The 230kV Corridor Route would cross into Millard County, Utah just north of Highway 6/50 and would continue to parallel the existing 230kV transmission lines. This route would pass near the communities of Ely and Baker in Nevada and Hinckley and Delta in Utah. The socioeconomic characteristics of Millard County are described under the Direct Route.

Southern Route

In Nevada, the Southern Route would originate west of Ely and would pass through White Pine County to the south of the other alternatives. This route would cross the Egan Range south of Ely then would cross Spring Valley just north of the Lincoln-White Pine county line.

In Utah, the Southern Route would pass through Millard County to the south of the other alternatives. This route would pass near the communities of Hinckley and Delta.

Electric and Magnetic Fields

Introduction

The proposed SWIP transmission line is a 500kV class transmission line, which would operate at a maximum voltage of 550kV. This voltage generates electric and magnetic fields in the space between the conductors and ground. The purpose of this report is to quantify the levels and expected impacts from the SWIP 500kV transmission line. This section covers:

- electric field near ground
- magnetic field near ground
- corona (audible noise, radio interference, television interference)

There is currently no national standard in the United States for power frequency electric and magnetic fields. However, several states have been active in establishing mandatory or suggested limits on 60 hertz (Hz) electric and, in two cases, magnetic fields. Seven states have specific electric field limits that apply to transmission lines: Florida, Minnesota, Montana, New Jersey, New York, North Dakota, and Oregon. These regulations are summarized in Table 3-9, adapted from Transmission/Distribution Health & Safety (TDHS) Report [1989]. Florida and New York have established regulations for magnetic fields.

Electric field limits for the states have been given in terms of maximum field or edge-of-right-of-way field, or both. Except for Florida, regulations have not explicitly stated the operating conditions under which the limits apply. The Florida regulation was adopted after extensive public hearings and controversy. The law states: "Although there is no conclusive evidence that there is any danger or hazard to public health at levels of existing 60 hertz electric and magnetic fields found in Florida, there is evidence of a potential for adverse health effects on the public. Further research is needed to determine if there are effects and the exposure levels at which effects may occur." [Florida Department of Environmental Regulation, 1989]

The Florida electric field strength standard is based on (1) the avoidance of perception of the
field at the edge or on the right-of-way and on (2) the levels near existing facilities. The electric field strength limit in Florida has been set at 2 kilovolts/meter (kV/m) at the edge of the right-of-way and 8 kV/m on the right-of-way for 230kV or smaller lines. For 500kV lines the electric field shall not exceed 10 kV/m on the right-of-way.

The Florida magnetic field limit at the edge of the right-of-way is 150 milligauss (mG) for lines of 230kV or less and 200mG for 500kV lines.

The Minnesota 8 kV/m maximum field limit is applied on a case-by-case basis by the Minnesota Environmental Quality Board (MEQB), which has jurisdiction over lines of nominal voltage 200kV and higher. The limit is included in construction permits granted by the MEQB rather than in a formal rule [e.g., Minnesota Environmental Quality Board (MEQB), 1977]. Minnesota does not have an edge-of-right-of-way field limit.

The Montana Board of Natural Resources and Conservation (BNRC) imposed a 1 kV/m electric-field limit at the edge of the right-of-way in residential and subdivided areas for the BPA Garrison-Spokane 500kV Transmission Project [BNRC, 1983]. The administrative rules incorporating this requirement were adopted in 1984 [Jamison, 1986]. These rules apply to lines designed for operation at 69kV and higher, over which the BNRC has routing authority. An affected landowner may waive the 1 kV/m requirement. An additional requirement in the rules is a 7 kV/m limit at road crossings. The 1 kV/m electric-field limit was adopted because of the degree of protection and assurance to the public it provided and because of the small amount of additional right-of-way required [Jamison, 1986]. Although Montana does not have a magnetic field limit, the imposition of the 1 kV/m electric field limit assures that edge-of-right-of-way magnetic fields would be less than 0.050 gauss [Jamison, 1986].

In New Jersey the Department of Environmental Protection (NJDEP), Bureau of Radiation Protection, established interim guidelines for maximum field levels at the edge of the right-of-way [New Jersey Commission on Radiation Protection (NJDEP), 1981]. Their 3 kV/m limit is in the form of a resolution and is not enforced but rather serves as a guideline for evaluating complaints.

The New York edge-of-right-of-way electric field limit resulted from the extensive public hearings on 765kV lines before the New York Public Service Commission (NYPSC) from 1975 to 1977. The opinions issued by the NYPSC in this case required that the interim edge-of-right-of-way electric-field limit be equivalent to that for 345kV lines NYPSC, 1978a, 1978b. This resulted in an edge-of-right-of-way limit of approximately 1.6 kV/m. This limit was explicitly implemented by specification of a 350-foot right-of-way width for 765kV lines. In addition, electric fields on public roads, private roads, and other terrain were limited to 7, 11, and 11.8 kV/m, respectively. These values were intended to limit the induced current to the largest anticipated vehicle to 4.5 milliampere (mA). The NYPSC also required that the utilities involved fund additional research in the area of biological effects of electric and magnetic fields. The final report of the New York State Scientific Advisory Program was issued in 1987 [Ahlborn et al., 1987]. New York adopted an edge-of-right-of-way magnetic field standard of 200 mG in August 1990 [TDHS Report, 1990].
The North Dakota Public Service Commission (NDPSC) has used an informal requirement of 9 Kv/m maximum field strength for transmission lines in that state [Banks, 1986]. This level is not explicitly cited in its orders. However, the NDPSC has addressed the question of adverse health effects directly and found no credible evidence which demonstrates any significant adverse biological or other environmental effects of transmission lines for the transmission lines under review.

Oregon has a formal rule in its transmission line siting procedures that specifically addresses field limits. The Oregon limit of 9 Kv/m is applied to areas accessible to the public [Oregon, 1980]. The Oregon rule also addresses grounding practices, audible noise, and radio interference.

Government agencies operating transmission systems have established design criteria, which include electric field levels. The BPA has maximum allowable fields of 9 and 5 Kv/m on and at the edge of the right-of-way, respectively [Lee et al., 1989]. BPA also has maximum allowable electric field strengths of 5 Kv/m, 3.5 Kv/m, and 2.5 Kv/m for road crossings, shopping center parking lots, and commercial/industrial parking lots, respectively. These levels are based on limiting the maximum short-circuit currents from anticipated vehicles to less than 1 Ma in shopping center lots and to less than 2 Ma in commercial parking lots.

The peak electric fields from the proposed transmission line would meet all state regulatory limits except that in Minnesota. The edge of right-of-way electric fields from the proposed line would meet criteria set in Florida and New Jersey but not those established in New York and Montana. The magnetic field at the edge of the right-of-way from the proposed line would be below the regulatory levels of states where such regulations exist.

Methods

The electric fields, magnetic fields, and corona effects from the proposed line were calculated using the BPA Corona and Field Effects Program (BPA, undated). Electric and magnetic fields for the proposed line were calculated at a height of 3.28 feet (1 meter). Calculations were performed out to the edge of the proposed 200 foot right-of-way for each. Because maximum voltage and current, and conductor height at a conductor temperature of 120° F (49 C) above ground are used, the calculated values given here represent worst case conditions (i.e., the calculated fields are higher than they would be in practice).

Corona computations were made under conditions of average operating voltage estimated as 2.5 percent above nominal. Levels of audible noise, radio interference and television interference are predicted for both fair and foul weather, however corona is basically a foul weather phenomenon.

The proposed SWIP 500kV line would parallel lines of various voltages along segments of the alternative routes. Seventeen possible parallel configurations were identified and analyzed. The field and corona effects levels were computed for the existing conditions (before the SWIP) and for all parallel lines with the addition of the proposed SWIP alternatives (refer to Chapter 4).
Results

Electric Field

An electric field is said to exist in a region of space if a charge, at rest in that space, experiences a force of electrical origin (i.e., electric fields cause free charges to move). Electric field is a vector quantity that is, it has both magnitude and direction. The direction corresponds to the direction a positive charge would move in the field. Sources of electric fields are unbalanced electrical charges (positive or negative) and time-varying magnetic fields. Transmission lines, distribution lines, house wiring, and appliances generate electric fields in their vicinity because of unbalanced electrical charge on unshielded energized conductors. Electric fields are expressed in units of volts per meter (V/m) or kilovolts (thousands of volts) per meter (kV/m).

The spatial uniformity of an electric field depends on the source of the field and on the distance from that source. On the ground under a transmission line the electric field is nearly constant in magnitude and direction over distances of a few meters. However, in close proximity to transmission or distribution line conductors the field decreases rapidly as distance from the conductors increases. Similarly, near small sources such as appliances, the field is not uniform and falls off even more rapidly with distance from the device. If an energized conductor (source) is inside a grounded conducting enclosure, then the electric field outside the enclosure is zero and the source is said to be shielded.

The electric field created by a high voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and people. The strength of the vertical component of the electric field at a height of 1 meter (3.28 feet) is frequently used to describe the electric field under transmission lines. The most important parameters of a transmission line that determine the electric field at 1 meter height are conductor height above ground and line voltage.

For evaluation of electric and magnetic fields from transmission lines it is necessary to calculate the fields for a specific line condition. The National Electrical Safety Code (NESC) states the condition for evaluating electric-field-induced short-circuit current for lines with voltage above 98kV line to ground as follows: conductors are at a final unloaded sag, at a temperature of 120°F (49°C), and at a maximum voltage (NESC, 1990). For the calculation of electric and magnetic fields from the proposed transmission lines the maximum operating voltage, the maximum continuous current, and the minimum conductor clearances at a conductor temperature of 120°F (49°C) were supplied by IPCo. Thus these calculations represent conditions that meet the NESC criteria.

Maximum or peak field values would occur over a small area at midspan where the conductor clearance is lowest. As the location of an electric field profile approaches a tower, the conductor clearance increases, and the peak field decreases. Very close to a tower, the electric field would be reduced considerably due to shielding by the grounded tower. The electric fields at the edge of the right-of-way are not as sensitive to conductor height as is the
peak field. Computed values at the edge of the right-of-way for any line height are fairly representative of what can be expected all along the transmission line corridor.

Sources of 60 Hz electric and magnetic fields exist everywhere that electricity is used, and levels of these fields in the modern environment vary over a wide range. Electric fields in publicly accessible places range from less than 1 volt/meter (V/m) to over 10 kV/m. The latter value is typically proximate to a high voltage transmission lines of 500kV or higher voltage.

Numerous measurements of residential electric fields have been reported for various parts of the United States, Canada, and Europe. There has been no systematic approach to sampling homes and measuring electric field exposure. However, area measurements and a few sets of personal exposure measurements are now sufficient to indicate a degree of consistency (Bracken, 1988).

Electric fields from household appliances are localized and decrease rapidly with distance from the source. Local electric fields 1 foot (0.3 meter) from small household appliances are typically in the range of 30 to 60 V/m. At 0.3 meter from an electric blanket, a field of 250 V/m was measured (Sheppard and Eisenbaum, 1977). Stopps and Janischewskyj (1979) reported electric field measurements near 20 different appliances. At 0.3 meter from the devices, fields ranged from 1 to 150 V/m with a mean of 33 V/m. In another survey, measurements 0.3 meter from common domestic and workshop sources yielded fields from 3 to 70 V/m (Deno and Zaffanella, 1982).

The localized fields from appliances are not uniform and care should be taken in comparing them with transmission line fields. In addition, appliance fields may be modified by charge redistribution induced by the presence of conducting bodies.

Florig (1986) performed extensive empirical and theoretical analysis of electric field exposure from electric blankets. Depending on what parameter was chosen to represent intensity of exposure and the grounding status of the subject, the equivalent vertical 60 Hz electric field exposure ranged from 20 to over 3500 V/m. The largest equivalent field corresponds to the measured field on the thorax with the blanket user grounded. The average field on the thorax of an ungrounded blanket-user yields an equivalent vertical field of 960 V/m.

Generally, occupations that are not directly related to high voltage equipment experience electric fields comparable with residential exposures. For example, the average electric field measured in 14 commercial and retail locations in rural Wisconsin and Michigan was 4.8 V/m. (ITT Research Institute, 1984) Median electric field was about 3.4 V/m. These values are about one-third the values in residences reported in the same study. Power-frequency electric fields near video display terminals are about 10 V/m, similar to other appliances (Harvey, 1983).

Using a small 60 Hz dosimeter, Deadman et al. (1988) measured occupational exposures over a one week period for 20 utility workers and 16 office workers. The geometric mean of the weekly exposures during work for the 20 utility workers was 48.3 V/m compared to 4.9 V/m for the office workers. The transmission linemen (n=2, 420 V/m) had the highest geometric
mean exposures. These results are consistent with previous studies that used less sophisticated instrumentation.

Thus, except for the relatively few occupations where high voltage sources are prevalent, electric fields encountered in the workplace are probably similar to residential exposures. Electric fields found in publicly accessible areas near high voltage transmission lines can range up to 12 Kv/m for the highest voltage lines. These levels are considerably higher than the levels found in other public areas.

As expected, electric fields in publicly accessible outdoor areas are related to the proximity of transmission and distribution systems. Electric fields in public buildings appear to be comparable with residential levels.

**Magnetic Fields**

Magnetic fields can be characterized by the force they exert on a moving charge or on an electrical current. Magnetic field is a vector quantity that is characterized by both magnitude and direction. Electrical currents are sources of magnetic fields.

The uniformity of a magnetic field depends on the nature and proximity of the source, just as the uniformity of an electric field does. Magnetic fields generated by transmission line are quite uniform over distances of a few meters near the ground. However, for small sources such as appliances, the magnetic field decreases rapidly over distances comparable with the size of the device.

The magnetic field generated by currents on transmission line conductors extends from the conductors through the air and into the ground. Because the magnetic field is not affected by nonferrous materials, the field is not influenced by normal objects on the ground under the line. This is in contrast to the electric field, which is essentially vertical near the ground. The most important parameters of a transmission line that determine the magnetic field at 1 meter height are conductor height above ground and the currents in the conductors.

As with electric fields, the maximum or peak magnetic fields occur in areas near the centerline and at midspan where the conductors are the lowest. If more than one line is present, the peak field would depend on the relative electrical phasing of the conductors. The magnetic field at the edge of the right-of-way is not very dependent on line height.

The magnetic field levels associated with the proposed line configurations are generally comparable with fields from the existing 500kV line along a portion of the route and from other 500kV transmission lines as characterized in Chapter 4. The levels at the edge of the right-of-way are comparable to the fields measured one foot (0.3 meter) away from some small appliances such as hair dryers, electric shavers, mixers, and portable heaters. (Gauger, 1985)
Transmission lines are not the only source of magnetic fields; as with 60 Hz electric fields, 60 Hz magnetic fields are present throughout the environment of a society that relies on electricity as a principal energy source.

Several investigations of residential fields have been conducted with the most extensive being in conjunction with epidemiological studies. Short-term measurements of magnetic fields in 483 residences in the Denver area resulted in mean fields of 0.76 Mg (standard deviation (SD) - 0.79 Mg) under low-power conditions, that is, with all appliances and lights off (Savitz, 1987).

Kaune et al. (1987) reported on 24-hour magnetic field measurements made in 43 residences in the Seattle area. The mean for these measurements was 1.0 Mg (median = 0.6 Mg, standard deviation = 1.2 Mg). The magnetic field data demonstrated a diurnal variation that was coincident with utility loads: peak values at 8 a.m. and 6-7 p.m. and minimum values very early in the morning. No correlation with individual power consumption was observed. The Denver and Seattle studies both concluded that the predominant sources of residential magnetic fields are external and that ground return currents could be an important source of residential magnetic fields.

Magnetic fields from appliances are localized and decrease rapidly with distance from the source. Localized 60 Hz magnetic flux densities have been measured near approximately 100 household appliances such as ranges, refrigerators, electric drills, food mixers, and shavers (Gauger, 1985). Ninety-five percent of the levels at a distance of 1.5 meter were less than 1 Mg. Devices that use light-weight, high-torque motors with little magnetic shielding exhibited the largest fields. These included vacuum cleaners and small handheld appliances and tools. Microwave ovens with large power transformers also exhibited relatively large fields. Electric blankets have been a much studied source of magnetic field exposure because of the time they are used and because of the close proximity to the body. Florig and Hoburg (1988) estimated that the average magnetic field in a person using an electric blanket was 15 Mg and the maximum field could be 100 Mg.

In a domestic magnetic field survey, Silva et al. (1988) measured fields near different appliances at locations typifying normal use (e.g., sitting at a typewriter or standing at a stove). Specific appliances with relatively large fields were:

- can openers (n = 9) with typical fields ranging from 30 to 225 Mg and a maximum value up to 2.7 G
- shavers (n = 4) with typical fields from 50 to 300 Mg and maximum fields up to 6.9 G
- electric drills with typical fields from 56 to 190 Mg and maximum fields up to 1.5 G.

Although studies of residential magnetic fields have not all considered the same independent parameters, a consistent characterization of residential magnetic fields can be seen from the data.
External sources play a large role in determining residential magnetic field levels. Transmission lines, when nearby, are an important external source. Ground currents in proximity to the house appear to represent a significant source of magnetic field. Distribution lines, per se, unless they are quite close to a residence, do not appear to be a traditional distance-dependent source.

Homes with overhead electrical service, appear to have higher average fields than those with underground service.

Appliances represent a localized source of magnetic fields, which can be much higher than average or area fields. However, fields from appliances approach area levels at distances greater than one meter from the device.

Magnetic fields in commercial and retail locations are comparable with those in residences. As in the case of appliances, certain equipment or machines can be a local source of higher magnetic fields. Utility workers who work close to transformers, generators, cables, transmission lines, and distribution systems clearly experience high fields. Other sources of fields in the workplace include motors, welding machines, computers, and video display terminals.

Possible effects associated with the interaction of electric and magnetic fields from transmission lines with people on and near a right-of-way fall into two categories: short-term effects that can represent a nuisance and potential long-term health effects. Only short-term effects are discussed here.

Short-term effects due to transmission line electric fields are associated with perception of induced currents and voltages or perception of the field. Induced current or spark discharge shocks can be experienced under certain conditions when contacting objects in an electric field. Magnetic fields associated with transmission and distribution systems can induce voltage and current in long conducting objects that are parallel to the transmission line.

A fence, irrigation pipe, pipeline, electrical distribution line, or telephone line forms a conducting loop when it is grounded. The earth forms the other portion of the loop. If only one end of the fence is grounded then an induced voltage appears across the open end of the loop. The possibility for a shock exists if a person closes the loop at the open end by contacting both the ground and the conductor.

Corona

Corona is the partial electrical breakdown of the insulating properties of air in the vicinity of the conductors of a transmission line. Energy and heat are dissipated in a small volume near the surface of the conductors. Part of this energy is in the form of small local pressure changes that result in audible noise. Corona-generated audible noise can be characterized as a hissing cracking sound that under certain conditions is accompanied by a 120 Hz hum.
Corona-generated audible noise is of concern primarily for contemporary lines operating at voltages of 345kV and higher during foul weather. The conductors of high voltage transmission lines are designed to be corona free under ideal conditions. However, slight variations and irregularities in the conductor surface cause higher electric fields near the conductor surface, and corona occurs. The most common source of enhanced electric fields at the conductor surface are water droplets on or dripping off the conductors. Therefore, audible noise from transmission lines is generally a foul weather, (i.e., wet conductor, phenomenon). Wet conductors can occur during periods of rain, fog, snow, or icing. Along the alternative routes of the proposed SWIP transmission line such conditions are expected to occur infrequently (less than five percent of the time). During fair weather, insects and dust on the conductor can also serve as sources of corona. The proposed line has been designed with three subconductors per phase to minimize corona.

Along most of the proposed line route there would be only slightly perceivable changes in levels of audible noise during foul weather. Along sections of the proposed route where low voltage or direct current lines exist, there would be an increase in the perceived noise above that from the existing line during periods of foul weather. However, the noise levels from the proposed line would be below levels identified to cause interference with speech or sleep. The audible noise from the SWIP transmission line would be below EPA guideline levels. Therefore, corona-generated audible noise from the proposed line is expected to be minimal.

Corona on transmission line conductors can also generate electromagnetic noise in the frequency bands used for radio and television signals. Interference with electromagnetic signals by corona-generated noise is generally associated with lines operating at voltages of 345kV or higher. This is especially true of interference with television signals. The threconductor bundle design of the proposed 500kV line is expected to minimize corona generation and thus keep radio and television levels at acceptable levels.

Audible Noise

Audible noise represents an unwanted sound from a transmission line, transformer, airport, vehicle traffic, etc. Sound is a pressure wave caused by a sound source vibrating or displacing air. The ear converts the pressure fluctuations into auditory sensations. Audible noise from a source is superimposed on the background or ambient noise that is present before the source is introduced.

Humans respond to sounds in the frequency range of 16 to 20,000 Hz. The response of the human is dependent on frequency with the most sensitive range being roughly between 2,000 and 4,000 Hz. The frequency-dependent sensitivity is reflected in various weighting scales for measuring audible noise. The A-weighted scale weights the various frequency components of a noise in approximately the same way that the human ear responds. The A-weighted scale is generally used to measure and describe levels of environmental sounds from vehicles or occupational sources. The A-weighted scale is also used to characterize transmission line noise. Sound levels measured on the A-scale are expressed Db(A) or dBA.
Audible noise levels and, in particular, corona-generated audible noise vary in time. In order to account for fluctuating sound levels, statistical descriptors have been developed for environmental noise. Exceedance levels, or L levels, refer to the A-weighted sound level that is exceeded for a specified percentage of the time. Thus, the L5 level refers to the noise level that is exceeded only five percent of the time. L50 refers to the sound level exceeded 50 percent of the time and corresponds to the median level. Sound-level measurements and predictions for transmission lines are often expressed in terms of exceedance levels with the L5 level representing the maximum level and the L50 level representing a median value.

There are no noise codes applicable to transmission lines in Idaho or Nevada. The EPA has established a guideline of 55 DBA for the annual average day-night level in outdoor areas (EPA, 1978). In computing this value, a correction (penalty) is added to nighttime noise. The noise levels of the proposed line fall below the EPA guideline.

Corona-generated audible noise can be characterized as a hissing cracking sound that under certain conditions is accompanied by a 120 Hz hum. Corona-generated audible noise is of concern primarily for contemporary lines operating at voltages of 345kV and higher during foul weather (refer to previous section on corona).

The calculated foul weather corona noise levels for the proposed line are comparable with the calculated levels for the existing lines except for the case of low-voltage alternating current (69kV) and direct current lines. The difference in noise level at the edge of the right-of-way would be barely discernible to the human ear except for the aforementioned low-voltage corridors.

Radio and Television Interference

In the United States, electromagnetic interference from electrical transmission systems is governed by the Federal Communications Commission (FCC) Rules and Regulations presently in existence (FCC, 1988). A power transmission system falls into the FCC category of "incidental radiation device" which is defined as "a device that radiates radio frequency energy during the course of its operation although the device is not intentionally designed to generate radio frequency energy". Such a device "shall be operated so that the radio frequency energy that is emitted does not cause harmful interference. In the event that harmful interference is caused, the operator of the device shall promptly take steps to eliminate the harmful interference." For purposes of these regulations, harmful interference is defined as "any emission, radiation or induction which endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radio communication service..."

Radio reception in the AM broadcast band (535 to 1,605 kilohertz) is most often affected by corona-generated electromagnetic interference (EMI). FM radio reception is rarely affected. Generally, only residences very near to transmission lines can be affected by RI. The RI levels predicted for the proposed 500kV line are comparable with the RI levels predicted for the existing corridors with the exception of those with low voltage (≤138kV) or DC lines.
Corona-caused TVI occurs during foul weather and is generally of concern for transmission lines with voltages of 345kV or above and only for receivers within about 600 feet of a line. Because of the multiple-conductor design of the proposed line, corona-generated TVI would be comparable with or below that on other 500kV lines. The levels for the proposed 500kV line are at or below levels predicted for the existing corridors except in those corridors with low voltage (≤138kV) or direct current lines.

There is a potential for interference with television signals at locations very near either the existing line or the proposed SWIP alternatives in fringe reception areas. However, several factors reduce the likelihood of occurrence. Corona-generated TVI occurs only in foul weather, consequently signals would not be interfered with during the majority of time characterized by fair weather. Since television antennas are directional, the impact of TVI is related to the location and orientation of the antenna relative to the transmission line. If the antenna is pointed away from the line, then TVI from the line would affect reception much less than if the antenna is pointed towards the line.

Other forms of TVI from transmission lines are signal reflection (ghosting) and signal blocking caused by the relative locations of the transmission structure and the receiving antenna with respect to the incoming television signal.

Interference with television reception can be corrected by any of several approaches:

- improving the receiving antenna system
- installing a remote antenna
- installing an antenna for TV stations less vulnerable to interference
- connecting to an existing cable system
- installing a translator (Cf. Loftness, 1977).

Typical transmission line engineering practice is to design all lines to be as free from corona and other sources of interference as possible. Radio and television interference complaints would be recorded and investigated by IPCo, and corrective measures taken as required. Electromagnetic compatibility measurements would be taken before and after the line is in service to determine if there has been any degradation in communication quality.

**CULTURAL ENVIRONMENT**

**Cultural Resources**

**Introduction**

Cultural resources include cultural properties and traditional lifeway values. Cultural properties are locations of past human activity, occupation or use, and include archeological, historic, or architectural sites, structures, or places with important public and scientific uses. They may include sites or places of traditional cultural or religious importance for specific
social or cultural groups. Traditional lifeway values are useful in the maintenance of a specific social or cultural group's religious beliefs, cultural practices, or social interaction. These values are abstract and nonmaterial (BLM Manual 8100).

The NEPA (§101[b][4]) establishes a federal policy of preserving not only the natural aspects, but also the historic and cultural aspects of our national heritage when undertakings regulated by federal agencies are planned. Implementing regulations (40 CFR Part 1502.16[g]) issued by the CEQ stipulate that the consequences of federal undertakings on historic and cultural resources be analyzed.

Additional requirements for protecting cultural resources are identified in the National Historic Preservation Act (NHPA) of 1966, as amended (80 Stat. 915, 94 Stat. 2987, 16 USC 490), and the Archaeological Resources Protection Act (ARPA) of 1979 (93 Stat. 721, 16 USC). In addition, the American Indian Religious Freedom Act of 1978 (P.L. 95-431) reaffirms the rights of Native Americans to believe, express, and exercise their traditional religion and requires that all federal agencies take into account the effects of their projects on traditional Native American religious practices. The Native American Graves Protection Act of 1990 also expressly provides for the protection of Native American graves, funerary objects, sacred objects, and items of cultural patrimony and gives Native American groups priority in the ownership and control of such human remains and artifacts.

Methods

Regulations for "Protection of Historic Properties" (36 CFR Part 800), which primarily implement Section 106 of the NHPA, define the key regulatory requirements. These regulations define a process for consulting with State Historic Preservation Officers (SHPOs), the federal Advisory Council on Historic Preservation (ACHP), and other interested parties to ensure that historic properties are duly considered as federal projects, are planned and implemented. The steps in this process are:

- identifying and evaluating historic resources that may be affected by the proposed undertaking
- assessing the potential effects of the undertaking on significant historic properties
- consulting with the SHPOs, ACHP, and other interested persons to determine ways to avoid or reduce effects on historic properties
- providing the ACHP a reasonable opportunity to comment on the proposed undertaking and its effects on significant historic properties
- proceeding with the undertaking under the terms of a Memorandum of Agreement or in consideration of ACHP comments involving all historic properties
The general thrust of this process is to establish a process for identifying impacts of development on cultural resources and create opportunities for adopting measures to avoid, minimize, mitigate, or accept such impacts. It is not a project vetoing regulatory context, as much as negotiating one. The studies undertaken for this EIS constitute an important initial step in this process, which will continue to be pursued during subsequent phases of project implementation.

Within the regulatory context of historic preservation, cultural resources are considered significant if they are determined eligible for inclusion in the National Register of Historic Places (NRHP). Historic cultural properties are National Register eligible if they are significant in American history, architecture, archaeology, engineering, and culture. They must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet at least one of four criteria:

(a) are associated with events that have made a significant contribution to the broad patterns of our history
(b) are associated with the lives of persons significant in our past
(c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction
(d) have yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60.4)

Results

In implementing these definitions it has become common practice to delineate three basic categories of resources: (1) prehistoric resources, (2) ethnographic sites, and (3) historic sites. As our nations heritage, these resources provide an important means of building a perspective on our modern lives.

Prehistoric resources predate the era of written records, which in the project area began with exploration by Europeans. Prehistoric resources are archaeological sites that reflect more than 10,000 years of occupation by numerous American Indian cultures. Prehistoric archaeological sites are abundant in the American West. They range from ruins now preserved as national monuments to small, simple scatters of chipped stone artifacts or broken clay pots. Inventories of 50,000 recorded sites per state are common, and increased levels of survey intensity indicate that literally hundreds of thousands more unrecorded and unevaluated archaeological sites dot the landscape.

Ethnohistoric resources (or traditional cultural properties) can be some of the most sensitive cultural resources for project planners to consider. The ethnohistoric era refers to the time when native ethnic groups were first described and documented by Europeans. Many
ethnohistoric resources have special significance for contemporary American Indian groups because of their former or continuing occupation or use of given localities. Such resources are by no means limited to current Indian reservation boundaries and, in many cases, there is very little physical evidence of these traditional cultural properties. Project impacts on such resources can be difficult to mitigate because the resources are often considered sacred by Indian communities. Mitigation measures, therefore, must be formulated in consultation with affected Native American groups.

Historic resources are some of the best documented cultural resources in the project area. Most cities, as well as smaller towns and rural areas, have a variety of old buildings listed on the National Register of Historic Places or on similar state registers. Other than old buildings, historic resources include ghost towns, mines, historic ranches, and a variety of structures, roads, and trails. Some historic resources that have disintegrated into archaeological sites are characterized by foundations, artifact scatters, or buried features.

Cultural History Overview

The project area has been occupied for thousands of years. This section briefly summarizes what is known about this long history of human use of the project area, which is situated primarily within the eastern Great Basin cultural area. The northern end, however, is in the northeastern Great Basin rim region and the extreme southern end is in an area with strong influence from Colorado Plateau groups. The culture history summarized in the section is primarily based on research in eastern Nevada. Variant cultural chronologies for peripheral areas are discussed in the technical report (Rogge and Woods 1992.)

Prehistory - Four prehistoric cultural stages, pre-Archaic, Archaic, Formative, and Numic, are represented in the study area. Generally, the pre-Archaic cultural stage spans the period of 13,000 to 8,000 BC, the Archaic dates from about 8,000 BC to AD 500 and the Formative stage, where present, lasts from about AD 500 to 1300. The Numic period, which may overlap with the Formative, begins at about AD 1200 to 1300 and ends with historic contact. Projectile point morphology, which reflects modifications in subsistence strategies and weapon systems, is the primary basis for distinguishing these stages.

The pre-Archaic cultural stage is also referred to as Lithic stage, Paleo-Indian period, or Early Big Game Hunting period, and farther to the west as the Western Pluvial Lakes tradition. Material remains of this early cultural stage are primarily large, well made lanceolate spear points. Fluted spear points give way to unfluted forms by about 8,000 BC. When found in stratified deposits, these projectile point styles are often associated with now extinct species of mammoth, bison, camel, mountain sheep, horse, and sloth. Although the vast majority of these resources are surface finds that lack depositional context, some pre-Archaic cave sites also are known.

The Archaic period is marked by the replacement of the larger lanceolate points with large side-notched and indented stemmed forms as well as the appearance of grinding implements. This change in projectile point morphology is generally acknowledged to be the result of the development of the atlatl (throwing stick) and dart weapon system. Archaic projectile point
types include Humboldt, Northern Side-notched, and Pinto series points. After 2,000 BC, the Elko series projectile points become dominant. Grinding implements are found in Archaic era sites and probably reflect the increased importance of native plant foods in the subsistence economy.

The early Archaic era is characterized by lake side cave and shelter sites with lacustrine resources serving as the primary subsistence base. During the middle and late Archaic, settlement shifted to upland habitats where pion became an important resource. Lake side sites were almost exclusively abandoned by the late Archaic. Excavations in caves and shelter sites have yielded much of the known data for the Archaic, but the majority of Archaic period, as well as Paleo-Indian stage sites consist of temporary camps evidenced by surficial chipped lithic scatters.

Two contemporaneous Formative cultures occupied portions of the study area. Where formative cultures were not present, Archaic groups continued to occupy the region. The Fremont inhabited the central portions of the project area while the Virgin Anasazi occupied the western Colorado Plateau in the southern end of the project area. Both engaged in agricultural pursuits and manufactured distinctive ceramics. Fremont architectural remains are dominated by semi-subterranean pit houses while the Virgin Anasazi built both pit houses and above ground masonry structures.

At about AD 1,200 to 1,300, the Formative and Archaic disappear from the archaeological record, being replaced by Numic speaking groups. The Numic mobile hunting and gathering lifeway is reminiscent of Archaic subsistence strategies. Diagnostic Numic artifacts include brownware pottery and Desert Side-notched arrow points. Numic groups continued to occupy the region and were present at the time of contact with Euro-Americans during the 18th and 19th centuries, marking the end of the prehistoric era.

Ethnohistory - During the ethnohistoric era, the study area was occupied by the Northern Shoshone, Bannock, Western Shoshone, Pahvant Ute, and Southern Paiute. Generally speaking, the Northern Shoshone and Bannock inhabited the project area in southern Idaho. The Western Shoshone ranged through eastern Nevada and northwestern Utah. The central portion of Utah was occupied by the Pahvant Ute while the Southern Paiute inhabited southwestern Utah and southern Nevada.

All of these groups speak various Numic dialects that belong to the Uto-Aztecan linguistic family. The Northern and Western Shoshone speak a Central Numic dialect. Western Numic is the dialect spoken by the Northern Paiute and Bannock. Both the Pahvant Ute and Southern Ute speak a Southern Numic dialect.

All of these groups led similar lifestyles with some localized variations. Mobile hunting and gathering was the primary subsistence strategy, although the Southern Paiute practiced limited agriculture. Seasonal rounds generally consisted of single households or extended families hunting and gathering during the spring and summer with groups of up to 10 households congregating for fall hunts and sharing resources through the winter.

The ethnohistoric groups commonly sought shelter from the elements in caves and rockshelters or constructed conical structures of wood and brush. Less formal shelters such
as lean-tos and sun shades were commonly built during the summer. Skins, particularly
rabbit fur, and grass and woven vegetable fiber were used for clothing. Baskets served as
primary vessels. Ceramic technology was known, but use of aboriginal ceramics waned after
contact with Euro-Americans. With the exception of the Northern Shoshone, none of these
groups acquired enough horses to make fundamental changes in their subsistence strategies.
The Northern Shoshone, however, adopted a number of Plains cultural traits along with the
horse, such as the tipis, buffalo robes, and buckskin clothing.

History - After the arrival of Europeans in the New World, portions of the study area were
claimed by Spain, Great Britain, France, Mexico, and Canada, as well as the United States.
The earliest European exploration was led by Escalante who skirted the eastern margin of the
study area in Utah. After the famous Lewis and Clark Expedition to the Pacific Coast in
1804-1806, fur trappers and mountain men were lured to the Rocky Mountains until the
decline of fur trading in about 1840.

Following routes established by the fur traders and missionaries, emigrants began to trickle
through the region by the early 1840s. Major overland routes were the Oregon Trail,
California Trail, Overland Trail, and Old Spanish Trail/Mormon Road. What began as a
trickle became a torrent after the discovery of gold in California. From 1840 to 1848 nearly
3,000 people made the overland journey to California. Between 1849 and 1860 nearly 300,000
transcontinental travelers had made the trek and these routes later served, with some
variation, as the Pony Express and stagecoach routes.

During the late 1840s Mormon settlers arrived in the region and began to establish towns in
Utah, along the Wasatch Front and Cache Valley. Later a "Mormon Corridor" was
established to the Pacific following the Old Spanish Trail, and Mormon communities were
established along this route.

Settlement in eastern Nevada is largely associated with the discovery of various ore deposits.
From about 1850, to the turn of the century, numerous discoveries were made and mining
districts were established in Kit Carson, Egan Canyon, Robinson, Ely, White Pine, Meadow
Valley, Pahranagat Valley, and Ferguson. Numerous settlements were founded at mining
camps or in nearby locations to support mining activities, including Contact, Cherry Creek,
McGill, Ruth, Kimberly, Riepetown, Hamilton, Ely, Osceola, Bristol Wells, Pioche, Hiko, and
Delamar.

The route of the first transcontinental railroad passes through the study area. Generally
following the route of the California Trail, the railroad was completed as a joint venture of
the Central Pacific and Union Pacific in 1869. A second transcontinental route (Western
Pacific) was completed in 1907. Other early railroads through the study area include the
Oregon Short Line, Nevada Northern, and Utah Central.

Just as the early transcontinental railroads followed the early trails so the early
transcontinental highways parallel these corridors. In general, the Lincoln Highway follows
the Overland Trail, the Victory Highway parallels the California Trail, and the Arrowhead
Interstate 15 follows the general corridor of the Old Spanish Trail/Mormon Road.
Very little of the study area is arable without irrigation. Consequently most early farming in
the study area was restricted to the Columbia Plateau, Snake and Cache river basins to the
north, along the Wasatch Front to the east and along the major water courses on the
Colorado Plateau to the south. Ranching was somewhat less restricted and practiced
throughout most of the study area, except for the Great Salt Lake Desert and other areas
devoid of vegetation. Both cattle and sheep ranches were common.

The federal government has been directly involved in the study area since the mid 19th
Century. Various expeditions by the Corps of Topographic Engineers conducted surveys for
the transcontinental railroad routes. Scientific surveys were conducted by the United States
Geological Survey. The United States Army was deployed to protect settlers and
transportation routes from raids by Native Americans. Later federal agencies took an active
role in controlling grazing, established forest reserves, and built water reclamation projects.
During World War II, two Japanese-American relocation camps were established at Minidoka
and Topaz. Various military bases are still present in the study area. The vast majority of
land within the study area is still administered by the federal government.

Regional Studies

The most sensitive cultural resources in the study area were inventoried in conjunction with
a regional study designed to identify alternative transmission line corridors and related
facility siting areas. A brief overview of the cultural history of the area was prepared for the
regional study and Native American groups were contacted to solicit their comments.

Information was tabulated for 462 of the most sensitive cultural resources within the study
region. Data about approximately 16,000 additional archaeological sites recorded within the
regional study area were obtained from the Intermountain Antiquities Computer System.
Although the location of most of the sites could be plotted, it is impossible to easily abstract
information about site types and sensitivities from the computerized files. The distribution of
the sites undoubtedly reflects where surveys have been completed rather than where sites are
and are not located. It is very likely that five to ten times as many sites remain to be
inventoried. Therefore, the more specific information compiled on the 462 manually
inventoried sites was relied on during the initial phases of study.

Phase I Sensitivity Modeling - The 462 inventoried resources were divided into three classes
of sensitivity: (1) exclusion areas, (2) avoidance level 1, and (3) avoidance level 2. The
classification into these categories was based on several factors including legal protection that
would affect the ability to license the proposed project, perceived resource sensitivity, and
cost to mitigate potential effects. Sensitivity ratings and the numbers and types of sites
assigned to these sensitivity classes are summarized in the technical report.

Only 12 of the 462 inventoried resources (or less than three percent of the inventory) were
classified as exclusion zones. Approximately 65 percent of the inventory (300 sites) were
assigned to the avoidance level 1 category. The remaining 150 sites were assigned to the
avoidance level 2 category.
All of the exclusion zones and most of the other avoidance category resources were avoided by the alternative corridors selected for further consideration. Only ten of the 300 avoidance level 1 sites and 11 of the avoidance level 2 sites are within the two-mile-wide alternative corridors. Therefore, the regional study resulted in minimizing potential adverse effects on the most significant cultural resources recorded within the project area.

**Alternative Corridor Studies**

The focus of the Phase II corridor studies was to identify recorded resources and evaluate their sensitivity. A model to predict sensitivities in uninventoried areas was also developed. Site data collected during Phase I were augmented by reviewing and compiling site file information at the SHPOs in Idaho, Nevada, and Utah, as well as from BLM Boise and Burley Districts in Idaho, the Elko, Ely, and Las Vegas Districts in Nevada, and the Richfield District in Utah. Several other agencies were contacted but it was determined that their files were unlikely to yield additional information.

The primary goal of the file search was to collect site location and site form data for all sites recorded within the two-mile-wide corridors centered on each alternative link centerline. Siting areas for ancillary facilities, such as substations and microwave communication sites, were studied as well. The Native American contact program initiated in Phase I was continued in an attempt to identify additional ethnohistoric sites that might be of significance to local Native American communities.

The Phase II results indicate that about 1,427 cultural resources have been recorded within the two-mile-wide corridors along the alternative links, and within the ancillary facility siting areas. Prehistoric resources comprise about 83 percent of the sites. The majority of these are isolates and lithic scatters, but more complex habitation sites are also included in the inventory. Ethnohistoric resources constitute only about 2.5 percent of the sites, but most of these are large areas whose boundaries are only vaguely defined. Specific features having archaeological or traditional cultural values have not been identified within these zones, but their documented use indicates such sites could be present. Historic resources constitute about 13 percent of the identified sites. Many types of historic sites are included in the inventory. There are some complex types such as historic trails and town sites, but isolated artifacts and trash scatters are the most common type. The remaining 1.5 percent of the inventory is comprised of sites that contain both prehistoric and historic components, or whose site classes or types are unrecorded. In the following sections, the resources recorded along each alternative route are briefly described.

**Phase II Sensitivity Modeling** - The Phase II sensitivity model was developed to reflect the varying importance of the different site types within the inventory. Five sensitivity categories, ranging from low to very high, were defined based on site class and site type. The very highly ranked resources included properties listed on the National Register of Historic Places, prehistoric, ethnohistoric and historic sites with human remains, and traditional cultural properties regarded as sacred. Resources rated as having high sensitivities include antelope traps, well-known rock shelter and rock art sites, major historic trails, roads, and railroads, and complex historical sites with standing architecture, such as
town sites. Moderate high sensitivity was assigned to prehistoric habitation sites, such as rock shelters, campsites, and villages, and relatively complex historic sites such as homesteads, ranches, railroad sidings, and dams. Site types assigned a moderate sensitivity include prehistoric artifact scatters, quarries, and rock art sites, ethnohistoric habitation and use areas, and historic trash scatters, dumps, and relatively simple structures such as cisterns, mining prospects, building foundations, and ditches. Low sensitivity was assigned to prehistoric isolates and rock features, and small, partially intact historic features such as minor roads, telegraph lines, camp sites, water tanks, railroad beds, powder magazines, and rock alignments.

Because the majority of the study corridors have not been systematically inventoried for cultural resources, a component of the model was developed to project where densities of unrecorded sites are likely to be high. These projections are based on the commonly held assumptions that prehistoric sites are encountered in higher densities near reliable water sources and within pinon-juniper vegetation communities. Ethnohistoric and historic sites were in effect modeled in conjunction with development of the Phase II inventory, because unrecorded but potential site areas were recognized as a result of literature review and from comments of knowledgeable agency resource specialists.

Of the 1,427 previously recorded cultural resources in the Phase II study areas, only 38 localities representing approximately 100 resources were assigned a high or very high sensitivity rating. Historic resources in this group include such sites as the Minidoka Japanese-American Relocation Center, a historic segment of the Nevada Northern Railroad, segments of the Oregon, California, and Hastings Cutoff trails, Kelton road, and Old Spanish Trail/Mormon Road, the Pony Express/Lincoln Highway and other Pony Express routes, the Osceola Ditch, and various historic cemeteries, burials, residences, and town sites. Prehistoric sites given a high or very high rating include the Deseret petroglyph panel, a Paleo-Indian campsite, burials, antelope traps, and rock shelter sites with rock art. The Humboldt, Wells and City of Rocks archaeological districts containing both historic and prehistoric sites are included as well.

In addition to recorded sites, 20 predicted sensitivity zones, areas with a high probability for unrecorded prehistoric sites, were identified. The majority of these are small areas, but a large area in the Deep Creek drainage in Idaho has been identified as highly sensitive.

During the Phase II studies, selected alternative links were combined to form various alternative routes. The cultural resources along each alternative are characterized in the following paragraphs.

Alternative Routes - Midpoint to Dry Lake

All of the Midpoint to Dry Lake alternative routes cross portions of four major historic trails: the Oregon, the Hastings Cutoff, the California, and the Pony Express route. The City of Rocks archaeological district also is within the two-mile-wide corridor as all the alternatives pass the district, but direct impacts can be avoided. All routes, except Route F, cross the Minidoka Japanese-American Relocation Center and all except Route A cross one or more
antelope trap sites. In addition, the Route A, C, and G corridors include a historic town site and a historic cemetery. The corridor for Route F includes a historic town site, cemetery, four residences, and a prehistoric campsite with burials.

The Midpoint to Dry Lake alternative routes include some of the predicted sensitivity zones as well. All alternatives except Route F cross the large Deep Creek high sensitivity zone. All but Route B and Route G cross the Dry Canyon Spring zone, but Routes B and G both cross the Antone and Telegraph Creek zones. Alternative Routes C and F cross the Texas Spring Canyon zone. Route D is the only one to cross the Thousand Springs Valley, which has pockets of predicted high sensitivity.

Route A

A total of 463 cultural resources have been identified in the two-mile-wide corridor of Route A. About 85 percent of them are prehistoric sites, 3 percent are ethnohistoric, and 12 percent are historic sites. Twelve of these resources have been assigned high or very high sensitivity ratings. In addition, 3 predicted high sensitivity zones have been projected by the modeling procedures.

A total of 72 cultural resources were plotted along Route A from the Midpoint Substation to the Jackpot area. Almost 60 of these were prehistoric sites, 10 were historic, and ethnohistoric habitation sites are located near Rock Creek and in the Jackpot vicinity. The resources with the highest ranked sensitivity were the Minidoka Japanese-American Relocation Center and the Oregon Trail.

Between Jackpot and the Windermere Hills about 30 prehistoric sites and 5 historic sites have been recorded along Route A. This segment of the route crosses the Thousand Springs Valley, as well as an area near Jackpot. Both these localities are identified as ethnohistoric habitation sites. The highest sensitivity sites along this segment of the route are the California Trail, the California/Immigrant Trail, and the historic town of Contact.

Between the Windermere Hills and Interstate 80, the Route A corridor contains 12 resources including the alignment of the historic Central Pacific Railroad.

Between Interstate 80 and Dolly Varden, the Route A corridor includes about 20 more recorded cultural resources with the majority, 13, being historic. A single ethnohistoric area is crossed in the vicinity of Oasis. The resources rated as most sensitive along this segment of the corridor are the Hastings Cutoff, the Shafter town site, and a cemetery.

From Dolly Varden to North Steptoe substation siting area, 23 more sites have been recorded within the corridor, 20 are prehistoric sites, and 1 is historic. Two ethnohistoric areas, a habitation area in Steptoe Valley and an exploitation area in the Schell Creek Range, are also crossed by the corridor. None are rated as highly sensitive.

From Steptoe to the Robinson Summit area, 26 resources have been recorded along Route A; 17 are prehistoric, 4 are historic, and 3 are general ethnohistoric habitation areas (Steptoe
Valley, Egan Range, and Butte Valley). The resource ranked as most sensitive is the Pony Express/Lincoln Highway alignment.

From Robinson Summit to Dry Lake more than 275 resources have been recorded along Route A. About 245 of these are prehistoric archaeological sites, approximately 20 are historic, and 7 are ethnohistoric areas. The most sensitive of these resources is the City of Rocks archaeological district.

Route B

A total of about 483 cultural resources have been identified in the two-mile-wide corridor along Route B. Of these, 87 percent are prehistoric sites, 4 percent are ethnohistoric resources, and 10 percent are historic sites. Ten of these have been assigned high or very high sensitivity and 4 high sensitivity zones have been projected by the modeling procedures.

The alignment for Route B is the same as Route A from Midpoint Substation to Jackpot. From Jackpot to the Windermere Hills area, Route B includes almost 55 recorded resources, that is about twice as many as along Route A. These include 45 prehistoric sites, 3 historic sites, and 2 ethnohistoric areas (Trout Creek and Thousand Springs). Route B crosses the California Trail in this area as does Route A. Another resource rated as particularly sensitive in this portion of Route B is an antelope trap, a relatively rare type of archaeological site.

From the Windermere Hills to Interstate 80, Route B contains 16 recorded resources, including 15 prehistoric sites and the alignment of the historic Central Pacific Railroad, also crossed by Route A. From Interstate 80 south to the North Steptoe substation siting area, the Route B corridor contains approximately 40 recorded resources (in contrast to about 45 along the Route A counterpart to this segment of Route B). About 25 of these are prehistoric archaeological sites, 7 are historic sites, and 5 are ethnohistoric areas (Goshute Mountain/Toano Range, Antelope Range, Antelope Valley, Steptoe Valley, and Schell Creek Range).

A short segment of Route B is again coincident with Route A (Links 261 and 270) where approximately a dozen cultural resources are recorded. Route B then diverges to the west of Route A into the Robinson Summit area. Route B includes approximately two dozen resources in this area, which is very similar to the Route A tallies. One of the most sensitive resources along Route B in this area is the Pony Express/Lincoln Highway alignment, just as along Route A. In addition, Route B crosses a small portion of another Pony Express Route.

From the Robinson Summit substation Site south to the Dry Lake substation site, Routes A and B are identical.
Route C

Route C is a combination of the route segments of Routes A and B. From the Midpoint Substation to Interstate 80, Route C is identical to Route B, and from Interstate 80 south to the Dry Lake substation site, Route C is identical to Route A.

A total of about 479 cultural resources have been identified in the two-mile-wide corridor along Route C. Approximately 86 percent of these are prehistoric sites, 3 percent are ethnohistoric, and 11 percent are historic sites. Ten of these resources have been assigned high or very high sensitivity. In addition 4 high sensitivity zones have been projected by the modeling procedures.

Route D

A total of 522 cultural resources have been identified in the two-mile-wide corridor along Route D. Of these, 83 percent are prehistoric sites, 3 percent are ethnohistoric sites, and 14 percent are historic sites. Eleven of these have been assigned high or very high sensitivity, and 4 high sensitivity zones have been projected by the modeling procedures.

Route D is identical to Route A from the Midpoint Substation to north of the Windermere Hills area. From there to the Dolly Varden area, it diverges to the west. In this area, Route D includes more than 80 recorded resources (in contrast to less than half that number along Route A). More than 50 of the Route D sites in this area are prehistoric, and about 25 are historic. The most sensitive resources in this area include the California Trail and the Hastings Cutoff, as along Route A, and also a historic railroad town and an antelope trap (but it does avoid the Shafter town site and a cemetery encountered along the Route A corridor). From Steptoe south to the Dry Lake substation site, Route D is identical to Route A.

Route E

Route E is a combination of Routes A and B. From the Midpoint Substation to Interstate 80, Route E follows the Route A corridor. From Interstate 80 south to the North Steptoe substation site, Route E is identical to Route B, and from the North Steptoe substation site on south to Dry Lake substation site, Route E is the same as Route A.

A total of approximately 458 cultural resources have been identified in the two-mile-wide corridor along Route E. About 85 percent of these are prehistoric sites, 4 percent are ethnohistoric localities, and 11 percent are historic sites. Ten of these resources have been assigned high or very high sensitivity, and 3 high sensitivity zones have been projected by the modeling procedures.
Route F

A total of 586 cultural resources have been identified in the two-mile-wide corridor along Route F. Of these, 87 percent are prehistoric sites, 3 percent are ethnohistoric locales, and 10 percent are historic sites. Fifteen of these resources have been assigned high or very high sensitivity, and 2 high sensitivity zones have been projected by the modeling procedures.

Route F is the only alternative that goes west from Midpoint Substation. It includes almost 160 recorded resources along those links that diverge from Route A at the northern end of the project area. (Only about 40 resources are recorded along Route A in this area.) Almost 140 of these are prehistoric, 14 are historic, and 3 ethnohistoric areas are crossed (Lower Salmon Falls, the West Bank of the Snake River, and Salmon Falls Creek). The most sensitive resources in this area include four houses listed on the National Register of Historic Places, the Oregon Trail, the historic Kelton Road, and a cluster of sites along the Snake River, which includes two sites where prehistoric burials have been recorded. (The high sensitivity sites along the counterpart portion of Route A include the Oregon Trail and the Minidoka Japanese-American Relocation Camp.) From the Jackpot vicinity to I-80, Route F is identical to Route B. From I-80 South to the Dry Lake substation site, Route F is identical to Route A.

Route G

A total of 483 cultural resources have been identified in the two-mile-wide corridor along Route G. About 83 percent are prehistoric sites, 4 percent are ethnohistoric resources, and 13 percent are historic sites. Thirteen of these resources have been assigned high or very high sensitivity, and 3 sensitivity zones have been projected by the modeling procedures.

Route G is identical to Route A from Midpoint Substation to an area north of the Windermere Hills, where Route G diverges to the southeast. Approximately a dozen resources have been recorded along this segment of Route G, which is very similar to the number recorded along the counterpart segment in Route A. The most sensitive resource along both segments is the California Trail, but Route G also includes two antelope trap sites, which are also rated as highly sensitive.

From the Windermere Hills to Dolly Varden Route G is identical to Route A. From Dolly Varden south to the North Steptoe substation site, Route G diverges to the west. This segment of Route G includes more than 35 recorded cultural resources, about a dozen more than along the counterpart segment of Route A. None of these are rated as highly sensitive.

From the North Steptoe substation site south to the Dry Lake substation site, Route G is identical to Route B.
Alternative Routes - Ely to Delta

The Ely to Delta alternative routes include fewer culturally sensitive areas than the longer north-south routes. The Direct Route crosses the Pony Express and Lincoln Highway alignments. The Cutoff Route also crosses these historic trails and roads and the corridor also includes the Deseret Petroglyph Panel, a National Register listed property. The 230kV Corridor crosses a segment of the Nevada Northern Railroad used by a historic train, the historic Osceola Ditch, and a historic town site. The Southern Route includes the City of Rocks archaeological district. The sensitivity modeling indicates that all the routes, except the Direct Route cross one predicted high sensitivity zone.

Direct Route

Approximately 34 cultural resources have been identified in the two-mile-wide corridor of the Direct Route. About 63 percent of these are prehistoric sites, 24 percent are ethnohistoric resources (Steptoe Valley, Schell Creek Range, Spring Valley, Antelope Valley, Snake Valley, the Drum Mountains, the Little Drum Mountains, and the Sevier Desert), and 13 percent are historic sites.

The most sensitive resources along this route are two alignments of the Pony Express Trail (one of which coincides with the Lincoln Highway).

Cutoff Route

A total of 40 cultural resources have been identified in the two-mile-wide corridor of the Cutoff Route. Of these 66 percent are prehistoric sites, 21 percent are ethnohistoric locales, and 13 percent are historic sites. One sensitivity zone has been projected by the modeling procedures.

The Cutoff Route is identical to the Delta Direct Route from the North Steptoe substation site to the vicinity of the Little Hills. From here, the Cutoff Route diverges to the south to meet and parallel two existing transmission line, one of which it parallels to the Delta area.

Approximately a dozen resources have been recorded along the divergent segment of the Cutoff Route, which is about identical to that recorded along the counterpart portion of the Direct Route. In addition to crossing the Pony Express alignments before diverging, the Cutoff Route corridor also includes the Deseret Petroglyph panel site, another resource ranked as highly sensitive.

230kV Corridor Route

A total of 101 cultural resources have been identified in the two-mile-wide corridor of the 230kV Corridor route. About 79 percent of these are prehistoric sites, 8 percent are
ethnohistoric resources, and 13 percent are historic sites. One high sensitivity zone is projected by the predictive model.

This route would begin in the Robinson Summit substation site and parallels two existing transmission lines, converging with the Cutoff Route in the vicinity of the Buckskin Hills. This route includes 78 recorded resources in addition to the almost two dozen along the coincident portions of the Cutoff and Direct Routes. The most sensitive resources along the 230kV Corridor Route include the historic Osceola Ditch that was constructed for placer mining by Chinese laborers, a historic mining town site, and a segment of the Nevada Northern Railroad used by a historic train.

Southern Route

Approximately 85 cultural resources have been recorded along the Southern Route; about 78 percent of these are prehistoric, 12 percent are ethnohistoric habitation or use areas (Egan Range, Lake Valley, Spring Valley, the Sevier Desert, the Wah Wah Mountains, and the Swasey Wash/Whirlwind Mountains area) and 10 percent are historic. One high sensitivity zone is projected by the predictive model. The most sensitive recorded resource along this route is the City of Rocks archaeological district located at the very western end of the route.

Ancillary Facility Siting Areas

Series Compensation Siting Study Areas

Three series compensation siting study areas are located along the Midpoint to Dry Lake alternative routes. All are in northeastern Nevada. They include the Thousand Springs, U.S. Highway 93, and Goshute Valley siting areas.

A total of approximately 150 cultural resources have been recorded within the Thousand Springs series compensation siting study area. The majority include prehistoric isolates and lithic scatters that were assigned low or moderate sensitivities. A segment of the Central Pacific Railroad, a resource of moderate-high sensitivity, is within the extreme southern edge of the siting area. One high sensitivity resource, a large lithic scatter with antelope traps, is located in the northeastern portion of the siting area.

The U.S. Highway 93 series compensation siting study area is just to the west of the Thousand Springs study area and is comparable in size. Approximately 80 cultural resources have been identified in the U.S. Highway 93 study area. As in Thousand Springs, many are low and moderate sensitivity sites, such as prehistoric isolates and lithic scatters, although 7 resources of moderate-high sensitivity have been recorded. The northern portion of the study area contains most of these sites, including the Melandco railroad siding and an associated historic trash scatter, two prehistoric campsites and an associated lithic scatter, and a segment of the Union Pacific Railroad. A segment of the Central Pacific Railroad again cuts through the southern edge of the siting area. A segment of the California Trail, a high
sensitivity resource, extends through the central portion of the siting area, almost spanning its full length. Although the northeastern corner of the Humboldt Wells National Register eligible district enters the southern portion of the siting area, the majority of the proposed district is not within the boundaries of the siting area. Areas of projected high sensitivity for prehistoric sites have been identified in the Thousand Springs Valley, part of which lies within the siting area.

The Goshute Valley series compensation siting study area is significantly smaller than the Thousand Springs and U.S. Highway 93 and contains only 3 cultural resources. One prehistoric isolate was identified, along with a segment of the Nevada Northern Railroad, historic in age but used commercially, running along the eastern edge of the siting area. A small portion of the Cobre antelope trap site extends into the northeastern edge of the siting area.

Substation Siting Study Areas

Four substation siting study areas are located along the Midpoint to Dry Lake alternative routes. The North Steptoe, Robinson Summit, and Hercules Gap siting areas are in east-central Nevada. The Dry Lake siting area is situated in southern Nevada at the southern terminus of the Midpoint to Dry Lake alternative routes.

The North Steptoe substation siting study area contains four prehistoric isolates, all of low sensitivity. The Steptoe Valley, a Western Shoshone habitation area of moderate sensitivity, extends into the siting area.

A total of 11 cultural resources were identified within the Robinson Summit substation siting study area. The majority are prehistoric lithic and artifact scatters of moderate sensitivity, although one campsite of moderate-high sensitivity was noted. A portion of the Egan Range, identified as a Western Shoshone Resource Procurement area of moderate sensitivity, is within the siting area.

The Hercules Gap substation siting study area is just east of the Robinson Summit study area and is slightly larger. A total of 23 cultural resources have been recorded in the Hercules Gap study area. As in Robinson Summit, most are prehistoric lithic and artifact scatters, again with one campsite noted in the siting area. The Steptoe Valley, recognized as a Western Shoshone habitation area of moderate sensitivity, extends into the siting area. A segment of the Nevada Northern Railroad crosses the eastern edge of the study area. This segment is part of a tourist railroad and was therefore given a high sensitivity ranking.

The Dry Lake substation siting study area contains 21 cultural resources. Ten are prehistoric or historic artifact scatters, primarily of moderate sensitivity. The Dry Lake Range, identified as a Southern Paiute habitation and resource exploitation area also of moderate sensitivity, is present in the eastern portion of the siting area. A cluster of moderate-high sensitivity prehistoric and historic sites, one a campsite, is centrally located within the siting area. The area also contains the Dry Lake railroad siding and townsite, which has been given a high sensitivity ranking. A segment of the Old Spanish Trail/Mormon Road extends through the
center of the siting area, ending at the Dry Lake townsit. The historic trail is a resource of very high sensitivity.

Three substation siting study areas are located in the Utah portion of the study area, near the eastern terminus of the Ely to Delta alternative routes. All are comparable in size, and include the Intermountain, Smelter Hills, and Sevier siting areas.

The Intermountain substation siting study area contains only one cultural resource, a prehistoric ceramic scatter of moderate sensitivity. Similarly, the Smelter Hills siting area just to the west contains a prehistoric lithic scatter, also of moderate sensitivity.

The Sevier siting area, located south of the other two areas, contains 6 cultural resources. Five are of moderate sensitivity and include one rock art site, two prehistoric lithic scatters, and two Goshute and Pahvant Ute habitation and resource exploitation areas (Cricket Mountains and Sevier River Valley). A Paleo-Indian campsite listed on the National Register also falls within the siting area.

Microwave Communication Sites

A series of locations has been identified along the Midpoint to Dry Lake alternative routes as potential microwave communication sites. Three are in Idaho and 14 are in Nevada. No cultural resources were specifically identified at any of these proposed locations. In a few instances, microwave sites may be placed within series compensation or substation siting study areas. The potential considerations regarding cultural resources for these areas are discussed above.


## TABLE 3-1

Summary of Land Jurisdiction

### Midpoint to Dry Lake Routes

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Miles Crossed</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BLM</td>
<td>BOR</td>
<td>Forest</td>
<td>State</td>
</tr>
<tr>
<td>Route A*</td>
<td>412.5</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Route B</td>
<td>413.6</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Route C</td>
<td>397.1</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Route D</td>
<td>409.6</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Route E</td>
<td>430.0</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Route F</td>
<td>406.1</td>
<td>0</td>
<td>0</td>
<td>2.3</td>
</tr>
<tr>
<td>Route G</td>
<td>414.2</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Utility</td>
<td>409.4</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
<tr>
<td>Agency</td>
<td>409.4</td>
<td>0.5</td>
<td>0</td>
<td>5.2</td>
</tr>
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</table>

### Ely to Delta Routes

<table>
<thead>
<tr>
<th>Alternative</th>
<th>BLM</th>
<th>Forest</th>
<th>State</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>122.9</td>
<td>0</td>
<td>7.2</td>
<td>0</td>
</tr>
<tr>
<td>Cutoff*</td>
<td>143.4</td>
<td>0</td>
<td>10.5</td>
<td>0</td>
</tr>
<tr>
<td>230kV Corridor*</td>
<td>131.0</td>
<td>9.0</td>
<td>9.0</td>
<td>11.8</td>
</tr>
<tr>
<td>Southern</td>
<td>197.4</td>
<td>0</td>
<td>12.0</td>
<td>1.6</td>
</tr>
</tbody>
</table>

* Environmentally Preferred Route
** Utility Preferred and Agency Preferred
# TABLE 3-2
Summary of Counties Crossed
(miles)

<table>
<thead>
<tr>
<th>County</th>
<th>Route A</th>
<th>Route B</th>
<th>Route C</th>
<th>Route D</th>
<th>Route E</th>
<th>Route F</th>
<th>Route G</th>
<th>Utility</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jerome</td>
<td>31.0</td>
<td>31.0</td>
<td>31.0</td>
<td>31.0</td>
<td>31.0</td>
<td>9.8</td>
<td>31.0</td>
<td>31.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Twin Falls</td>
<td>41.9</td>
<td>41.9</td>
<td>41.9</td>
<td>41.9</td>
<td>41.9</td>
<td>67.3</td>
<td>41.9</td>
<td>41.9</td>
<td>41.9</td>
</tr>
<tr>
<td>Cassia</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>0</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Gooding</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elko</td>
<td>144.6</td>
<td>146.5</td>
<td>138.5</td>
<td>146.2</td>
<td>152.6</td>
<td>138.5</td>
<td>138.9</td>
<td>138.9</td>
<td>138.9</td>
</tr>
<tr>
<td>White Pine</td>
<td>111.3</td>
<td>112.5</td>
<td>111.3</td>
<td>110.2</td>
<td>114.0</td>
<td>111.3</td>
<td>108.7</td>
<td>105.6</td>
<td>107.1</td>
</tr>
<tr>
<td>Lincoln</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
<td>109.3</td>
</tr>
<tr>
<td>Nye</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
<td>46.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>County</th>
<th>Direct</th>
<th>Cutoff</th>
<th>230kV Corridor</th>
<th>Southern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utah</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millard</td>
<td>41.4</td>
<td>98.6</td>
<td>99.5</td>
<td>116.4</td>
</tr>
<tr>
<td>Juab</td>
<td>39.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Pine</td>
<td>48.9</td>
<td>55.3</td>
<td>61.3</td>
<td>94.6</td>
</tr>
</tbody>
</table>

1 of 1
TABLE 3-3

Alternative Routes Adjacent To WSAs

This table lists the mileage of the centerlines of alternative routes that pass adjacent to Wilderness Study Areas (WSAs) and Wilderness boundaries.

### Midpoint to Dry Lake Routes

<table>
<thead>
<tr>
<th>Route</th>
<th>Route A</th>
<th>Route B</th>
<th>Route C</th>
<th>Route D</th>
<th>Route E</th>
<th>Route F</th>
<th>Route G</th>
<th>Utility</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of WSAs</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>0-1/4 mile</td>
<td>18.8</td>
<td>18.8</td>
<td>18.6</td>
<td>19.3</td>
<td>18.8</td>
<td>20.8</td>
<td>18.8</td>
<td>20.8</td>
<td>18.8</td>
</tr>
<tr>
<td>1/4-1 mile</td>
<td>14.0</td>
<td>31.8</td>
<td>14.0</td>
<td>28.0</td>
<td>31.8</td>
<td>21.5</td>
<td>14.0</td>
<td>21.5</td>
<td>14.0</td>
</tr>
<tr>
<td>1-3 miles</td>
<td>37.5</td>
<td>44.8</td>
<td>37.5</td>
<td>46.3</td>
<td>44.8</td>
<td>39.8</td>
<td>41.0</td>
<td>44.5</td>
<td>44.5</td>
</tr>
</tbody>
</table>

### Ely to Delta Routes

<table>
<thead>
<tr>
<th>230 kV</th>
<th>Direct</th>
<th>Cutoff*</th>
<th>Corridor**</th>
<th>Southern</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of WSAs</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>0-1/4 mile</td>
<td>0</td>
<td>6.8</td>
<td>6.0</td>
<td>4.8</td>
</tr>
<tr>
<td>1/4-1 mile</td>
<td>0</td>
<td>7.0</td>
<td>6.3</td>
<td>9.3</td>
</tr>
<tr>
<td>1-3 miles</td>
<td>7.3</td>
<td>18.3</td>
<td>3.5</td>
<td>13.8</td>
</tr>
<tr>
<td>Wilderness</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0-1/4 mile</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1/4-1 mile</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-3 miles</td>
<td>0</td>
<td>3.3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

WSAs within 3 miles of alternative routes:

- Mt. Grafton, South Pequop, Bluebell, Goshute Peak, Goshute Canyon, Goshute Canyon and N.A., Meadow Valley Mountain, Fish & Wildlife 1, 2 & 3, Arrow Canyon, Notch Peak, King Top, Lower Salmon Falls Creek, Marble Canyon, Wah Wah Mountains, Howell Peak, Fish Springs, Delamar Mountain, Evergreen, Fortification Range.

Wilderness Areas within 3 miles of alternative routes affected by route:

- Mount Moriah

* Environmentally Preferred Route
** Utility and Agency Preferred Route
## TABLE 3-4

Scenic Quality/Variety Class Definitions

<table>
<thead>
<tr>
<th>BLM Scenic Quality Classes</th>
<th>FS Variety Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class A:</strong></td>
<td><strong>Class A:</strong></td>
</tr>
<tr>
<td>Outstanding areas where characteristic features of landform, rock, water, and vegetation are distinctive or unique in the context of the surrounding region. These features exhibit considerable variety in form, line, color, and texture.</td>
<td>Areas where features of landform, vegetation patterns, water forms, and rock formations are of distinctive or unusual visual quality. These features exhibit considerable variety in form, line, color, and texture.</td>
</tr>
<tr>
<td><strong>Class B:</strong></td>
<td><strong>Class B:</strong></td>
</tr>
<tr>
<td>Above average areas in which features provide variety in form, line, color, and texture and, although the combinations are not rare in the surrounding region, they provide sufficient visual diversity to be considered moderately distinctive.</td>
<td>Areas where features contain variety in form, line, color, and texture or combinations thereof, but which tend to be common throughout the character types and are not outstanding in visual quality.</td>
</tr>
<tr>
<td><strong>Class C:</strong></td>
<td><strong>Class C:</strong></td>
</tr>
<tr>
<td>Common areas where characteristic features have little variation in form, line, color, or texture in relation to the surrounding region.</td>
<td>Areas with very little or minimal variety, if any, in form, line, color, and texture.</td>
</tr>
<tr>
<td>VRM</td>
<td>VQO</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Class I:</strong> This class provides primarily for natural ecological changes; however, it does not preclude very limited activity. Any contrast created within the characteristic environment must not attract attention.</td>
<td><strong>Preservation:</strong> Management activities, except for very low visual impact recreation facilities, are prohibited. This VQO allows for only &quot;ecological&quot; changes. This management objective applies to wilderness areas, primitive areas, other special classified areas, and some unique management units that do not justify other special classification.</td>
</tr>
<tr>
<td><strong>Class II:</strong> Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. A contrast may be seen but should not attract attention. It is important to note that Wilderness Study Areas (WSAs), considered to be Class II by the BLM, had not been identified when the original BLM visual analysis was completed.</td>
<td><strong>Retention:</strong> Management activities must not be visually evident to the casual forest visitor. Modifications must repeat form, line, color and texture found in the surrounding natural landscape.</td>
</tr>
<tr>
<td><strong>Class III:</strong> Contrasts to the basic elements (form, line, color, texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape.</td>
<td><strong>Partial Retention:</strong> Modifications may be visually evident, but must be integrated into and visually subordinate to the surrounding landscape. Activities may introduce form, line, color and texture not common in the surrounding landscape, but they should not attract attention.</td>
</tr>
<tr>
<td><strong>Class IV:</strong> Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements (form, line, color, texture) inherent in the characteristic landscape.</td>
<td><strong>Modification:</strong> Management activities may visually dominate the surrounding natural landscape; however, they must repeat the naturally established elements of form, line, color and texture to appear compatible with the natural surroundings.</td>
</tr>
<tr>
<td><strong>Class V:</strong> No longer used (VRM 1986).</td>
<td><strong>Maximum Modification:</strong> Modifications may visually dominate the surrounding natural landscape, yet when viewed from background distance, activities must appear as natural occurrences within the landscape. Alterations in foreground and middleground views may be out of scale or introduce visual elements not found in the natural landscape.</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>IDAHO</td>
<td></td>
</tr>
<tr>
<td>Cassia</td>
<td>2,560</td>
</tr>
<tr>
<td>Gooding</td>
<td>728</td>
</tr>
<tr>
<td>Jerome</td>
<td>601</td>
</tr>
<tr>
<td>Twin Falls</td>
<td>1,944</td>
</tr>
<tr>
<td>NEVADA</td>
<td></td>
</tr>
<tr>
<td>Elko</td>
<td>17,135</td>
</tr>
<tr>
<td>White Pine</td>
<td>8,903</td>
</tr>
<tr>
<td>Lincoln</td>
<td>10,635</td>
</tr>
<tr>
<td>Nye</td>
<td>18,064</td>
</tr>
<tr>
<td>Clark</td>
<td>7,927</td>
</tr>
<tr>
<td>UTAH</td>
<td></td>
</tr>
<tr>
<td>Juab</td>
<td>3,396</td>
</tr>
<tr>
<td>Millard</td>
<td>6,648</td>
</tr>
</tbody>
</table>

Sources:  
Idaho Department of Water Resources and University Research Center, June 1985.  
Nevada Department of Taxation, 1989.  
Nevada Department of Administration, 1990.  
Utah Office of Planning and Budget, 1988.
TABLE 3-7

Assessed Values and Tax Rates by County

<table>
<thead>
<tr>
<th>State/County</th>
<th>1990 Average Tax Rate Per $100</th>
<th>1990 Total County Assessed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assessed Value</td>
<td></td>
</tr>
<tr>
<td>IDAHO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassia</td>
<td>1.65*</td>
<td>$487,609,543</td>
</tr>
<tr>
<td>Gooding</td>
<td>2.35*</td>
<td>261,155,102</td>
</tr>
<tr>
<td>Jerome</td>
<td>2.45*</td>
<td>351,347,121</td>
</tr>
<tr>
<td>Twin Falls</td>
<td>2.27*</td>
<td>1,156,527,810</td>
</tr>
<tr>
<td>NEVADA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elko</td>
<td>2.50**</td>
<td>574,613,762</td>
</tr>
<tr>
<td>White Pine</td>
<td>2.49</td>
<td>120,485,528</td>
</tr>
<tr>
<td>Lincoln</td>
<td>2.35***</td>
<td>51,224,433</td>
</tr>
<tr>
<td>Nye</td>
<td>2.71</td>
<td>551,845,998</td>
</tr>
<tr>
<td>Clark</td>
<td>2.68</td>
<td>11,294,874,939</td>
</tr>
<tr>
<td>UTAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juab</td>
<td>1.43*</td>
<td>242,852,400</td>
</tr>
<tr>
<td>Millard</td>
<td>1.24*</td>
<td>2,874,632,000</td>
</tr>
</tbody>
</table>

* Represents tax rates for urban areas. Rural tax rates are significantly lower, between 1.25 and 1.50 per $100 assessed value.

** Represents average of rates for three tax districts in county.

*** Represents average of rates for seven tax districts in county.

Lincoln County Assessor's Office, 1989.
Nevada Department of Taxation, 1991.
### TABLE 3-8

Population of Study Area Communities

<table>
<thead>
<tr>
<th>State/Communities</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1980</td>
</tr>
</tbody>
</table>

**IDAHO**
- Buhl: 3,629, 3,640
- Bliss: 208, 220
- Eden: 355, 410
- Gooding: 2,949, 2,830
- Hansen: 1,078, 1,090
- Hagerman: 602, 660
- Jerome: 6,891, 6,960
- Kimberly: 2,307, 2,710
- Twin Falls: 26,209, 27,540
- Wendell: 1,974, 2,130

**NEVADA**
- Elko: 14,736, 13,600
- Ely: 4,756, 5,170
- Wells: 1,256, 1,290
- Caliente: 1,111, 1,160
- Las Vegas: 230,030, 258,295**

**UTAH**
- Delta: 2,998, 7,411*
- Hinckley: 658, 933*

* 1982 estimates from Millard County Growth Management Plan based on assessment of impacts from Intermountain Power Projects. Figures are not official state estimates.

** Figures presented are for 1988 since 1990 census data were not available for all communities.

*** Figure represents City of Las Vegas population from 1990 census and does not represent Clark County

**Sources:**
- Idaho Department of Commerce, 1989
- Nevada Department of Taxation, 1989
- Utah Department of Employment Security, 1991
- U.S. Department of Agriculture, 1982
### TABLE 3-9
States with Transmission Line Field Limits

<table>
<thead>
<tr>
<th>STATE AGENCY</th>
<th>WITHIN RIGHT-OF-WAY</th>
<th>AT EDGE OF RIGHT-OF-WAY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. 60-Hz Electric Field Limit, kV/m</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida Department of Environmental Regulation</td>
<td>8(≤230 kV)</td>
<td>2</td>
<td>Codified regulation, adopted after a public rulemaking hearing in 1989.</td>
</tr>
<tr>
<td></td>
<td>10(500 kV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minnesota Environmental Quality Board</td>
<td>8</td>
<td></td>
<td>12 kV/m limit on the HVDC nominal electric field.</td>
</tr>
<tr>
<td>Montana Board of Natural Resources and Conservation</td>
<td>7</td>
<td>1*</td>
<td>Codified regulation, adopted after a public rulemaking hearing in 1984.</td>
</tr>
<tr>
<td>New Jersey Department of Environmental Protection</td>
<td>3</td>
<td></td>
<td>Used only as a guideline for evaluating complaints.</td>
</tr>
<tr>
<td>New York State Public Service Commission</td>
<td>11.8</td>
<td>1.6</td>
<td>Explicitly implemented in terms of a specified right-of-way width.</td>
</tr>
<tr>
<td></td>
<td>(7,11)b</td>
<td></td>
<td>33 kV/m limit on the HVDC total electric field.</td>
</tr>
<tr>
<td>Oregon Facility Siting Council</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. 60-Hz Magnetic Field Limit, mG</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida Department of Environmental Regulation</td>
<td>150 (≤230 kV)</td>
<td></td>
<td>Codified regulations, adopted after a public rulemaking hearing in 1989.</td>
</tr>
<tr>
<td></td>
<td>200 (500 kV)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Landowner may waive limit
*bAt road crossings