmental effects are anticipated to be minimal for each of the first three alternatives analyzed. Moderate visual effects would be created under Alternative 4. The power line would contrast and be visible against the skyline from some public areas. Pole structures and materials would be selected to mitigate visual effects. Of the two potential health hazards (electrocution and exposure to electromagnetic fields [EMF]) identified in this EA, only biological effects from low-strength, low-frequency EMF pose a minor human health risk. The proposed line at 115 kV would emit an electrical field much less than the 25-$kV \cdot m^{-1}$ "ceiling limit" set by the American Conference of Governmental Industrial Hygienists (Appendix A). In addition, the occupancy time of any nearby facility

would be expected to be a maximum of only 24 percent of the permanent occupancy that is assumed in setting the ceiling limit. Any accident potential is considered to be minor and would affect construction workers only. About 23 acres (ac) (9 hectares [ha]) would be disturbed during construction. These sites would be restored. Possible adverse effects to potential habitat for bald eagles (*Haliaectus leucocephalus*), southwestern willow flycatchers (*Empidonax traillil extimus*), whooping cranes (*Grus americanus*), and Mexican spotted owls (*Strix accidentalis lucida*) and cultural resources are not expected to occur due to the proposed placement of structures, roads, and laydown areas in existing roadways or disturbed areas. Timing of actions to avoid adverse effects to sensitive species or their habitats and other project requirements would be enforced during construction and maintenance activities. The cumulative effects of the Proposed Action together with past, present, and reasonably foreseeable actions on BLM and USFS lands are anticipated to be negligible. Present activities on DOE, BLM, and USFS lands would not change if the Proposed Action was implemented.

1.0 PURPOSE AND NEED

1.1 Introduction

The *National Environmental Policy Act of 1969* (NEPA) requires Federal agency officials to consider the environmental consequences of their proposed actions before decisions are made. In complying with NEPA, the United States (U.S.) Department of Energy (DOE) follows the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508) and DOE's NEPA implementing procedures (10 CFR 1021). The purpose of an Environmental Assessment (EA) is to provide Federal decision makers with sufficient evidence and analysis to determine whether to prepare an Environmental Impact Statement (EIS) or issue a Finding of No Significant Impact. In this case, the DOE decision to be made is whether to construct and operate a 19.5-mile (mi) (31-kilometer [km]) electric transmission line (power line) reaching from the Norton Substation, west across the Rio Grande, to locations within the Los Alamos National Laboratory (LANL) Technical Areas (TAs) 3 and 5 at Los Alamos, New Mexico. The construction of one electric substation at LANL would be included in the project as would the construction of two line segments less than 1,200 feet (ft) (366 meters [m]) long that would allow for the uncrossing of a portion of two existing power lines. Additionally, a fiber optics communications line[1] would be included and installed concurrently as part of the required overhead ground conductor for the power line. The new power line would improve the reliability of electric service in the LANL and Los Alamos County areas as would the uncrossing of the crossed segments of the existing lines. Additionally, installation of the new power line would enable the LANL and the Los Alamos County electric grid, which is a shared resource, to be adapted to accommodate the future import of increased power when additional power service becomes available in the northern New Mexico area. Similarly, the fiber optics line would allow DOE to take advantage of future opportunities in enhanced communications services.

The objectives of this EA are to (1) describe the baseline environmental conditions at the proposed power line location, (2) analyze the potential effects to the existing environment from construction, operation, and maintenance of a new power line, and (3) compare the effects of the Proposed Action and the four action alternatives to the No Action Alternative. In addition, the EA provides DOE with environmental information that could be used in developing mitigative actions to minimize or avoid adverse effects to the integrity of the human environment and natural ecosystems should DOE decide to proceed with construction and operation of the new power line. Ultimately, the goal of NEPA and this EA is to aid DOE officials in making decisions based on understanding the environmental consequences of their decision.

1.1.1 Role of Cooperating Agencies

Two other Federal government agencies have jurisdiction over lands involved in the Proposed Action and have participated in the predecisional Draft EA preparation process as Cooperating Agencies (per the definition under the CEQ's Regulations for Implementing the Procedural Provisions of NEPA, 40 CFR Parts 1500-1508, Subsection 1501.6). These agencies are the U.S. Department of Agriculture (USDA), Forest Service (USFS), Santa Fe National Forest, Española Ranger District; and the U.S. Department of Interior, Bureau of Land Management (BLM), Taos Field Office. Land under the administrative control of both agencies would be crossed by the proposed power line. It is anticipated that only this one EA prepared by DOE would be completed for the proposed electric power system upgrades and that it would be adopted by each of the Cooperating Agencies. This EA would serve to facilitate NEPA compliance for each of the Cooperating Agencies, as well as for DOE.

[1] A fiber optics line is a cable that transmits data in the form of light signals.

1.2 Background

LANL is one of several national laboratories where DOE missions for national security, energy resources, environmental quality, and science are supported. LANL occupies about 43 square miles (mi^2) (111 square kilometers [km^2]) of land under the administrative control of DOE. It is located in north-central New Mexico, about 60 mi (96.5 km) northeast of Albuquerque and 25 mi (40 km) northwest of Santa Fe (Figure 1[2]).

Ownership and distribution of utility services are currently split between DOE and Los Alamos County. DOE administers and distributes most utility services to LANL facilities, and the County provides these services to the Los Alamos town site, White Rock, and in some cases, to nearby Bandelier National Monument (BNM). Utility services at LANL include electrical power, natural gas, steam, water, sanitary wastewater, and refuse. DOE administers the Norton-Los Alamos (NL) Line, which is one of the two 115-kilovolt (kV) power lines serving LANL. Public Service Company of New Mexico (PNM) owns the second line, the Reeves Line, which is located between the Bernalillo-Algodones (BA) Substation to LANL. DOE administers and operates a steam-driven power plant at TA-3 that is used on an as-needed basis. DOE also administers various low-voltage transformers at LANL facilities and approximately 34 mi (55 km) of 13.8-kV distribution lines. Communication services include telephone and cable television provided by local commercial carriers, and within LANL itself, government-owned fiber optics lines. Government-owned broad band fiber optics services are present within LANL boundaries, but regional fiber optics infrastructure is not currently available within 25 mi (40 km) of LANL so LANL is unable to connect via fiber optics to other DOE facilities like Sandia National Laboratory in Albuquerque, New Mexico, using high-speed, high-volume communications.

1.2.1 Existing Electric Power Service to LANL

LANL is supplied with electrical power through a cooperative arrangement with Los Alamos County, known as the Los Alamos Power Pool (Power Pool), which was established in 1985. Electric power is supplied to the Power Pool through two existing regional 115-kV electric power lines, one originating from the Norton Substation (referred to as the Norton-Los Alamos Line or the NL Line) and one originating from the BA Substation (also known as the Reeves Line) (Figure 2). The substations are owned by PNM. LANL additionally can produce about 15 megawatts (MW) at the 20-MW, gas-fired generating plant in TA-3.

Power Pool resources currently provide 72 to 94 MW of electrical power originating from a number of hydroelectric, coal, and natural gas generating stations throughout the western U.S. The ability to accept additional power into the Power Pool grid is now limited by at least two factors: (1) the regional electric import capability of the existing northern New Mexico power transmission system and (2) the contractual rights held by the Power Pool for importing power from the regional transmission network. Thus, even if additional power lines were brought into the northern New Mexico region, the Power Pool would be unable to accept additional power unless it was able to increase its contractual import rights. The power import capability is limited by the regional transmission import system. Many northern New Mexico communities, including Santa Fe and Española, also receive power through the Norton and the BA Substations (Figure 3). In recent years, the population growth in northern New Mexico, together with expanded industrial and commercial usage, has greatly increased the power demands on the northern New Mexico regional power system. Several proposals for bringing additional power into the region have been considered. A more recent one, the PNM proposal for a 345-kV power line called the Ojo Line Extension (OLE) Project, has been abandoned. Other power line corridor locations remain under

[2] Some maps may contain acronyms or abbreviations not yet introduced in the text. Please refer to the acronym list on page vii for a complete explanation of all acronyms and terms.

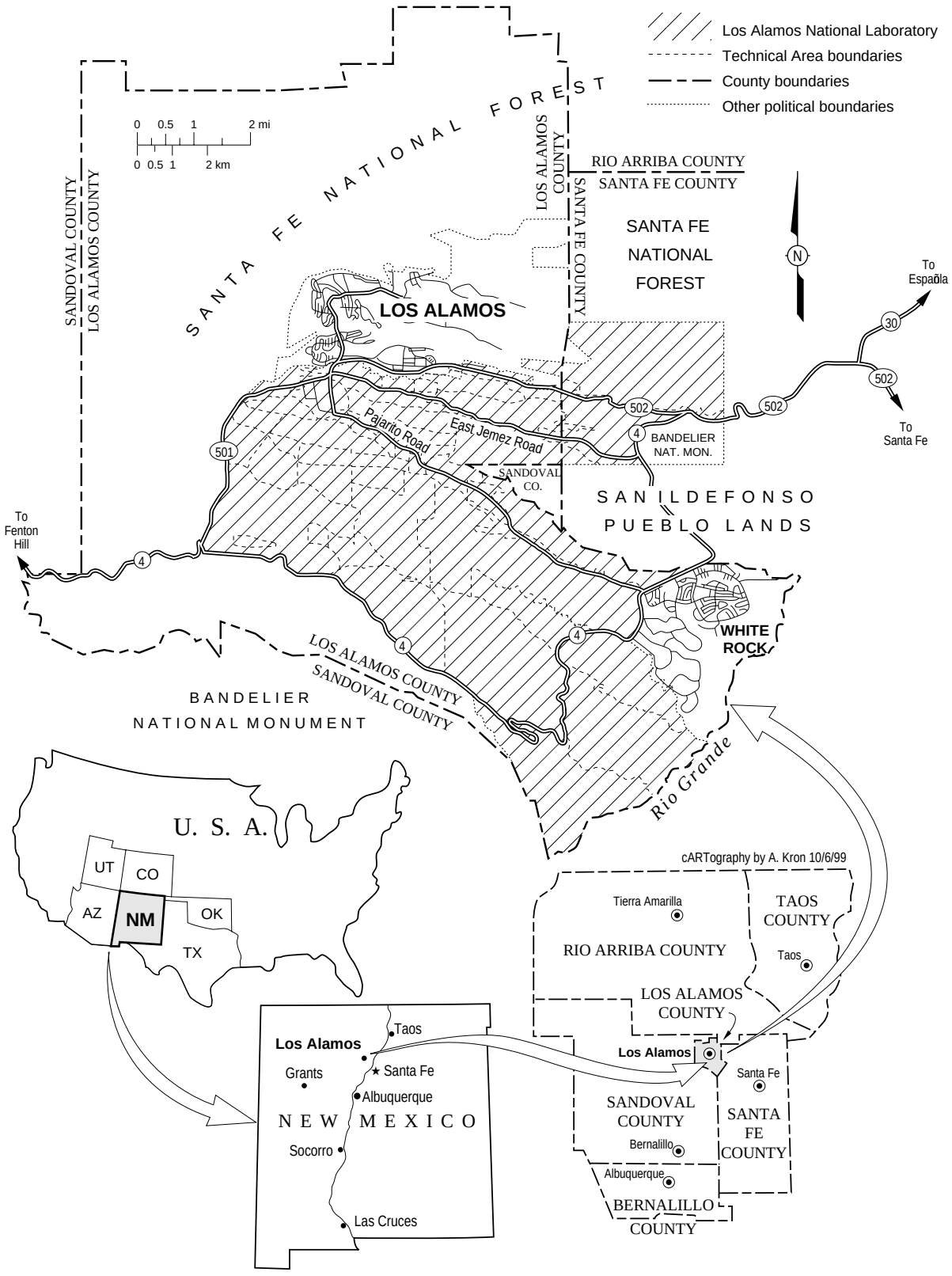

Figure 1. Location of Los Alamos National Laboratory

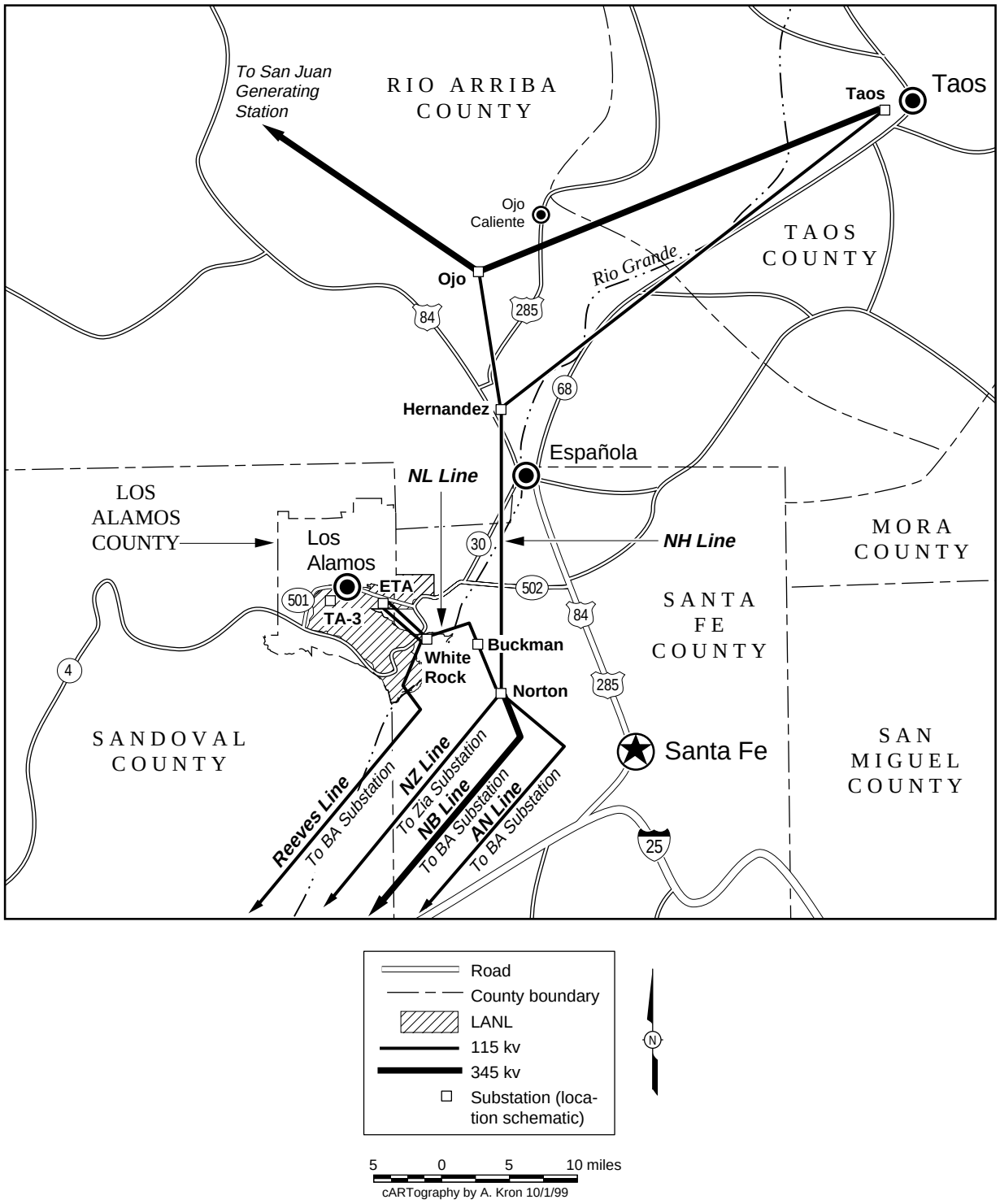

Figure 2. Existing Northern New Mexico Transmission System

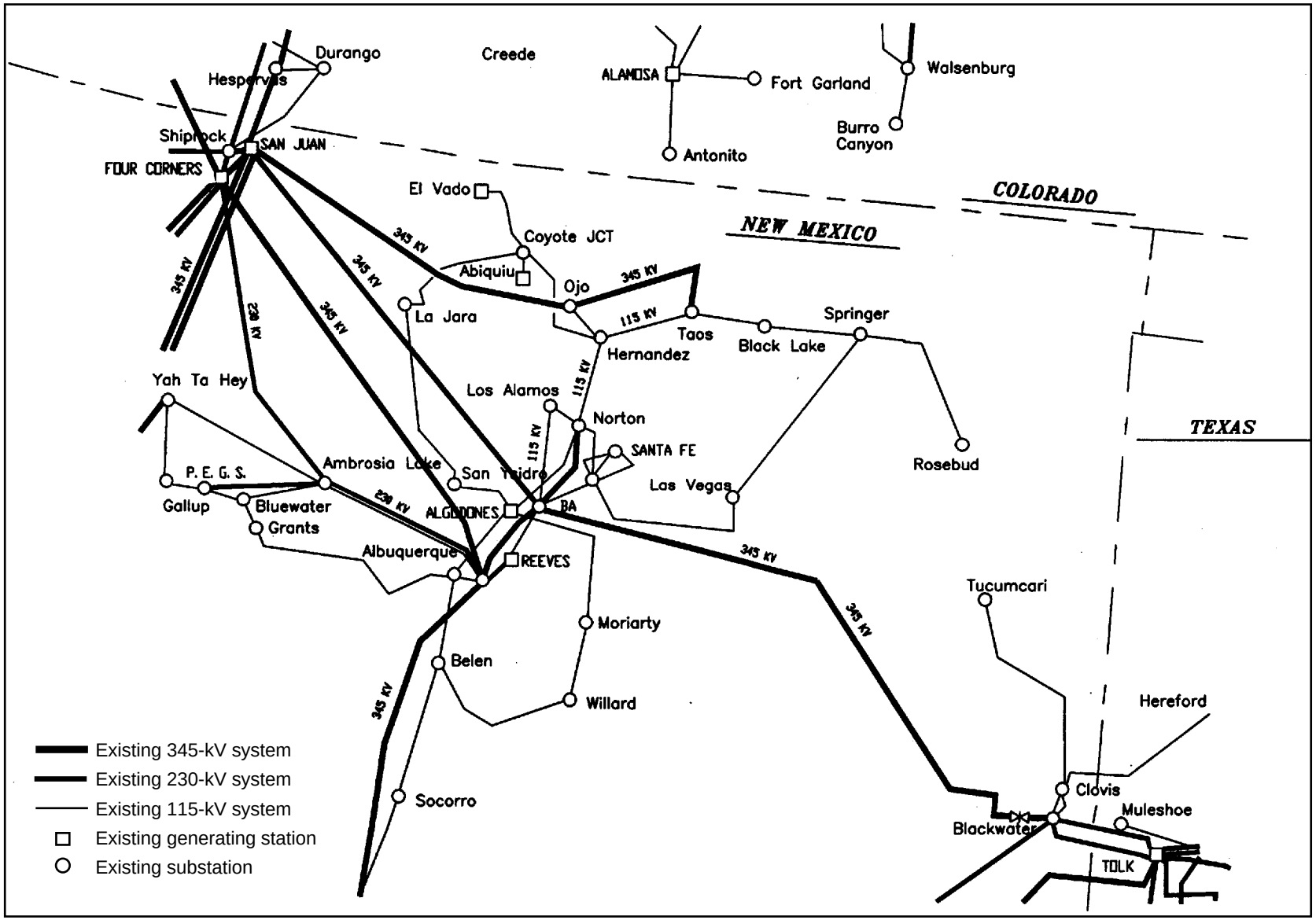

Figure 3. New Mexico power transmission grid.

consideration, but it is uncertain when any new regional power lines would be constructed and become serviceable.

The existing local electric transmission system supplying LANL and Los Alamos County has been found to be deficient in a study conducted by technical representatives of PNM, Plains Electric Generation and Transmission Cooperative (Plains Electric), and the Power Pool (PNM 1994). An operating plan intended to minimize the potential for a complete loss of electric service to the Power Pool has been discussed and partially implemented. This plan calls for improved load monitoring, equipment upgrades, and optimization of some available power sources. The local power transmission and distribution lines and the TA-3 generating plant suffer from several deficiencies. Power line breakdowns due to deterioration and the inefficiencies of the TA-3 generating plant compromise the continued reliability of electric power delivery to the Power Pool.

Dependence upon only two power lines to supply LANL and Los Alamos County is inconsistent with prudent utility industry practices for fully redundant power line service to large, critical load areas. Consistent with these practices, other major electricity users in the northern New Mexico area are served by multiple power lines (three or more). Multiple power lines are necessary to provide a contingency supply capability in case of, for example, power line failure due to acts of God, or in case of a scheduled shutdown for maintenance.

The reliability of the NL Line and the Reeves Line that serve the Power Pool are additionally compromised because they cross at one location within LANL. In doing so, they do not provide physically separate avenues for the delivery of power from independent power supply sources. The crossing of power lines results in a situation where a single outage event, such as a conductor or structural failure, could potentially cause a major power loss to the Power Pool. If such an event occurred when the TA-3 generating plant was not operating or was being serviced or repaired, there would be no power available to the Power Pool. A single outage event could have serious and disruptive consequences to LANL and to the citizens of Los Alamos County. While some LANL facilities and County emergency facilities have back-up plans and capabilities in the event of such an occurrence, the negative consequences of such an event would weigh substantially on many of the private and commercial Power Pool customers.

Heightening concern for reliable delivery of electricity to Power Pool customers is the anticipated growth of load requirements at LANL and within Los Alamos County. Under existing electric power import agreements with PNM, the electrical power import capability to the Power Pool is contractually limited to 72 MW during winter months when the output of the El Vado and Abiquiú hydroelectric plants is negligible. The contractual import capability to the Power Pool increases to as much as 95 MW during the spring and early summer months when the El Vado and Abiquiú hydroelectric plants are at full output. The mid-range forecast of peak load requirements for the Power Pool is estimated to be about 107 MW in the year 2001, and the long-range forecast of mid-range peak load requirements is estimated to be about 124 MW by about the year 2007 (DOE 1999a)[3]. The recently issued *Final Site-Wide Environmental Impact Statement (SWEIS) for LANL* (DOE 1999a) and the *Draft Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts at LANL* (DOE 1999b) both consider preferred alternatives that, if fully implemented, would result in additional power demands being placed on the Power Pool and, in turn, on the regional electric transmission system that cannot be met under the current import agreements for electric power. Power shortages (brownouts) in the Los Alamos area could become more frequent during peak use periods unless greater electric power import arrangements can be made. The two existing 115-kV power lines that bring electric power into the Power Pool are limited up to the thermal rating of each of the lines. The weaker of the two lines (NL Line) has a thermal

[3] These numbers represent current information available at the time of preparation of this EA.

rating of 118 megavolt amperes (MVA) of electric power. The thermal rating of the Reeves Line is 133 MVA. However, depending upon either one of the two existing lines to transmit the maximum long-term forecasted load would further heighten reliability concerns. In the event of a single line failure, the remaining line would not be able to transmit the electricity needed to meet the forecasted customer loads, which would result in brownouts or powers outages (blackouts).

1.2.2 Fiber Optics Service to LANL

LANL is supplied with communication services by several above and below ground lines entering the Los Alamos area. The communications industry continues to expand its ability to deliver enhanced services to their customers. An example of this is the development of fiber optics to carry encoded information (data) from point to point through the use of light pulses. Fiber optics cables that carry data in the form of light signals to various users within LANL exist onsite, but there is no fiber optics cable infrastructure in place to connect LANL with other cable systems. Fiber optics service infrastructure is expanding from large metropolitan areas and should eventually be available to areas such as LANL. Communications companies are increasingly converting their overhead lines to buried fiber optics cable systems; however, burying fiber optics cables is not possible in some areas due to terrain and other limitations. A recent advancement in the communications and utilities industries is the use of a composite overhead ground wire, which can be used in conjunction with overhead power lines in place of the usual ground wires. This special composite wire incorporates the latest technology in high-frequency and bandwidth fiber optics, making it suitable for voice, data, and image communications while still maintaining the characteristics necessary to provide adequate and suitable protection of power lines from lightning discharges.

1.3 Purpose and Need for Agency Action

DOE is responsible for ensuring that its assigned national security, energy resources, environmental quality, and science missions are adequately met at LANL. In order for LANL to function effectively as a national laboratory, the local and regional utility infrastructure, including electric power and communications, must be adequate and reliable. For the purpose of meeting the present and mid- to long-range forecasted electricity demands at LANL, DOE needs to act now to ensure a reliable power transmission capability to the Power Pool. To facilitate the growing needs at LANL for communicating data and information to scientists around the world, DOE needs to take advantage of new technology developments in order to tie into advanced communications fiber optics systems when they become available to the region.

1.4 Scope of This EA

A “sliding-scale” approach (DOE 1993) is the basis for the analysis of potential environmental and socioeconomic effects in this EA. That is, certain aspects of the Proposed Action have a greater potential for creating adverse environmental effects than others; therefore, they are discussed in greater detail in this EA than those aspects of the action that have little potential for effect. For example, implementation of the Proposed Action could affect visual resources. This EA, therefore, presents in-depth descriptive information on these resources to the fullest extent necessary for effects analysis. On the other hand, implementation of the Proposed Action would cause only a temporary effect on air quality during installation activities. Thus, a minimal description of the potential effects regarding air quality is presented.

When details about a Proposed Action are incomplete, as they are for the Proposed Action evaluated in this EA (for example, the exact location of access roads has not been determined), a “bounding” analysis is often used to assess potential effects. When this approach is used, reasonable maximum assumptions are made regarding potential emissions, effluents, waste streams, and project activities (see Sections 2.0

and 4.0 of the EA). Such an analysis usually provides an overestimation of potential effects. In addition, any proposed future action(s) that exceeds the assumptions ("bounds") of this effects analysis would not be allowed until an additional NEPA review could be performed. A decision to proceed or not with the action(s) would then be made.

1.5 Public Involvement

DOE provided written notification of this NEPA review to the State of New Mexico, the four Accord Pueblos (San Ildefonso, Santa Clara, Jemez, and Cochiti), the Mescalero Apache, and to over 30 stakeholders in the area on June 25, 1998. In addition to providing notification, DOE requested stakeholder comments and participation in the NEPA scoping process. In response to this request, DOE received written comments from six respondents. Concerns ranged from detailed questions on the project to a desire for DOE to prepare an EIS. Where appropriate and to the extent practicable, concerns and comments have been considered in this EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This section discusses the Proposed Action, four alternatives to the Proposed Action, and a No Action Alternative. For purposes of this document, the Proposed Action and the action alternatives are described as a series of segments to differentiate the administrative control of land and the alternate power line routes. The Proposed Action would include Segments 1, 2, 3, and 4 that would be constructed using 345-kV pole structures for the first three segments and 115-kV pole structures along Segment 4. The proposed power line would be operated at 115 kV for its entire length. Alternative 1 would include the same segments as the Proposed Action but would be constructed and operated at 345 kV for the first three segments, and constructed and operated at 115 kV for Segment 4. Alternative 2 would include the same segments as the Proposed Action but would be constructed and operated at 115 kV for its entire length. Alternative 3 would be constructed and operated the same as the Proposed Action except it would not include Segment 4 but would include Segment 5, which is a more northerly route. Alternative 4 would be constructed and operated the same as the Proposed Action except it would not include Segment 4 but would include Segment 6, which is a more southerly route. Figure 4 shows the potential locations for the Proposed Action and each action alternative. The following matrix summarizes these alternatives (Table 2-1).

Table 2-1. Comparison of the Proposed Action, Alternatives, and Power Line Segments

	Power Line Segments (Responsible Federal Agency)					
Alternatives	**1 (BLM)**	**2 (USFS)**	**3 (DOE)**	**4 (DOE)**	**5 (DOE)**	**6 (DOE)**
Proposed Action	X	X	X	X	–	–
Alternative 1	X	X	X	X	–	–
Alternative 2	X	X	X	X	–	–
Alternative 3	X	X	X	–	X	–
Alternative 4	X	X	X	–	–	X
Segment Lengths	0.25 mi (0.4 km)	7 mi (11 km)	2.8 mi (4.5 km)	9.5 mi (15 km)	7.5 mi (12 km)	15.5 mi (25 km)

X = Segment is included in alternative.
– = Segment not included in alternative.

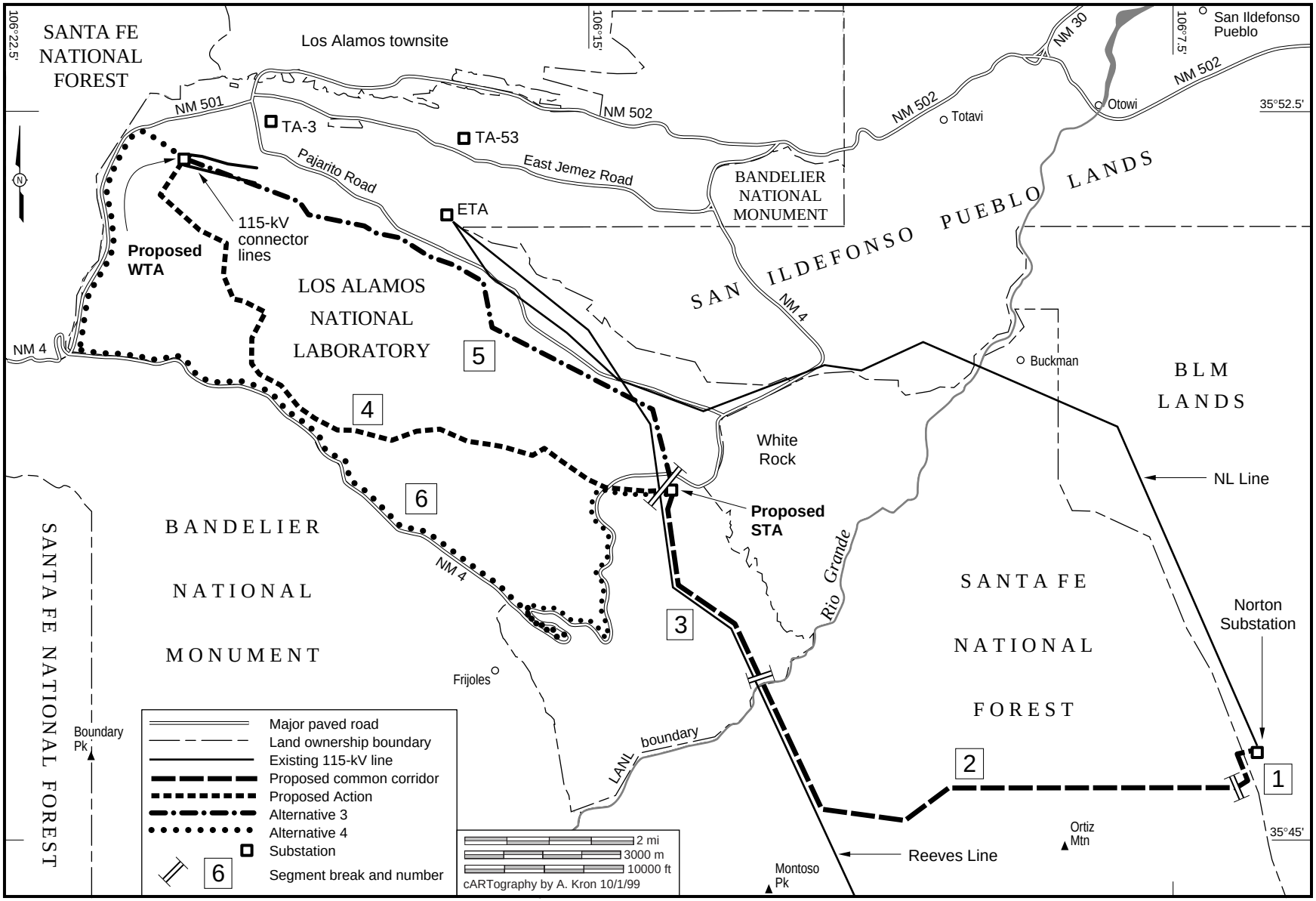

Figure 4. The Proposed Action with Alternatives

2.1 Proposed Action

The Proposed Action involves the construction and operation of a new 115-kV power line that would originate at the existing PNM-owned 345/115-kV Norton Substation located on BLM-administered land in Santa Fe County and would terminate at a proposed DOE-administered West Technical Area (WTA) Substation. This action would improve the reliability of the power system by eliminating a single point of failure in the present system. The proposed route was developed to minimize potential adverse environmental effects to the maximum extent practicable. The pole structures from the Norton Substation to the point where the power line would reach New Mexico State Route (NM) 4 would be built to 345-kV specifications but operated at 115 kV to provide the flexibility to tie-in Los Alamos to the 345-kV transmission grid in the future (Segments 1, 2, and 3 are discussed in detail later in the text). The rest of the pole structures from this point through the WTA to the existing TA-3 Substation would be built to and operated at 115-kV specifications (Segment 4).

The majority of the 115-kV power line structures would be wood- or metal-pole structures, H-frame type, with bolted wood or metal cross bracings and crossarms (Figure 5a). The remaining structures would be a variation of these structures. The average height of the 115-kV pole structures would be about 79 ft (24 m) from the ground level with about 11 ft (3 m) of the 90-ft- (27-m-) long pole structures buried. The width of the pole structures would be about 15 ft (4.5 m). The power line conductors consist of three bare aluminum conductors steel reinforced (ACSR) that are approximately 1 inch (in.) (2.5 centimeters [cm]) in diameter. They would be connected to a newly assigned 115-kV three-phase power circuit breaker on the existing network. From the 115-kV breaker at the Norton Substation, the line conductors would be strung overhead to the first new pole structure on USFS land. Three sets of polymer insulators attached to the crossarm would support the three ACSR phase conductors. The power line would be protected from lightning strikes by two overhead ground conductors, one of which would include the composite fiber optics cable.

The 345-kV pole structures would be assembled in the same way as the 115-kV structures except the 345-kV pole structures would be taller, the spacing wider, and the polymer insulators and other hardware would be bigger and longer. The average height of the 345-kV pole structures would be about 106 ft (32 m) from the ground level with about 14 ft (4 m) of the 120-ft- (36.5-m-) long pole structures being buried. The width of the pole structures would be about 27 ft (8 m) (Figure 5b).

There would be no pole structures within Segment 1. The line would span from the Norton Substation across to the first pole structure in Segment 2. Segments 2 and 3 of the Proposed Action would require about forty-three 345-kV pole structures; Segment 4 would require about fifty-five 115-kV pole structures. The average span (distance) between pole structures would be about 800 ft (244 m) for the 115-kV pole structures and about 1,200 ft (365 m) for the 345-kV pole structures. The span would mainly depend on the pole structure heights and required maximum and minimum conductor sags through the different terrains and canyon and river crossings.

A 200-ft (61-m) right-of-way (ROW) would be established in which to locate a narrower power line corridor. The corridor would range in width between 100 ft (30 m) for the 115-kV constructed line segments to 150 ft (45 m) for the 345-kV constructed line segments. Power line construction would occur within a corridor that would begin on BLM land at the Norton Substation and extend the entire distance of the proposed power line (19.5 mi [31 km]). The total acreage within this ROW would be about 473 acres (ac) (191 hectares [ha]) with about 23 ac (9 ha) actually being disturbed during construction. At the Norton Substation, the power line ROW would extend generally west across BLM and USFS land and cross the Rio Grande onto DOE land (Figure 6). Once on DOE land, the proposed ROW would extend northwest to a location south of NM 4 near the White Rock community. From this point on, the ROW would follow a route across LANL that would end at the proposed WTA Substation.

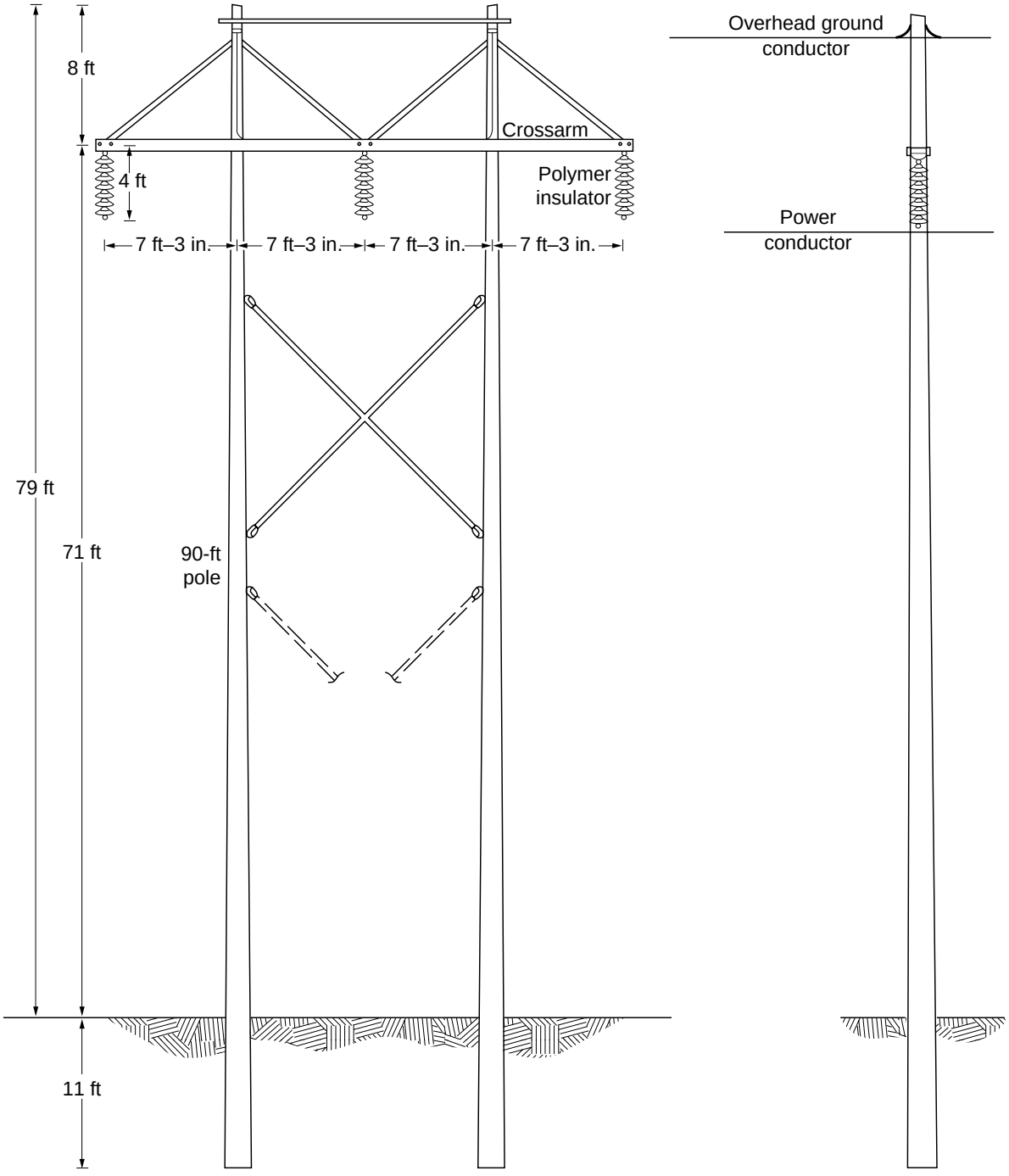

Figure 5a. Typical H-frame diagram for 115-kV pole structure

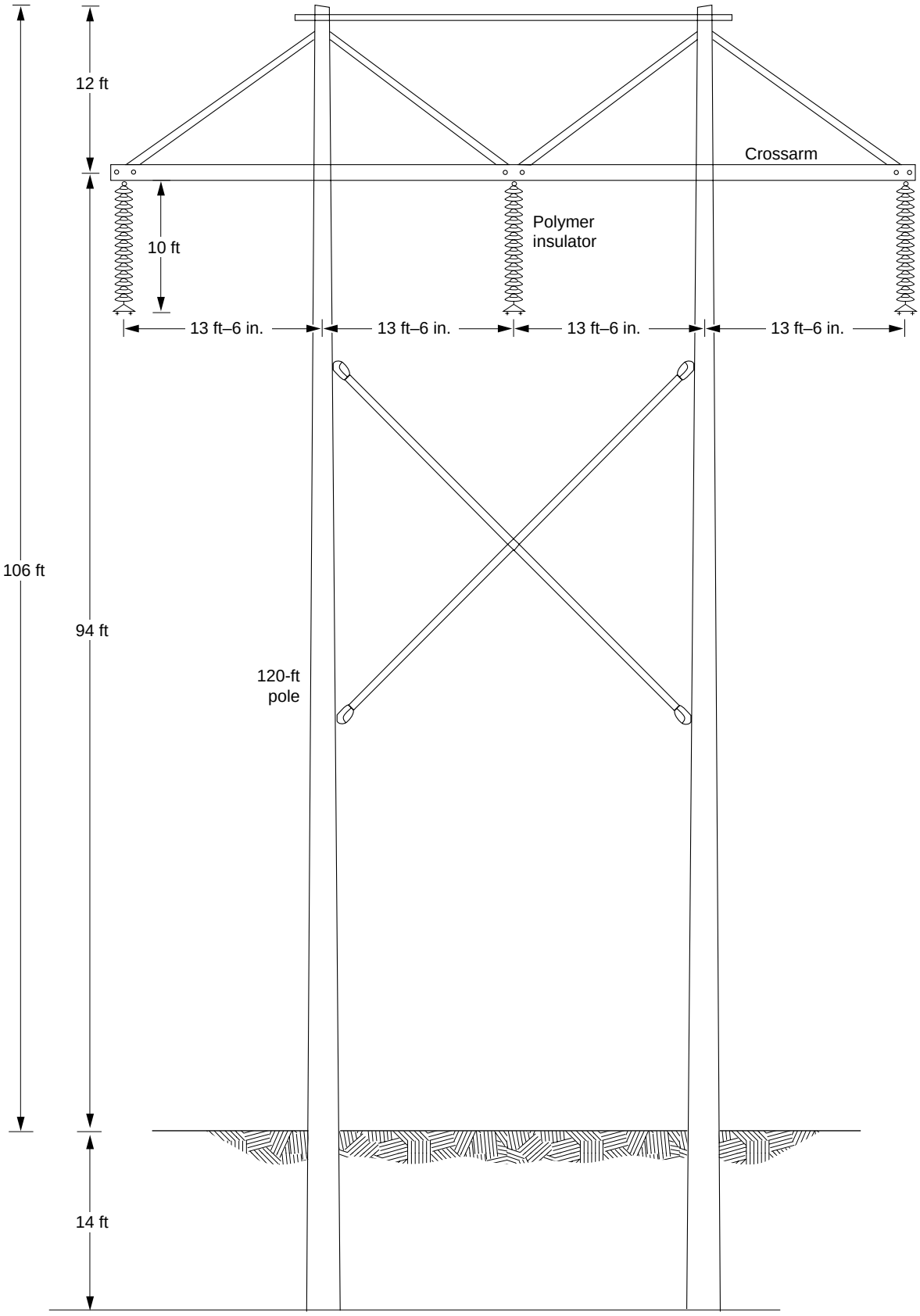

Figure 5b. Typical H-frame diagram for 345-kV pole structure

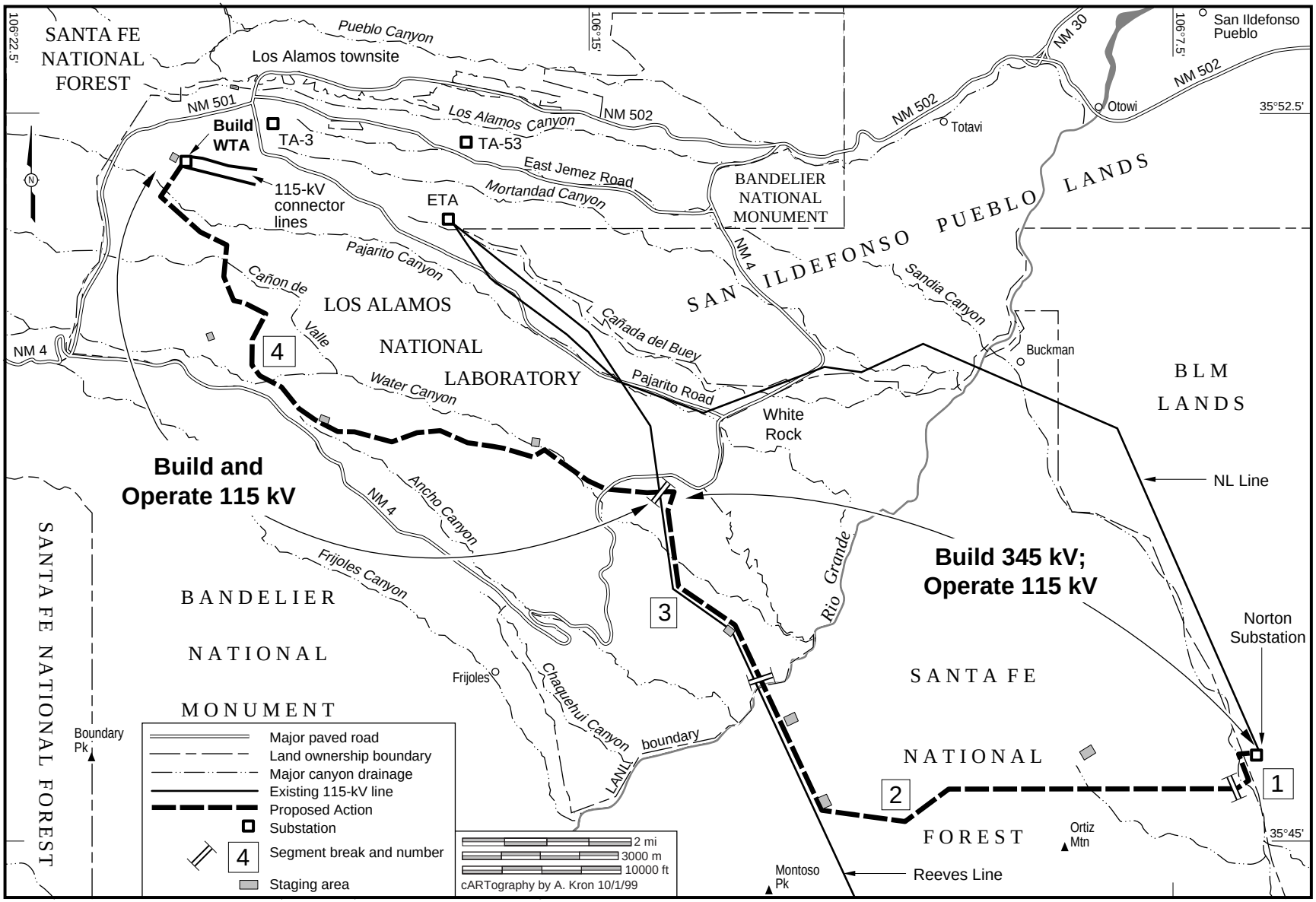

Figure 6. Proposed Action

Two 115-kV lines would be built to connect the WTA Substation to TA-3 and the East Technical Area (ETA) Substation at TA-5.

Two 115-kV line segments would also be constructed to uncross a section of the existing transmission network that serves the Power Pool. These segments would be about 1,200 ft (365 m) long.

2.1.1 Description of the Proposed Power Line Right-of-Way Segments

The Proposed Action ROW is a series of segments numbered 1 to 4. Segment delineation has been established to facilitate the discussion and analysis of potential effects and to differentiate lands administered by BLM, USFS, and DOE. The first three segments (1-3) are common to the Proposed Action and to each alternative (see Sections 2.2, 2.3, 2.4, and 2.5). Segment 4 is specific to the Proposed Action and Alternatives 1 and 2.

Segment 1 would originate at the Norton Substation on BLM land and extend about 1,200 ft (365 m) generally west to the boundary between the BLM and USFS. Segment 2 would begin at the BLM and USFS boundary and extend generally west for a total of approximately 7 mi (11 km) across the USFS land to the west bank of the Rio Grande in White Rock Canyon. Segment 3 would begin on the west bank of the Rio Grande and extend west from White Rock Canyon across a broad mesa top between lower Water Canyon and Ancho Canyon. At this point the segment would turn northwest across lower Water Canyon to a location on the south side of NM 4. The total length of Segment 3 would be about 2.8 mi (4.5 km). Segment 4 would begin at the south side of NM 4 and extend west, parallel to and south of NM 4, and then cross NM 4. At this point, Segment 4 would turn northwest within a wide portion of lower Water Canyon and then the line would turn south out of Water Canyon within an existing fire break corridor. Segment 4 would continue northwest within (and adjacent to) the existing fire break along the south rim of Water Canyon. This segment would then extend north across Water Canyon onto the eastern tip of the mesa top between Water Canyon and Cañon de Valle. The rest of the segment would run generally northwest before ending at the proposed WTA Substation. The total length of Segment 4 would be about 9.5 mi (15 km).

2.1.2 Power Line Construction Activities

Power Line Structures

Construction of the power line, access roads, and designated staging areas could begin at multiple locations within the proposed ROW. Construction is proposed to start in 2004 and would take approximately 12 months to complete. As many as 38 personnel would be directly involved in the construction of the proposed power line during the peak period with a total of 78 personnel over the entire construction period. The Proposed Action involves the following construction activities: modifying the Norton Substation; building a combination 345-kV- (Segments 1, 2, and 3) and 115-kV-designed power line (Segment 4); building two short 115-kV lines for tie-in to the existing TA-3, TA-53, and ETA Substations; two short uncrossing lines; and constructing one substation (WTA). Existing access roads would be used. These would be upgraded or lengthened, but would not require extensive modifications or disturbance. A bounding total of about 5 ac (2 ha) of soil disturbance would be needed to provide new access roads that would be required under the Proposed Action. These roads would be various lengths and widths. Up to a total of about 18 ac (7 ha) of soil around pole structures would likely be disturbed during the construction of the Proposed Action. Figure 6 illustrates the location of proposed construction staging areas under the Proposed Action. The proposed route was developed to avoid potential adverse environmental effects to the maximum extent practicable.

Power Line Construction

Modifications to the Norton Substation would be conducted primarily within the fenced area. Some fencing and other infrastructure surrounding the substation would be modified. Power line construction would begin by surveying a 200-ft (61-m) ROW that would allow flexibility in locating the power line during design and construction. Within this ROW, a 100- to 150-ft- (30- to 45-m-) wide corridor would be used to provide access for placement of the power line pole structures or towers. Segments 2 and 3 of the proposed power line across USFS land and part of DOE land would require a 150-ft- (45-m-) wide corridor to accommodate the 345-kV power line structures. The remaining Segment (4) must have a 100-ft- (30-m-) wide corridor to accommodate the 115-kV power line structures. The two short 115-kV lines would be constructed in a developed area that would require limited clearing. No explosives would be used to construct the power line.

Ground disturbance and selective clearing of vegetation within the corridor would be limited to those areas necessary to accommodate pole structure placement, staging areas, access roads, and the location of the WTA. Trees located within the corridor that could interfere with the overhead lines would be removed, but large scale clearing of vegetation is not anticipated. Following the construction of the power line, disturbed areas would be reseeded with an appropriate seed mix to stabilize the topsoil, and would be monitored and reseeded as appropriate to ensure adequate coverage to control erosion. Non-reflective materials would be used where power lines are expected to be visible to nearby residents and other potential viewers to reduce visibility except in the crossing of the Rio Grande where enhanced visibility of the line is desired for aeronautical safety and to prevent collisions with birds. No artificial lights would be installed anywhere along the line.

Construction and maintenance activities would be avoided or curtailed in areas where Federally-designated threatened and endangered (T&E) species[4] occur, particularly during nesting seasons or where habitat for these species is present. Habitat disturbance would be both temporary and minimal. Pole structures and lines would utilize designs that minimize risk of injury or electrocution to nesting, roosting, or flying birds, so that no effects from the energized lines are expected on birds. Wetlands and floodplains would also be avoided. Power lines would span all wetland areas, and if necessary, conductors and small equipment would be hand carried through these areas during the construction phase of the project so as to avoid the use of heavy equipment. The Norton Substation is situated adjacent to the Cañada Ancha floodplain, thus the beginning of the corridor would cross the floodplain. Power line structures would be placed to avoid geologically unstable areas such as the Cañada Ancha floodplain. Construction and maintenance activities would be monitored by a trained biologist to ensure that Federally-listed T&E species would not be adversely affected.

Clearing or excavation activities during site construction have the potential to generate dust. Standard dust suppression methods (such as water spraying) would be used to minimize the generation of dust during all phases of construction activities.

Pole structures would be located to avoid cultural resource sites including historical and prehistorical archaeological sites, as would access roads and staging areas. Sites would be fenced prior to construction as a protective measure as necessary. Construction activities would be monitored by a trained archaeologist to ensure that these sites would not be affected. If buried items or remains of cultural significance are encountered during construction, activities would cease until their significance was determined and appropriate actions taken.

[4] Under the *Endangered Species Act of 1973* (16 USC 1531 et seq.), DOE is required to consider the potential effects of all its activities on Federal T&E species and their critical habitat.

Once the proposed power line corridor is selectively cleared, power line structure installation would take place. Storm water run-off would be subject to implementation of a National Pollutant Discharge Elimination System (NPDES) permit and an associated Stormwater Pollution Prevention (SWPP) Plan under the *Clean Water Act* (CWA) (33 USC 1251 et seq). The NPDES SWPP Plan would identify all site surface water drainage plans and best management practices (BMPs) that would be implemented to avoid unnecessary soil erosion during construction. The BMPs would include designs for constructing and maintaining surface water flow check dams, storm water retention ponds, and other erosion control measures as deemed necessary under the NPDES permit.

Wire for the proposed power line would be delivered on steel reels that are normally returned to the manufacturer for reuse. Any unused wire could be used elsewhere, returned to the manufacturer, or recycled. There would be about 10 cubic yards (yd^3) (7.6 cubic meters [m^3]) of miscellaneous boxes and packaging that could be disposed of in an appropriate municipal solid waste landfill. No radioactive or hazardous wastes are expected to be generated as a result of implementing the Proposed Action.

The Segment 4 ROW of the Proposed Action intersects two LANL Environmental Restoration Program potential release sites (PRSs). Power line structures would be placed to avoid these areas. These PRSs would also be identified in the field to protect the sites from construction activities.

Power pole structures would be delivered for installation by heavy equipment using existing roads or short sections of new access roads. A truck-mounted drill rig would be used to drill holes for each power line structure. A maximum of about 6,000 square feet (ft^2) (557 square meters [m^2]) of surface area would be disturbed at each pole structure location.

After all power pole structures are erected, the power line conductors would be installed. Conductors and static wires would be strung and supported from the cross arms and insulators using standard power line construction techniques of the Institute of Electronics and Electrical Engineers (IEEE) Guide 524-1992 (IEEE 1992). In two locations along the proposed power line corridor, a helicopter or manual means may be used to string the line to minimize any effects on sensitive T&E habitat sites. These locations are 1) where the proposed power line crosses the Rio Grande in White Rock Canyon and 2) where the proposed line crosses sensitive habitats in Water Canyon in Segment 4.

Substation

The WTA Substation would be constructed at LANL's TA-69, approximately 0.7 mi (1 km) east-southeast of NM 501. In addition, two 115-kV feeder lines would be built to tie in to the 115-kV loop near the existing TA-3 power plant. This action would extend the 115-kV system to improve its reliability by connecting it through the proposed WTA Substation (Figure 7). The WTA Substation would occupy approximately 3 ac (1 ha). Small amounts of waste would be generated by the removal of power lines, which would be disposed of at an appropriate municipal solid waste landfill.

Uncrossing of Existing Lines

In addition to new power line construction, DOE would uncross the Reeves and NL Lines, the two existing 115-kV power lines coming into Los Alamos. This scheme would require new conductors for a portion of the NL Line to make the conductors the same as the Reeves Line conductors. Three new 115-kV wood- or metal-pole structures would be erected under the existing lines about 300 ft (91 m) and 1,000 ft (305 m) away from the crossing to act as transfer points for the two lines. A temporary four-pole V-switch structure would be erected near the crossing. This would provide for temporary connection and switching of the two lines to enable the lines to be uncrossed without shutting down both lines at the same time. A step-by-step switching procedure that would include erecting the pole structures and reconnecting the conductors would be developed. The temporary four-pole V-switch structure would be

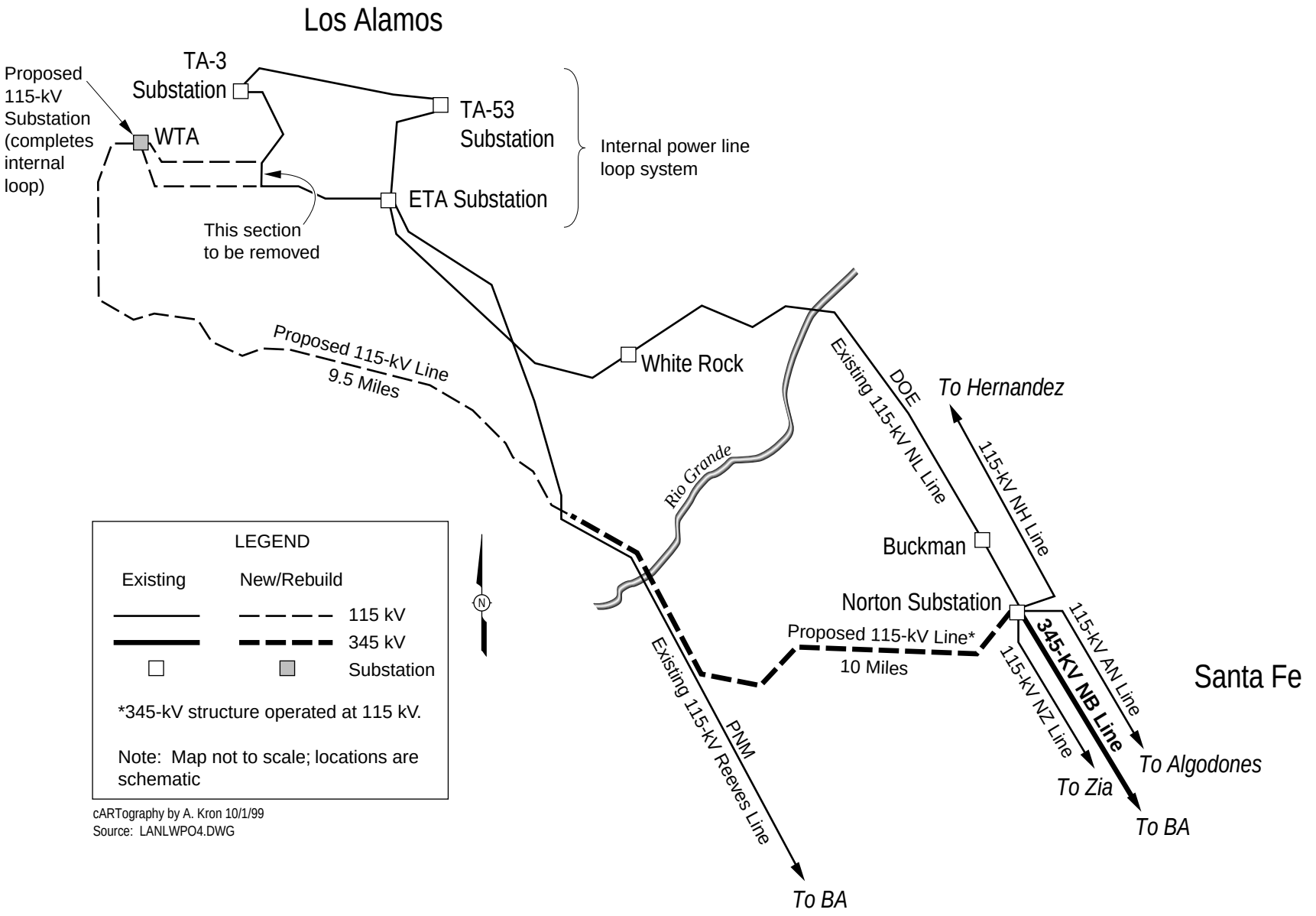

Figure 7. Existing system and Proposed Action.

removed after work on uncrossing the lines is completed. Areas where the work would be done are in the same areas where previous maintenance work on the power lines has been performed. The work could be accomplished within approximately three weeks and would include reseeding of areas after work is completed.

2.1.3 Power Line Operations

The proposed power line system would have a minimum life expectancy of about 50 years and would become operational approximately in the year 2005. The system would operate continuously at a nominal 115-kV, 3-phase, 60-Hertz (Hz) voltage. Individual power pole structures would be serviced on a routine basis via established access roads used during the installation of the power line. This includes annual line inspection, tree trimming as required, and replacement of broken polymer insulators and cross arms as required. Vegetation, roads, and fire breaks would be managed according to best industry management practices within the proposed power line corridor. There would be no waste generated during line operations. There could be a small amount of waste generated by maintenance activities that would be disposed of in a municipal solid waste facility. In addition, all maintenance activities would be conducted in a manner that would not violate permits, consultations, or easement agreements established by DOE, BLM, and USFS as conditions for operating the system.

Under the Proposed Action, the Norton Substation would continue to receive electricity administered by PNM. The present Power Pool capacity would not change from existing levels. Electrical power delivered to the Norton Substation would be transformed to a 115-kV system and switched through a new 115-kV terminal at the Norton Substation for transmission to the Power Pool.

Under the Proposed Action, the WTA Substation would receive and transfer electricity within the Power Pool. Electricity would be transferred through the proposed power line and transformed as necessary for distribution. Within the Power Pool, the WTA Substation would increase reliability of the 115-kV LANL transmission system. Presently, all incoming power to LANL is received at the ETA Substation. With the addition of a new power line and a new substation, power can be delivered to LANL at two different locations (ETA and proposed WTA). This would also create an internal loop, which is a desirable feature that enhances the reliability of the system (Figure 7).

As the proposed power line system approaches its minimum life expectancy, the system would either be upgraded or decommissioned. Such actions would be the subject of a separate NEPA analysis when alternatives for action become ripe for decision.

2.2 Alternative 1

Alternative 1 would involve the construction and operation of a power line ROW that would follow the same route as the one described under the Proposed Action, which would include Segments 1, 2, 3, and 4 (Figure 8). Segments 1, 2, and 3 would be built and operated at 345 kV. Segment 4 would be built and operated at 115 kV. Access roads and construction staging areas would be constructed in the same locations as identified under the Proposed Action. The total length (19.5 mi [31 km]) of the ROW under this alternative would be the same as the Proposed Action. Construction techniques as well as the schedule, workforce, and approach to constructing the power line would be essentially the same as that described under the Proposed Action. Uncrossing of the Reeves and the NL Lines would also occur under this alternative. Measures to protect sensitive biological and cultural resources would be the same as those described under the Proposed Action.

In contrast to the Proposed Action, this alternative would require the construction and operation of a power line to 345-kV specifications over Segments 1, 2, and 3. The rest of the line (Segment 4) would be constructed and operated to 115-kV specifications as described in the Proposed Action (Section 2.1).

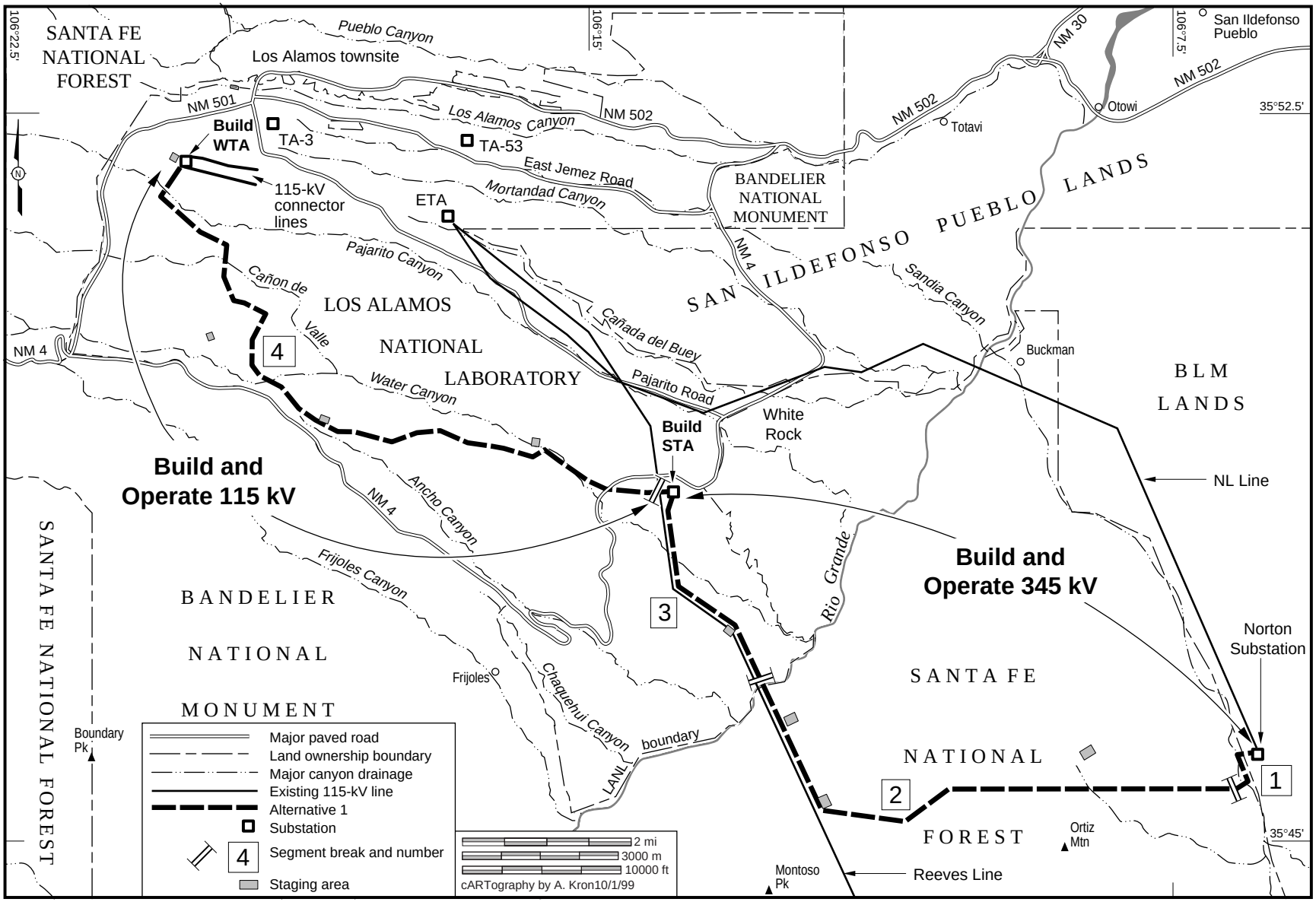

Figure 8. Alternative 1

The number and placement of pole structures would be the same as described in the Proposed Action (Section 2.1). Two substations, WTA and South Technical Area (STA), would be required under this alternative with a connection to the 345-kV side power circuit breaker on the existing network at the Norton Substation. The STA Substation would be constructed at a location south of NM 4, at the northern end of Segment 3. The corridor width and affected acreage would remain the same as described in the Proposed Action (Section 2.1). Measures to protect sensitive biological and cultural resources would be the same as those described under the Proposed Action.

2.3 Alternative 2

Alternative 2 would involve the construction and operation of a power line that would follow the same route as the one described under the Proposed Action, which would include Segments 1, 2, 3, and 4 (Figure 9). All four segments would be built and operated at 115 kV. Access roads and construction staging areas would be constructed in the same locations as identified under the Proposed Action. The total length of the ROW under this alternative would be the same as the Proposed Action. Construction techniques as well as the schedule, workforce, and approach to constructing the power line would be essentially the same as that described under the Proposed Action. Uncrossing of the Reeves and the NL Lines would also occur under this alternative. Measures to protect sensitive biological and cultural resources would be the same as those described under the Proposed Action.

In contrast to the Proposed Action, this alternative would require the construction and operation of a power line to 115-kV specifications over the entire length of the corridor. More pole structures would be placed in Segments 2 and 3 because the shorter 115-kV pole structures (79 ft [24 km]) also require shorter spans. The crossing of the Rio Grande would require two taller 106-ft (32-m) structures to span the canyon. Only one substation, WTA, would be required under this alternative. The corridor would be 100 ft (30 m) wide over its entire length rather than the combination 100- to 150-ft- (30- to 45-m-) wide corridors as under the Proposed Action. Although the ROW would total about 473 ac (191 ha), only about 26 ac (10.5 ha) would be disturbed by construction of this corridor. Segments 1, 2, and 3 would require approximately 66 pole structures and Segment 4 would require about 55 pole structures to support the power line. Measures to protect sensitive biological and cultural resources would be the same as those described under the Proposed Action.

2.4 Alternative 3

Alternative 3 considers the installation and operation of a power line corridor across BLM, USFS, and DOE land along the previously described Segments 1, 2, and 3 up to a location south of NM 4. From there this alternative's route across LANL would differ from the Proposed Action. This alternative power line route is illustrated in Figure 10. The power line corridor under this alternative includes Segment 5, which begins at a location south of NM 4 at the end of Segment 3. This line would be built using 345-kV type pole structures along Segments 1, 2, and 3; would use 115-kV type pole structures along Segment 5; and would operate at 115 kV the entire length. Segment 5 represents an alternate route for the northernmost section of the proposed ROW that parallels existing 115-kV lines. This segment would extend north-northwest approximately 7.5 mi (12 km) from the location south of NM 4 across the north-central portion of LANL through the proposed WTA Substation and end with two 115-kV feeder lines to tie-in to the TA-3 Substation. This alternative's ROW is approximately 17.5 mi (28 km) long and covers an area of about 423 ac (171 ha). Only about 22 ac (9 ha) would actually be disturbed by power line construction and operation.

The number (approximately 43) and height (106 ft [32 m]) of pole structures needed for Segments 2 and 3 would remain the same as estimated under the Proposed Action. However, the number of pole structures for Segment 5 (approximately 50) would be less than Segment 4 under the Proposed Action.

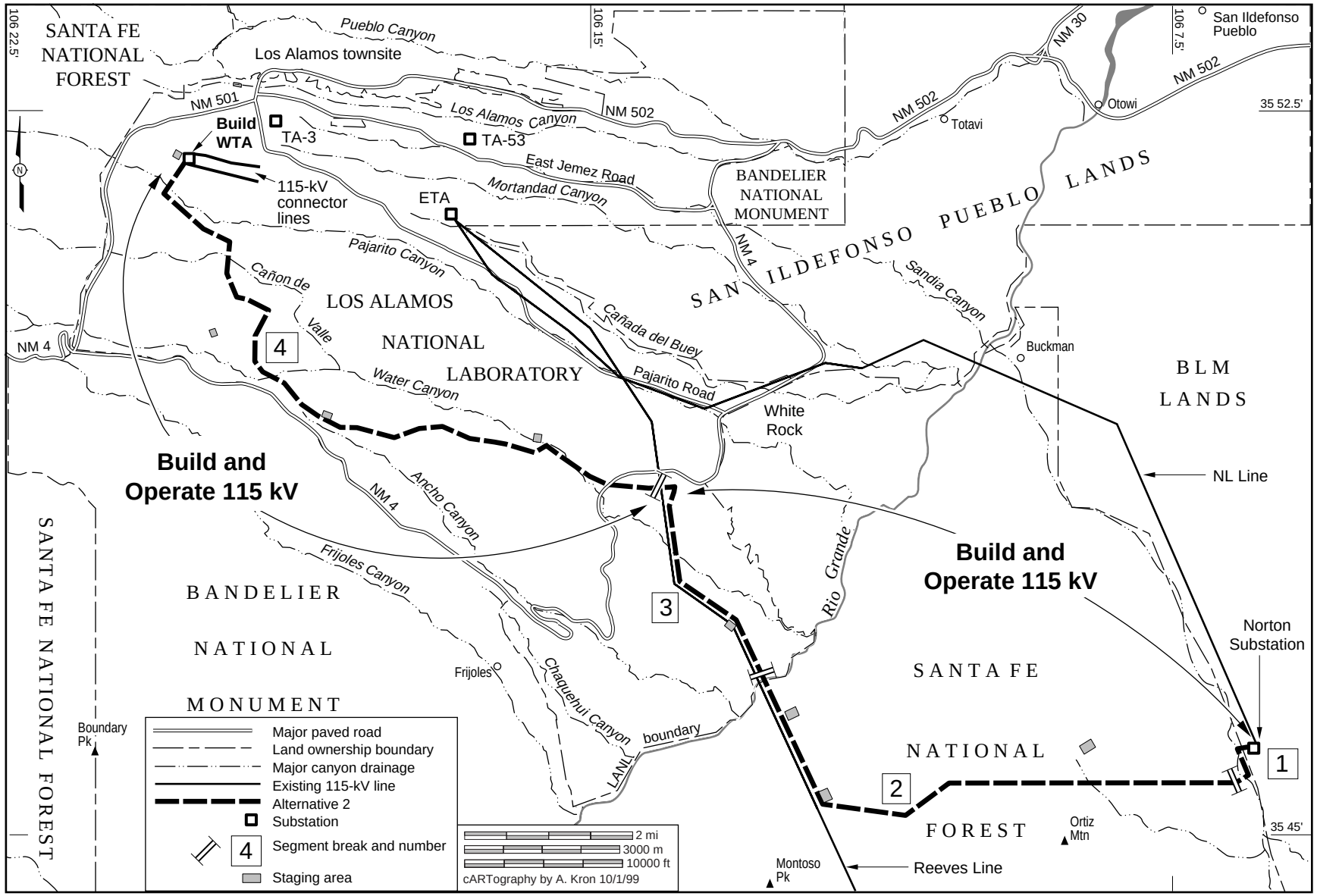

Figure 9. Alternative 2

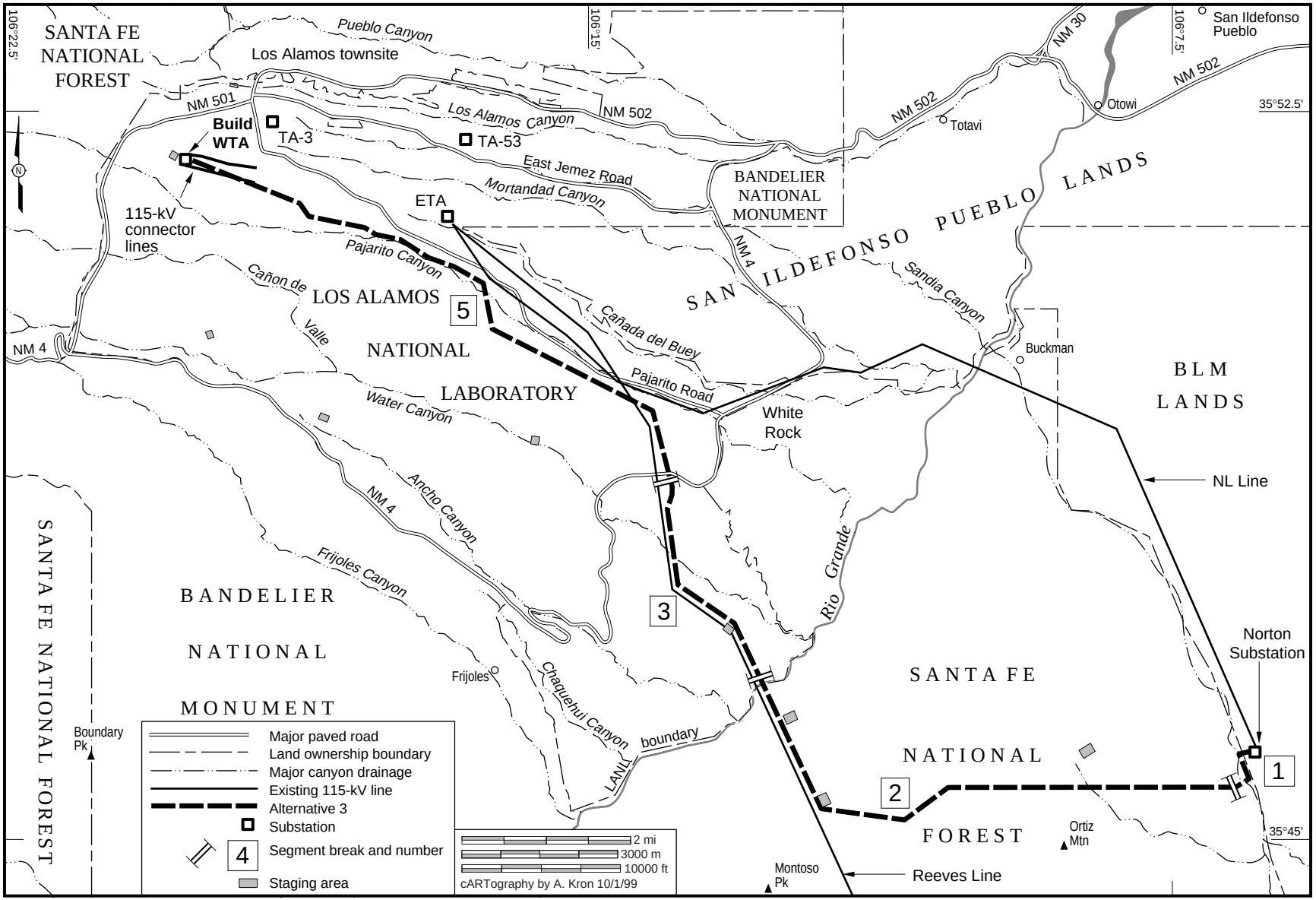

Figure 10. Alternative 3

The corridor width would remain the same for Segments 1, 2, and 3. The width of Segment 5 would be 100 ft (30 m). The uncrossing of the NL and Reeves Lines would also occur under this alternative. Measures to protect sensitive biological and cultural resources would be the same as those described under the Proposed Action.

2.5 Alternative 4

Alternative 4 would involve the construction and operation of a power line corridor across BLM, USFS, and DOE land (i.e., Segments 1, 2, and 3) up to a location south of NM 4. From here the alternative route would generally follow an existing developed road and utility corridor (13.8-kV line) at LANL (Segment 6) as illustrated in Figure 11. This line would be built using 345-kV type pole structures along Segments 1, 2, and 3; would use 115-kV type pole structures along Segment 6; and would operate at 115 kV the entire length. The 13.8-kV line and the water and communication lines in this area may need to be relocated. The total length of the ROW for this alternative is about 25.5 mi (41 km). However, from the location south of NM 4, Segment 6 would closely parallel NM 4 to the intersection with NM 501, a ROW distance of 15.5 mi (25 km) with a ROW area of 376 ac (152 ha). Only about 30 ac (12 ha) would actually be disturbed by power line construction and operation. At the intersection with NM 501, Segment 6 would extend northward along NM 501 to a location directly west of the WTA Substation. At this location, Segment 6 would extend east through the WTA Substation and end with two 115-kV feeder lines to tie-in to the TA-3 Substation. This alternative would also involve the construction and operation of the WTA Substation as described in Section 2.1. All power line and access road construction, operation, and maintenance activities would be similar to those described under the Proposed Action.

The number (approximately 43) and height (106 ft [32 km]) of pole structures needed for Segments 2 and 3 would remain the same as estimated under the Proposed Action. The number of pole structures for Segment 6 (approximately 102) would be greater than for Segment 4 under the Proposed Action. Corridor widths would remain the same as estimated under the Proposed Action. The uncrossing of the NL and Reeves Lines would also occur under this alternative. Measures to protect sensitive biological and cultural resources would be the same as those described under the Proposed Action.

2.6 No Action Alternative

The No Action Alternative describes existing conditions and serves as a baseline for comparing the potential environmental effects of the Proposed Action. It must be considered even if DOE is under a court order or legislative command to act [10 CFR 1021.32(c)]. Under the No Action Alternative, a new power line originating at the Norton Substation and ending at LANL would not be constructed. No land clearing or installation of power line components would occur on BLM, USFS, or DOE lands. Any potential environmental effects along the proposed power line ROW would not occur. BLM and USFS lands would remain as Federal lands available for their present multipurpose uses. DOE land uses at LANL would also remain unchanged. The potential benefit of reliability in electrical power supply from a new power line for current and future LANL and Los Alamos County operations would not occur.

More frequent and longer duration of outages would be expected due to extensive maintenance problems with existing lines and shortages in the regional power supply. There is a plan for load shedding at LANL in the event of a substantive reduction in the supply of power. This plan includes a priority list of facilities. The plan was not necessarily designed to serve for selected reduction in operations that would be needed for managing excess demand, but it could be used for that purpose. Load shedding would occur until additional power could be obtained to return LANL to normal operations.

Fiber optics cable infrastructure to provide higher speed, higher volume communication service for LANL would be delayed until another method for access, such as buried fiber optics cable systems, is provided to distant areas. The burial of such systems may be difficult through many areas that access

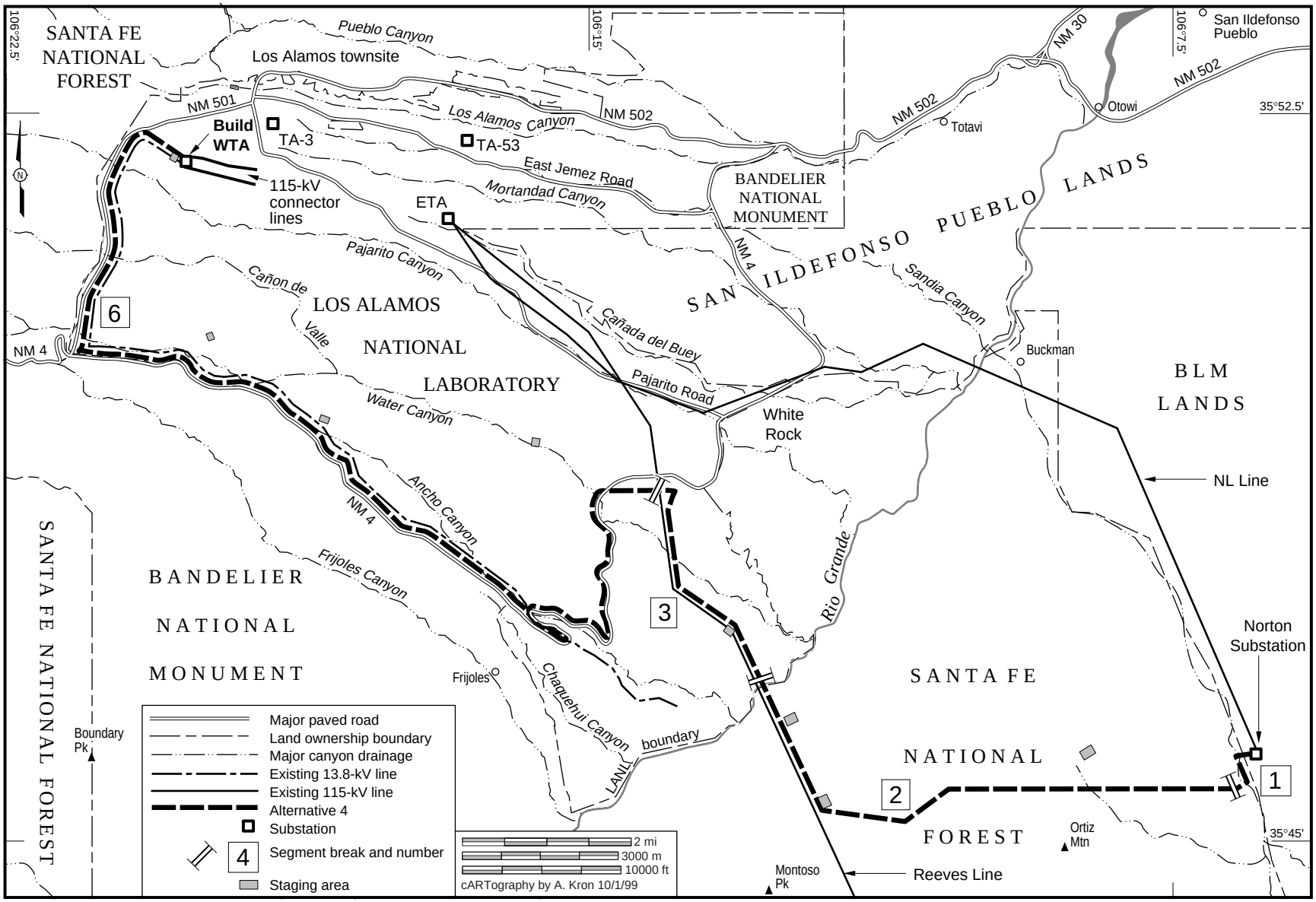

Figure 11. Alternative 4

LANL. Burial of cable could have adverse effects on sensitive biological (inclusive of wetlands and T&E species). It could also have adverse effects on cultural resources.

2.7 Alternatives Considered but Dismissed

There are numerous potential ROWs that could be evaluated for constructing a new power line to the Power Pool. New power line ROWs (such as a ROW that parallels NM 502) could originate at any location in northern New Mexico that is serviced by a 345-kV power supply and could terminate at any location in Los Alamos County that would provide access to the existing Power Pool. In order to address the Purpose and Need for Agency Action (Section 1.3), potential ROWs that would be excessively longer than proposed under Alternatives 1 through 4, or that are not specifically designed to improve the reliability of the existing Power Pool were not considered as viable alternatives, and were not analyzed further in this EA.

Enhancement of the Existing Norton-Los Alamos Power Line

The enhancement of the existing NL power line would not meet DOE's Purpose and Need for Agency Action. Under this scenario, the NL power line that crosses San Ildefonso Pueblo (Figure 4) would be upgraded to improve reliability and to handle an increased power load. This action would require the removal and replacement of the existing pole structures with newer and taller pole structures capable of carrying 345 kV of electricity. A new substation would need to be built either on DOE or Pueblo lands. Construction of an upgraded NL power line could require a wider corridor than currently exists and could have adverse effects on wildlife habitats and cultural sites on Pueblo lands. The ROW for this power line would continue to be leased to DOE by the Pueblo. Control of and access to this line would be limited to the conditions of the lease and would not be under direct government control.

This scenario would not improve the reliability of the Power Pool because the total number of lines feeding the Pool would remain at two. The loss of either of the two existing lines would continue to pose a major power supply problem at LANL and Los Alamos County. Load shedding and curtailment of essential mission activities at LANL could still occur. The improvements in system reliability that come with the construction of a third power line would not occur under this scenario. Therefore, this scenario has been dropped from further consideration in this EA.

Construction and Operation of a 345-kV Power Line

The construction and operation of a 345-kV power line was considered. This scenario would involve construction and operation of a 345-kV power line along the entire length of the proposed power line project. A 345-kV power line would increase reliability and provide additional electrical capacity to the Power Pool. The final SWEIS for LANL considers that the Preferred Alternative, if fully implemented, would result in additional power demands that cannot be met under the current import agreements for electric power (DOE 1999b). However, at this time, DOE has not committed to revising these import agreements to increase electrical capacity at LANL. This alternative would far exceed the level of effort and expense necessary to increase the reliability of electric service at LANL and would also far exceed projections of electrical consumption by the Power Pool for the next 10 years. Therefore, this scenario has been dropped from further consideration in this EA.

Construction of the OLE Transmission Line

Revival of the OLE Transmission Line project was considered. This scenario would involve the construction and operation of the formerly proposed OLE project. This project was designed by PNM to consist of about 47 mi (75 km) of 345-kV power line. This power line would originate at a new substation in the Coyote, New Mexico area, pass through the Jemez Mountains, connect with a new substation in the Los Alamos area, cross Los Alamos and Santa Fe Counties, and terminate at the existing

Norton Substation. This proposed power line would provide 345 kV of increased power capacity directly to LANL and improve system reliability by creating two additional lines of service into the Power Pool. The PNM request to begin construction of the OLE project was denied by the New Mexico Public Utility Commission (now called the Public Regulation Commission). If either DOE or PNM decided to pursue this scenario, it is questionable whether or not the necessary approvals required to initiate construction could be obtained from the Commission.

In the early 1980s, the Bureau of Indian Affairs determined that the OLE project could have a significant impact on the environment and prepared an EIS for the project (BIA 1986). Based on the assumptions used in this EIS, the OLE project could disturb over twice the amount of land and result in greater environmental impacts than would be expected under the Proposed Action analyzed in this EA. Portions of the proposed OLE route would cross private lands and require lease agreements. The OLE project would provide additional power capacity to the Power Pool as well as to portions of northern New Mexico. Since the OLE project would have significant environmental impacts and far exceed the requirements of what DOE needs to do in order to meet its Purpose and Need for Agency Action, the OLE project scenario has been dropped from further consideration in this EA.

Development or Enhancement of Alternative Power Generating Technology

The development or enhancement of alternative power generation at LANL was considered. This scenario would involve the development of local or onsite alternative power technologies such as solar, hydroelectric, nuclear, natural gas turbines, and coal to generate the needed electricity. An alternative power generating technology scenario (e.g. solar power) would be cost and time intensive due to the technical and environmental challenges involved. A new power plant or major enhancement of the power generating plant in TA-3 using alternative or existing technology for electricity generation (such as natural gas-fired turbines) could not be achieved in a reasonable time period to meet the power supply reliability need. Similarly, the installation of small, power generation units at individual buildings could not be achieved at a reasonable cost and within a reasonable time frame as this would include the need for installation of an additional gas main, refitting of heating, ventilation, and air conditioning (HVAC) systems, and installing backup fuel supply capabilities. Electrical standard industry practices for estimating costs of centrally located gas-fired turbines is, at a minimum, about $1M per megawatt of power generated (therefore, 90 megawatts of power would cost a minimum of about $90M to produce). In addition, preliminary cost estimate studies have indicated that the cost for installing a new gas main to LANL would range from $80M to $200M to support these turbines. Best professional estimates of the time required to install these technologies and make them operational would be in excess of ten years. Hydroelectric and nuclear power would be prohibitive in terms of cost, schedule, and public perception. Some of the possible energy sources, such as natural gas and coal, considered in this scenario could increase environmental pollution and require additional fuel supplies and extensive and expensive permitting, monitoring, and mitigation programs. Use of natural gas or oil could adversely affect natural and cultural resources during the construction of new pipelines and facilities. Since this scenario does not meet DOE's Purpose and Need for Agency Action in a timely and fiscally responsible fashion and does not fully respond to the need for reliable power delivery, it has been dropped from further consideration in this EA

Underground Construction

Construction of electric and fiber optics lines underground was considered. Underground electric transmission systems have been constructed in the U.S. since the late 1920s, both for voltage distribution lines and high-voltage (HV) systems (BIA 1985). HV systems are classified as those equal to or greater than 115 kV. Most underground HV installations have been constructed in congested urban areas. An underground HV power line requires technological considerations very different from those utilized for lower voltage underground distribution lines. The underground construction of HV power lines is vastly

more complex and costly than a low-voltage line because of technical problems associated with mechanical and voltage stresses on the HV insulating material. For installations of 115-kV power lines over a distance of approximately 19.5 mi (31 km), there are only three types of technically feasible underground transmission cable systems in service. These are 1) high-pressure, oil-filled pipe systems; 2) low-pressure, self-contained, oil-filled cable systems; and 3) solid dielectric systems.

Construction of an underground transmission line requires a continuous zone of disturbance approximately 2 ft wide and 3 to 5 ft deep (0.6 m wide and 0.9 to 1.5 m deep). If a high-pressure oil-filled type cable system is used, above ground pumping and pressurizing facilities would be required. Large overhead structures are required where a transition is made between overhead and underground transmission lines. Underground construction of a 115-kV transmission line can cost five to ten times more per mile than a new 115-kV transmission line installed overhead (DOE 1994).

Running underground utilities would pose additional effects to sensitive resources such as biological and cultural resources. The technical complexity associated with mechanical and voltage stresses on the HV insulating material, very high costs, and difficulties in construction associated with trenching, access, and servicing associated with manholes required for installing, jointing, splicing, and maintaining underground installations, combined with environmental considerations eliminate an underground transmission system as a viable project alternative.

2.8 Related DOE NEPA Actions

2.8.1 Final SWEIS for the Continued Operation of the Los Alamos National Laboratory (DOE/EIS-0238)

The Final LANL SWEIS, dated January 1999, was issued in February of that year (DOE 1999a). A record of decision was issued in September 1999 and a Mitigation Action Plan (MAP) was issued in October 1999. As discussed in the SWEIS, DOE will continue operating LANL. Four action alternatives for the continued operation of the facility were analyzed in the SWEIS: 1) the Expanded Operations Alternative, 2) the Preferred Alternative, 3) the Reduced Operations Alternative, 4) the Greener Alternative, and 5) the No Action Alternative. The affected environment for most resources is within a 50-mi (80-km) radius of LANL. Analysis indicates little difference in the environmental impacts among the alternatives analyzed. The primary discriminators are collective worker risk due to radiation exposure, socioeconomic effects due to LANL employment changes, and electrical power demand. Per the MAP, a Natural Resources Management Plan will be developed over the next two years. This EA addresses only actions that are under consideration to meet reliability requirements and does not address additional electrical power demand or capacity at LANL. An additional NEPA review would need to be performed by DOE to address increased electrical power or capacity demands at LANL.

2.8.2 Final EIS for the Conveyance and Transfer of Certain Land Tracts at Los Alamos National Laboratory (DOE/EIS-0293)

The *Draft Conveyance and Transfer of Certain Land Tracts at Los Alamos National Laboratory EIS* was issued in February 1999 (DOE 1999b), and a Final EIS was issued in February 2000. A record of decision is expected in the Spring of 2000. DOE needs to meet requirements that were legislated under Section 632 of Public Law (PL) 105-119 *The Departments of Commerce, Justice, and State, The Judiciary, and Related Agencies Appropriations Act of 1998, (42 USC §§ 2391)* to convey and transfer certain parcels of land. To be conveyed or transferred, these tracts must not be necessary for DOE mission-related required use, must have undergone any necessary environmental restoration or remediation activities, and must be suitable to support future uses for historic, cultural, or environmental preservation purposes, for community self-sufficiency purposes, or for diversification purposes by the named recipients. This EA does not evaluate the potential need for additional electrical power for Los

Alamos County or Santa Fe County development as described in the Proposed Action Alternative addressed in the Draft EIS. The power line(s) considered within this EA do not cross any lands being considered for conveyance and transfer action by DOE.

2.8.3 Bighorn Sheep EA

The potential introduction of bighorn sheep into the area is currently being contemplated. It is anticipated that an EA will be developed in about 2002 to consider the potential impacts associated with their reintroduction into the Pajarito Plateau. The EA effort would be led by the U.S. Department of the Interior, National Park Service, Bandelier National Monument with participation by the New Mexico Game and Fish Department. DOE is a Cooperating Agency in the preparation of the planned EA.

3.0 AFFECTED ENVIRONMENT

3.1 Regional Setting

The Proposed Action and each of the other alternatives analyzed would be located within areas of Los Alamos and Santa Fe Counties that include LANL, a section of USFS land, and a small section of BLM land. BLM lands are used primarily for grazing and recreation and include numerous dirt and gravel roads, several utility corridors, and the Norton Substation. USFS lands are more remote and include areas that are used for cattle grazing and public recreation as well as utility corridors.

LANL is a government-owned, contractor-operated (by the University of California [UC]), multidisciplinary research facility that is located on 43 mi^2 (111 km^2) of land in north-central New Mexico approximately 60 mi (96.5 km) north of Albuquerque. It comprises a large portion of Los Alamos County and extends into Santa Fe County. LANL is situated on the Pajarito Plateau along the eastern flank of the Jemez Mountains and consists of 49 TAs. The Pajarito Plateau slopes downward towards the Rio Grande along the eastern edge of LANL and contains several finger-like mesa tops separated by relatively narrow and deep canyons.

Commercial and residential development in Los Alamos County is confined primarily to several mesa tops lying north of the core LANL facility, in the case of the Los Alamos Townsite, or southeast, in the case of the communities of White Rock and Pajarito Acres. The lands surrounding Los Alamos County are largely undeveloped wooded areas with large tracts located to the north, west, and south of LANL that are administered by the USFS (Santa Fe National Forest), the National Park Service BNM, and BLM (to the southeast). Lands held in trust for San Ildefonso Pueblo by the U.S. Department of the Interior border LANL to the east.

Detailed descriptions of LANL's natural resources environment, cultural resources, socioeconomics, waste management, regulatory compliance record, and general operations are presented in the *Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory* (DOE 1999a) and the *Environmental Surveillance and Compliance at Los Alamos During 1998* (LANL 1999a) report. These documents may be found in the LANL library and are available on the world wide web at http://nepa.eh.doe.gov/eis/eis0238/eis0238.html and at http://lib-www.lanl.gov/la-pubs/la-13633.pdf.

3.2 Potential Environmental Issues

Based on the Proposed Action construction and operation description, potential environmental issues were identified depending upon their individual applicability to the Proposed Action or the other alternatives analyzed in this EA. Table 3-1 identifies the issues of interest and the subsection in the EA

where these potential issues are discussed. Certain issues are regional in nature and may not have a direct correlation to a particular power line segment.

Table 3-1. Potential Environmental Issues

Environmental Category	Applicability	Described in Section
Visual Resources (including wilderness areas)	Yes	3.3
Human Health	Yes	3.4
Cultural Resources	Yes	3.5
Ecological Resources, T&E Habitat, Wetlands, Floodplains	Yes	3.6
Water Quality	Yes	3.7
Land Use	Yes	3.8

Based on the Proposed Action and alternatives, potential environmental resources that may be affected were identified using the sliding scale approach as discussed in Section 1.4. Table 3.2 lists those environmental resources that were considered but not analyzed further because the Proposed Action and the alternatives are expected to have either no effect or a negligible effect on these resources.

Table 3-2. Environmental Issues Dismissed

Environmental Category	Applicability	Described in Section
Socioeconomics	The proposed power line corridor and roads would be constructed over a period of 12 months. Total labor requirements for the proposed project are estimated to be 78 persons. Construction would probably bring a temporary work force to the project area. Because of the relatively low number of workers and short time frame needed to construct the proposed power line, construction activities would have a negligible effect on the socioeconomic character of the surrounding communities. Maintenance and operation of the new power line would be performed by existing commercial organizations and staff.	NA
Noise	Power line and background noise level measurements were measured along the 345-kV NL Line and along the 115-kV Reeves Line. Noise levels under the power line were found to be consistent with background levels. Los Alamos County has promulgated a local noise ordinance that established noise level limits for residential land uses (DOE 1999b). The U.S. Environmental Protection Agency (EPA) recommends 55 decibels (dB) as an acceptable noise level for residential areas to protect the public health and welfare. The sounds generated by the proposed lines are expected to be well below these maximum levels. If any construction equipment is used that would increase the background noise level by more than 6 dB within an AEI, then the activity must be scheduled outside of the March 1 to May 15 time frame of any given year. Due to distance of the power line from BNM, no operational noise will affect BNM. Construction noise above background levels may occur in approximately the two-mile section closest to NM 4 and BNM for a very short time.	NA

Table 3-2. Cont.

Environmental Category	Applicability	Described in Section
Air Quality	The National Ambient Air Quality Standards (NAAQS) of the Clean Air Act for nonradioactive air emissions are regulated by the State of New Mexico for the U.S. EPA. None of the areas within LANL and its surrounding counties are designated as nonattainment areas. A nonattainment area has air quality worse than that designated by the NAAQS for one or more criteria pollutants. Construction activities would temporarily increase localized particulate and other criteria pollutants. This increase would raise short-term emissions by less than 2 percent over LANL's total 1998 emission levels, except for particulate matter (PM) and sulfur dioxides (SO_2). PM emissions would increase by less than 9 percent for the one-year power line construction period. SO_2 levels would increase by about 40 percent during the one-year power line construction period, but LANL emissions for this particulate are so low that even this increased amount would be less than ½ ton (0.45 metric ton) per year.	NA
Waste Management	No solid waste management, treatment, or active disposal sites would be disturbed by any of the ROWs. Wastes generated by the Proposed Action would either be recycled, left onsite (e.g., soils and rocks), or would go to an appropriate municipal solid waste landfill.	NA
Environmental Justice	Populations that are subject to environmental justice considerations are present within 50 mi (80 km) of Los Alamos County. However, as none of the routes associated with the Proposed Action or the alternatives are located in populated areas, the implementation of the Proposed Action is not expected to result in any disproportionately high and adverse human health or environmental effects on minority and low-income populations.	NA
Utilities	Construction of a new 19.5-mi (31-km) power line would ensure that a reliable electric transmission system exists to deliver electricity to operations and residents in the project area.	NA
Environmental Restoration	There are no environmental restoration sites on either BLM or USFS land. There are no PRSs in Segment 3. Two PRSs intersect Segment 4. These PRSs would be clearly delineated before construction began and would not be disturbed during construction of the power line.	NA

NA = Not Applicable

3.3 Visual Resources

The following discussion addresses the visual character of the corridors for the Proposed Action and the alternatives (by segment). The visual qualities of Segments 1 and 2 were analyzed according to the BLM's Visual Resource Management methodology. The general area of Segments 3, 4, 5, and 6 was analyzed according to the USDA Visual Quality Objectives system (BIA 1986). Table 3-3 describes the visual categories used in these systems that apply to the proposed power line.

Table 3-3. BLM and USFS Visual Resource Systems as Applied to the Proposed Power Line

System	Classification	Description	Application to Power Line ROW	Corresponding OLE Section
BLM	Class I	Restricted management activities; applies to wilderness and other similar areas	NA	NA
	Class II	Management activities may change basic visual elements but should not be evident and should not attract attention	Segment 2 (westernmost 0.5 mi [0.8 km])	Segment W (approx. milepost 0-0.5)
	Class III	Management activity may be evident and attract some attention; however, changes should be subordinate to the existing characteristic landscape	Segment 1, Segment 2 (all but westernmost 0.5 mi [0.8 km])	Segment W (approx. milepost 0.5-6.36)
USFS	Partial Retention	Noticeable deviations must remain visually subordinate to the landscape character	Segment 3; canyon portions of Segments 4, 5, and 6	Segment X, Z
	Modification	Deviations from the natural landscape begin to dominate but the modifications retain some attributes similar to the surrounding areas and complementary to those within the landscape being viewed	Mesa top portions of Segments 4, 5, and 6	Segment Z

NA = not applicable

The dominant landform in the Segment 1 area is Cañada Ancha. An escarpment of the Caja del Rio forms the western border of Cañada Ancha and can be viewed from the proposed ROW. Thus, although this area is generally undeveloped, the Norton Substation, several 115-kV power lines, and a 345-kV power line introduce industrial elements. A dirt road, a pipeline ROW, and an abandoned railroad grade are also located within Segment 1. Segment 1 is considered to be a Class III landscape.

The dominant landforms in the Segment 2 area are mesas, benches, and canyon escarpments. This segment area includes White Rock Canyon and the Rio Grande. The area is largely undeveloped. A few dirt roads and a 115-kV power line cross the area. This segment provides views of the Jemez Mountains, BNM, the communities of White Rock and Pajarito Acres, and LANL, particularly from the eastern edge of White Rock Canyon. This segment area also overlooks the Rio Grande where the two existing power lines span the river. Portions of this segment area are visible from White Rock and from BNM. The White Rock Canyon and Rio Grande part of this area is categorized as a Class II landscape. The remainder of the segment area is categorized as Class III landscape.

The dominant landforms of the Segments 3, 4, 5, and 6 areas are mesas and canyons. All of Segment 3 parallels an existing 115-kV power line. Segments 4 and 5 cross NM 4 and pass through partially developed LANL TAs. Segment 6 parallels an existing 13.8-kV utility corridor along NM 4 and NM 501 for most of its length. Although various underground utilities and an overhead electrical distribution line run along these roads, the area bordering the highway is generally undeveloped in the vicinity of the proposed ROW. Segment 6 also passes along the boundary of the BNM Ponderosa Campground and the entrance to BNM. These areas, analyzed according to USFS methods, fall into the requirements of two categories: partial retention and modification. The partial retention category is considered a slightly altered landscape with moderate scenic integrity, and the modification category is considered a moderately altered landscape with low scenic integrity (USDA 1995). Segment 3 and the mesa top areas of Segments 4, 5, and 6 meet the visual quality objective of the partial retention category; the canyon areas of Segments 4, 5, and 6 meet the visual quality objective of the modification category (BIA 1986).

The area where the existing power lines would be uncrossed is on a mesa dominated by power lines and other industrial elements. It is within the modification category area.

The visual characteristics of the proposed power line segments are summarized in Table 3-4.

Table 3-4. Existing Visual Environment - Segments 1 through 6.

Alternative	Segment	Character and Visibility	Dominant Landforms
All	1	Industrial development in area of Norton Substation; otherwise undeveloped	canyon bottom
All	2	Undeveloped but with 115-kV power line present in part of area	mesa, benches White Rock Canyon
All	3	Undeveloped but parallel to existing 115-kV power line; visible against skyline from residences along southwest margin of White Rock	mesa top White Rock Canyon
Proposed Action	4 (east)	Undeveloped; visible at NM 4 crossing and from dirt trail up Water Canyon (restricted access); also visible on skyline from LANL roads and along western part of segment from NM 4 at distance of 0.5 to 1 mi (0.8 to 1.6 km)	canyon bottom
Proposed Action	4 (west)	Undeveloped with roads and LANL facilities interspersed; southwestern part of segment visible from LANL roads; probably screened by trees from BNM Ponderosa Campground and by elevation differences from Bandelier entrance	mesa top
Alternative 1	1-4	Same as above	Same as above
Alternative 2	1-4	Same as above	Same as above
Alternative 3	5	Undeveloped with roads and LANL facilities interspersed, parallel to existing 115-kV power line; partly visible from Pajarito Road and from LANL facilities	mesa tops and canyon crossings
Alternative 4	6	Generally undeveloped except for highways, underground utilities, and electrical distribution line; visible on skyline and along highways for entire length; visible at BNM Ponderosa Campground and BNM entrance	mesa tops and canyon crossings
All	Uncrossing	Existing power lines and other industrial elements	mesa top

3.4 Human Health

In this EA, human health considers both LANL workers and the general public residing in the vicinity of LANL. UC routinely monitors the health of LANL workers. Worker health monitoring programs assess a wide range of potential concerns including exposures to radioactive materials, hazardous chemicals, and routine workplace hazards such as electrical shock or physical injury. The greatest worker health hazard associated with operation and maintenance of any power line is electrocution. Another potential concern is worker exposure during operation and maintenance to electromagnetic fields (EMF). Physical injuries (e.g., falls) can also be a potential hazard. No electrical shocks or electrocutions have occurred for personnel working on outdoor power lines at LANL. The effects of EMF exposures to power line workers at LANL are not routinely monitored. Only minor physical injuries (e.g., cuts or scratches) have historically been recorded for power line workers at LANL.

Public health in the vicinity of LANL can be evaluated indirectly through several ongoing environmental monitoring programs. Annual air, water, soil, and biota monitoring data indicate that public exposures to LANL emissions or effluents are being maintained at or below permitted or recommended levels that have been established to protect public health and welfare. Because of the design of the power lines in

the vicinity of LANL, electrocution or physical injuries are not considered to be a potential hazard to members of the public. EMF exposures from 115-kV power lines to members of the public are not subject to regulatory control and are not routinely monitored at LANL.

3.5 Cultural Resources

Cultural resources include prehistoric and historic sites and Traditional Cultural Properties (TCPs). A site is defined as a location where human activity is evident. The visible indications of such activity may be identified by structural sites, bedrock mortars, game traps, petrogylphs, steps and roads, water-catching devices, habitation areas, terraces, shrines, and artifact scatters. Lone projectile points, stone tools and debris (lithic flakes), and potsherds obviously derived from the same vessel, are considered to be isolated occurrences. Historic cultural resources dating prior to 1943 and between the years 1943 to 1956 are also identified during field surveys. TCPs, which are resources of cultural or religious importance to Native Americans and other area community members, are identified by those communities.

Under the National Historic Preservation Act of 1966 (NHPA) (16 USC 470 et seq), cultural resources undergo an evaluation process that determines if the resource is eligible for listing on the National Register of Historic Places (NRHP). Resources that are already listed, determined eligible for listing, or are undetermined are afforded a level of consideration under the NHPA Section 106 process. Resources that are not yet identified are considered to have undetermined eligibility; these include subsurface archaeological deposits, unrecorded burials, and unidentified TCPs.

In order to be determined eligible for listing on the NRHP, a resource must meet one or more of the criteria found in 36 CFR Part 60 as follows:

- Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: Associated with the lives of people significant in our past.
- Criterion C: Embodies the distinctive characteristics of a type, period, or method of construction.
- Criterion D: Yielded or may be likely to yield information important in prehistory or history.

The resource also must retain most, if not all, of seven aspects of integrity: location, design, setting, workmanship, material, feeling, and association.

The ROW, access roads, staging areas, and substation sitings have been surveyed for cultural resources for the Proposed Action. This resulted in the identification and location of 36 sites; 30 sites are considered to be potentially eligible, or eligible, for the NRHP (LANL 1999b). Segments 5 and 6 were not inspected by a ground survey for this project, however, data base searches were conducted for known cultural resources located within these areas. Approximately 52 percent of Segment 5 and 65 percent of Segment 6 have been previously surveyed for cultural resources. There are 25 known sites in Segment 5, 24 of which are considered eligible or potentially eligible to the NRHP. Twenty-four sites are known to exist in Segment 6, all of which are considered eligible or potentially eligible to the NRHP. The following sections describe the resources identified along the various segments.

3.5.1 Cultural Resources Eligible for National Register Listing

No prehistoric sites are located in Segment 1 within land administered by BLM. The route of the abandoned "Chili Line" railroad (Laboratory of Anthropology [LA] 126543) crosses this segment of the power line ROW. The remains of this historic resource represent a portion of the Denver and Rio

Grande narrow-gauge railroad that was built in the 1880s to connect Alamosa, Colorado to Española, New Mexico, and on to the townsite of Buckman. In 1886 this line was extended to Santa Fe. A portion of this NRHP-eligible extension crosses Segment 1.

Segment 2 follows the route of the former OLE project ROW (PNM 1997a). Five prehistoric sites have been identified within this segment (three Archaic sites and two sites with unknown affiliations). Each of these sites was determined to be eligible for the NRHP, however, one site was tested and recommended for no further study based upon test results. TCPs have not been identified along this segment of corridor on lands administered by the USFS.

The cultural resources survey of DOE lands contained within Segments 3 and 4 resulted in a recommendation to the State Historic Preservation Officer (SHPO) of potential eligibility to the NRHP of 25 sites. TCPs have not been identified along this corridor segment.

A cultural resources data search of Segment 5 resulted in 25 known prehistoric and historic sites located within the boundaries of the power line corridor. Thirteen of these sites have been recommended to the SHPO for eligibility to the NRHP, and 11 sites were determined to be eligible for the NRHP. TCPs have not been identified along this corridor segment.

A cultural resources data search of Segment 6 identified 24 known prehistoric and historic sites located within the boundaries of the power line ROW. Fourteen of these sites were recommended to the SHPO for eligibility to the NRHP, and 10 sites were determined to be eligible for the NRHP. TCPs have not been identified along this corridor segment.

A cultural resources data search of the site proposed for the uncrossing of the NL and Reeves Lines was performed. It identified no cultural sites or TCPs present in the area bounded or buffered by the existing power lines (LANL 1995a).

3.6 Ecological Resources

Ecological resources include all plants and animals, with special emphasis on Federal T&E species, floodplains, and wetlands that could be affected by implementation of either the Proposed Action or any of the alternatives. This section discusses the presence, location, and extent of potentially affected diverse ecological resources by ROW segments. Each segment was evaluated using existing DOE, BLM, and USFS documentation, a geographic information system (GIS) database, and site-specific surveys.

Under the *Endangered Species Act of 1973* (16 USC 1531 et seq.), government agencies are required to consider the potential effects of all its activities on Federally-listed T&E species and their critical habitat. Table 3-5 lists four T&E species that may be located within LANL boundaries or nearby. Habitat potentially suitable for use by these species may be associated with areas along the six segments of ROWs subject to this analysis. These four species of Federally-listed T&E species are the Mexican spotted owl (*Strix occidentalis lucida*), bald eagle (*Haliaeetus leucocephalus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*).

LANL contains American peregrine falcon (*Falco peregrinus anatum*) habitat. Recently, the peregrine falcon was removed from the Federal Endangered Species List. LANL is required to track de-listed species for five years, thus potential effect to peregrine falcon habitat will continue to be tracked until the end of 2004. The peregrine falcon will not be discussed further in this EA.

Table 3-5. Federal Threatened or Endangered Species Considered under the Proposed Action

Common Name	Scientific Name	Status*	Habitat
Mexican spotted owl	*Strix occidentalis lucida*	FT	Ponderosa pine and mixed conifer forests. Uneven-aged, multistoried forests with closed canopies.
Bald eagle	*Haliaeetus leucocephalus*	FT	Roosts in riparian areas near streams and lakes.
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	Nests in riparian areas with willows and cottonwoods.
Whooping crane	*Grus americana*	FE	Sandbars and wetlands. Uses White Rock Canyon during migration.

* FE = Federally listed as Endangered, FT = Federally listed as Threatened
Source: DOE 1999c

The small amount of BLM land involved with this project (Segment 1) is predominantly classified as a piñon-juniper savannah with small areas of grama-snakeweed grasslands. There are no known Federally-listed T&E species or wetlands on Segment 1. The Cañada Ancha is a large arroyo, which occasionally floods with stormwater run-off, flowing in a northerly direction.

USFS land (Segment 2) consists primarily of piñon-juniper savannah with small areas of grama-snakeweed grasslands. Portions of Segments 2 and 3 near the Rio Grande corridor in White Rock Canyon may be used by the following T&E species: southwestern willow flycatcher, whooping crane, and bald eagle. Floodplains and wetlands occur along both banks of the Rio Grande. Two wetland types can be found along the Rio Grande: riverine and palustrine. The riverine type is characterized by wetlands found along rivers, creeks, and streams (fast-flowing water). The palustrine type is characterized by marshes, swamps, bayous, and sloughs (slow-moving water).

Segments 2 and 3 contain bald eagle winter foraging and roosting habitat. Bald eagles have been observed several times along the Rio Grande in White Rock Canyon. Large areas within the LANL boundary have been identified as potential bald eagle foraging habitat. The bald eagle primarily occurs in habitats along permanent streams and lakes but this species can occasionally be found along other types of riparian areas.

Segments 2 and 3 extend perpendicular to the Rio Grande, which has been identified as a potential spring and fall migratory route for a remnant population of whooping cranes. Whooping cranes migrate from northern Utah and south-central Oregon to south-central New Mexico. Recent assessments indicate that only three individuals survived to make the spring 1999 migration northward and individual birds are not expected to occur in the vicinity of LANL.

Several vegetation zones exist within the boundaries of Segments 3, 4, 5, and 6 at LANL. These zones include juniper savannahs at the lowest elevations in White Rock Canyon, piñon-juniper woodlands at intermediate elevations on the mesas, and ponderosa pine (*Pinus ponderosa* var. *scopulorum Engelm.*) forests at higher elevations on the mesas. In addition, mixed conifer forests containing Douglas fir (*Pseudotsuga menziesii* var. *glauca* (Beissn.) Franco) and white fir (*Abies concolor* (Gord. & Glend.) Lindl. Ex Hildebr.) occur on the north-facing slopes of some canyons. Riparian zones and wetlands occur in several locations throughout LANL including intermittent stream channels in canyon bottoms and along the Rio Grande in White Rock Canyon.

Segments 4, 5, and 6 lie within a region of LANL that has been identified as a heavy use area for resident and migratory elk (*Cervus elaphus nelsoni*) populations. Current studies indicate that the area within the

constructed firebreak and the area affected by the La Mesa fire are used by elk to access surface water sources in the bottom of Water Canyon.

Segment 4 includes several areas that are within or directly adjacent to potential Mexican spotted owl roosting, nesting, and foraging habitat. The portion of Segment 4 near the crossing of Water Canyon is within occupied Mexican spotted owl nesting, roosting, and foraging habitat. The remaining portion of the segment is south of a region of Cañon de Valle that has been designated as potential Mexican spotted owl nesting, roosting, and foraging habitat.

The area west of, and including, the west end of Segment 5 has been identified as potential Mexican spotted owl foraging and roosting habitat. Both Two Mile and Pajarito Canyons to the west of Segment 5 contain areas that have been identified as potential nesting, roosting, and foraging habitat for the Mexican spotted owl. A section of Pajarito Canyon to the north of Segment 5 also contains potential nesting, roosting, and foraging habitat of the southwestern willow flycatcher. This Pajarito Canyon area is also the location for uncrossing the existing power lines.

At the uncrossing location, the natural vegetation along the mesa tops and throughout the wide canyon bottoms is consistent with open-to-dense piñon-juniper woodland overstory with big sagebrush (*Artemisia tridentata* Nutt.), chamisa (*Chrysothamnus nauseosus* (Pall.) Britton) and blue grama grass (*Bouteloua gracilis* (Willd. Ex Kunth) Lag. Ex Griffiths). There are wetland areas at the bottom of Pajarito Canyon containing wetland vegetation. The piñon-juniper woodland overstory becomes mixed with a sparse ponderosa pine overstory from east to west. Southwestern willow flycatcher habitat is found near the 115-kV uncrossing location.

3.7 Water Quality

The predominant surface water features within the proposed project area are ephemeral and intermittent streams in canyon bottoms and arroyos that provide drainage. These ephemeral and intermittent streams are considered to be Waters of the U.S. under the CWA. Water quality standards for Waters of the U.S. consist of two elements: (1) use classification and (2) criteria that, if not exceeded, will protect the designated use. The ephemeral and intermittent streams within the proposed project area are protected for livestock watering and wildlife habitat. Various water quality criteria (e.g., physical, chemical, and biological characteristics) have been established to ensure that the intended use of the surface waters can be maintained.

Under the CWA, the NPDES program requires the permitting of point-source and certain non-point source effluent discharges to Waters of the U.S. (LANL 1996). Before an effluent can be discharged, it must first meet specific chemical, physical, and biological criteria specified in the NPDES permit. In addition, SWPP Plans defined under the NPDES program are required for certain types of terrain disturbances to prevent the pollution of surface and ground waters. Any construction activity that would disturb five or more acres ($\geq$ 2 ha) is required to be permitted under the NPDES program. Permitted projects under this program would be required to develop and implement a SWPP Plan for the duration of the construction period.

By the end of 1997, LANL had reduced from 88 in 1996 the number of NPDES permitted outfalls to 68 and had 14 NPDES permits for storm water discharges (LANL 1998). Water quality samples were found to be in compliance with permit requirements in greater than 99 percent of all samples collected. These results indicate that the water quality at LANL is being adequately maintained to meet permit conditions and to support the intended livestock and wildlife usage. No similar information exists for BLM- or USFS-administered lands that would be crossed by the proposed power line. These areas do not require permitting under the CWA.

3.8 Land Use

Recreational resources such as hiking and biking paths, horseback trails, parks, and athletic facilities are abundant in Los Alamos and Santa Fe Counties. Recreational opportunities such as camping, fishing, and hunting are restricted at LANL, but are available on some of the surrounding Federal lands.

The Norton Substation (Segment 1) is located on land administered by BLM. Much of this segment contains extensive utilities infrastructure; however, BLM's Rio Grande Management Framework Plan has grazing identified as the dominant land use for this area with some recreation and economic activities. Recreational uses include, but are not limited to, sight-seeing, hiking, biking and horseback riding, camping, fishing, hunting, and driving off-road vehicles. Economic uses of these lands include special uses, water, mining, grazing, timber, fire wood, and piñon pine nut gathering (USDA 1987).

The *Santa Fe National Forest Land Management Plan* allows new utility corridors to be established near existing utility systems (USDA 1987). The area that includes Segment 2 is managed in accordance with this plan. Segment 2 is primarily a piñon-juniper woodland with other power lines nearby such as the 115-kV Reeves Line. This portion of USFS land is used for cattle grazing and public recreation. Recreational uses include, but are not limited to, sight-seeing, hiking, biking, horseback riding, camping, fishing, hunting, and off-road vehicle use. Economic uses of these lands include special uses, water, mining, grazing, timber, fire wood, piñon pine nut gathering, and guide services.

The Site Development Plan (SDP) for LANL identifies existing land uses at the facility (LANL 1990). These uses include experimental science, waste management, and high explosives research, development, and testing. Areas may also be designated as environmental research/buffer zones. Land use over much of LANL is restricted by topography and other natural and constructed constraints. Land along Segments 3, 4, and 5 is variously classified. These segments are discussed in the following paragraphs.

Segment 3 crosses an undeveloped area currently designated as an environmental research/buffer zone. The SDP designates the large mesa top areas of TA-70 and TA-71 for experimental science uses. Under each of the power line alternatives, Segment 3 extends across an area that is of limited access to the general public. This area is fenced and not open to vehicular travel.

Segment 4 is fenced and passes through the south-central portion of LANL that is not open to the general public. Segment 4 crosses near some areas designated for high explosives research, development, and testing; however, these areas would not be incompatible with the proposed power line.

Segment 5 passes to the south of developed areas along Pajarito Road. Segment 5 is within a fenced area and designated as environmental research/buffer that is not open to the general public. Portions of Segment 5 cross areas designated for high explosives research, development, and testing but do not cross any high hazard areas. Segment 6 is fenced and not open to the general public and it follows an existing utility corridor that runs along NM 4 and NM 501. This is only a 13.8-kV line. The corridor may require expansion and relocation of the power, water, and communication lines in this area to accommodate a 115-kV power line.

The area containing the proposed NL and Reeves Lines uncrossing is highly disturbed, adjacent to a roadway and a LANL industrialized technical area. Numerous access roads and construction staging areas are planned to support the power line. The staging areas would all be in previously disturbed areas and the majority of the access roads are existing dirt roads.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Proposed Action

The essential components of the Proposed Action are: construct Segments 1, 2, and 3 to 345-kV specifications and Segment 4 to 115-kV specifications, operate entire line at 115 kV, and construct WTA Substation (see Figure 6).

4.1.1 Visual Resources

The proposed project would affect the visual environment in the vicinity of the ROW both during and after construction. During construction, there would be short-term visual effects caused by creation of construction staging areas and equipment used in the construction process. Depending on their locations, the staging areas and use of heavy equipment could disrupt the visual field with elements that are out of character with the surrounding environment. Only 5 acres of land would be disturbed for new staging areas and access roads along the entire length of the proposed line. Revegetation after construction would return the disturbed areas to a more natural condition within a few years. After construction, the power line would have two principal visual effects – selectively cleared corridors in wooded areas and visible pole structures and lines that would contrast with natural landforms. Because the corridors would be cleared selectively, no major swathes of de-vegetated areas would be visible. The finished power line would be most disruptive in areas visible to a large number of people, where the surrounding area is undeveloped, or where the contrast with the natural landscape is marked, such as along the skyline.

The analysis of visual resources considers the sensitivity of the viewing area and the degree of change in the viewshed. The detailed analysis is described in Appendix B. Using the BLM visual management system, visual effects would be low in Segment 1 and low to moderate in Segment 2 of the route (BIA 1986). Segment 2 includes the Rio Grande crossing. Portions of Segments 3 and 4 would be visible over large sections of LANL, from NM 4 and NM 502, from the Caja del Rio, and from the Los Alamos townsite and White Rock. About four miles of trails within the BNM Wilderness Area would have discontinuous views of a number of pole structures in Segment 4. Generally the pole structures would be 2 to 3 mi (3.2 to 4.8 km) from these viewpoints. Therefore, the power line would not result in dramatic changes to the character of the wilderness area. Substantial portions of the power line would be visible to travelers on NM 4 and to visitors using BNM campgrounds and trails adjacent to NM 4 between Ponderosa Campground and the entrance to BNM, particularly along Burnt Mesa Trail. The power line would be visible, along with other LANL development, at distances of 1 to 2 mi (1.6 to 3.2 km) from these recreation areas. Overall, there would not be a dramatic change to the character of BNM. Visual effects in Segments 3 and 4 would be low to moderate. In places, the visual effect of the proposed line would be lessened by the presence of minor local relief and vegetation at the observer's position, similar existing power line structures, and other industrial features at LANL.

The additional pole structure installations required to uncross the existing 115-kV lines would not change the landscape in this area. Therefore, uncrossing the existing lines would have no visual effect.

4.1.2 Human Health Risks

Adverse health effects to workers and members of the general public are not expected as a result of the Proposed Action. Of the hazards identified in this section, only biological effects from low-strength, low-frequency EMF could pose a potential human health risk from implementing the Proposed Action. However, distances between the proposed power line and the nearest occupationally-occupied buildings, as well as the relatively low electrical field strength from a 115-kV line, virtually eliminate this hazard.

Human health effects may occur from routine power line construction and operation activities. Literature on safety and health as related to utilities, especially electrical utilities, including injury statistics was reviewed to identify health hazards. The greatest human health hazard associated with any power line is the possibility of indirect contact of conductors with long conducting objects such as a metal pipe, antenna, or heavy equipment (BIA 1986). With a range of pole structure height above ground of 79 to 106 ft (24 to 32 m) for this project, this hazard is minimized. Special attention would be given to the use of long metal objects when working beneath the power line and to maintenance activities during operations.

Power lines generate two types of EMF—60-Hz fields and radio frequency. Only non-ionizing frequencies are produced by power lines. A potential concern regarding power lines is the biological effects of the 60-Hz EMF generated by power lines. These concerns are typically associated with higher-voltage power lines (e.g., 345 kV) or substations. Specifically, concerns exist over the possibility that EMFs can induce cancer or stimulate central nervous system or heart tissue. In the EIS on the Proposed OLE project (BIA 1986), the U.S. Bureau of Indian Affairs reviewed and summarized studies on the biological effects of power lines. There have also been numerous more-recent studies on this subject (EPRI 1997; CPEEFBS 1996). The dominant body of evidence indicates that at exposure levels well above those normally encountered in residences, EMFs can produce biological effects, but these effects do not provide a consistent picture of a relationship between the biological effects of these fields and health hazards (CPEEFBS 1996). Electric utility workers can reasonably be expected to experience an increased health risk overall, but an epidemiological mortality study of 138,905 workers at five U.S. electric utilities found fewer deaths from all causes, including total cancers, than is expected in the general U.S. male population (Savitz and Loomis 1995). The several human health effects studies are summarized in Appendix A, as well as a listing of the current occupational standard. Considering cancers in specific organs, the Savitz and Loomis study (1995), found no association between occupational magnetic field exposure and leukemia, but a link to brain cancer under certain conditions.

Along Segments 1, 2, and 3, there are no routinely occupied private residences or work-related facilities in proximity to the proposed ROW. Along Segment 4, the nearest occupied facilities are located approximately 300 ft (91 m) away at the TA-22-52 shop building and approximately 600 ft (183 m) away at the TA-49-144 trailer office. Electrical field strengths within 70 to 200 ft (21 to 61 m) of a power line range from approximately 0.1 to 0.8 kilovolt per meter ($kV \cdot m^{-1}$) (BIA 1986). Although not explicitly stated, this field strength is for a 345-kV power line because the BIA reference was for an EIS regarding a 345-kV power line and substation. At 300 or 600 ft (91 or 183 m) away, it is assumed that the proposed 115-kV line would emit an electrical field of less than or equal to 0.1 kV. The field strength of the line would be much less than the 25 $kV \cdot m^{-1}$ "ceiling limit" set by the American Conference of Governmental Industrial Hygienists (ACGIH). In addition, the occupancy time of these buildings would be a maximum of only 24 percent of the permanent occupancy that was assumed in the establishment of the exposure standards. Therefore, this line would result in exposures, if any, that are much less than the ACGIH occupational standard of 10 milliamperes per square meter ($mA \cdot m^{-2}$) in the body (Bailey et al., 1997), and adverse health effects from EMF are not expected. (See Appendix A for discussion of the relationship between the ACGIH exposure standard and whole body dose.)

4.1.3 Cultural Resources

Adverse effects on cultural resources are not expected under the Proposed Action. Pole structures, modifications to existing access roads, and construction equipment areas would all be located in a manner so as to avoid all known cultural sites. Protective fencing would be constructed around archaeological sites as necessary to ensure their protection. All construction activities would be monitored by a qualified archaeologist (LANL 1999a).

Segment 1 would not require ground disturbance within the Norton Substation's previously disturbed area. One historic resource (LA 126543) is located within this segment of the corridor but would be avoided by line installation work. Segment 2 would require ground disturbance, including soil blading, pole structure and tie-down anchor excavations, and tree clearing. Five prehistoric resources have been identified within this segment of the ROW and three are located within the corridor. Avoidance of cultural resources would be accomplished by locating all construction activities and by performing routine maintenance in areas away from known resources. The planned development described in Segments 3 and 4 would involve land disturbance activities as described and the protective construction measures discussed in Section 2.1.2. None of the 36 prehistoric or historic sites within the ROW would be directly affected. No cultural resources are located within the uncrossing area for the existing power lines.

4.1.4 Ecological Resources

Under the Proposed Action, some overstory and understory vegetation along the mesa tops and across wide canyon bottoms would be disturbed, or selectively cleared within a maximum 150-ft- (45-m-) wide corridor for the length of the proposed power line ROW. Vegetation within narrow canyon slopes and bottoms would not be disturbed. Following construction, the disturbed corridor would be reseeded and stabilized as necessary. Native vegetation would be temporarily replaced with selected ground cover species; however, native species of grasses and other vegetation would eventually return to the corridor. As currently described, long-term maintenance of the proposed power line would have minimal effects on vegetation.

Wildlife in and adjacent to the proposed power line ROW along the mesa tops would be affected by loss or disturbance of habitat during construction. Wildlife that currently inhabit the proposed power line corridor would be displaced during power line construction as vegetation is removed and soil is disturbed. Displaced wildlife would most likely occupy adjacent habitat. Following reseeding and stabilization activities, some of the displaced wildlife would return to the new habitat within the proposed power line corridor.

Larger wildlife species that currently move through the proposed power line corridor would be temporarily disturbed during construction activities, but would most likely continue using the corridor for foraging and migration, following reseeding and stabilization activities. In some cases, the proposed power line corridor would provide additional foraging (grazing and browsing) habitat for deer and elk, and the power line may provide additional perching sites for larger bird species that occupy or use the area. This deer and elk foraging area would be within the core area of LANL and sufficiently far enough away from public roads so as to not cause additional automobile crashes due to deer and elk crossing these roads. The power line is mostly through piñon-juniper areas, which is not a deer and elk habitat area. Pole structures and lines would utilize designs that minimize risk of injury or electrocution to nesting, roosting, or flying birds so that effects from the energized lines are minimized.

Environmental effects on the following Federally listed T&E species were considered for construction and operational activities: the bald eagle, the Mexican spotted owl, the whooping crane, and the southwestern willow flycatcher. Potential effects to habitat are possible from implementation of the Proposed Action, however, any effect is not expected to be adverse. The Rio Grande Canyon near White Rock is the location for potential suitable habitat for whooping cranes. Since so few birds are expected to use the Rio Grande near LANL, construction and maintenance activities in this area are not likely to disturb their migration. In addition, the power line crossing the Rio Grande as proposed would be highly visible to any large birds that migrate through or use the canyon.

All segments include areas that have been designated as potential bald eagle foraging habitat. The proposed ROW represents a small fraction of the total foraging habitat available to this species

throughout LANL. Disturbance to bald eagle foraging habitat would be temporary in nature and would only occur during power line construction so that the overall effect to the foraging area available to this species would be minor.

Several areas near the proposed power line corridor contain suitable owl habitat and are capable of supporting Mexican spotted owl nesting, foraging, and roosting. One of these areas is within the buffer area of a spotted owl Area of Environmental Interest (AEI). Site-specific mitigation measures developed for this species would be strictly followed in the nesting area. During the construction of the proposed power line, areas of disturbance would be limited to the circular zone around each of the pole structures, up to a radius of 100 ft (31 m). There would be no disturbance within the power line corridor itself, because existing roads would be used for access. With respect to the Mexican spotted owl AEI in question, approximately 13 ac (5 ha) of this disturbance would occur in the buffer area. This represents approximately 0.66 percent of the total area for this AEI, which is 1,982 ac (802 ha). None of this disturbance around the pole structures would occur in the core area of the AEI. Since there would be no permanent disturbances to soils and since revegetation would be implemented, the forests and woodlands would eventually recover to their preconstruction conditions.

An existing section of power line, referred to as the proposed uncrossing location, in the eastern part of the Pajarito Canyon and the adjacent mesa tops, would be improved through minor pole structure relocations. This site is adjacent to an AEI for southwestern willow flycatcher. Work at this site would not be conducted between March 15 and May 30. This improvement would not require the disturbance of any undeveloped land, wetlands, or Federally-listed T&E species potential habitat.

Wetland and riparian areas occupy locations along the eastern portion of Segment 3 and in three locations along Segment 4. Floodplains and wetlands would be avoided during power line construction and maintenance activities. Segment 4 crosses upper Water Canyon three times and Cañon del Valle once. No activity would occur in those canyon bottoms because the power line would be placed so as to span the canyons, and therefore no direct or indirect effects to those floodplains and wetlands are expected. No soil disturbance, vegetation removal, or erosion would be allowed to enter these narrow canyons as per the SWPP Plan.

One construction lay-down (staging) area would likely be located within the Water Canyon floodplain. No direct or indirect adverse effect to the floodplain area was identified as existing access roads and cleared areas are located in this area and would be utilized for this staging site.

4.1.5 Water Quality

There would be no adverse effect on water quality under the Proposed Action. This project would require an NPDES construction permit as more than 5 ac (2 ha) of land would be disturbed. A SWPP Plan would be developed prior to construction. The plan would specify measures to prevent spills and leaks of fuel from fuel storage tanks and/or refueling activities on site; require erosion and sediment migration controls such as silt-fences, hay bales, or berms on steep slopes; state that excavation spoils would not be placed in or near drainages; and call for reseeding and revegetating disturbed sites. The plan would be reviewed and approved by LANL personnel responsible for water quality issues. Adherence to the plan would preclude any adverse effects on water quality.

4.1.6 Land Use

The proposed power line is not expected to have a major effect on existing land uses. Although the proposed project would be 19.5 mi (31 km) in length and affect up to 473 ac (191 ha), the power line's construction and operation would be consistent and compatible with all existing land uses and these land uses would be expected to continue. Segments 1 and 2 are described in Section 3.8 as primarily grazing

and recreational use areas. An additional power line ROW is not anticipated to cause a long-term effect to the primary grazing and recreational characteristics of the land. Minor, short-term effects to the area would likely occur during the construction phase of these segments.

Segments 3 and 4 would be located within fenced areas that have been designated in the LANL SDP under future and existing land use in the categories of environmental research and high explosives research, design, and testing (LANL 1990). Segment 4 is closed to the general public. Segment 3 would partially parallel an operational 115-kV power line (Reeves Line). The new line would partially parallel the existing line through this segment and would not affect the current land use status.

Portions of Segment 4 would be within the high explosives testing area and consequently potential adverse effects on existing or future testing are possible. The power line would be outside of the TA-36 firing site hazard circle, and therefore not be vulnerable to fragments during any high explosive shots. Additionally, Segment 4 may provide a minimal constraint within the Dynamic Testing area and Two Mile Mesa South within areas designated for future experimental use, as development could not occur within the ROW. The Segment 4 ROW would not interfere with prime developable areas. Uncrossing the NL and Reeves Lines would have no effect on current or future land uses, nor would the siting and planned use of access roads and construction staging areas.

4.2 Alternative 1

The essential components of this alternative are: construct and operate Segments 1, 2, and 3 to 345-kV specifications, construct and operate Segment 4 to 115-kV specifications, and construct both WTA and STA Substations (see Figure 8).

4.2.1 Visual Resources

Effects on visual resources under this alternative would be the same as estimated under the Proposed Action (Section 4.1.1). The number and location of pole structures and the route of the ROW would be unchanged. Uncrossing of the existing lines would occur with minimal visual effect.

4.2.2 Human Health

Human health effects under this alternative would be essentially the same as those discussed under the Proposed Action. EMF exposures to workers and members of the public would be well below ACGIH guidelines because of the distance between occupied facilities or residences and the power line. Therefore, human health would not be adversely affected by activities associated with this alternative.

4.2.3 Cultural Resources

The environmental consequences are the same as those described under the Proposed Action (Section 4.1.3). Alternative 1 would involve land disturbance activities as described under the Proposed Action but prehistoric or historic sites would not be affected by this alternative. As with the Proposed Action, avoidance measures would be required for all cultural resources located within the areas associated with this ROW.

4.2.4 Ecological Resources

Potential effects to ecological resources under this alternative would be the same as those addressed under the Proposed Action (Section 4.1.4) for flora and fauna, Federally-listed T&E species, and floodplains and wetlands. The number of pole structures, amount of area disturbed, and length and route of the ROW would remain the same. The uncrossing of the existing lines would not require the disturbance of any undeveloped lands, wetlands, or Federally-listed T&E species potential habitat.

4.2.5 Water Quality

There would be no adverse effect on water quality under Alternative 1. This project would require an NPDES construction permit as more than 5 ac (2 ha) of land would be disturbed. A SWPP Plan would be developed prior to construction. The plan would specify measures to prevent spills and leaks of fuel from fuel storage tanks and/or refueling activities on site; require erosion and sediment migration controls such as silt-fences, hay bales, or berms on steep slopes; state that excavation spoils would not be placed in or near drainages; and call for reseeding and revegetating disturbed sites. The plan would be reviewed and approved by LANL personnel responsible for water quality issues. Adherence to the plan would preclude any adverse effects on water quality.

4.2.6 Land Use

The environmental consequences to land resources under Alternative 1 are identical to those for the Proposed Action as described in Section 4.1.6, including the uncrossing of the NL and Reeves Lines, and the siting and use of access roads and construction staging areas. Alternative 1 would provide a compatible land use for the area.

4.3 Alternative 2

The essential components of this alternative are: construct Segments 1, 2, 3, and 4 to 115-kV standards, operate entire line at 115 kV, and construct WTA Substation (see Figure 9).

4.3.1 Visual Resources

Effects on visual resources under this alternative would be essentially the same as estimated under the Proposed Action (Section 4.1.1). Although there would be more pole structures, the pole structures would be shorter and less visible. Therefore, the effects are expected to be slightly less than those of the Proposed Action.

4.3.2 Human Health

Human health effects under this alternative would be the same as those discussed under the Proposed Action. EMF exposures to workers and members of the public would be well below ACGIH guidelines because of the distance between occupied facilities or residences and the power line. Therefore, human health would not be adversely affected by activities associated with this alternative.

4.3.3 Cultural Resources

The environmental consequences are essentially the same as those described under the Proposed Action. The only differing factors are shorter spacing between pole structure alignments and a slightly narrower corridor. As currently scoped, this narrower 100-ft- (30-m-) wide corridor for the 115-kV pole structures, would result in 12 less cultural resource sites located within the corridor. However, none of the NRHP-eligible prehistoric or historic sites would be affected by this alternative. As with the Proposed Action, avoidance measures would be required for all cultural resources located within the areas associated with this ROW.

4.3.4 Ecological Resources

The environmental consequences described in Section 4.1.4 would be essentially the same under Alternative 2. The only potential additional consequence could be the clearing of a few taller trees and other vegetation, since there would be more pole structures with less height in Segments 2 and 3, and a

possible need for more or longer access roads. The uncrossing of the existing lines would not require the disturbance of any undeveloped lands, wetlands, or Federally-listed T&E species potential habitat.

4.3.5 Water Quality

There would be no adverse effect on water quality under Alternative 2. This project would require an NPDES construction permit as more than 5 ac (2 ha) of land would be disturbed. A SWPP Plan would be developed prior to construction. The plan would specify measures to prevent spills and leaks of fuel from fuel storage tanks and/or refueling activities on site; require erosion and sediment migration controls such as silt-fences, hay bales, or berms on steep slopes; state that excavation spoils would not be placed in or near drainages; and call for reseeding and revegetating disturbed sites. The plan would be reviewed and approved by LANL personnel responsible for water quality issues. Adherence to the plan would preclude any adverse effects on water quality.

4.3.6 Land Use

The environmental consequences to land resources under Alternative 2 are identical to those for the Proposed Action as described in Section 4.1.6, including the uncrossing of the NL and Reeves lines, and the siting and use of access roads and construction staging areas. Alternative 2 would provide a compatible land use for the area.

4.4 Alternative 3

The essential components of this alternative are: construct Segments 1, 2, and 3 to 345-kV specifications and Segment 5 to 115-kV specifications, operate entire line at 115 kV, and construct WTA Substation (see Figure 10).

4.4.1 Visual Resources

The visual effects of power line construction under Alternative 3 would be the same for Segments 1, 2, and 3 as under the Proposed Action (Tables B-1 and B-2 in Appendix B). The overall visual effect of Segment 5 would be low to moderate, less than that of Segment 4 (Table B-1). The visual effects of Segment 5 at sensitive areas is summarized in Table B-4. There would be no effects at the uncrossing site.

4.4.2 Human Health

Potential effects on human health would be essentially the same under this alternative as projected under the Proposed Action for Segments 1, 2, and 3. For the purposes of analysis in this EA, preliminary estimates have been made of distances to the nearest point of access for Segment 5 from permanent or quasi-permanent worker locations at LANL. The nearest occupational settings are approximately 600 to 700 ft (183 to 213 m) to TA-51-103, approximately 750 ft (228 m) to TA-66-1, and approximately 1,500 ft (457 m) to the TA-18-30 main building. Electrical field strengths within 70 to 200 ft (21 to 61 m) of the power line centerline range from approximately 0.1 to 0.8 $kV \cdot m^{-1}$ (BA 1986). These field strengths result in much less than the 10 $mA \cdot m^2$ occupational standard set by the ACGIH; therefore, health effects from EMF are not expected. (See Appendix A for a summary of the history of EMF health effects studies.)

4.4.3 Cultural Resources

Under this alternative, the environmental consequences to cultural resources on Segments 1, 2, and 3 are identical to those for the Proposed Action as described in Section 4.1.3. The corridor would require

ground disturbance, including soil blading, pole structure and tie-down anchor excavations, and tree clearing. Twenty-two prehistoric and two historic resources have been located on the 52 percent of the ROW in Segment 5 that has been previously inspected for cultural resources. However, none of the NRHP-eligible prehistoric or historic sites would be affected by this alternative. As with the Proposed Action, avoidance measures would be required for all cultural resources located within the areas associated with this ROW.

4.4.4 Ecological Resources

Potential effects on flora and fauna under this alternative would generally be the same as those addressed under the Proposed Action (Section 4.1.4). There is a wetland intersected by the route, but it would be spanned by the power line so that it would not be disturbed. The route is located in a canyon bottom (that may contain floodplains) for approximately 4,000 ft (1,219 m). These floodplains would be either avoided or spanned by the power line. The eastern portion of Segment 5 would include an area that is adjacent to and south of potential habitat for southwestern willow flycatcher. Southwestern willow flycatchers would not be disturbed by construction and maintenance activities because their habitat would be avoided, and because construction adjacent to the AEI would not occur between March 15 and May 30. To date, no sightings of the bird has occurred in this area. In addition, nearly half the length of Segment 5 would go directly through Mexican spotted owl habitat, with over 11,000 ft (3,353 m) passing through core habitat. Construction activities would be restricted during potential breeding seasons. The uncrossing of the existing lines would not require the disturbance of any undeveloped lands, wetlands, or Federally-listed T&E species potential habitat.

4.4.5 Water Quality

There would be no adverse effect on water quality under Alternative 3. This project would require an NPDES construction permit as more than 5 ac (2 ha) of land would be disturbed. A SWPP Plan would be developed prior to construction. The plan would specify measures to prevent spills and leaks of fuel from fuel storage tanks and/or refueling activities on site; require erosion and sediment migration controls such as silt-fences, hay bales, or berms on steep slopes; state that excavation spoils would not be placed in or near drainages; and call for reseeding and revegetating disturbed sites. The plan would be reviewed and approved by LANL personnel responsible for water quality issues. Adherence to the plan would preclude any adverse effects on water quality.

4.4.6 Land Use

At approximately 17.5 mi (28 km) in length, Alternative 3 is the shortest of the power line alternatives. The environmental consequences for Alternative 3 to land uses on Segments 1, 2, and 3 are identical to those for the Proposed Action as described in Section 4.1.6. Segment 5 is located within an area that has been designated in the LANL SDP under future and existing land use in the categories of environmental research and high explosives research, design, and testing (LANL 1990). These areas are closed to the public.

Portions of Segment 5 are within the high explosives testing area and consequently potential adverse effects on existing or future land use are possible. The power line would be outside of the TA-36 firing site hazard circle, and therefore not be vulnerable to fragments during any high explosive shots. Additionally, Segment 5 may provide a minimal constraint upon land use on Two Mile Mesa South within areas designated for future experimental use, as development could not occur within the ROW. The final siting of the Segment 5 ROW should not bisect prime developable areas on Two Mile Mesa South, but should be limited to a corridor along the edges of the mesa top.

Uncrossing the NL and Reeves Lines would have no effect on current or future land uses, nor would the siting and use of access roads and construction staging areas. Alternative 3 would provide a compatible land use for the area.

4.5 Alternative 4

The essential components of this alternative are: construct Segments 1, 2, and 3 to 345-kV specifications and Segment 6 to 115-kV specifications, operate entire line at 115 kV, and construct WTA Substation (see Figure 11).

4.5.1 Visual Resources

The visual effects of power line construction under Alternative 4 would be the same for Segments 1, 2, and 3 as under the Proposed Action (Tables B-1 and B-2 in Appendix B). The overall visual effects of constructing Segment 6 would be low to high and would be much greater than the Proposed Action (Table B-1). Approximately 15 mi (24 km) of wilderness trails in the northern third of BNM would have views of substantial portions of Segment 6. In addition, pole structures would be visible from most of the area of BNM that lies between Frijoles Canyon and NM 4. Large numbers of pole structures would be visible from Ponderosa and Juniper Campgrounds. Construction of Segment 6 would create a substantial change in the views from wilderness and other recreational areas in BNM. The effects on sensitive areas are summarized in Table B-5. The visual effects of uncrossing the 115-kV power lines would be negligible as in the Proposed Action.

4.5.2 Human Health

Human health effects under this alternative would be essentially the same as those discussed under the Proposed Action. For the purposes of analysis in this EA, preliminary estimates have been made of distances to the nearest point of access for Segment 6 from permanent or consistently occupied worker locations at LANL or neighboring agencies. The nearest occupational settings are approximately 1,500 ft (457 m) away at TA-33, Building 168, and 250 to 500 ft (76 to 152 m) away at the BNM "Guard Station." Electrical field strengths within 70 to 200 ft (21 to 60 m) of a power line range from approximately 0.1 to 0.8 $kV \cdot m^{-1}$ (BIA 1986). Although not explicitly stated, presumably this field strength is for a 345-kV power line because the BIA reference was an EIS regarding a proposed 345-kV power line and substation. At 250 to 1,500 ft (76 to 457 m) away, it is assumed that the proposed 115-kV line would emit an electrical field of less than or equal to 0.1 kV. The field strength of the line would be much less than the 25-$kV \cdot m^{-1}$ "ceiling limit" set by the ACGIH. In addition, the occupancy of these buildings would be less than the permanent occupancy that was assumed in the establishment of the exposure standards. Therefore, this line would result in exposures, if any, that are much less than the ACGIH occupational standard of 10 milliamperes per square meter ($mA \cdot m^{-2}$) in the body (Bailey et al. 1997), and adverse health effects from EMF are not expected. (See Appendix A for discussion of the relationship between the ACGIH exposure standard and whole body dose.) EMF exposures to workers and members of the public would be well below ACGIH guidelines because of the distance between occupied facilities or residences and the power line. Therefore, human health would not be adversely affected by activities associated with this alternative.

4.5.3 Cultural Resources

Under this alternative the environmental consequences to cultural resources on Segments 1, 2, and 3 are identical to those for the Proposed Action as described in Section 4.1.3. The corridor would require ground disturbance, including soil blading, pole structure and tie-down anchor excavations, and tree clearing. Twenty-two prehistoric and two historic resources have been located on the 65 percent of the corridor in Segment 6 that has been previously inspected for cultural resources. However, none of the

NRHP-eligible prehistoric or historic sites would be affected by this alternative. As with the Proposed Action, avoidance measures would be required for all cultural resources located within the areas associated with this ROW.

4.5.4 Ecological Resources

Potential effects to ecological resources under this alternative, which includes Segment 6, would be the same as those addressed under the Proposed Action (Section 4.1.4) on flora and fauna, Federally-listed T&E species, and floodplains and wetlands. The vegetative zones, wildlife, and habitat are similar. Segment 6 is longer than other segments, increasing the potential for more ecological disturbance, however, much of the routing shares the already disturbed corridor of NM 4 and an existing power line. A populated zone-tailed hawk habitat area is located near Segment 6. This area is near the entrance to BNM and TA-33. Site-specific mitigation measures developed for this species would be strictly followed in the nesting area. Work in this area would not be conducted during the nesting period.

An existing section of power line, referred to as the uncrossing location, in the eastern part of the Pajarito Canyon and the adjacent mesa tops, would be improved through minor pole structure relocations. This improvement would not require the disturbance of any undeveloped land, wetlands, or Federal T&E species habitat.

4.5.5 Water Quality

There would be no adverse effect on water quality under Alternative 4. This project would require an NPDES construction permit as more than 5 ac (2 ha) of land would be disturbed. A SWPP Plan would be developed prior to construction. The plan would specify measures to prevent spills and leaks of fuel from fuel storage tanks and/or refueling activities on site; require erosion and sediment migration controls such as silt-fences, hay bales, or berms on steep slopes; state that excavation spoils would not be placed in or near drainages; and call for reseeding and revegetating disturbed sites. The plan would be reviewed and approved by LANL personnel responsible for water quality issues. Adherence to the plan would preclude any adverse effects on water quality.

4.5.6 Land Use

At 25.5 mi (41 km) in length, Alternative 4 is the longest of the power line alternatives. The environmental consequences to land resources on Segments 1, 2, and 3 are identical to those for the Proposed Action as described in Section 4.1.6. Segment 6 is located within an area that has been designated in the LANL SDP under future and existing land use in the categories of physical support and infrastructure (LANL 1990). Segment 6 currently contains a 13.8-kV power, water, and communication lines that may need to be relocated. This may also involve increasing the width of the existing ROW to accommodate a new power line. Alternative 4 would provide a compatible land use for the area.

Uncrossing the NL and Reeves Lines would have no effect on current or future land uses or the siting and use of access roads and construction staging areas. The current location of an operational helicopter pad in TA-49 does pose a potential environmental consequence along Segment 6. The helicopter pad is located approximately 300 ft (91 m) north of NM 4, and would be approximately 100 ft (30 m) north of the Segment 6 ROW boundary. This is not an incompatible land use situation. The helicopter pad is only used for logistical support during wildfire and emergency response initiatives, however, its proximity to the power line would present a potential hazard to helicopter flights into and out of the area. Information regarding the estimated frequency of such an effect is not readily available. Should such an accident occur, the consequences would be severe.

4.6 No Action Alternative

Under the No Action Alternative, the proposed power line would not be built. A ROW across BLM and USFS lands would not be needed. Substation(s) would not be constructed or modified. Improvements to existing dirt roads and fire breaks that would service a new power line would not be done. The uncrossing of the existing Reeves Line and NL Line would not be done as a part of the Proposed Action but could be evaluated as a separate action. The reliability of the existing power supply system would not improve and could potentially worsen under this alternative. Aging of the lines would continue and repairs would be more frequently required.

The potential to disturb approximately 23 ac (9 ha) of wildlife habitat from power line construction activities would not occur under the No Action Alternative. Because of mandatory mitigation and avoidance requirements, the effects on Federally-listed T&E species and cultural resources as well as the potential to disturb PRSs would be essentially the same under this alternative as expected under the Proposed Action.

There would be no changes to visual resources under the No Action Alternative. The construction of approximately 19.5 mi (31 km) of new power line would not occur and existing viewsheds would remain unchanged. Potential future BLM, USFS, and DOE land uses in the proposed ROW may be more flexible or diverse under this alternative. However, based on existing land use plans and policies, the proposed power line would not exclude any current or planned land uses.

The reliability of the existing power supply to the Power Pool would continue to be a serious concern under the No Action Alternative. Without a third line, the Power Pool would be dependent on only two power lines. The loss of either one of these lines would require the activation of a load shedding agreement between LANL and Los Alamos County. Essential national security operations at LANL could be restricted and certain County services could also be limited.

Because of the age of the existing lines and their heavy usage, maintenance activities would increase in frequency and complexity. These activities would need to be conducted during off-peak hours (e.g., after midnight) and on energized lines to avoid curtailment of the power supply and to perform increasing maintenance operations. Performing such activities on energized lines under less than ideal conditions would increase the risk of injury to workers and the potential for loss of power. Periodic brownouts or blackouts could be expected to continue. The potential for worker exposures to EMF would not occur under the No Action Alternative.

4.7 Comparison of Alternatives

Table 4-1 summarizes and compares the effects of the Proposed Action to the four action alternatives being considered and to the No Action Alternative.

Table 4-1. Comparison of Alternatives

Factor	Proposed Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4	No Action
Visual Resources	Moderate visual effects. Contrasts with surrounding visual resources; visible against skyline from public areas but parallels existing line in part.	Moderate visual effects similar to the Proposed Action.	Moderate visual effects similar to the Proposed Action.	Moderate visual effects. Contrasts with surrounding visual resources; visible against skyline but parallels existing power line in part; potentially less visually disruptive than the Proposed Action.	Moderate to high visual effects; power line in direct line-of-view of Bandelier visitors; potentially much more visually disruptive than the Proposed Action.	Visual resources would not be affected by a new power line.
Human Health	No health effects from EMF or other hazards. No appreciable effect on human health expected.	Essentially the same as the Proposed Action.	Essentially the same as the Proposed Action.	Essentially the same as the Proposed Action.	Essentially the same as the Proposed Action.	Potential to increase human health risks from more frequent maintenance activities.
Cultural Resources	It is likely that cultural resource sites and segments containing Native American traditional or spiritual use areas would not be directly affected by the construction and operation of this corridor. Resources can be avoided by relocation or rerouting of ground disturbing activities. If resources are unavoidable then testing or excavation may be required.	It is likely that cultural resource sites and segments containing Native American traditional or spiritual use areas would not be directly affected by the construction and operation of this ROW. Resources can be avoided by relocation or rerouting of ground disturbing activities. If resources are unavoidable then testing or excavation may be required.	It is likely that cultural resource sites and segments containing Native American traditional or spiritual use areas would not be directly affected by the construction and operation of this ROW. The slightly narrower width of this alternative, as currently scoped, could impact fewer sites than would the Proposed Action. Resources can be avoided by relocation or rerouting of ground disturbing activities. If resources are unavoidable then testing or excavation may be required.	There are 25 known archaeological and historic resources within the 52% of the corridor covered by prior cultural resources surveys. Low likelihood that segments containing cultural and Native American traditional or spiritual use sites would be affected by the construction and operation of this corridor. Resources can be avoided by relocation or rerouting of ground disturbing activities. If resources are unavoidable then testing or excavation may be required.	There are 24 known archaeological and historic resources within the 65% of the corridor covered by prior cultural resources surveys. Low likelihood that segments containing cultural and Native American traditional or spiritual use sites would be affected by the construction and operation of this corridor. Resources can be avoided by relocation or rerouting of ground disturbing activities. If resources are unavoidable then testing or excavation may be required.	No change

Table 4-1. cont.

Factor	Proposed Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4	No Action
Ecological Resources: Flora and Fauna	Mesa top and wide canyon bottom vegetation would be disturbed on about 23 ac (9 ha) throughout the length of the power line route. Reseeding and stabilization activities following construction would restore the majority of area disturbed. Native vegetation would return to the disturbed corridor over a period of time, and the corridor would be managed appropriately.	Mesa top and wide canyon bottom vegetation would be disturbed on about 23 ac (9 ha) throughout the length of the power line route. Reseeding and stabilization activities following construction would restore the majority of area disturbed. Native vegetation would return to the disturbed corridor over a period of time, and the corridor would be managed appropriately.	Effects on flora and fauna are similar to the Proposed Action except that there would be more pole structures and therefore more land would be disturbed (26 ac/10.5 ha).	Effects on flora and fauna are similar to the Proposed Action except that the area disturbed (22 ac/9 ha) would be slightly less.	Effects on flora and fauna are similar to the Proposed Action except that the area disturbed (30 ac/12 ha) would be slightly greater.	No disturbances to vegetation.
Ecological Resources: Federal T&E Species	No adverse effects on the following Federal T&E species could occur: bald eagle, southwestern willow flycatcher, whooping crane, and Mexican spotted owl. Mitigation measures would be enforced during construction and maintenance activities.	No adverse effects on the following Federal T&E species could occur: bald eagle, southwestern willow flycatcher, whooping crane, and Mexican spotted owl. Mitigation measures would be enforced during construction and maintenance activities.	Effects on Federal T&E species are similar to the Proposed Action.	Effects on Federal T&E species similar to the Proposed Action except that the area disturbed (22 ac/9 ha) would be slightly less.	Effects on Federal T&E species are similar to the Proposed Action except that the area disturbed (30 ac/12 ha) would be slightly greater.	No change
Ecological Resources: Wetlands and Floodplains	Effects on wetlands and other sensitive areas are not anticipated.	Effects on wetlands and other sensitive areas are not anticipated.	Effects on wetlands and other sensitive areas are similar to the Proposed Action.	Effects on wetlands and other sensitive areas are similar to the Proposed Action.	Effects on wetlands and other sensitive areas are similar to the Proposed Action.	No change
Water Quality	Water quality protected by NPDES permit and SWPP Plan.	Water quality protected by NPDES permit and SWPP Plan.	Water quality protected by NPDES permit and SWPP Plan.	Water quality protected by NPDES permit and SWPP Plan.	Water quality protected by NPDES permit and SWPP Plan.	No change
Land Use	Potential changes in land use are consistent with BLM, USFS, and DOE plans. Most current land uses would continue.	Potential changes in land use are consistent with BLM, USFS, and DOE plans. Most current land uses would continue.	Potential changes in land use would be similar to the Proposed Action.	Potential changes in land use would be similar to the Proposed Action.	Potential changes in land use would be similar to the Proposed Action.	No change in current land uses at BLM, USFS, or DOE.

5.0 ACCIDENT ANALYSIS

An accident is an unplanned sequence of events that results in undesirable consequences. The term unplanned is generally interpreted as an event or sequence of events that have a frequency of occurrence of less than or equal to once per ten years ($\leq 1 \times 10^{-1}$/yr). Of greatest concern are those accidents that have the potential to cause loss of life.

The method used to identify accidents for the activities proposed in this EA was to review literature on safety issues as related to the utilities industry, especially electrical utilities. This EA considers risks to LANL workers or to the general public that could result from accidents. At least two of the literature sources reviewed for this EA consisted of historical reviews of many other literature sources on accidents and human safety as related to the electrical utility industry (BIA 1986 and CPEEFBS 1996).

Three hazards with the potential to cause loss of life in constructing and maintaining the power line are

- electrocution,
- falls from elevated heights, and
- potential events related to the use of helicopters for construction or maintenance.

Until the particular methods for constructing and maintaining the proposed power line are identified, only general injury statistics can be explored to identify potential death injury rates associated with this project.

A mortality study of career (approximately 30 years) workers at five U.S. electric utilities shows that less electric utility workers died from all causes than would be expected in the general male population (EPRI 1998). This is attributed to the tendency for employed people to be healthier than the general population.

5.1 Electrocution

The greatest human health hazard associated with any power line is the possibility of indirect contact of conductors with long conducting objects such as a metal pipe, an antenna, or heavy equipment (BIA 1986). Although the incidence of death for the electric services industry resulting from all causes is slightly lower than corresponding rates for the private sector as a whole, line workers face a greater risk of electric shock (Garfinkel 1995).

Nationwide injury statistics compiled by the National Safety Council reveal that for the years 1989 to 1991, an annual average of one in 3,105 workers associated with power lines, generating stations, and distribution stations died from an electrical current (NSC 1994). This frequency translates to a probability of 9.6×10^{-4} fatalities per year from electrocution for this project. No deaths above the rate experienced by the standard electrical industry are expected for this project.

5.2 Falls Resulting in Deaths

Based on the Savitz and Loomis 1995 data, one in 985 (about 1.0×10^{-3}) utility workers died from accidental falls over a 30-year career. Assuming a 30-year career, the probability of a fatality from a fall for this one-year project is 3.4×10^{-5}. No deaths are expected above the rate experienced in the standard electrical industry.

5.3 Helicopter Use

Helicopters are being considered for use in constructing the power line and for performing "live work" maintenance during the operational phase. "Live work" is defined as the various methods used to carry out erection and maintenance, including connection and disconnection, on live parts of electric installations. Because of the increased use of helicopters, the Electric Power Research Institute (EPRI) has been testing the safety of two helicopter techniques at its testing center in Massachusetts. The main concern is electrocution, but the concern is primarily for 230-, 345-, and 500-kV systems. So far, testing has shown that the predictive equation used to determine safe work distances is conservative (EPRI 1999). Although guidelines and rules have been developed for various aspects of airborne power line construction and maintenance, injury statistics related to this specific, relatively new technique are not available. The contractor hired to construct the proposed power line would adhere to established guidelines for conducting such activities. The IEEE has developed comprehensive guidelines for airborne live-line maintenance operations. The IEEE has also developed guidelines for helicopter-based insulator washing and the Occupational Safety and Health Administration has adopted work rules related to helicopter landing zone procedures. The Helicopter Association International is developing additional guidelines.

6.0 CUMULATIVE EFFECTS

Cumulative effects on the environment result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes them. These effects can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7). This section considers the cumulative effects of the Proposed Action together with other actions occurring within and directly adjacent to the potentially affected region.

6.1 Activities in the Vicinity of the Proposed Right-of-Way

The cumulative effects of the Proposed Action together with past, present, and reasonably foreseeable actions on BLM-administered land are anticipated to be negligible. Past activities in this area have involved the installation and operation of the Norton Substation and associated power lines. These activities have resulted in some restrictions on land use, however, the majority of land uses in the area have remained unchanged and are not expected to change due to implementing the Proposed Action or any of the alternatives considered. Cattle grazing, firewood gathering, and general recreational use would continue to be the dominant land uses. The siting and operation of the new proposed 345-kV-designed power line would not contribute substantially to restrictions on current land use practices such as cattle grazing, firewood gathering, and general recreational use. The Proposed Action would contribute to the existing visual effects associated with the Norton Substation and related power lines. The future foreseeable non-DOE activities on BLM land near the Norton Substation may involve the construction and operation of another 115-kV line extending from the substation east towards Tesuque, New Mexico. This action would further contribute to the limited land use restrictions in the area as well as the magnitude of visual resource effects in the area of the Norton Substation.

The cumulative effects of the Proposed Action together with past, present, and reasonably foreseeable actions on USFS-administered land are anticipated to be negligible. Past activities in this area have involved the installation and operation of the single 115-kV power line (the Reeves Line), and the development and use of many primitive roads. Land use practices under the USFS Land Use Management Plan allow for livestock grazing, firewood gathering, and general public recreational use. These activities would remain unchanged. The siting, construction, and operation of the new proposed 345-kV-designed power line would not contribute substantially to restrictions on current land use

practices such as utility corridor operation, cattle grazing, firewood gathering, and general recreational use. The Proposed Action would contribute to the existing visual conditions associated with USFS lands.

Past activities that could contribute to a cumulative effect on Segments 3 and 4 are limited primarily to activities associated with outdoor tests that were conducted in support of DOE missions at LANL. Segment 3 and most of Segment 4 have traditionally been used as undeveloped or inactive buffer areas for ongoing operations at LANL. In some cases, hazardous or radioactive wastes have been disposed of in these areas that now require clean-up. These historical land uses have indirectly preserved an extensive amount of wildlife habitat and cultural resources. The Proposed Action would not be expected to change the uses of these lands at LANL. Segments 3 and 4 would continue to serve as both outdoor testing and buffer areas for operations at LANL. Environmental clean-up activities would continue as currently planned. Wildlife habitat and cultural resources would continue to be preserved. Visual resources would be affected as the Proposed Action would add a third 115-kV operated power line to the existing viewshed.

The Proposed Action would greatly enhance the reliability of the Power Pool but would not provide additional power capacity. The LANL SWEIS and the Conveyance and Transfer EIS have identified the need for additional power capacity to fully implement the Preferred Alternatives identified in each EIS. Therefore, the Proposed Action would not have a cumulative effect on the fundamental need for additional power capacity for the Power Pool.

The proposed route from the Norton Substation to the WTA at LANL is not expected to conflict with any current land uses or potential future development on BLM, USFS. or DOE lands. Any potential environmental effects are expected to be negligible. Therefore, the Proposed Action is not expected to have an adverse cumulative effect on Federal land uses or the environment.

An additional potential activity in the general area is the introduction of bighorn sheep. As mentioned earlier in Section 2.8.3, an EA will be developed to consider the potential impacts associated with the reintroduction of bighorn sheep into the area. There is currently no known contemplated plan to reintroduce desert bighorn sheep in the LANL area. The power line would parallel an existing 115-kV line in this area.

In October 1999 DOE designated an area at LANL as suitable and usable as a wildlife reserve. The objective of this establishment is to conserve, protect, and enhance the habitat for the plants and animals that inhabit the site or use it intermittently. The wildlife reserve site includes over 1,300 ac (526 ha) of LANL land along the Rio Grande and canyon escarpment. Land on the eastern side of the river is managed by the USFS and land abutting on the south is managed by BNM. The proposed power line was considered as an inherent planned future activity in this area during the establishment of the wildlife reserve. The power line would be over 100 feet above the upper rim of the White Rock Canyon Reserve area.

6.2 A Related Action

This EA examines the environmental consequences arising from the addition of a 115-/345-kV line to the existing Power Pool. Another related activity, which could further enhance local as well as regional transmission reliability and rectify the Northern New Mexico Import limitations, is being pursued by DOE and several utility companies and is discussed below.

At this time, studies are underway on a near-future transmission development strategy by Plains Electric, Tri-State Generation & Transmission Association, PNM, and DOE. PNM is also evaluating electric power generation for the region. These developments are expected to rectify the network deficiencies that now exist in the Northern New Mexico Import Area and also in the northeastern area of New Mexico. Power Pool representatives have participated in the study process to ensure that the expanding

needs and subsequent reliability concerns of the Power Pool are considered. The purpose of these multi-utility joint study efforts is to evaluate the northeastern area of New Mexico and Northern New Mexico Import Area operational and planning requirements.

As a result of these joint study efforts, the regional transmission reliability would be upgraded and the Power Pool, in the future, would be able to secure additional import rights through the regional transmission system. Discussions are ongoing and consideration is being given to a project that would reconfigure the Norton-Hernandez (NH) power line (115-kV line) from the Hernandez Substation to ETA (NL 115-kV line). This proposal is known as the "NH-NL Reconfiguration." The proposed inter-connection would tie into the NL line at a location north of the Norton Substation near Buckman. The only DOE asset affected by the NH-NL reconfiguration is the NL line (Figure 12). This project would also increase the reliability of the overall system since a shutdown from the Norton Substation to the south would not cut off power from the Hernandez side.

Under the preferred NH-NL reconfiguration option, DOE's involvement would be limited to reconductoring the existing DOE-owned 115-kV power line from the point of inter-connection to ETA. Reconductoring could achieve a transmission path rating of 280 MVA as opposed to the 80-MVA thermal limitation under the current NH configuration. A double circuit 115-kV option has also been discussed and would involve a structure replacement on the existing NH line. One circuit would constitute the Hernandez to ETA line and the other circuit would reestablish the NH line. Under this option, a transmission path rating of 560 MVA could be achieved. This is a 480-MVA improvement over the current NH configuration. This configuration would afford LANL the opportunity to secure additional import rights to meet future electrical needs.

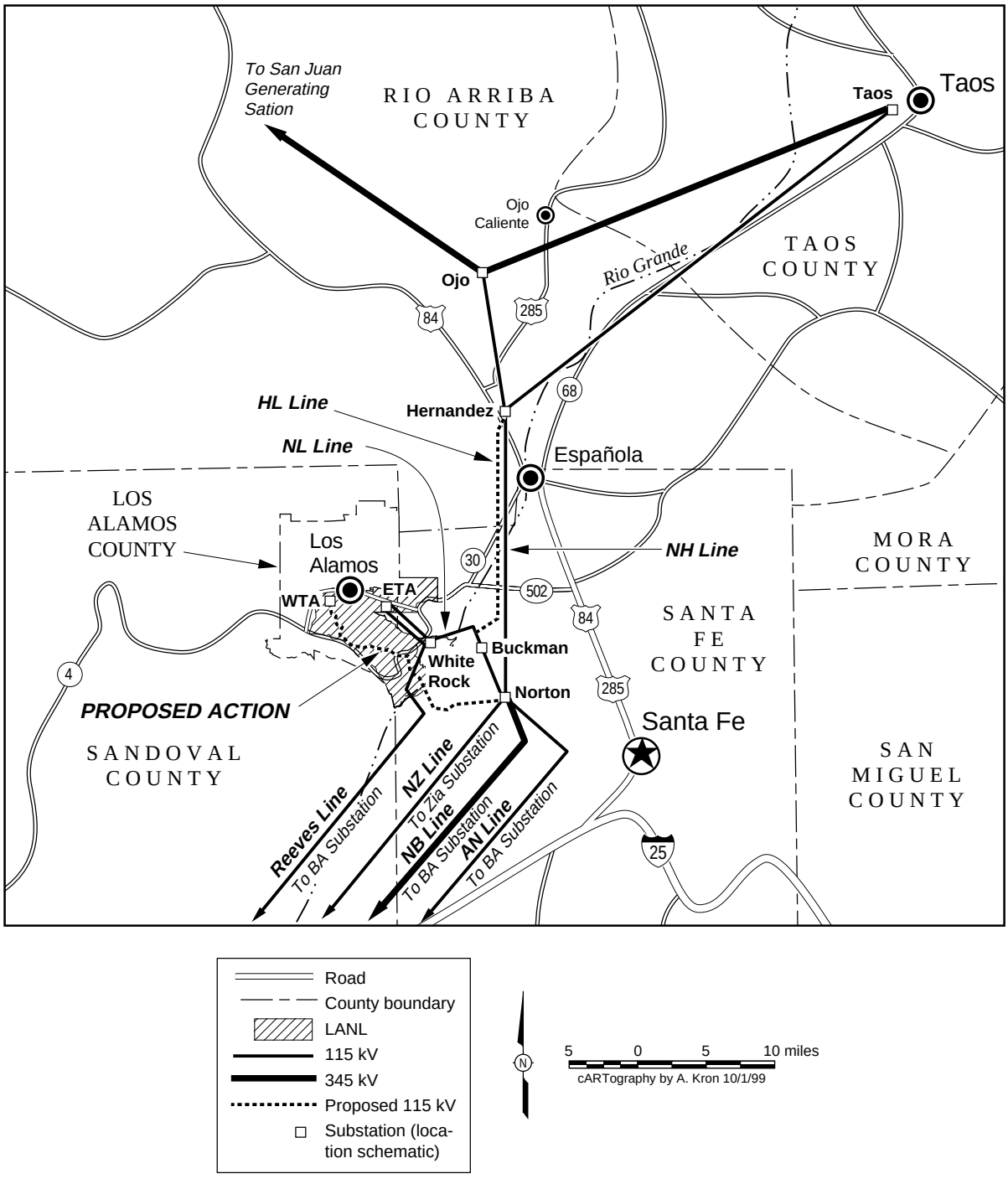

Figure 12. Proposed Northern New Mexico Transmission System

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7.0 AGENCIES CONSULTED

The following Federal and State agencies were consulted during the preparation of this EA.

Federal Agencies
- U.S. Department of Interior, U.S. Fish and Wildlife Service (USFWS)

The USFWS was requested in a letter dated October 20, 1999 to concur with DOE's determination of affects to Federal T&E species and their critical habitats pursuant to Section 7 requirements under *The Endangered Species Act* (16 USC 1531 et seq). In a letter dated December 21, 1999, the USFWS concurs with DOE's determination that the construction of the proposed Electrical Power Systems Upgrades may affect, but is not likely to adversely affect the Mexican spotted owl, southwestern willow flycatcher, bald eagle, or whooping crane.

- U.S. Department of Interior, Bureau of Land Management, Taos Field Office
- U.S. Department of Agriculture, Forest Service, Santa Fe National Forest

The BLM and USFS assisted in the preparation of this EA as Cooperating Agencies for the purpose of providing information and analysis of effects to lands under their respective administrative control.

State Agencies
- New Mexico Office of Cultural Affairs, Historic Preservation Division

The NM SHPO was requested in a letter dated October 15, 1999 to concur with DOE's determination of affects to cultural resources pursuant to Section 106 of *The National Historic Preservation Act* (16 USC 470 et seq). SHPO concurrence in a determination of no effect was signed and dated November 3, 1999. An added comment stated, "no effect if all sites are avoided."

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APPENDIX A: Summary of Studies on Health Effects from Exposure to Electric and Magnetic Fields

The principle that alternating current fields can elicit biological effects via induced electric fields/currents has been known since the middle of the 19th century (Bailey et al. 1997). "Public concern regarding possible health risks from residential exposures to low-strength low-frequency electric and magnetic fields produced by power lines and the use of electric appliances has generated considerable debate among scientists and public officials." In 1991, Congress asked that the National Academy of Sciences (NAS) review the research literature on the effects from exposure to these fields and determine whether the scientific basis was sufficient to assess health risks from such exposures (CPEEFBS 1996). In response to legislation directing DOE to enter into an agreement with the NAS, the National Research Council convened the committee on the Possible Effects of Electromagnetic Fields on Biological Systems. The Committee was asked to review and evaluate the existing scientific information on the possible effects of exposure to electric and magnetic fields on the incidence of cancer, on reproduction and developmental abnormalities, and on neurobiologic response as reflected learning behavior. In addition, the committee was asked to identify future research needs and to conduct a risk assessment to the extent that the research data justified. Among the first organizations to assess the human health implications of exposures to EMF was an International Radiation Protection Association working group in 1974.

Although no consensus has been reached on the possible effects to the public of EMF, the ACGIH has issued occupational exposure guidelines as "Threshold Limit Values" (TLV) for EMF of 25 $kV \cdot m^{-1}$ ("ceiling limit") for static electric and power-frequency electric fields. The goal of these TLVs is to limit the induced current density (current flow through a bulk tissue reference area) that is caused by alternating current EMFs to 10 $mA \cdot m^{-2}$ in the body. The exposure ceiling value is the concentration that should not be exceeded during any part of the working day. The whole body exposure guideline refers to a level of EMF that nearly all workers can be repeatedly exposed to daily without adverse health effects.

Leading up to issuance of the Final Environmental Impact Statement on the Proposed OLE project, the U.S. Bureau of Indian Affairs reviewed and summarized studies on the biological effects of power lines (BIA 1986). Russian studies on 500 workers at 220-, 330-, 400-, and 500-kV substations showed changes in reaction tests and alterations in electrocardiogram and electroencephalogram tests among workers at the 400- and 500-kV substations. A study in Spain on nine workers at a 400-kV switchyard reported that they complained of vertigo, nausea, fatigue, and headaches. Similar studies, as described below, were performed elsewhere to determine whether the same health effects could be measured. In the U.S. in 1973, ten linemen were monitored for nine years for changes in the nervous and circulatory systems, lungs, kidneys, vision, hearing, and sperm production. In Canada, the nervous system, circulatory system, and gastrointestinal system of 56 substation workers who were exposed to high-voltage fields for 4.5 years were studied. In Sweden, 53 substation workers were monitored for chronic health problems and for abnormalities in the central nervous system, the circulatory system, and blood. None of the studies above showed any of the negative health effects observed in the Russian and Spanish workers, nor were any other health problems discovered (BIA 1986). In France, the health of 267 people living within 82 ft (25 m) of 200-kV and 400-kV power lines was compared with the health of a second group of people living within 410 ft (125 m) of the same power lines. No difference was found between the two groups.

A U.S. study indicated an increased incidence in cancer of young people living near backyard distribution lines; however, the results of this study have been challenged in studies where the incidence of increased cancer near distribution lines could not be found. Reviews of worldwide human and animal research on possible linkages between cancer and long-term exposure to high electric fields experienced by linemen and switchyard workers concluded no increase in cancer (BIA 1986).

Citing that reports of leukemia and brain cancer among men in electrical occupations suggest a small increase in risk, but that most previous studies failed to classify magnetic field exposure accurately or to consider potential confounders, Savitz and Loomis (1995) conducted an historical cohort mortality study of 138,905 men employed at five large electric power companies in the United States between 1950 and 1986 with at least 6 months of work experience. Exposure was estimated by linking individual work histories to data from 2,842 workshift magnetic field measurements (presumably associated with a full range of voltage energy systems). Mortality follow-up identified 20,733 deaths based on 2,656,436 person-years of experience. Death rates were analyzed in relation to magnetic field exposure history with Poisson regression. Total mortality and cancer mortality rose slightly with increasing magnetic field exposure. Leukemia mortality, however, was not associated with indicies of magnetic field exposure except for work as an electrician. Brain cancer mortality was modestly elevated in relation to duration of work in exposed jobs and much more strongly associated with magnetic field exposure indicies. Brain cancer risk increased by an estimated factor of 1.94 with a mortality rate ratio of 2.6 in the highest exposure category. In contrast to other studies, these data did not support an association between occupational magnetic field exposure and leukemia but did suggest a link to brain cancer.

A study of residential exposure to magnetic fields and acute leukemia in children (Linet et al. 1997) found no evidence of increased risk to children living in homes characterized by high magnetic field levels. "Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential EMF produces cancer, adverse neurobehavioral effects, or reproductive and developmental effects" (CPEEFBS 1996).

Lastly, EPRI claims that early statistical associations between childhood leukemia and indirect measures of magnetic field exposure are not borne out by studies that used actual in-house EMF measurements (EPRI 1997). EPRI also claims that research has provided solid data on a lack of association between EMF and reproductive outcomes and has identified weaknesses in several proposed mechanisms of the biological action of EMF.

APPENDIX B: Visual Resource Analysis

The visual effects analysis is based on the following:

- incorporates previous NEPA analysis (BIA 1986) of visual effects for Segments 1 and 2,
- focuses on sensitive viewpoints within the foreground (0-0.5 mi [0-0.8 km]) and midground (0.5-4 mi [0.8-6 km]) areas surrounding the power line corridor, and
- assumes that the power line, when in the background (greater than 4 mi [6 km]), would be unobtrusive.

Visual effects were estimated using computer modeling, specifically the ArcInfo® GIS. ArcInfo® uses digital elevation data to calculate mean elevations of grid cells, measuring 528 ft (161 m) on a side. All grid cells within the foreground and midground zones were selected for analysis. ArcInfo® was used to model vegetation and factored in the height of the vegetation that intervened between each cell and the power pole structures. Power pole structures were plotted in their approximate locations using the preliminary design and average expected distances between pole structures for all segments.

The model software assigned a value to each cell based on the number of pole structures that could be seen from that cell once terrain, vegetation, and pole structure height were taken into consideration. ArcInfo® then was used to produce maps of the visibility of the power line. Sensitive viewing areas were then compared to the maps to determine the degree to which the power line was visible. Sensitive viewing areas were defined as recreational and park areas[5], residential areas[6], main travel routes[7], and Native American use areas, specifically, the San Ildefonso Pueblo land use area south of Tsankawi. The San Ildefonso Pueblo use area was included since the presence or sight of the power line might interfere with traditional cultural activities on that tract. If other TCPs are located within the foreground or midground, they could be similarly affected; however, effects on these sites cannot be determined at this time. Sensitive viewing areas tend to be located in upland areas, often at distances greater than 2 mi (3 km) from the power line. Sensitive viewing areas are listed by segment in Table B-1.

Table B-1. Sensitive Viewing Areas Occurring within the Foreground and Midground of the Power Line

Sensitive Viewing Areas	Foreground	Midground	Approximate Area Affected
Segment 1 (BLM)			
Caja del Rio	X	X	1 mi^2 (2.5 km^2) to west of Norton Substation; approximately 3 mi^2 (8 km^2) of Canada Ancha and adjacent areas to east
Segment 2 (Forest Service)			
NW Santa Fe	NA	X	1.5 mi^2 (4 km^2) of Las Campanas area
White Rock	NA	X	4 mi^2 (10 km^2)
NM 4	NA	X	7 mi (11 km) of road
BNM	NA	X	1.5 mi (2.4 km) of entrance road; 1 mi (1.6 km) of Lower Alamo Crossing Trail
Tsankawi	NA	NA	NA

[5]The northern sections of BNM, as well as the Tsankawi section and various trails; the Caja del Rio, including the east edge of White Rock Canyon (referred to here as the "Power Line" overlook).

[6]Northwestern Santa Fe, White Rock, and portions of the Los Alamos townsite.

[7]NM 501, NM 502, NM 4.

Table B-1. Cont.

Sensitive Viewing Areas	Foreground	Midground	Approximate Area Affected
White Rock Overlook	NA	NA	NA
Power Line Overlook[4]	X	X	Single viewpoint on east edge of White Rock Canyon
Caja del Rio	X	X	Primarily areas to the south of Segment 2 (approximately 9 mi^2 [23 km^2]) and east of Canada Ancha (approximately 12 mi^2 [31 km^2])
San Ildefonso	NA	NA	NA
Segment 3 (DOE East Section)			
San Ildefonso	NA	X	Occasional spots within the "sacred area"
NM 4	X	X	4 mi (6 km) of road
White Rock	NA	X	1.5 mi^2 (4 km^2) of SW White Rock
Tsankawi	NA	X	One point on mesa top
BNM	NA	X	Part of Juniper Campground
Power Line Overlook	NA	X	Single viewpoint on east edge of White Rock Canyon
Caja del Rio	NA	X	Approximately 9 mi^2 (23 km^2) on east side of Rio Grande
Segment 4 (DOE West Section)			
Los Alamos townsite	NA	X	Portions of central business district, North Mesa, Barranca Mesa
Forest Service Trails	NA	X	0.5 mi (0.8 km) of lower Mitchell Trail; 2 mi (3 km) of Pipeline Road; 2 mi (3 km) of Quemazon Trial; 2 mi (3 km) of Ski Hill Road
NM 4	X	X	1 mi (1.6 km) in foreground; 8 to 9 mi (13 to 14 km) midground
White Rock	NA	X	0.5 mi^2 (1 km^2) southwest of White Rock
Power Line Overlook	NA	X	Single viewpoint on east edge of White Rock Canyon
Caja del Rio	NA	X	Approximately 1 mi^2 (1.6 km^2) on east side of Rio Grande
NM 501	NA	X	2.5 mi (4 km) of road
San Ildefonso	NA	X	1 to 2 mi^2 (2.5 to 5 km^2) of "San Ildefonso Sacred Area"
BNM	NA	X	1 mi (1.6 km) of entrance road; part of Juniper Campground; 1 mi (1.6 km) of Apache Springs Trail; 1 to 2 mi (1.6 to 3 km) of Upper Frijoles Crossing Trail; 0.5 mi (0.8 km) of unnamed trail on Escobas Mesa; 2.5 mi (4 km) of Burnt Mesa Trail; 1 mi (1.6 km) of Bear Springs Trail and 1 mi (1.6 km) of unnamed trail to NW; Ponderosa Campground and immediate surroundings
Tsankawi	NA	X	1 point on the mesa top
Pajarito Ski Area	NA	NA	NA
Segment 5			
Los Alamos Townsite	NA	X	Mesa tops throughout most of townsite
White Rock	NA	X	About 1.5 mi^2 (4 km^2) of southwest White Rock

Table B-1. Cont.

Sensitive Viewing Areas	Foreground	Midground	Approximate Area Affected
San Ildefonso	NA	X	Areas along the southwest margin of the "Sacred Area" and other scattered areas within the "Sacred Area"
NM 4	X	X	About 2 mi (3 km) near White Rock and occasional scattered locations between White Rock and the junction with NM 501
NM 501	X	X	About 2 mi (3 km) along western boundary of LANL
Power Line Overlook	NA	X	Single viewpoint on east edge of White Rock Canyon
Caja del Rio	NA	X	About 2 to 3 mi^2 (5 to 8 km^2) along eastern side of the Rio Grande
BNM	NA	X	Occasional spots on the Burnt Mesa Trail and northern part of the Upper Frijoles Crossing Trial; Ponderosa Campground and immediate surroundings
Tsankawi	NA	X	A few higher elevations in western half
Forest Service Trails	NA	X	Occasional points along the Pajarito Canyon Trail, the Canon de Valle Trail near its junction with NM 501, the Rendija Canyon Trail, and the Cabra Loop Trail; about 2 mi (3 km) of the Quemazon Trail and 1 mi (1.6 km) of the Mitchell Trail
Segment 6			
Los Alamos Townsite	NA	X	Central part of townsite
White Rock	NA	X	1.5 mi^2 (4 km^2) of southwest White Rock
San Ildefonso	NA	X	Occasional areas along the southwest boundary of the "Sacred Area"
NM 4	X	NA	Along entire length between White Rock and junction with NM 501
NM 501	X	X	2 mi (3 km) along western LANL boundary
"Power Line" overlook	NA	X	Single viewpoint on east edge of White Rock Canyon
Caja del Rio	NA	X	About 2 to 3 mi^2 (5 to 8 km^2) along eastern side of the Rio Grande
Bandelier NM	X	X	An area covering about 10 mi (16 km) east-west and 4 mi (6 km) north-south, including the entrance road, Juniper Campground, and large sections of most trails except for Lower Frijoles Canyon Trail; Ponderosa Campground and immediate surroundings
Forest Service Trail	NA	X	Occasional spots along upper Pajarito Canyon Trail, Guaje Ridge Trail, Rendija Canyon Trail, and Cabra Loop Trail; 1 to 2 mi (1.6 to 3 km) of Quemazon Trail; 1 mi (1.6 km) of Mitchell Trail

Large areas of the foreground and midground zone would have no view of the proposed power line (no pole structures visible). Table B-2 summarizes overall visibility of the power line segments, irrespective of sensitive viewing areas. This table displays the percentage of grid cells in the foreground and midground zone that would view no (0) pole structures, 1 to 5 pole structures (low visibility), 6 to 10 pole structures (moderate visibility), and more than 10 pole structures (high visibility).

Table B-2. Visibility of Proposed Power Line within the Foreground and Midground Zone of the Proposed Power Line Segments

Visibility of Power Line	Percentage of Grid Cells Affected					
	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
not visible (0 pole structures)	74	34	61	64	64	58
low (1-5 pole structures)	26	36	23	16	27	18
moderate (6-10 pole structures)	0	21	14	8	7	9
high (>10 pole structures)	0	9	2	12	2	15

Tables B-1, B-2, and subsequent tables in the visual resources sections tend to overstate the visibility of the power line because the modeling does not take into consideration minor local relief and vegetation at the observer's position. In addition, the use of non-reflective pole structure materials (except for the Rio Grande crossing) and gradual oxidation of the conductor cables, which would reduce their reflectivity, would reduce the visibility of the power line.

The severity of visual effects of Segments 1, 2, 3, and 4 at sensitive viewing areas is listed in Table B-3.

Table B-3. Effect of the Proposed Action on the Existing Visual Environment

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	Magnitude
Segment 1 Summary	Additional industrial elements	Low - power lines and substation present
Segment 2 Summary	Addition of industrial element in undeveloped area; additional industrial development in existing power line corridor	Overall: Low to Moderate
NW Santa Fe	All pole structures are in midground or background; nearest pole structures - 3 mi (4.8 km) from private land	Low - few residents; pole structures at some distance; viewers have long viewing time
White Rock	All pole structures are in midground or background; nearest pole structures - 1.5 mi (2.4 km) from residential streets; existing power line overlaps with about 7 proposed pole structure locations; SE White Rock most affected	Moderate - stationary viewers (residents) have long viewing time; existing power line already in field of view
NM 4	All pole structures are in midground or background; nearest pole structures - 2.25 mi (3.6 km)	Low - viewers traveling at highway speed; pole structures rarely in direct line of view
BNM	All pole structures are in midground or background; nearest pole structure - 3 mi (4.8 km) from nearest trail, 2.75 mi (4.4 km) from entrance road	Low to moderate - pole structures at some distance; not in direct line of view of drivers; over a distance of 2.5 mi (4 km) of Lower Alamo Crossing Trail
"Power Line" overlook	Pole structures in fore, mid, and background	Moderate - viewer attention focused on White Rock Canyon and Rio Grande; however, line must be visible for aircraft safety as it crosses Rio Grande

Table B-3. Cont.

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	**Magnitude**
Caja del Rio	Pole structures in fore, mid, and background	Low to moderate - short-term visits by recreationists; many areas overgrazed; power lines already present in some areas
Segment 3 Summary	Additional industrial elements in existing power line corridor; new elements would be about 30 ft (9 m) higher than existing structures and surrounding vegetation.	Overall: Low to Moderate
San Ildefonso	All pole structures are in midground or background; nearest pole structures about 1.75 mi (3 km) away from “Sacred Area;” power line not visible from most of “Sacred Area”	Low - existing power line along entire length of Segment 3
“Power Line” overlook	Pole structures in fore, mid, and background; nearest pole structure - 1 mi (1.6 km); visibility indicator balls on lines for aircraft and bird safety	Moderate - viewer attention focused on White Rock Canyon and Rio Grande
Caja del Rio	Pole structures in mid and background; nearest pole structure - 1 mi (1.6 km)	Low - pole structures at distance; other power lines present
NM 4	All pole structures are in fore or midground; nearest pole structure <0.25 mi (0.4 km); maximum number of pole structures in foreground - 3	Low - existing power line along entire length of Segment 3
White Rock	All pole structures in foreground, nearest pole structure - 0.5 mi (0.8 km)	Low - existing power line along entire length of Segment 3
BNM	All pole structures in midground; nearest pole structure >2.35 mi (4 km) from entrance road; Juniper Campground and park entry station	Moderate - frequent viewers at BNM
Tsankawi	Nearest pole structure - 3.75 mi (6 km)	Low - one or two pole structures visible from one point in monument at near background distance
Segment 4 Summary	New industrial elements in undeveloped areas; new elements would be about 20 ft (6 m) higher than surrounding vegetation	Overall: Low to Moderate
Los Alamos townsite	Pole structures within mid and background; nearest pole structure - >1.25 mi (2 km) from residential streets and townsite trails	Low - line would be viewed against the LANL industrial background
Forest Service Trails	Nearest pole structure to Mitchell Trail >3 mi (5 km); nearest pole structure to Ski Hill Road - 1 mi (1.6 km); nearest pole structure to lower Quemazon Trail >1 mi (1.6 km); nearest pole structure to Pipeline Road -2 mi (3 km)	Low - heavy vegetation on trials; short residence time on roads
NM 4	Pole structures are in fore and midground throughout length of NM 4; nearest pole structure - <0.5 mi (0.8 km)	Moderate - many viewers, short residence time at any one location
White Rock	Pole structures within mid and background; nearest pole structure - between 0.5 and .75 mi (0.8 and 1 km)	Moderate - stationary viewers have long viewing time; primarily affects southwest White Rock
Caja del Rio	Pole structures within mid and background; nearest pole structure - 3 mi (5 km)	Low - pole structures at distance; short-term visits

Table B-3. Cont.

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	**Magnitude**
NM 501	Pole structures within mid and background; nearest pole structure >0.5 mi (0.8 km)	Low - viewers have short viewing time while driving; heavy vegetation along road
San Ildefonso	Pole structures within mid and background; nearest pole structure - 1 mi (1.6 km)	Moderate - visible from several discrete areas within "Sacred Area" but not visible from most of "Sacred Area"
BNM	Pole structures within mid and background; from entry station, Juniper and Ponderosa Campgrounds, and entrance road, nearest pole structure >1.5 mi (2.4 km); from Apache Springs Trail, nearest pole structure - 2.25 mi (3.6 km); from Upper Frijoles Crossing Trail, nearest pole structure - 2.25 mi (3.6 km); from Burnt Mesa Trail, nearest pole structure - 0.75 mi (1 km); from trail on Escobas Mesa, nearest pole structure 1.75 mi (3 km); from Alamo Springs Trail, nearest pole structure >2.25 mi (3.6 km); from vicinity of Bear Springs Trail, nearest pole structure >3.25 mi (5 km)	Moderate - visible from several hiking areas and monument entrance; many viewers; effects moderated by LANL vegetation screening and distance
Tsankawi	Nearest pole structure >3.25 mi (5 km)	Low - only visible from one point on mesa, line nearly at background

Table B-4. Effects of Alternative 3 on the Existing Visual Environment

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	**Magnitude**
Segment 5 Summary	Additional industrial elements in developed areas; new elements would be about 30 ft (9 m) higher than existing structures and higher than surrounding vegetation.	Overall: Low to Moderate
Los Alamos Townsite	Pole structures within mid and background; nearest pole structure - 1.5 mi (2.4 km)	Low - pole structures at distance; other industrial elements and power lines present
White Rock	Pole structure within mid and background; nearest pole structure - 0.75 mi (1 km)	Low to moderate - residential viewers, long viewing time; other industrial elements visible
San Ildefonso	Pole structures within mid and background; nearest pole structure - 1.5 mi (2.4 km)	Moderate - few pole structures visible from several areas in western part of "sacred area;" the view from a few scattered areas in the southwestern part include 6 to 20 pole structures
NM 4	Pole structures within mid and background; nearest pole structure - 0.5 mi (0.8 km)	Low - pole structures not in direct line of sight of viewers
NM 501	Pole structures within fore, mid, and background; nearest pole structure - 0.1 mi (0.16 km)	Low - pole structures not in direct line of sight of viewers

Table B-4. Cont.

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	**Magnitude**
Caja del Rio	Pole structures within mid and background; nearest pole structure - 3 mi (5 km)	Low - pole structures at distance; short-term viewers
Pajarito Ski Area	Pole structures within mid and background; nearest pole structure >3.75 mi (6 km)	Low - not in direct line of sight of viewers; pole structures at near background distance; difference in elevation causes pole structures to merge with surrounding vegetation
BNM	Pole structures within mid and background; nearest pole structure about 2.3 mi (4 km)	Low to moderate - recreational viewers; primarily affects Burnt Mesa Trail, Juniper and Ponderosa Campgrounds; view from most areas is <5 pole structures
Tsankawi	Pole structures within mid and background; nearest pole structure - 3 mi (5 km)	Low to moderate - recreational viewers; pole structures at distance; other power lines and industrial features present
Forest Service Trails	Pole structures within mid and background; nearest pole structure - 1 mi (1.6 km)	Low to moderate - recreational viewers; other power lines and industrial features present; difference in elevation causes pole structures to merge with surrounding vegetation

Table B-5. Effects of Alternative 4 on the Existing Visual Environment

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	**Magnitude**
Segment 6 Summary	Additional industrial elements in minimally developed areas; in foreground of major recreational travel route (NM 4 and NM 501); new elements would be about 30 ft (9 m) higher than existing structures and about 20 to 50 ft (6 to 15 m) higher than surrounding vegetation.	Overall: Low to High
Los Alamos Townsite	Pole structures in mid and background; nearest pole structure >3.5 mi (5.6 km)	Low - pole structures at distance; other power lines and industrial features present
White Rock	Pole structures in mid and background; nearest pole structure approximately 0.6 mi (0.9 km)	Moderate - residential viewers; primarily affects southwest White Rock
San Ildefonso	Pole structures in mid and background; nearest pole structure >3.5 mi (5.6 km)	Low - pole structures at near background distance; other power lines and industrial features present
NM 4	Pole structures in foreground throughout affected section of road	High - pole structures in direct line of sight of viewers; high number of recreational viewers
NM 501	Pole structures in foreground throughout affected section of road	High - pole structures in direct line of sight of viewers
Caja del Rio	Pole structures in mid and background; nearest pole structure - 2 mi (3 km)	Moderate - pole structures at distance; other power lines and industrial features present

Table B-5. Cont.

Sensitive Viewing Areas	Alteration of Existing Visual Environment	
	Nature of Change	**Magnitude**
Pajarito Ski Area	Pole structures in mid and background; nearest pole structure - >2.5 mi (4 km)	Low - pole structures at distance; not in viewer's direct line of sight
BNM	Pole structures in fore, mid, and background; nearest pole structure <0.25 mi (0.4 km)	High - recreational viewers; most trails in northern BNM, except Lower Frijoles Canyon; proposed line highly visible from Juniper and Ponderosa Campgrounds
Forest Service Trails	Pole structures in fore, mid, and background; nearest pole structures <0.25 mi (0.4 km)	Moderate - recreational viewers; other power lines and industrial features present; difference in elevation causes pole structures to merge with surrounding vegetation in some areas

GLOSSARY OF TERMS

Accord Pueblos Accord refers to the written agreements signed by DOE and the four Pueblos on December 8, 1992, stating the basic understanding and commitments of the parties and describing the general framework for their working together. Subsequently, cooperative agreements between each Pueblo and DOE, and between each Pueblo and the University of California have been signed, which specify further details related to the accord agreements.

archaeological sites (resources) Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

conductors Conductors consist of three bare aluminum wires that are steel reinforced, approximately 1 in. (2.5 cm) in diameter.

cultural resources Any prehistoric or historic sites, buildings, structures, districts, or other places or objects (including biota of importance) considered to be important to a culture, subculture, or community for scientific, traditional, or religious purposes or for any other reason. In the SWEIS, prehistoric cultural resources refer to any material remains and items used or modified by people before the establishment of a European presence in the upper Rio Grande Valley in the early 17th Century; historic cultural resources include all material remains and any other physical alteration of the landscape that has occurred since the arrival of Europeans in the region.

ecological resources For the purposes of the analyses presented in this document, ecological resources include all flora and fauna, sensitive species, threatened or endangered species, and wetlands that could be affected by implementation of any of the alternatives.

ecological risk assessment A quantitative evaluation that considers both the probability of exposure as well as the consequences from an exposure to a known hazard on an environmental receptor.

electromagnetic field (EMF) A field of force associated with an electric charge in motion.

Environmental Assessment (EA) A written environmental analysis that is prepared pursuant to the *National Environmental Policy Act* to determine whether a major federal action could significantly affect the environment and thus require preparation of an environmental impact statement. If the action would not significantly affect the environment, then a finding of no significant impact is issued.

Environmental Impact Statement (EIS) A document required of federal agencies by the *National Environmental Policy Act* for proposals for legislation or major federal actions significantly affecting the quality of the human environment. A tool for decision making, it describes the positive and negative environmental impacts of the proposed action and alternative actions.

environmental justice A requirement of Executive Order 12898 for federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental impacts of federal programs, policies, and activities on minority and low-income populations.

Environmental Restoration Program A project at LANL responsible for investigation and remediation of solid waste management units.

generation (1) The process of producing electricity; (2) the amount of electric energy, expressed in watt-hours; (3) sometimes implies generating plant, as used in this text.

geographic information system (GIS) Computer hardware, software, and data with spatial and other attributes. A GIS system can store, display, and analyze geographic data.

infrastructure The basic services, facilities, and equipment needed for the functioning and growth of an area.

kilovolt (kV) A kilovolt is 1,000 volts of electricity.

load (a) The amount of electric power delivered or required at any specified point in a system; (b) the amount of electricity required by a customer or a piece of equipment. When the term refers to the sum of the demands in an electric system, it is usually expressed in megawatts.

low-income population A community in which 25 percent or more of the population is characterized as living in poverty. The SWEIS uses the U.S. Bureau of the Census 1990 data to establish poverty thresholds; the 1990 poverty threshold for unrelated individuals was a 1989 income of $6,451 for those under age 65; $5,947 for those age 65 and older; and $12,674 for a family of four.

megawatt (MW) A unit of power equal to 1 million watts. Megawatt thermal is commonly used to define heat produced, while megawatt electric defines electricity produced.

mitigation The alleviation of adverse impacts on resources by avoidance, by limiting the degree or magnitude of an action, by repair or restoration, by preservation and maintenance that reduces or eliminates the impact, or by replacing or providing substitute resources or environments.

National Emission Standards for Hazardous Air Pollutants A set of national emission standards for listed hazardous pollutants emitted from specific classes or categories of new and existing sources. These standards were implemented in the *Clean Air Act Amendments.*

National Environmental Policy Act (NEPA) A law that requires federal agencies to consider the environmental impact of their activities—including the impact on cultural resources; endangered, threatened, or sensitive species; and floodplains or wetlands—before deciding to proceed with those activities.

National Environmental Research Park An outdoor laboratory set aside for ecological research to study the environmental impacts of energy developments. National environmental research parks were established by DOE to provide protected lands areas for research and education in the environmental compatibility of energy technology development and use.

National Pollutant Discharge Elimination System (NPDES) Federal permitting system required for municipal and industrial effluents regulated through the *Clean Water Act*, as amended.

National Register of Historic Places (NRHP) A list of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance maintained by the Secretary of the Interior. The list is expanded as authorized by Section 2(b) of the *Historic Sites Act of 1935* (16 U.S.C. §462) and Section 101(a)(1)(A) of the *National Historic Preservation Act of 1966*, as amended.

natural resources For the purposes of this document, lands providing natural, recreational, and economic opportunities for various users.

peaking power Electricity supplied during a period of the greatest demand.

potential release sites (PRSs) Sites potentially contaminated with hazardous or mixed wastes.

Power Pool Two or more electric systems interconnected and coordinated—in this EA, the County and LANL—for combined load and maintenance to supply electricity in an economical manner.

Public Service Commission (a) Formerly known as Public Utility Commission; (b) governmental agency whose members are appointed or elected to regulate investor-owned electric utilities; (c) the commission in each state makes the final decisions regarding rates, service territories, and construction.

reliability The characteristic of a system expressed by probability that it will perform a required mission under stated conditions for a stated mission time. Improved reliability of a system is commonly achieved by such techniques as increasing redundancy, increasing physical separation of redundant components, and increasing reliability of individual components.

riparian area A term used to describe the vegetation found next to bodies of water or wetland areas.

sensitive species For the purposes of this document, species of concern at the federal and/or state level are referred to as "sensitive species."

Site Development Plan (SDP) A comprehensive plan created to guide LANL land use, facilities, and infrastructure decision making.

Site-Wide Environmental Impact Statement (SWEIS) A type of programmatic EIS that analyzes the environmental impacts of all or selected functions at a DOE site. As part of its regulations for implementation of NEPA, DOE prepares site-wide EISs for certain large, multiple-facility DOE sites; it may prepare EISs or EAs for other sites to assess the impacts of all or selected functions at those sites (10 CFR 1021.330 [c]).

socioeconomics The social and economic condition in the study area.

solid waste management unit Any unit from which hazardous constituents may migrate, as defined by the *Resource Conservation and Recovery Act.* A designated area that is or is suspected to be the source of a release of hazardous material into the environment that will require investigation and/or corrective action.

State Historic Preservation Office(r) (SHPO) A position in each U.S. state that coordinates state participation in the implementation of the *National Historic Preservation Act* (16 U.S.C. §470 *et seq.*). The SHPO is a key participant in the Section 106 process, assisting in the steps of identification of eligible resources, evaluating effects of undertakings, and developing mitigation measures or management plans to reduce any adverse effects to eligible cultural resources.

substation A set of transformers that change the voltage of electric energy to levels appropriate for end use.

threatened and endangered (T&E) species Animals, birds, fish, plants, or other living organisms threatened with extinction by human-produced or natural changes in their environment. Requirements for declaring species threatened or endangered are contained in the *Endangered Species Act of 1973*.

transmission lines Also known as power lines. Wires or cables through which high voltage (115 kV - 345 kV) electric power is moved from point to point.

technical area (TA) A geographically defined area at LANL containing land and facilities dedicated to one or more functions.

volt (V) A unit of electrical pressure; the force which causes electrical charges to move through conductors. In the United States, 120 volts is standard; 220-240 volts are standard in foreign countries.

waste management The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated pollution prevention, surveillance, and maintenance activities.

watt (W) A metric measurement of power; the rate of work done or energy expended.

wetland Land or areas exhibiting hydric (requiring considerable moisture) soil concentrations, saturated or inundated soil during some portion of the year, and plant species tolerant of such conditions.