water sources occur within the Upper Colorado River drainage basin, and because construction and hydrostatic testing of pipelines may require water, consultation regarding depletions should be required.

- To avoid impacts to the four endangered Colorado River fish mentioned above, no in-stream work should occur between July 1 and September 30.

- Construction activities should avoid modification of critical habitat for any species.

- Any pipelines crossing rivers with listed aquatic species should have remotely actuated block or check valves on both sides of the river; pipelines should be double-walled pipe at river crossings; and pipelines should have a spill/leak contingency plan, which includes timely notification of the local USFWS ecological service office.

3.9 VISUAL RESOURCES

3.9.1 What Are the Visual Resources Associated with Energy Corridors in the 11 Western States?

Visual resources refer to all objects (man-made and natural, moving and stationary) and features (e.g., landforms and water bodies) that are visible on a landscape. These resources add to or detract from the scenic quality of the landscape, that is, the visual appeal of the landscape. A visual impact is the creation of an intrusion or perceptible contrast that affects the scenic quality of a landscape. A visual impact can be perceived by an individual or group as either positive or negative, depending on a variety of factors or conditions (e.g., personal experience, time of day, and weather/seasonal conditions).

The 11 western states analyzed in this PEIS encompass a wide variety of landscape types, determined by geology, topography, climate, soil type, hydrology, and land use. Included in this vast region encompassing nearly 1.2 million square miles are spectacular landscapes such as the Grand Canyon, Mt. Rainier, and Glacier and Yellowstone National Parks, as well as relatively flat and visually monotonous landscapes such as the Wyoming Basin and High Plains of eastern Colorado. Although much of the region is sparsely populated, human influences have altered much of the visual landscape, especially with respect to land use and land cover, and, in some places, intensive human activities such as mineral extraction and energy development have seriously degraded visual qualities. Large, fast-growing cities such as Las Vegas and Phoenix also contain heavily altered landscapes, with urban sprawl and associated visual blight spreading into what were recently relatively intact landscapes. Nonetheless, the various scenic attractions of the 11-state area help attract millions of tourists to the region each year and contribute to making tourism a major component of some regional and local economies.

Table 3.9-1 summarizes selected scenic resources, such as national parks, monuments, and recreation areas; national historic sites, parks, and landmarks; national memorials and battlefields; national seashores, national wild and scenic rivers, national historic trails, and national scenic highways; and other national scenic areas occurring within the 11-state region by state. In addition, many other scenic resources exist on federal, state, and other nonfederal lands, including traditional cultural properties important to Tribes.

Because scenic resources in a given area are largely determined by geology, topography, climate, soil type, and vegetation, scenic resources are generally homogenous within an ecoregion, defined as an area that has a general similarity in ecosystems and characterized by the spatial pattern and composition of biotic and abiotic features, including vegetation, wildlife,

TABLE 3.9-1 Summary of Selected Potentially Sensitive Visual Resource Areas within the 11 Western States[a]

State	National Parks[b]	National Monuments[c]	National Recreation Areas (NRA)[d]	National Conservation Areas[e]	Other National Park Service Areas[f]	National Natural Landmarks	National Historic Landmarks	National Scenic Trails	National Historic Trails	National Scenic Highways[g]	National Scenic Areas (NSA)	National Scenic Research Areas (NSRA)	National Wild and Scenic Rivers[h]	National Wildlife Refuges[i]	State Totals
Arizona	3	19	2	3	4	9	9	0	2	5	0	0	1	9	66
California	8	10	5	3	9	32	63	1	4	7	1	0	14	35	192
Colorado	4	6	2	2	3	11	4	1	3	10	0	0	2	7	55
Idaho	1	3	2	1	2	11	2	1	4	6	0	0	7	7	47
Montana	2	3	2		4	10	5	1	2	1	3	0	2	20	55
Nevada	2	0	2	3	1	6	2	0	3	3	0	0	0	8	30
New Mexico	2	11	1	1	2	12	11	1	2	8	0	0	4	7	62
Oregon	1	4	3	2	3	6	10	1	4	10	1	1	47	22	115
Utah	5	7	2	1	1	4	4	0	4	7	0	1	0	4	40
Washington	3	2	4		6	16	11	1	2	6	1	0	3	21	76
Wyoming	2	2	2		2	6	7	1	5	1	0	0	1	7	36

a Includes features wholly or partly within state boundaries.

b Does not include national historic parks or national historical parks.

c Includes national monuments managed by the NPS, FS, BLM, and USFWS.

d Includes national recreation areas managed by the NPS and FS.

e Includes Headwaters Forest Reserve, Yaquina Head Outstanding Natural Area, and Steens Mountain Cooperative Management and Protection Area.

f Includes national historic parks, national historical parks, national preserves, national reserves, national seashores, national historic sites, national battlefields, national memorials, national memorial parkways, and the San Francisco Presidio.

g Includes all-American roads and national scenic byways.

h The congressionally authorized wild and scenic study rivers are not included.

i Includes Desert National Wildlife Range.

geology, physiography, climate, soils, land use, and hydrology (EPA 2006b). The 11 western states where Section 368 federal energy corridors may be designated encompass 34 ecoregions, each of which contains a diverse set of visual resources. The number of ecoregions within any one state ranges from 5 in Nevada to 12 in California. The areal coverage of an ecoregion within any one state varies greatly among the 11 western states. In some states, ecoregions account for as little as 1 square mile (e.g., the Puget Sound and Colorado Plateau ecoregions in Oregon and New Mexico, respectively). In contrast, the portion of the Central Basin and Range ecoregion within Nevada encompasses about 82,000 square miles. The general environmental setting of the 34 ecoregions and the states in which the ecoregions occur are discussed in Appendix Q, and a map of the 34 ecoregions is shown in Figure 3.8-1.

3.9.2 How Were the Potential Impacts of Corridor Designation and Land Use Plan Amendment to Visual Resources Evaluated?

The responsibility of the BLM and the FS for managing the visual (scenic) resources of public lands is established by law. The NEPA requires that measures be taken to "assure for all Americans…aesthetically pleasing surroundings." The FLPMA states that "public lands will be managed in a manner which will protect the quality of scenic values of these lands." The NFMA requires that the FS inventory and evaluate visual resources and incorporate visual quality objectives into the planning process. Methods have been developed to assist federal agencies that are responsible for visual resource planning and for assessing visual resource impacts.

The BLM conducts visual inventories and analyses within the guidelines established in its Visual Resource Management (VRM) System (BLM 1984a; 1986a,b). The BLM uses the VRM procedures and methods to support decision making for planning activities and reviews of proposed developments on BLM-administered lands.

The VRM System consists of three phases: (1) inventory of scenic values and assignment of visual resource inventory classes; (2) designation of BLM management classes for all public lands using the RMP process, including the designation of "special areas" such as wilderness areas, Wilderness Study Areas (WSAs), ACECs, wild and scenic rivers, scenic areas, etc., where management objectives (not necessarily scenic value) require preservation of the natural setting; and (3) use of the Visual Contrast Rating System to evaluate the compliance of a proposed project with the existing VRM class for the proposed project location and to determine the nature and extent of visual impacts associated with the project. Visual simulations are then prepared for areas of visual sensitivity. Mitigation plans are prepared for projects not in compliance with VRM objectives; these plans demonstrate and quantify how VRM compliance will be accomplished. If the project is subsequently implemented, design considerations and mitigation measures are used to minimize the visual impacts of the project. Compliance with VRM objectives is then monitored and maintained throughout the life of the project.

The FS conducts visual inventories and analyses within the guidelines established in its Scenery Management System (SMS) (FS 1995a). The SMS presents a systematic approach for determining the relative value and importance of visual resources. The system is used in the context of ecosystem management to inventory and analyze scenery, establish overall resource goals and objectives, and monitor visual resources.

The SMS consists of two major phases: inventory and implementation. The inventory phase involves several steps: (1) determination of landscape character; (2) analysis of scenic integrity; (3) determination of inherent scenic attractiveness; (4) determination of landscape visibility, including constituent analysis and determination of seen areas and distance zones; and (5) the determination of initial scenic class assignments. In the implementation phase, (1) scenic class assignments are consolidated and mapped; (2) scenic integrity objectives are assigned to management areas; and (3) maps reflecting scenic integrity objectives are created and subsequently used in the planning process to determine the compatibility of proposed actions with the visual quality objectives for the affected lands.

The visual impact analysis conducted for the PEIS assumes that visual impact levels would be proportional to the number of visually sensitive features that would be near a proposed corridor or intersected by it. In most cases, visually sensitive features that would fall within or be located close to a designated corridor would be more likely to be affected by future energy transport project development than those sensitive features farther away from a corridor; however, it should be recognized that a visual impact assessment is highly site- and project-specific, and actual future projects and their locations are not known at this time.

Two GIS-based proximity analyses were performed. The first analysis, hereafter referred to as the intersection analysis, identified locations (primarily on federal lands) where selected visually sensitive features would be intersected by a designated energy corridor, meaning that some portion of the features fell within 1,750 feet of the designated centerline of a proposed corridor. The second analysis, hereafter referred to as the buffer analysis, identified locations where some portion of a sensitive feature fell within 5 miles of a designated corridor centerline. The 5-mile buffer width was selected because it includes the foreground and middleground view ranges specified by the BLM's and FS's VRM and SMS Systems respectively (BLM 1986a; FS 1995a). The buffer distance thus includes areas where the impacts are most likely to be of concern. It is important to note that it was not possible to perform these analyses for the No Action Alternative because specific ROW locations (centerlines and widths) could not be specified.

For each nearby or intersected visual resource feature, the intersection or closest point of approach between the feature and the corridor's centerline was identified and mapped. The information is presented both in map (Map Atlas, Part 3) and tabular formats (Appendix S). The tables are organized by state and by feature type.

The list of scenic resources included in the analysis includes:

- National parks, national monuments, national recreation areas, national preserves, national wildlife refuges, national reserves, national conservation areas, national seashores, national historic sites, national historic parks, national battlefields, national memorials, national memorial parkways, and the San Francisco Presidio;
- National wild and scenic rivers;
- Congressionally authorized wild and scenic study rivers;
- National scenic trails and national historic trails;
- National historic landmarks and national natural landmarks;
- All-American roads and national scenic byways; and
- National scenic areas and national scenic research areas.

The analysis is limited in terms of both completeness and accuracy. For example, the analysis is limited to data that were available in GIS format at the time of analysis; thus, it is recognized that many additional scenic resources exist at the national, state, and local levels and that impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. In addition, the GIS system, while capable of extremely high spatial accuracy, is limited by the accuracy of the data used in the analysis, since the datasets were obtained from many sources and are subject to error. It should be noted that in addition to the resource types and specific resources analyzed in the PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other nonfederal sensitive visual resources, and communities close enough to the corridors to be affected by visual impacts.

3.9.3 What Are the Potential Impacts to Visual Resources of the Alternatives, and How Do They Compare?

3.9.3.1 Potential Visual Resources Impacts of the No Action Alternative

Under the No Action Alternative, if project-specific ROWs are authorized and energy transport project development occurs, visual impacts may occur on federal and nonfederal lands both within and within sight of the energy transport projects built under the alternative. The magnitude and extent of impacts would depend on the type of project authorized, its location, its total length, and a variety of site-specific factors that are not known at this time but would be addressed by environmental reviews at the project-specific level.

If project-specific ROWs were authorized and development occurred under No Action, projects would be less likely to be colocated and would be more likely to occur within multiple, widely spaced energy transport ROWs crossing federal and nonfederal lands, relative to the Proposed Action. Without colocation, ROWs and associated infrastructure (such as roads and compressor stations) would typically be visible from a larger area and might therefore be visible to a larger number of people. In addition, there would be a greater potential for visual impacts because each ROW would require its own infrastructure (e.g., service roads, support structures), some of which might be avoided through colocation (under the Proposed Action). Because there would typically be more ROWs in a given area, the average viewing distance from an observer to the ROW and associated facilities would decrease, and the associated visual impact would therefore increase because the impacts would be viewed from shorter distances. The likelihood of a ROW being visible from a sensitive feature (e.g., a wilderness study area) would also increase, as would the likelihood of seeing more than one ROW from a given viewing point, although site-specific design and mitigation measures might be used to minimize or eliminate some of these situations. In short, noncolocation of ROWs would generally lead to more severe visual impacts for a larger number of viewers over a larger area.

It should be noted that while there is greater potential for visual impacts without the colocation of ROWs, the visual impacts at a given location might actually be reduced in some cases without colocation because a viewer would see fewer transmission lines, pipelines, ROW clearings, and energy transport infrastructures at that location. A given landscape, which might be able to absorb one ROW and associated facilities without serious visual degradation, might be overwhelmed by multiple colocated facilities, especially if the observation point was close to the ROW. This consideration is important for particularly sensitive visual resources such as national historic sites, historic trails, and Tribal cultural properties; site-specific NEPA analyses should identify these situations and specify design and/or mitigation measures to avoid or minimize the associated visual impacts.

Under No Action, in the absence of dedicated energy corridors and an associated expedited permitting process, there could be increased siting of ROWs on nonfederal lands and a concomitant shift of visual impacts associated with the ROWs to those lands, although some ROWs would still be sited on federal lands. This factor could lead to increased visual impacts in some cases, because inconsistent or less thorough environmental analyses might be performed and/or fewer mitigation requirements might be fulfilled on individual projects.

3.9.3.2 Potential Visual Resources Impacts of the Proposed Action

Designation of the proposed energy corridors and land use plan amendments alone are not expected to impact visual resources. Under the Proposed Action, if project-specific ROWs are authorized and energy transport project development occurs, visual impacts may occur on federal and nonfederal lands both within and within sight of the energy transport projects built under the alternative. The magnitude and extent of impacts would depend on the type of project authorized, its location, its total length, and a variety of site-specific factors that are not known at this time but would be addressed by environmental reviews at the project-specific level.

If project-specific ROWs are authorized and energy transport project development occurs under the Proposed Action, some energy transport projects could be developed in the designated energy corridors, as opposed to being developed on separate ROWs. If projects were colocated within the proposed corridors rather than being built on separate ROWs, it is expected that some project infrastructure, such as the ROW and access and maintenance roads, could be shared among projects, reducing the number of locations where potential visual impacts associated with construction and operation of energy transport projects might occur. Because the overall number of potential impacts would decrease and because the potential impacts would occur within a smaller visible area, visual impacts would decrease in most places away from the designated energy corridors. However, within the corridors, and for areas close to the corridors with direct views of the projects within the corridors, the concentrating effects of colocation could potentially increase overall impact levels in those areas and potentially counteract the decrease in impacts associated with shared facilities. The extent of these effects would vary from site to site and would depend on the number and types of facilities, the extent to which facilities were shared between projects, and the visual absorption capacities of the landscapes in which the projects were sited.

On federal lands outside the proposed corridors, the federal land management agencies would continue to permit energy transport projects on a project-by-project basis and/or designate project-specific ROWs through their normal land use planning process on lands under their jurisdiction. The colocation effects on visual impacts that would result with multiple projects in the proposed corridors would not occur, with the expected result being an increase in the visually affected areas (because of utilizing multiple, physically separated ROWs) and an increase in the number of visual impacts (because facilities would not be shared among projects).

Table 3.9-2 lists the number of selected, potentially sensitive visual resource areas that are intersected by the proposed corridors or are located within 5 miles of a proposed energy corridor for each western state. It should be noted that some features may be near or intersected by corridors at more than one location. These visual resources may be at greatest risk for visual impacts from project development because of their proximity to the corridors. Tables S-1 and S-2 in Appendix S list the individual potentially sensitive visual resource areas that are summarized in Table 3.9-2. Maps showing where corridors designated under the Proposed Action intersect potentially sensitive visual resource areas or pass within 5 miles of a potentially sensitive visual resource area are presented in the Map

TABLE 3.9-2 Summary of Selected Potentially Sensitive Visual Resource Areas within or near[a] the Proposed Section 368 Energy Corridors[b]

State	National Parks[c]	National Monuments[d]	National Recreation Areas (NRA)[e]	National Conservation Area[f]	Other National Park Service Areas[g]	National Natural Landmarks	National Historic Landmarks	National Scenic Trails	National Historic Trails	National Scenic Highway[h]	National Scenic Areas (NSA)	National Scenic Research Areas (NSRA)	National Wild and Scenic Rivers	National Wildlife Refuges[j]	State Totals
Arizona	0/0	0/4	2/2	0/0	0/1	0/0	0/1	NA[i]	2/2	1/1	NA	NA	0/0	0/2	5/13
California	0/1	0/2	1/1	1/1	0/2	0/1	0/1	1/1	3/4	1/2	0/0	NA	1/2	0/6	8/24
Colorado	0/1	0/1	1/1	0/1	0/0	0/2	0/0	1/1	1/1	5/5	NA	NA	0/0	0/1	8/14
Idaho	0/0	0/3	0/1	1/1	0/0	0/1	0/0	1/1	1/3	0/0	NA	NA	0/0	0/4	3/14
Montana	0/0	0/0	0/0	0/0	0/0	0/2	0/1	1/1	1/2	0/0	0/0	NA	0/0	0/1	2/7
Nevada	0/1	NA	1/2	1/3	0/0	0/1	0/1	NA	3/3	0/1	NA	NA	NA	1/2	6/14
New Mexico	0/0	0/1	0/0	0/0	0/1	0/0	0/0	1/1	2/2	2/3	NA	NA	0/0	1/2	6/10
Oregon	0/0	0/0	0/0	0/1	0/0	0/0	0/0	1/1	2/2	1/4	0/0	0/0	2/7	0/2	6/17
Utah	0/1	1/3	0/2	0/0	0/0	0/1	0/0	NA	3/3	1/4	NA	0/0	NA	0/2	5/16
Washington	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/1	0/0	1/2	0/0	NA	0/0	0/0	2/3
Wyoming	0/0	0/0	1/1	0/0	0/0	0/0	0/0	1/1	3/4	0/0	NA	NA	0/0	0/1	5/7
Totals	0/4	1/14	6/10	3/7	0/4	0/8	0/4	8/8	21/26	12/22	0/0	0/0	3/9	2/23	56/139

a Includes features within 5 miles of corridor centerline.

b Within each cell, the first number indicates the number of features with corridor intersections, and the second number indicates the number of features with proximity events (i.e., corridor passes within 5 miles of feature).

c Does not include national historic parks or national historical parks.

d Includes national monuments managed by the NPS, FS, BLM, and USFWS.

e Includes national recreation areas managed by the NPS and FS.

f Includes Headwaters Forest Reserve, Yaquina Head Outstanding Natural Area, and Steens Mountain Cooperative Management and Protection Area.

g Includes national historic parks, national historical parks, national preserves, national reserves, national seashores, national historic sites, national battlefields, national memorials, national memorial parkways, and the San Francisco Presidio.

h Includes all-American roads and national scenic byways.

i NA = not applicable; feature type does not occur in the state.

j Includes Desert National Wildlife Range.

Atlas, Part 3. It should be noted that it was not possible to perform these analyses for areas where corridors were not designated because specific ROW locations (centerlines and widths) could not be specified.

Table 3.9-3 lists the number of selected, potentially sensitive visual resource areas that are intersected by nonlocally designated portions of corridors proposed under the Preferred Alternative, or are located within 5 miles of nonlocally designated portions of corridors proposed under the Proposed Action Alternative. The table thus summarizes the number of resource areas that may be at greatest risk for visual impacts solely as a result of designation of corridor segments beyond those currently designated by local agency land managers. Those portions of designated corridors that coincide with existing locally designated corridors are indicated on the visual resource analysis maps in the Map Atlas, Part 3.

3.9.3.3 Comparison of Alternatives

Because the No Action Alternative does not designate corridors, if project-specific ROWs are authorized and development of energy transport projects occurs under this alternative, it is likely to result in less colocation of energy transport projects than under the Proposed Action, assuming that the same amount of development occurred under both alternatives. The lack of concentrated impacts that result from colocation would be expected to result in a lower overall level of impacts along individual corridors, but because there would be no sharing of ROWs, roads, and other facilities between projects, the No Action Alternative would likely result in a higher number of impacts, spread out over a larger area.

The Proposed Action involves designation of Section 368 federal energy corridors. If project-specific ROWs are authorized and development of energy transport projects occurs under this alternative, it is anticipated that the designation of corridors under the Proposed Action would result in greater colocation of energy transport projects than under No Action, assuming that the same amount of development occurred under both alternatives, which would likely lead to sharing of some facilities such as ROWs and roads between projects. Sharing of facilities would reduce the number of visual impacts, but colocation of projects would concentrate the impacts along the energy corridors. Relative to No Action, this could lead to a higher level of visual impacts to federal and nonfederal lands within or within sight of the corridors, but visual impacts farther away from the corridors would likely be smaller because colocation would lead to fewer ROWs and facilities overall.

3.9.4 Following Corridor Designation and Project-Specific ROW Authorization, What Types of Impacts Could Result to Visual Resources with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

Designation of corridors and amendment of land use plans alone are not expected to impact visual resources. If project-specific ROWs are authorized and energy transport project development occurs under either of the alternatives, visual impacts may occur on federal and nonfederal lands, including Tribal cultural properties, both within and within sight of the energy transport projects built under the alternatives. The magnitude and extent of impacts would depend on the type of project authorized, its location, its total length, and a variety of site-specific factors that are not known at this time but would be addressed by environmental reviews at the project-specific level. Impacts to visual resources that could occur with the development, construction, operation, and decommissioning of an energy transport project (regardless of project location) are discussed in Section 3.9.4.2. These impacts could occur on both federal and nonfederal lands, including traditional cultural properties important to Tribes.

TABLE 3.9-3 Summary of Selected Potentially Sensitive Visual Resource Areas within or near[a] Nonlocally Designated Portions of the Proposed Section 368 Energy Corridors under the Proposed Action[b]

State	National Parks[c]	National Monuments[d]	National Recreation Areas (NRA)[e]	National Conservation Areas[f]	Other National Park Service Areas[g]	National Natural Landmarks	National Historic Landmarks	National Scenic Trails	National Historic Trails	National Scenic Highway[h]	National Scenic Areas (NSA)	National Scenic Research Areas (NSRA)	National Wild and Scenic Rivers	National Wildlife Refuges[j]	State Totals
Arizona	0/0	0/3	1/1	0/0	0/1	0/0	0/1	NA[i]	1/1	0/0	NA	NA	0/0	0/0	2/7
California	0/0	0/0	1/1	0/1	0/1	0/0	0/0	1/1	2/4	1/1	0/0	NA	1/2	0/3	6/14
Colorado	0/1	0/1	1/1	0/1	0/0	0/0	0/0	1/1	1/1	2/2	NA	NA	0/0	0/1	5/9
Idaho	0/0	0/3	0/1	0/1	0/0	0/1	0/0	1/1	1/3	0/0	NA	NA	0/0	0/4	2/14
Montana	0/0	0/0	0/0	0/0	0/0	0/1	0/1	1/1	1/2	0/0	0/0	NA	0/0	0/1	2/6
Nevada	0/1	NA	0/2	0/3	0/0	0/0	0/0	NA	2/3	0/0	NA	NA	NA	1/3	3/12
New Mexico	0/0	0/1	0/0	0/0	0/1	0/0	0/0	1/1	1/2	2/2	NA	NA	0/0	1/2	5/9
Oregon	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/1	2/1	1/3	0/0	0/0	2/5	0/2	6/12
Utah	0/1	1/3	0/1	0/0	0/0	0/0	0/0	NA	3/3	1/4	NA	0/0	N/A	0/2	5/14
Washington	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/1	0/0	NA	0/0	0/0	0/1
Wyoming	0/0	0/0	1/1	0/0	0/0	0/0	0/0	1/1	3/4	0/0	NA	NA	0/0	0/1	5/7
Totals	0/3	1/11	4/8	0/6	0/3	0/2	0/2	7/7	17/24	7/13	0/0	0/0	3/7	2/19	41/105

[a] Includes features within 5 miles of corridor.

[b] Within each entry, the first number indicates the number of features with corridor intersections, and the second number indicates the number of features with proximity events (i.e., corridor passes within 5 miles of feature).

[c] Does not include national historic parks or national historical parks.

[d] Includes national monuments managed by the NPS, FS, BLM, and USFWS.

[e] Includes national recreation areas managed by the NPS and FS.

[f] National Conservation Areas, which include Headwaters Forest Reserve, Yaquina Head Outstanding Natural Area, and Steens Mountain Cooperative Management and Protection Area.

[g] Includes national historic parks, national historical parks, national preserves, national reserves, national seashores, national historic sites, national battlefields, national memorials, national memorial parkways, and the San Francisco Presidio.

[h] Includes all-American roads and national scenic byways.

[i] NA = not applicable; feature type does not occur in the state.

[j] Includes Desert National Wildlife Range.

3.9.4.1 What Factors Influence the Evaluation of Visual Impacts?

The construction, operation, and decommissioning of energy transport and distribution facilities may cause a variety of visual impacts. Because of the subjective and experiential nature of human visual perception and cognition, the human response to visual impacts cannot be quantified systematically, even though the impacts of a proposed development can be described specifically. Factors that influence the perception and evaluation of visual impacts include (BLM 1984, 1986a,b; FS 1995a):

- *Visibility factors*. These are factors that affect the visibility of an area of interest to typical viewers. Circumstances or activities that reduce or eliminate views of the impacted feature will reduce the level of perceived visual impact for most viewers.

- *View duration*. Duration affects the perceived visual impact; impacts that are evident for a long period of time are generally judged to be more severe than those that are visible only briefly. Similarly persons residing or working near an affected area may be exposed to more visual impacts over time than one-time or infrequent visitors to the impacted area, such as park users or recreationists.

- *Viewer distance and angle*. Viewer distance from an area is a key factor in determining the level of visual impact, with the perceived impact diminishing as the distance between the viewer and the affected area increases. Viewer angle relative to the impact may also affect the perceived visual impact, as landscapes may be scrutinized more closely (thus increasing the potential for a visual impact) as viewing angles approach 90°.

- *Landscape setting*. Landscape setting plays a key role in determining the level of perceived visual impacts because it provides the context for judging the degree of visual intrusion of a project or activity. The landscape setting includes the perceived scenic value, visual absorption capacity (the degree to which the landscape can absorb visual impacts without serious degradation in perceived scenic quality), scenic integrity, and, in some cases, the unique scenic, cultural, or ecological values of a landscape.

- *Seasonal and lighting conditions*. Because visual contrast is a key factor in determining the visual impact of a proposed project or activity, seasonal and lighting conditions that affect contrast may affect perceived visual impact.

- *Number of viewers*. Impacts are generally more acceptable in areas that are seldom seen; conversely, impacts in areas that are heavily used/viewed are generally less acceptable.

- *Viewer activity, sensitivity, and cultural factors*. The type of activity in which a viewer is engaged when viewing a visual impact may affect his or her perception of impact level. Some individuals and groups may be inherently more sensitive to visual impacts than others as a result of educational and social background, life experiences, and other cultural factors.

3.9.4.2 What Are the Usual Impacts to Visual Resources of Building and Operating Energy Transport Projects?

Direct visual impacts from the construction, operation, and decommissioning of an energy transport project include the temporary impacts associated with activities that occur during the construction and decommissioning phases of a project and the longer-term impacts that result from the presence and operation of the project facilities themselves.

Visual Impacts during Site Construction. Potential visual impacts that could result from construction activities include contrasts in form, line, color, and texture resulting from ROW clearing with associated debris; road building/upgrading; construction and use of staging and laydown areas; mainline and support facility construction; blasting of rock faces and other cavities; vehicular, equipment, and worker presence and activity; and associated vegetation and ground disturbances, dust, and emissions.

ROW Construction. Construction on a ROW requires clearing of vegetation, large rocks, and other objects. The nature and extent of ROW clearing is affected by the ROW requirements of the project, the types of vegetation and other objects to be cleared, and the extent to which a preexisting cleared ROW is being used. Because the construction ROW may be wider than the permanent ROW (see Appendix G), the initial cleared area might be much wider than the permanent ROW and thus potentially result in a greater visual impact. More complete vegetation clearing and topographic grading would be required for the construction of access roads, maintenance roads, and roads to support facilities (e.g., electric substations or pump stations). Typically, vegetation-clearing activities would create visual impacts if refuse materials are not either disposed of off-site, mulched, or otherwise concealed. Related activities could include bracing and cutting existing fences and constructing new fences to contain livestock; providing temporary walks, passageways, fences, or other structures to prevent interference with traffic; and providing lighting in areas where work might be conducted at night.

Establishment of multiple ROWs within one corridor could increase visual impacts associated with clearing, but because roads and, in some cases, support structures could potentially be shared between facilities, the level of impacts would not necessarily increase in a linear fashion. The preexistence of a cleared ROW at a given location might also reduce visual impacts, because less clearing would be required.

Road Building/Upgrading. As noted above, construction of new temporary and permanent access roads and/or upgrading of existing roads to support project construction and maintenance activities will be required. Road development may introduce strong visual contrasts to the landscape, depending on the routes relative to surface contours and the widths, lengths, and surface treatments of the roads. Construction of access roads would have some associated residual impacts (e.g., vegetation disturbance) that could be evident for some years afterward, with a gradual diminishing of impacts over time.

Staging and Laydown Areas. Construction of new energy transport facilities in either a new or existing ROW would require staging areas for stockpiling and storage of equipment and materials needed during construction. For electricity transmission lines, staging areas are generally 1 to 3 acres in size and typically located every 8 to 10 miles along the line (see Appendix G). Staging areas for pipelines could be 15 to 30 acres in size and might also include a 10- to 30-acre construction yard that serves as an assembly point for construction crews and includes offices, storage trailers, and fuel tanks. Laydown areas are used for temporary stockpiling and storage of equipment and materials during construction and are normally located adjacent to but not within the ROW. Laydown areas may be located every 8 to 10 miles along the ROW and may be several acres in size. The nature and extent of visual impacts associated with these areas would depend in part on the size of the area and the nature of required clearing and grading, whether the area was an existing or newly constructed site, and on the types and amounts of materials stored at the staging areas. Some newly constructed staging areas could be converted into permanent facilities for facility maintenance, while laydown areas would be reclaimed immediately after completion of construction.

Construction of Mainline Facilities. Large, cleared, and generally level areas are required for electricity transmission line tower construction and assembly, as well as cable-pulling sites (which may be located on existing laydown areas); these areas would be reclaimed after construction. Smaller areas are generally required for pipeline trenching and related construction activities. Because both types of facilities are linear, construction activities generally proceed as a "rolling assembly line," with a work crew gradually moving through an area at varying rates depending on circumstances. Transmission line construction activities include clearing, leveling, and excavating at tower sites, as well as the assembly and erection of towers followed by cable pulling (see Figure 3.9-1). Pipeline mainline construction activities include clearing, leveling, trenching, and laying of pipe (see Figure 3.9-2). Both electric and pipeline mainline construction activities would have potentially substantial but temporary visual impacts.

FIGURE 3.9-1 Towers under Construction

FIGURE 3.9-2 Trenching in Preparation for Installation of Gas Pipeline

Construction of Support Facilities. Construction of a variety of support facilities would also be required when constructing an electricity transmission line or pipelines. Support structures for electricity transmission and distribution systems include substations, while pipelines require pumping stations, metering facilities, city gate stations, and pigging facilities. Construction activities associated with these facilities include clearing, grading, soil compacting, and surfacing, in addition to constructing buildings and fences. Substation construction typically requires 6 to 9 months and covers approximately 10 to 15 acres for the fenced station plus 3 acres for construction support. Natural gas compressor station facilities are generally sited on 15 to 22 acres of land, while pump stations for petroleum product pipelines occupy roughly 25 acres.

Blasting of Rock Faces and Other Cavities. A number of the construction activities associated with ROW clearing, road building, and facilities construction could sometimes involve blasting of rock faces, trenches, and cavities for transmission tower foundations. In all cases, there are potentially temporary visual impacts from dust, smoke, and debris associated with blasting. Subsurface blasting impacts would not be visible after remediation; however, rock face blasting typically would permanently alter the form of the affected area, although alterations to color may gradually diminish over a long period of time.

Workers, Vehicles, and Equipment. The various construction activities described above require work crews, vehicles, and equipment that would add to visual impacts during construction. Small-vehicle traffic for worker access and large-equipment traffic (trucks, graders, excavators, and cranes) would be expected for road construction, site preparation, and tower/pipeline installation. Both kinds of traffic would produce visible activity and dust in dry soils. Suspension and visibility of dust would be influenced by vehicle speeds, road surface materials, and weather conditions. Temporary parking for vehicles would be needed at or near work locations. Unplanned and unmonitored parking could likely expand these areas, producing visual contrast by suspended dust and loss of vegetation. Construction activities would proceed in phases, with several crews moving through a given area in succession, giving rise to brief periods of intense construction activity (and associated visual impacts), followed by periods of inactivity. There would be the temporary presence of large cranes to erect transmission towers as well as possible helicopter use for particularly remote or rugged terrain. Cranes and other construction equipment would produce emissions while in operation and may thus create visible exhaust plumes.

Other Visual Impacts from Construction. Ground disturbance would result in visual impacts that produce contrasts of color, form, texture, and line. Excavating for tower foundations and ancillary structures, trenching to bury pipelines, grading and surfacing roads, clearing and leveling staging areas, and stockpiling soil and spoils (if not removed) would (1) damage or remove vegetation, (2) expose bare soil, and (3) suspend dust. Soil stockpiles could be visible for the duration of construction. Soil scars, exposed slope faces, eroded areas, and areas of compacted soil could result from excavation, leveling, and equipment/vehicle movement. Invasive species may colonize disturbed and stockpiled soils and compacted areas. These species may be introduced naturally; in seeds, plants, or soils introduced for intermediate restoration; or by vehicles. In some situations, the presence of invasive species may introduce contrasts with naturally occurring vegetation, primarily in color and texture. The presence of workers and construction activities could also result in litter and debris that could create negative visual impacts within and around work sites. Site monitoring and restoration activities could reduce many of these impacts.

Visual Impacts during Site Operation. The operation and maintenance of pipelines or electricity transmission lines and their associated facilities, roads, and ROWs would have potentially substantial long-term visual effects. Some impacts are common to transmission lines and pipelines; however, the mainline structures are fundamentally different in terms of visual impacts, with electricity transmission lines generally having larger visual impacts than pipelines. In the following discussion, impacts that are similar between the two energy transport projects are discussed together, while impacts that are significantly different are discussed separately.

ROW. The width of cleared area for the permanent ROW for a given project would be determined at a project-specific level, but in general, it would be expected to be substantially wider for electricity transmission line projects than for pipeline projects (see Appendix G). Visual impacts associated with ROW clearing include the potential loss of vegetative screening that would result in the opening of views, especially down the length of the ROW; potentially significant changes in form, line, color, and texture for viewers close to the ROW; and potentially significant changes in line and color for viewers with distant views of the ROW. In general, the impacts would be greater in forested areas, where vegetation-clearing impacts are more conspicuous, particularly in areas where there are strong color contrasts between understory and overstory vegetation. The presence of snow cover might accentuate color contrasts. In nonforested areas, visual impacts from ROW clearing would typically be expected to be less, both because there would normally be less vegetation removal and also because there are generally fewer contrast issues associated with vegetation removal in nonforested areas.

While the opening of views for viewers close to a cleared ROW might be a positive visual impact in some circumstances, the introduction of strong linear and color contrasts in middle ground and background views as a result of clearing ROWs can create large negative visual impacts, particularly in forested areas where either the viewer or the ROW is elevated in such a way that long stretches of ROW are visible. Viewing angle can also be an important factor in determining the perceived visual impact in these settings. In worst-case situations, the impacts can be visible for many miles. Various design and mitigation measures can be used to avoid or reduce impacts in these situations (see Section 3.9.4.3).

Where areas of bare soils are exposed (generally associated with construction activities, e.g., pipeline trenching), reclamation efforts would include reseeding these areas. Good mitigation practice would dictate reseeding with native plants, which would minimize visual contrasts, but depending on circumstances, a number of years might pass before contrasts between reseeded and uncleared areas would no longer be noticeable. If non-native plants were used for reseeding or if a lack of proper management led to the growth of invasive species in the reseeded areas, noticeable color and texture contrasts might remain indefinitely. The unsuccessful reclamation of cleared areas may result in soil erosion, ruts, gullies, or blowouts and could cause long-term negative visual impacts.

Other cleared areas would include maintenance roads and facility access roads (e.g., electric substations or pump stations). Some support facilities would be surrounded by cleared areas. Visual impacts associated with these cleared areas would include the potential loss of vegetative screening that would result in the opening of views and potentially significant changes in form, line, color, and texture for viewers close to the cleared area. Clearing for roads might be subject to some of the linear contrast concerns mentioned above for ROWs, but impacts would normally be far less severe; mainline facility maintenance roads would generally be within the cleared ROW and, in most cases, would not add substantially to the impact, while access roads would generally be shorter. In both cases, the cleared area would be relatively narrow, especially compared to typical electricity transmission line ROW clearings.

Roads. In many cases, construction access roads would not be needed during operations and would be reclaimed after construction. In some cases, certain roads would remain, such as the permanent maintenance roads used for transmission line/pipeline inspection and maintenance and the permanent facility access roads. Maintenance roads (where needed) would generally be dirt or gravel roads, while some facility access roads might be paved. In addition to vegetative clearing, roads may introduce strong visual contrasts to the landscape, depending on the routes relative to surface contours and the widths, lengths, and surface treatments of the roads. Ground disturbances (e.g., grading, erosion control measures, and blasting) might introduce lasting visual impacts, while improper management could lead to the growth of invasive species or erosion, both of which could introduce undesirable contrasts in line, color, and texture, primarily for foreground and near-middleground views.

Mainline Facilities: Electricity Transmission Lines. Electricity transmission towers, where visible, would create potentially large visual impacts. The tower structures, conductors, insulators, aeronautical safety markings, and lights would all create visual impacts. A transmission line's visual presence would last from construction throughout the life of the project.

Tower structures for the 500-kV lines analyzed would typically be galvanized steel lattice towers, but they could be steel monopole towers in some cases. The structures could be as tall as 150 feet with crossarms as much as 100 feet wide, although crossarms typically would be far less wide. Towers could be considerably taller in special situations (e.g., valley crossings). Various types of steel lattice transmission towers and steel monopoles would be used depending on function, but the towers within each class are very similar in appearance. Lattice towers have an open framework of thin members (compared to monopoles) but overall are much wider than monopoles. Monopoles present a single but more massive upright member, but the overall width is much smaller than that of a lattice tower (see Figure 3.9-3). Special steel lattice turning towers may be employed to bear the extra weight and tension of conductors where a turn occurs in the line. Turning towers utilize stronger, thicker, steel members than are used for typical steel lattice towers, and appear more massive than typical towers when viewed from the same view point.

FIGURE 3.9-3 Towers: Lattice (left) and Monopole (right)

Under certain conditions, lattice towers tend to blend better into the background when viewed from a distance against mountains or vegetation. With their slender members and open structure, they allow the forms, lines, colors, and textures of the background landscape to show through. The simpler, narrower monopoles may create less contrast with the natural environment in foreground views when viewed against the sky (i.e., skylined) compared to the "industrial" structural look of lattice towers, which can be visually overbearing at short distances (DOE 2003b).

Both types of towers would create vertical lines in the landscape, an effect that is much more pronounced for monopoles than for lattice towers, and the conductors would create horizontal lines that would be visible depending on viewing distance and lighting conditions. Structures located so that viewers would see land or vegetation (such as a mountain) behind the structures (i.e., not skylined) would generally create smaller visual impacts. In the open landscapes present in much of the West and under favorable viewing conditions, the towers and conductors might be visible for many miles, especially if skylined. A variety of mitigation measures can be used to reduce impacts from these structures (see Section 3.9.4.3), but because of their size, it is difficult to avoid at least some level of visual impact in many circumstances, except at very long distances.

Tower structures, conductors, and insulators are subject to specular reflection, that is, the direct reflection of light off smooth reflective surfaces. These reflections could cause very bright spots (or brief flashes of light to moving observers) to appear under certain lighting conditions where the sun directly illuminates the reflective surface, which could extend the visibility of the surfaces for several miles (BPA 2002). Nonreflective coatings or processes to eliminate or diminish specular reflection are commercially available and are often used to mitigate these impacts.

Other visual impacts associated with electricity transmission lines include aeronautical safety markings and warning lights, airway marker balls, and bird deflectors. Aeronautical safety markings and warning lights are required by the FAA (FAA 2006) and are designed to enhance the visibility of the structures to aircraft. As such, they increase visual impacts associated with the towers and/or conductors on which they are placed.

Safety markings consist of red and white markings painted on the upper parts of towers, and the regular geometry and colors of the markings would contrast with the natural surroundings when visible (during daylight hours). The warning markings would be less visible in distant views. Warning lights would be visible on towers and in some cases on conductors both day and night, but they would be much more noticeable to ground-based observers at night. The red steady or flashing lights might be visible for a number of miles, depending on atmospheric and other viewing conditions. Aviation marker balls are round colored balls (usually aviation orange) that are attached to the conductors or overhead ground wires for daytime marking. They are available in various sizes, ranging from 9 inches in diameter and larger, with 24-inch balls in common use. Their spherical shape and the colors of the markings contrast with natural surroundings when visible (during daylight hours).

Substations. Each transmission line will start from an existing substation and end at a new substation. Intermediate substations may also be required if there is a voltage change along the route. Substations vary in size and configuration but may be several acres in size; they are cleared of vegetation and typically surfaced with gravel. They are normally fenced, may include security lighting, and are reached by a permanent access road. In general, substations include a variety of visually complex structures, conductors, fencing, lighting, and other features that result in an "industrial" appearance. The industrial look of a typical substation, together with the substantial height of its structures (up to 40 feet or more) and its large areal extent, may result in large, negatively perceived visual impacts for nearby viewers if the facility cannot be screened from view (see Figure 3.9-4).

Mainline Facilities: Liquid Petroleum and Gaseous Product Pipelines. In the United States, liquid petroleum and gaseous product pipelines are generally buried several feet below the surface, except at valves, compressor stations, pigging stations, city gate stations, metering facilities, some river crossings, and/or where very steep topography, bedrock, or other subsurface conditions preclude burial. Visual impacts are therefore typically less for buried portions of a pipeline than for above-ground portions and are limited primarily to those impacts associated with ROW clearing. In situations where pipelines cannot be buried, smaller-diameter pipelines might be laid directly on the ground, while larger-diameter pipelines would rest on regularly spaced support structures that are typically constructed of metal

FIGURE 3.9-4 Transmission Lines Leaving Substation

or concrete.[10] An above-ground pipeline generally would introduce a strong, generally horizontal line into natural landscapes and might introduce significant color contrast as well, depending on surface treatment.

Valves. Valves are short, above-ground sections of one or more pipelines, which control flow through a pipeline and may typically be found at spacings of every 5 to 20 miles along the pipeline route. Valves typically occupy an area of a few hundred square feet or less and generally do not require a pad or surfacing. They may be enclosed by a railing and are typically about waist high. The visible pipeline consists of two short vertical segments and a horizontal segment long enough to contain the valve. Their regular geometry introduces form and line contrasts into most natural landscapes and may introduce color contrasts as well, depending on surface treatment; however, their relatively small size typically results in large visual impacts only for nearby viewers (see Figure 3.9-5).

FIGURE 3.9-5 Natural Gas Control Valve

[10] Interstate pipelines eligible for inclusion in Section 368 energy corridors would be subject to U.S. Department of Transportation Office of Pipeline Safety installation requirements.

Compressor and Pump Stations. Natural gas pipelines may require compressor stations, and liquid petroleum product pipelines may require pump stations in order to keep the pipeline product at sufficient pressure to ensure flow. Natural gas compressor station facilities are generally sited on 15 to 22 acres of land and usually placed at 40- to 100-mile intervals along the pipeline. Pump stations for petroleum product pipelines are located approximately every 50 to 200 miles along a pipeline. Pump station acreage varies widely but can exceed 25 acres. Both types of facility typically contain above-ground pipeline, valves, control systems, structures (typically made of sheet metal), and lighting systems; they may be on pavement or gravel and are normally fenced facilities. Pump stations may also contain large liquid storage tanks. Structure heights may exceed 30 feet. Both types of facilities typically have a very industrial appearance, with visually complex and generally rectilinear geometry, and the facilities typically introduce strong visual contrasts in line, form, texture, and color with nonindustrial surroundings, particularly for nearby viewers (see Figures 3.9-6 and 3.9-7).

Pipeline Inspection Gauge (Pig) Launch/ Recovery Facilities. For liquid petroleum product pipelines, pig launch/recovery facilities (pigging facilities) would be colocated with

FIGURE 3.9-6 Typical Natural Gas Compressor Station

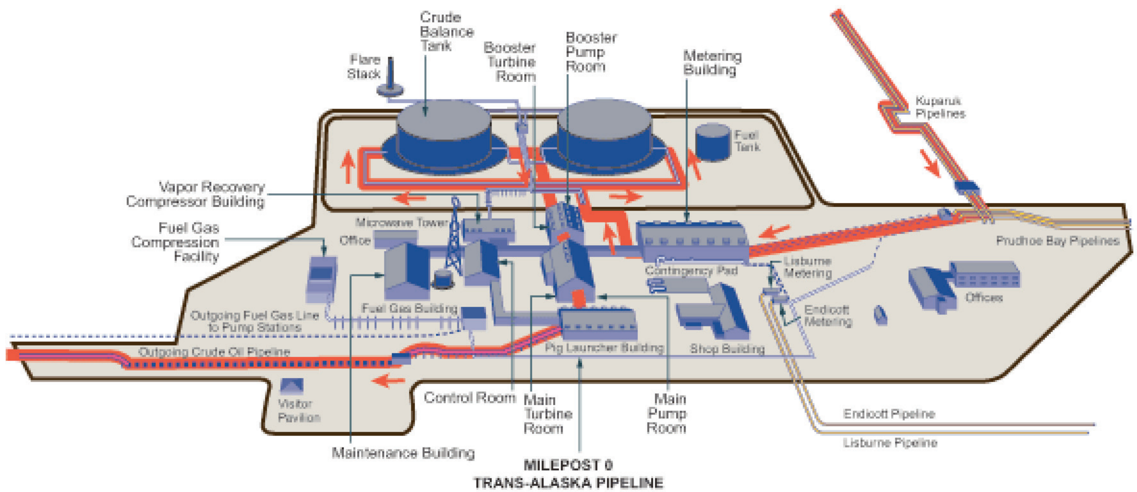

FIGURE 3.9-7 Schematic of Pumping Station

pump stations. For natural gas facilities, pigging facilities would be on the ROW but would not be colocated with compressor stations. Pigging facilities are usually smaller than pump or compressor stations and typically consist of one or more short sections of above-ground pipeline, valves, and other control equipment, and they may include buildings (typically made of sheet metal), generators, storage areas, and a helipad. Pigging facilities are normally fenced and surfaced with gravel. While they have a similar industrial look, pigging facilities would generally be expected to have smaller visual impacts than either pump or compressor stations because of their smaller size.

City Gate Stations and Metering Stations. City gate stations are small facilities that would be located at points where gas from a transport pipeline would be distributed to small-diameter gas mains for eventual end use. City gate stations would normally be gravel-surfaced, fenced facilities with short segments of above-ground pipes and valves and one or more control buildings (see Figure 3.9-8). Meter/regulator stations are small facilities that generally would be constructed adjacent to the cleared pipeline ROW at each of the receipt and interconnect points. Typically, a meter/regulator station

FIGURE 3.9-8 Typical Natural Gas City Gate

would include meter and regulator equipment, a filter separator, and a control building housed within a fenced perimeter.

River Crossings (Pipeline Bridges). In those instances where pipelines could not rest on stream or river bottoms and could not be buried underneath a stream or river, a pipeline bridge would be used. Pipeline bridges vary in size and construction depending on pipeline size, and they can range from relatively simple structures that cross small streams to large suspension bridges that cross major rivers. In some cases, pipelines can be "piggybacked" on existing bridges; in such cases, the visual impacts are generally minimal. However, the strong horizontal line of a pipeline bridge could be conspicuous in river crossings, particularly over larger rivers, and if a suspension bridge is used, the strong vertical and curved lines that are introduced may add substantially to the visual impact. It should be noted that some people might regard an aesthetically well-designed bridge as a positive visual addition to a landscape, or at least it could be regarded far less negatively than other visual impacts (see Figure 3.9-9).

Workers, Vehicles, and Equipment. Visual impacts from workers, vehicles, and equipment should generally be smaller at most locations during operation of an electricity transmission/distribution line or pipeline than impacts that occur during construction. Maintenance activities would consist primarily of regular ROW inspections, maintenance activities (e.g., vegetation management on the ROW), and occasional repairs. Some inspections and other activities might be conducted by helicopter or small aircraft. Ground-based activities require work crews (generally small crews except for major repairs), vehicles, and equipment that would create small, temporary visual impacts while under way. Some small-vehicle traffic for workers and large-equipment traffic for ROW management and repairs would be expected. Both would produce visible activity and dust in dry soils. Suspension and visibility of dust would be influenced by vehicle speeds, road surface materials, and weather conditions.

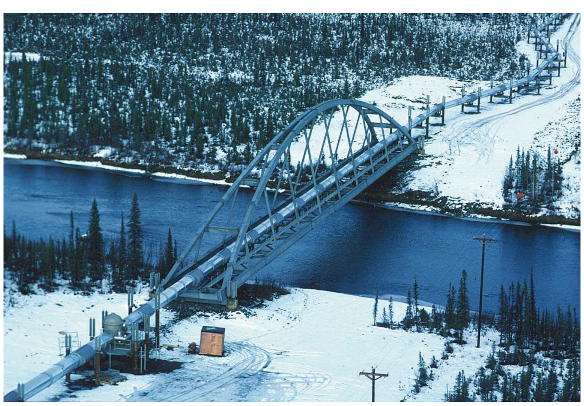

FIGURE 3.9-9 Trans-Alaska Pipeline Bridge over Gulkana River

Visual Impacts during Site Decommissioning. For both electricity transmission/distribution facilities and pipelines, decommissioning would involve removal of all above-ground facilities and gravel workpads and roads; subsurface facilities would be removed to a depth of 3 feet from the surface. Either the original construction laydown areas or new laydown areas, each several acres in size, would be established to support decommissioning; however, such laydown areas would be used only for interim storage, and salvaged equipment and materials would be promptly removed from laydown areas to staging areas that are not located on federal land. Other decommissioning activities would include road redevelopment, recontouring, grading, scarifying, seeding and planting, maintenance, management, and monitoring of the revegetation until self-sustainable (with compliance check-off), and perhaps stabilizing disturbed surfaces within the ROW.

Visual impacts during decommissioning would be similar in nature to those encountered in the construction phase but typically of shorter duration and smaller magnitude. Along with the decommissioning activities themselves, impacts would include the presence of workers, vehicles, and equipment with intermittent or phased activity persisting over extended periods of time, as well as the presence of idle or dismantled equipment for as long as it remained on-site. Decommissioning activities could generate dust, emissions, litter, and other effects associated with the presence of workers, vehicles, and equipment.

Newly disturbed soils would create a visual contrast that generally would persist for at least several seasons before revegetation would begin to disguise past activity. Invasive species may colonize newly and recently reclaimed areas. These species may be introduced naturally; in seeds, plants, or soils introduced for intermediate restoration; or by vehicles. Non-native plants that are not locally adapted could produce persisting contrasts of color, form, and texture. In forested areas and in areas with dry soils or other challenging environments, regrowth to preproject conditions could take a number of years and might not be realized without active management.

3.9.4.3 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Visual Resources?

The programmatic evaluations identified potential visual impacts that could be incurred during the construction, operation, and decommissioning of pipelines and electricity transmission lines within a designated energy corridor. The nature, extent, and magnitude of these potential impacts would vary on a site-specific basis and depend on the specific phase of the project (e.g., construction or operation). Similarly, visual impact mitigation measures would vary on a site-specific basis and depend on the specific phase of the project.

The BLM, DOI, and FS have established mitigation measures pertaining to visual impacts of energy production and roads on federal lands of the western United States. Several of their publications (BLM 1984, 1985, 1986a,b, 1992, 2006c; DOI and USDA 2006; FS 1975, 1977, 2001) were the sources for mitigation measures listed in this section. These publications describe additional mitigation measures and provide related information.

In addition, the Proposed Action include the mandatory implementation of IOPs (see Section 2.4), which are intended to help ensure that energy transport projects proposed for Section 368 corridors are planned, implemented, operated, and eventually removed in a manner that protects and enhances environmental resources.

Mitigation Measures Related to Project Siting within a Designated Corridor. The greatest potential for visual impacts associated with a designated corridor would occur as a result of decisions made during the siting and design of the projects within a corridor. In many cases, visual impacts associated with pipelines and electricity transmission lines could be avoided by careful project siting. Assessment of visual resources needs to be part of the project's early pre-planning phases and continued throughout the life of the project. A professional landscape architect should be a part of the planning team evaluating visual resource issues as project siting options are considered. The professional landscape architect, and the planning team as a whole, must abide by the VRM/SMS manuals and handbook procedures for conducting detailed visual resource analyses that identify and map landscape characteristics, key observation points (KOPs) and key viewsheds, prominent scenic and cultural landmarks, and other visually sensitive areas along the corridor to be developed. The land management agency and locally based public should be consulted to provide input on identifying important visual resources in the project area and on the siting and design process. GIS tools and visual impact simulations provide valuable tools for conducting visual analyses (including mapping), analyzing the visual characteristics of landscapes, visualizing the potential impacts of project siting and design, and fostering the type of communication among stakeholders that informs decision making. The visual analyses provide data that will be critical for identifying constraints and opportunities for siting projects to minimize visual impacts.

The following specific project-siting measures can help reduce visual impacts of corridor development:

- Because the landscape setting observed from national historic sites, national trails, and Tribal cultural resources may be a part of the historic context contributing to the historic significance of the site or trail, project siting should avoid locating facilities that would alter the visual setting such that they would reduce the historic significance or function, even if compliant with VRM/SMS objectives.

- Where possible within a corridor, projects should be sited outside the viewsheds of KOPs.

- When ROWs and associated facilities must be sited within view of KOPs, they should be sited as far away as possible, since visual impacts generally diminish as viewing distance increases.

- Siting within a corridor should take advantage of both topography and vegetation as screening devices to restrict views of projects from visually sensitive areas.

- The eye is naturally drawn to prominent landscape features (e.g., knobs and waterfalls); thus, projects and their elements should not be sited next to such features where possible within corridors.

- The eye naturally follows strong natural lines in the landscape, and these lines and associated landforms can "focus" views on particular landscape features. For this reason, linear facilities generally should not be sited within a corridor so that they bisect ridge tops or run down the center of valley bottoms.

- "Skylining" of transmission towers, communication towers, and other structures should be avoided within the corridor; that is, they should not be placed on ridgelines, summits, or other locations where they will be silhouetted against the sky from important viewing locations. Skylining draws visual attention to the project elements and can greatly increase visual contrast.

- Siting within a corridor should take advantage of opportunities to use topography as a backdrop for views of facilities and structures to avoid skylining.

- Siting of linear features (ROWs and roads) within a corridor should follow natural land contours rather than straight lines, particularly up slopes. Fall-line cuts should be avoided. Following natural contours echoes the lines found in the natural landscape and often reduces cut-and-fill requirements; straight lines can introduce conspicuous linear contrasts that appear unnatural.

- Siting of facilities within a corridor, especially linear facilities, should take advantage of natural topographic breaks (i.e., pronounced changes in slope), and siting of facilities on steep side slopes should be avoided. Facilities sited on steep slopes are often more visible (particularly if either the project or viewer is elevated); they may also be more susceptible to soil erosion, which could also contribute to negative visual impacts.

- Where possible, ROWs and roads within a corridor should follow the edges of clearings (where they would be less conspicuous) rather than passing through the center of clearings.

- Because visual impacts are usually lessened when vegetation and ground disturbances are minimized, siting within a corridor should take advantage of existing clearings to reduce vegetation clearing and ground disturbance.

- Locations for ROW crossings of roads, streams, and other linear features within a corridor should be chosen to avoid KOP viewsheds and other visually sensitive areas and to minimize disturbance to vegetation and landforms.

- The ROW should cross linear features (e.g., trails, roads, and rivers) within a corridor at right angles whenever possible to minimize the viewing area and duration.

- Pipeline crossings of national scenic trails, national historic trails, and national recreation trails should be accomplished using directional drilling whenever possible.

- To the extent possible, projects should be colocated within a corridor to utilize existing/shared ROWs, existing/shared access and maintenance roads, and other infrastructure in order to reduce visual impacts associated with new construction.

Mitigation Measures Related to Project Design. Most visual impact mitigation measures that apply to siting pipeline and electricity transmission projects as a whole would also apply to siting and designing individual facilities, structures, roads, and other components of the projects. A number of additional mitigation measures are directed at minimizing vegetation and ground disturbance to lessen associated visual impacts:

- Where possible both within and outside of designated corridors, structures, roads, and other elements should be sited outside the viewsheds of KOPs and not in visually sensitive areas; they should be sited in swales, around bends, and behind ridges and vegetative screens.

- Where exceptional circumstances exist, electric transmission lines may be buried for short distances to reduce visual impacts.

- Where screening topography and vegetation are absent, natural-looking earthwork berms and vegetative or architectural screening should be used to minimize visual impacts. Vegetative screening can be particularly effective along roadways.

- Low-profile structures should be chosen whenever possible to reduce their visibility.

- The siting and design within and outside of designated corridors of facilities, structures, roads, and other project elements should match and repeat the form, line, color, and texture of the existing landscape in accordance and compliance with the VRM/SMS class objectives.

- Openings in vegetation for facilities, structures, roads, etc., should mimic the size, shape, and characteristics of naturally occurring openings to the extent possible.

- Through site design, minimize the number of structures required. Activities should be combined and carried out in one structure, or structures should be colocated to share pads, fences, access roads, lighting, etc.

- Design and locate structures and roads to minimize and balance cuts and fills. Use retaining walls, binwalls, half bridges, and tunnels to reduce cut and fill. Reducing cut and fill has numerous visual benefits, including fewer fill piles, landform and vegetation that appears more natural, fewer or reduced color contrasts with disturbed soils, and reduced visual disturbance from erosion and the establishment of invasive species.

- Locate facilities, structures, and roads in stable, fertile soils to reduce visual contrasts from erosion and to better support rapid and complete regrowth of affected vegetation. Site hydrology should also be carefully considered in siting operations to avoid visual contrasts from erosion. Strip, stockpile, and stabilize topsoil from site before excavating earth for facility construction.

- The vegetation-clearing design for the ROW and other features in forested areas should incorporate partial ROW clearing where feasible, including topping rather than removing trees that exceed the allowable height and leaving "islands" of vegetation within the ROW. Trees that would not present a safety or engineering hazard or otherwise interfere with operations should be left on the ROW. These actions would result in reduced vegetative disturbance (and therefore less slash), narrower ROWs, better screening, and a more natural-looking appearance.

- The vegetation-clearing design in forested areas should include the feathering of ROW edges (i.e., the progressive and selective thinning of trees from the edge of the ROW inward) combined with the mixing of tree heights from the edge of the ROW to create an irregular vegetation outline. These actions would result in a more natural-appearing edge, thereby avoiding the very high linear contrasts associated with straight-edged, clear-cut ROWs.

- Structures, roads, and other project elements should be set as far back from road, trail, and river crossings as possible, and vegetation should be used to screen views from crossings, where feasible.

Mitigation Measures Related to Building and Structural Materials. Visual impacts associated with electricity transmission and pipeline projects could be partially mitigated by choosing appropriate building and structural materials and surface treatments (i.e., paints or coatings designed to reduce contrast and reflectivity). A careful study of the site should be performed to identify appropriate colors and textures for materials; both summer and winter appearance should be considered, as well as seasons of peak visitor use. The choice of colors should be based on the appearance at typical viewing distances and consider the entire landscape around the proposed development. Appropriate colors for smooth surfaces often need to be two to three shades darker than the background color to compensate for shadows that darken most textured natural surfaces.

Specific mitigation measures include the following:

- Materials and surface treatments should repeat and/or blend with the existing form, line, color, and texture of the landscape.

- If the project will be viewed against an earthen or other non-sky background, appropriately colored materials should be selected for structures, or appropriate stains/coatings should be applied to blend with the project's backdrop.

- Materials, coatings, or paints having little or no reflectivity should be used whenever possible.

- Grouped structures should all be painted the same color to reduce visual complexity and color contrast.

- Consider using multiple color camouflage technology applications for projects within sensitive viewsheds and with visibility distance between 1/4 or 2 miles. Refer to BLM guidance on "the use of color to mitigate visual impacts."

- Above-ground pipelines should be painted/coated to match their surroundings.

- Electricity transmission/distribution projects should utilize nonspecular conductors and nonreflective coatings on insulators.

- Monopoles may reduce visual impacts more effectively than lattice towers in foreground and midground views, while lattice towers may be more appropriate for more distant views, where the latticework would "disappear," allowing background textures to show through.

- Lighting for facilities should not exceed the minimum required for safety and security, and designs that minimize upward light scattering (light pollution) should be selected.

Mitigation Measures Related to Construction. Visual impacts associated with construction activities can be partially mitigated by implementing the following measures, where feasible:

- Where possible, staging areas and laydown areas should be sited outside the viewsheds of KOPs and not in visually sensitive areas; they should be sited in swales, around bends, and behind ridges and vegetative screens.

- A site reclamation plan should be in place prior to construction. Reclamation of the construction ROW should begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of impacted areas as quickly as possible.

- Visual impact mitigation objectives and activities should be discussed with equipment operators before construction activities begin.

- Penalty clauses should be used to protect trees and other sensitive visual resources.

- Existing rocks, vegetation, and drainage patterns should be preserved to the maximum extent possible.

- Valuable trees and other scenic elements can be protected by clearing only to the edge of the designed grade manipulation and not beyond through the use of retaining walls, and by protecting tree roots and stems from construction activities. Berms can also be used to protect trees from blasting. Brush-beating or mowing rather than vegetation removal should be done where feasible.

- Slash from vegetation removal should be mulched and spread to cover fresh soil disturbances (preferred) or should be buried. Slash piles should not be left in sensitive viewing areas.

- Installation of gravel and pavement should be avoided where possible to reduce color and texture contrasts with the existing landscape.

- Horizontal and vertical pipeline bending should be used in place of cut and fill activities where feasible.

- For road construction, excess fill should be used to fill uphill-side swales to reduce slope interruption that would appear unnatural and to reduce fill piles.

- The geometry of road ditch design should consider visual objectives; rounded slopes are preferred to V-shaped and U-shaped ditches.
- Road-cut slopes should be rounded, and the cut/fill pitch should be varied to reduce contrasts in form and line; the slope should be varied to preserve specimen trees and nonhazardous rock outcroppings.
- Planting pockets should be left on slopes where feasible.
- Benches should be provided in rock cuts to accent natural strata.
- Topsoil from cut/fill activities should be segregated and spread on freshly disturbed areas to reduce color contrast and aid rapid revegetation. Topsoil piles should not be left in sensitive viewing areas.
- Disposal of excess fill material downslope should be avoided in order to avoid creating color contrast with existing vegetation/soils.
- Excess cut/fill materials should be hauled in or out to minimize ground disturbance and impacts from fill piles.
- Soil disturbance should be minimized in areas with highly contrasting subsoil color.
- Sculpt and shape natural or previously excavated bedrock landforms when excavation of these landforms are required. Integrate percent backslope, benches, and vertical variations into final landform that repeats the natural shapes, forms, textures, and lines of the surrounding landscape. Integrate and transition the earthen landform into the excavated bedrock landform. Sculpted rock face angles, bench formations, and backslope need to adhere to the natural bedding planes of the natural bedrock geology. Half-case drill traces from pre-split blasting are not to remain evident in the final rock face. Remove the color contrast from the excavated rock faces by color treating with a rock stain.
- Construction on wet or frozen soils should be avoided to reduce erosion.
- Communication and other local utility cables should be buried where feasible.
- Culvert ends should be painted or coated to reduce color contrasts with existing landscape.
- Signage should be minimized; reverse sides of signs and mounts should be painted or coated to reduce color contrasts with the existing landscape.
- The burning of trash should be prohibited during construction; trash should be stored in containers and/or hauled off-site.
- Litter must be controlled and removed regularly during construction.
- Dust abatement measures should be implemented in arid environments to minimize the impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils.
- In visually sensitive areas, use air transport capability to mobilize equipment and materials for clearing, grading, and erecting transmission towers, preserving the natural landscape conditions between tower locations.

Mitigation Measures Related to Operations and Maintenance. Visual impacts associated with operation and maintenance activities could be partially mitigated by implementing the following measures, where feasible:

- Interim restoration should be undertaken during the operating life of the project as soon as possible after disturbances.

- Maintenance activities should include dust abatement (in arid environments), litter cleanup, and noxious weed control.

- Use of lighting at facilities should be minimized to reduce light pollution.

- Road maintenance activities should avoid blading existing forbs and grasses in ditches and adjacent to roads.

Mitigation Measures Related to Reclamation. As noted above, a reclamation plan that includes visual impact mitigation measures should be in place prior to construction, and reclamation activities should be undertaken as soon as possible after disturbances occur and be maintained throughout the life of the project. The following reclamation activities/practices can partially mitigate visual impacts associated with electricity transmission/distribution lines and pipelines, where feasible:

- All above-ground and near-ground structures should be removed.

- Contour soil borrow areas, cut and fill slopes, berms, waterbars, and other disturbed areas to approximate naturally occurring slopes, thereby avoiding form and line contrasts with the existing landscapes. Contouring to rough texture would trap seed and discourage off-road travel, thereby reducing associated visual impacts.

- Randomly scarify and roughen cut slopes to reduce texture contrasts with existing landscapes and aid in revegetation.

- Consider combination of seeding, planting of nursery stock, transplanting of local vegetation within the proposed disturbance areas, and staging of construction enabling direct transplanting. Revegetate with native vegetation, establishing a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape.

- Disturbed areas should be covered with stockpiled topsoil or mulch and revegetated by using a mix of native species selected for visual compatibility with existing vegetation.

- Gravel and other surface treatments should be removed or buried.

- Rocks, brush, and forest debris should be restored whenever possible to approximate preexisting visual conditions.

- Edges of revegetated areas should be feathered to reduce form and line contrasts with the existing landscapes.

3.10 CULTURAL RESOURCES

3.10.1 What Are Cultural Resources, What Laws Address Cultural Resources, and How Are the Agencies Meeting Their Responsibilities?

Cultural resources include archaeological, historic, architectural sites or structures, or places from the past having important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social or cultural groups, such as American Indian Tribes

Text Box 3.10-1
Why Is It Important to Take Cultural Resources into Account?

Cultural resources are important to maintaining our heritage and are physical connections to our past. In most cases, cultural resources are also nonrenewable. Once removed, they are irreplaceable.

(“traditional cultural properties”). Cultural resources can be either man-made or natural physical features associated with human activity and, in most cases, are unique, fragile, and nonrenewable. Cultural resources that meet the eligibility criteria (Text Box 3.10-2) for listing on the NRHP are termed “historic properties” under the NHPA.

3.10.1.1 What Laws and Regulations Address Cultural Resources?

Cultural resources are addressed by a suite of laws, regulations, and policies that apply to actions taken by federal agencies and to actions that involve federal lands. Major laws and policies are summarized in Table 3.10-1. NEPA and NHPA are the two primary laws governing the consideration of cultural resources in this PEIS.

NHPA is a comprehensive law that creates a framework for managing cultural resources in the United States. The law expands the NRHP; establishes SHPOs, Tribal historic preservation officers (THPOs), and the Advisory Council on Historic Preservation (ACHP); and provides a number of mandates for federal agencies. Section 106 of NHPA directs all federal agencies to take into account the effects of their undertakings (actions or authorizations) on cultural resources included in or eligible for the NRHP (“historic properties”). Section 106 also states that the agency afford the ACHP a reasonable opportunity to comment with regard to the undertaking. Section 106 is implemented by regulations of the ACHP (36 CFR 800).

Text Box 3.10-2
NRHP Criteria for Significance

“The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and...” meet one or more of the following four criteria for evaluation: A, B, C, or D.

Criterion A: Associative Value – Event. “Properties can be eligible for the *National Register* if they are associated with events that have made a significant contribution to the broad patterns of our history.”

Criterion B: Associative Value – Person. “Properties can be eligible for the *National Register* if they are associated with the lives of persons significant in our past.”

Criterion C: Design or Construction Value. “Properties can be eligible for the *National Register* if they 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 and distinguishable entity whose components may lack individual distinction.”

Criterion D: Information Value. “Properties can be eligible for the *National Register* if they have yielded, or may be likely to yield, information important in prehistory or history.”

Also applicable is a special criteria consideration:

Criteria Consideration G: Properties That Have Achieved Significance within the Last Fifty Years. “A property achieving significance within the last fifty years is eligible if it is of exceptional importance.” (36 CFR 60.4)

3.10.1.2 How Are the Agencies Meeting Their Section 106 Responsibilities for This PEIS?

The regulations governing Section 106 of the NHPA (36 CFR 800) outline a process for federal agencies to take into account the effects

TABLE 3.10-1 Cultural Resource Laws and Regulations

Law or Order Name	Intent of Law or Order
Antiquities Act of 1906	This was the first law to protect and preserve cultural resources on federal lands. It makes it illegal to remove cultural resources from federal land without a permit, establishes penalties for illegal excavation and looting, and allows the President to establish historical monuments and landmarks.
National Historic Preservation Act (1966) (NHPA)	This law created the legal framework for considering the effects of federal undertakings on cultural resources in the United States. The law expands the NRHP, establishes the Advisory Council on Historic Preservation, State Historic Preservation Offices, and Tribal Historic Preservation Offices. Section 106 and its accompanying regulations direct all agencies to take into account the effects of their actions on properties included in or eligible for the NRHP, and establishes the process for doing so.
E.O. 11593, “Protection and Enhancement of the Cultural Environment” (1971)	E.O. 11593 directs federal agencies to inventory their cultural resources and to record to professional standards any cultural resource that may be altered or destroyed.
Archaeological and Historic Preservation Act (1974) (AHPA)	The AHPA addresses impacts to cultural resources resulting from federal activities and provides a funding mechanism to recover, preserve, and protect archaeological and historical data.
Archaeological Resources Protection Act of 1979 (ARPA)	ARPA establishes civil and criminal penalties for the unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources, prohibits trafficking in resources from public lands, and directs federal agencies to establish educational programs on the importance of archaeology.
American Indian Religious Freedom Act of 1978 (AIRFA)	AIRFA protects First Amendment guarantees to religious freedom for American Indians. It requires federal agencies to consult when a proposed land use might conflict with traditional Indian religious beliefs or practices, and to avoid interference to the extent possible.
Native American Graves Protection and Repatriation Act of 1990 (NAGPRA)	NAGPRA establishes the rights of Indian Tribes to claim ownership of certain “cultural items,” including human remains, funerary objects, sacred objects, and objects of cultural patrimony. It requires federal agencies and museums to identify holdings of such remains and work towards their repatriation. Excavation or removal of such cultural items requires consultation, as does discovery of these items during land use activities.
E.O. 13007, “Indian Sacred Sites” (1996)	E.O. 13007 defines sacred sites and directs agencies to accommodate Indian religious practitioners’ access to and use of sacred sites, avoid adverse effects, and maintain confidentiality. It does not create new rights, but strongly affirms those that exist.
E.O. 13287, “Preserve America” (2003)	E.O. 13287 encourages the federal government to take a leadership role in the protection, enhancement, and contemporary use of historic properties and establishes new accountability for agencies with regard to inventories and stewardship.
National Environmental Policy Act (NEPA) (1969)	This law requires federal agencies to analyze the impacts of an action on the human environment, to ensure that federal decision makers and the public are aware of the environmental consequences of a project before implementation.
Federal Land Policy and Management Act of 1976 (FLPMA)	This act requires the BLM to manage its lands on the basis of multiple use in a manner that will “protect the quality of…historical…and archeological values.” It is a comprehensive law that provides for long-range land use planning, permits to regulate use of the public lands, and enforcement of public land laws and regulations.

of their undertakings on historic properties. The BLM and DOE have elected to integrate compliance with Section 106 of the NHPA with the NEPA process as allowed per 36 CFR 800.8(c)(1) through 800.8(c)(4). The following discussion focuses on the individual steps of the Section 106 process as applied in this PEIS, beginning with a discussion of how the PEIS and the actions being considered in the document qualify for consideration under NHPA.

Undertaking: To initiate the Section 106 process, it is necessary to define the undertaking to be reviewed. In this case, the undertaking is the designation of energy transport corridors in the 11 western states through the amendment of federal land use plans. This action does not authorize any development; future energy transport projects will be separate undertakings subject to the provisions of Section 106. Nor does this action unduly constrain future management options. Applications for ROWs within corridors will not be automatically granted, but are subject to reviews required for all federal projects, including NEPA and NHPA. In the event that an adverse effect to an historic property is likely to occur as a result of project development within a Section 368 corridor, and that effect cannot be avoided, minimized, or mitigated, the agency official retains the authority to require the project to be sited outside the corridor.

The Section 106 process requires the Agencies to identify properties, evaluate potential impacts to significant resources, and define measures to avoid, mitigate, or minimize impacts from the designation of energy transport corridors in the 11 western states. As stated above, corridor designation may increase the likelihood of future development in these identified locations, thus reducing impacts across the landscape, but also concentrating development within the corridors. Although there are no effects to cultural resources from designation, cultural resources within the Section 368 energy corridors have a higher likelihood of being affected when there is an actual project. The potential for effects resulting from future site-specific authorizations consistent with designation of the Section 368 corridors indicates that a Section 106 review be conducted for this undertaking. Due to the scope and scale of this undertaking and the fact that specific impacts cannot be assessed until a project is proposed, this Section 106 assessment is necessarily programmatic.

Use of the NEPA process for Section 106 purposes: The regulations for Section 106 permit the Agencies to integrate Section 106 compliance with the NEPA process (36 CFR 800.8). Due to the scope and scale of this undertaking, the Agencies have chosen to implement this provision in order to reduce redundancies when complying with both laws; provide the broadest possible opportunities and greatest convenience for the public to review and consult on the Agencies' proposed actions; and ensure that concerns pertaining to historic properties are fully integrated into the PEIS and the RODs.

The Section 106 regulations clearly state that integrating the Section 106 compliance process with NEPA does not waive Agency obligations under either law. While the regulations do permit the Agencies to take advantage of the NEPA process, the Agencies must still adhere to the fundamental direction for compliance with Section 106. The following summarizes the Agencies' actions to comply with these provisions (36 CFR 800.8(c)(1) through 800.8(c)(4)).

Notification: A federal agency must disclose its intent to integrate the NHPA Section 106 process with the NEPA process to the appropriate SHPOs and the ACHP prior to the review. The Agencies notified the National Conference of State Historic Preservation Officers, the 11 western SHPOs, and the ACHP of their intention to implement the Section 106 regulations early in the NEPA process.

Identify consulting parties through NEPA scoping process: The public involvement process for NEPA has been extensive and sustained. It has included outreach and invitations to consult to other federal agencies, state and local governments, nongovernmental organizations, and the public. In addition, the Agencies have separately notified and consulted with the ACHP, the NCSHPO, the SHPOs, federally recognized Tribes, and other interested parties, beginning early in the NEPA process. Although the project does not designate corridors on Tribal lands, THPOs were specifically included in the outreach for the PEIS (see Appendixes B, C, and D).

Identify historic properties and assess the effects: The types of historic properties likely to occur within specific corridors were identified through a review of the literature and consultation with SHPOs, agency resource specialists, federally recognized Tribes, and through the public involvement process. This data is presented in Table 3.10-2. The potential effects of corridor development are discussed in the PEIS, especially in Chapters 3 and 4.

Consult regarding the effects of the undertaking with Tribes that may attach religious and cultural significance to affected historic properties: Tribal consultation for Section 106 has been integrated with the government-to-government consultation that has been ongoing throughout the development of the PEIS. Tribal consultation is addressed in Sections 1.9.3 and 3.11 and Appendix U, and is also briefly summarized in Appendix T on Section 106 consultation.

Involve the public and identify, in cooperation with consulting parties, alternatives and proposed measures that might avoid, minimize, or mitigate any adverse effects: The corridor siting process, defined in Chapter 2, identifies a multiple step effort to locate corridors with reference to significant values on the land. This has been an iterative process during which various locations for specific corridors were considered; historic preservation partners have participated in this effort throughout. Tribal consultation has also been ongoing throughout the corridor siting process. Where Tribes have identified areas of specific concern, these areas have been avoided. Consultation with SHPOs and state, regional, and local agency resource specialists from the DOI and the FS has contributed significantly to the identification of critical resource concerns during the corridor siting process. (See Appendix K for information on which corridors were moved to accommodate cultural resources.)

IOPs are identified in Chapter 2. These are mandatory programmatic directions that will guide future development within corridors to minimize or mitigate the impacts that may come from future development, including direct, indirect, and cumulative effects. Although corridor use is not mandatory, it is likely that designation will attract future development. Chapter 3 defines the types of impacts that may be expected from future development. The IOPs are intended to help coordinate historic preservation reviews among the various federal land managing agencies for multiple projects. The IOPs present a program of action to minimize or mitigate the effects of locating projects within these corridors. These measures have been developed in consultation with the SHPOs, ACHP, federally recognized Tribes, and the public through ongoing consultation and through the review and comment process for the draft PEIS.

Review of environmental documents: The Agencies have submitted the draft and invitations to consult on the draft PEIS to the SHPOs, THPOs, Tribes, ACHP, and other parties identified as potentially interested in historic preservation. In addition, the draft was released to the public for review and comment. Subsequent to public review of the draft PEIS, numerous corridor adjustments and other revisions were made, in consultation with local constituents, Tribes, SHPOs, federal, state, and local agencies, and other parties to resolve issues with corridor location, IOPs, or other concerns regarding historic preservation.

TABLE 3.10-2 Time Periods and Examples of Characteristic Cultural Resources for Culture Areas in the 11 Western States

Culture Area	Paleoindian	Middle Period or Archaic	Late or Sedentary Period
Northwest Coast	*10,500+ to 4000 BC* Cave or rockshelter occupation sites	*4000 BC to AD 200* Open campsites	*AD 200 to 1750* Semisubterranean house villages Open campsites Tent camps
California	*9000(?) to 6000 BC* Open campsites Animal kill or processing sites	*6000 to 3000 BC* Open campsites Coastal villages Plant and seafood processing sites	*3000 to AD 1750* Large coastal villages Burial mounds Extensive seafood and sea mammal processing sites Intensive plant processing sites Prehistoric trails
Great Basin	*9500+ to 6000 BC* Open campsites Cave occupation sites Lithic processing sites Animal kill or processing sites	*6000 to 2000 BC* Cave or rockshelter occupation sites Pithouse villages Plant processing sites Fishing sites Lithic processing sites Animal kill or processing sites	*2000 to AD 1750* Cave or rockshelter occupation sites Tipi ring sites Cave burials Cairns and cairn lines Small pithouse villages Plant processing sites Storage pits Lithic processing sites Pictograph and petroglyph sites Animal kill or processing sites Prehistoric roads
Southwest	*12,000 to 6000 BC* Open campsites Animal kill or processing sites Cave occupation sites Lithic processing sites	*6000 to 1 BC* Open campsites Cave or rockshelter occupation sites Pithouses and storage pits Wattle-and-daub structures Lithic processing sites Pictograph and petroglyph sites	*AD 1 to 1750* Pithouse villages Storage pits Above-ground structures (pueblos) Below-ground structures (kivas) Irrigation ditches Roads Navajo hogans and pueblitos Pictograph and petroglyph sites Intaglios Prehistoric roads or trails
Plains	*10,000 to 6000 BC* Open campsites Cave or rockshelter occupation sites Animal kill or processing sites Lithic processing sites	*6000 to 1 BC* Open campsites Cave or rockshelter occupation sites Pithouses and storage pits Tipi ring sites Cairns and cairn lines	*AD 1 to 1750* Open campsites Tipi ring sites Wattle-and-daub structures Earthlodge villages Burial mounds Storage pits

TABLE 3.10-2 (Cont.)

Culture Area	Paleoindian	Middle Period or Archaic	Late or Sedentary Period
Plains (Cont.)		Animal kill or processing sites Lithic processing sites Plant processing sites	Cave or rockshelter occupation sites Small pithouse villages Cairns and cairn lines Animal kill and processing sites Lithic processing sites Plant processing sites Pictograph and petroglyph sites Prehistoric trails
Plateau	*10,000 to 6000 BC* Open campsites Cave or rockshelter occupation sites Fishing sites Lithic processing sites Animal kill or processing sites	*6000 to 2000 BC* Open campsites Small pithouse villages Cave occupation sites Animal or fish processing sites Plant processing sites Animal kill or processing sites	*2000 to AD 1750* Pithouse and longhouse villages, often with burials Tipi ring sites Cave burials Cairns and cairn lines Open campsites Cave occupation sites Storage pits Animal or fish processing sites Lithic processing sites Plant processing sites Pictograph and petroglyph sites Animal kill or processing sites Prehistoric trails

Source: Modified from BLM (2007c).

Approval of the undertaking: The amendment of land use plans to designate Section 368 corridors is not expected to have direct impacts on historic properties. Future development projects within the designated corridors have the potential to adversely affect historic properties that may be located within the corridors. Specific projects will be subject to the Section 106 process, calling for development of actions to avoid, minimize, or mitigate adverse effects to historic properties. In addition, this PEIS identifies IOPs that provide programmatic guidance for future development that will assist in satisfying the requirements of the NHPA and various other laws. The IOPs do, in effect, provide a robust suite of practices for the consideration of historic properties throughout the anticipated life of the corridors. The Agencies' responsibilities under Section 106 will be satisfied through a binding commitment to these IOPs with the signing of the ROD.

3.10.2 What Are the Cultural Resources Associated with Energy Corridors in the 11 Western States?

3.10.2.1 Regional Prehistoric Cultural Contexts

Cultural resources are the physical evidence of past human activity. Through archaeology and ethnographic research, scientists have developed an historic framework for understanding how North America was settled and how Native peoples lived on this continent prior to the arrival of Europeans. The history of Native Americans in the 11 western states is commonly approached by dividing the American West into six cultural areas: Great Basin, Southwest, Plains, Plateau, California, and the Northwest Coast (see Figure 3.10-1). These cultural areas generally correspond to the major physiographic regions of the American West. The Native groups in a given cultural area had to adapt to the regional climate and environment in order to survive. As a result, there are certain shared ways of life that characterize each region. Table 3.10-2 provides a summary of the major prehistoric periods and the types of cultural resources associated with each culture area. The cultural resource types presented in Table 3.10-2 represent the most common remains associated with each time period, not the total range of cultural resources associated with each time period. More detailed historical chronologies and discussions of known cultural resource types are found in Appendix U.

3.10.2.2 What Is the Historical Setting of the Western United States?

Historic period cultural resources occur across all 11 western states. As with the prehistoric periods, Euro-American settlement and use of the West can also be understood through adaptation to the six cultural regions that loosely correspond to the major physiographic regions of the West. While there is considerable overlap in the general types of cultural resources that are found in the West, there is considerable regional variability. Table 3.10-3 lists the cultural areas and historic era cultural resource types by state. Again, this list of cultural resource types is not comprehensive, but is intended to provide the most common property types. Additional information on the historic context for the 11 western states and the types of resources expected for each area is presented in Appendix U.

3.10.3 How Were the Potential Effects of Corridor Designation to Cultural Resources Evaluated?

The analysis used in the PEIS regarding cultural resources attempts to characterize the types of cultural resources that could be found in the energy corridors being designated. This section contains summary tables of the historic and prehistoric time periods and their associated cultural resource types. This information is intended to provide an understanding of the cultural resources that could potentially be encountered in the proposed energy corridors. The summary tables are based on Appendix J, which contains a more thorough discussion of the various time periods.

While the scope of the PEIS does not allow examination of any particular locations or individual cultural resources, it was possible to collect cultural resources data on the Proposed Action and analyze it using a GIS. Information on known cultural resources within a 2-mile-wide corridor was requested from cultural resources managers within each of the affected states. The data received varied in completeness and detail. A discussion of the information collected for the project is provided in Appendix T.

Generally, some information on known cultural resources within a corridor was provided, as well as the number of cultural resources eligible for the NRHP. Traditional cultural properties were not identified specifically. (See Section 3.11 for a discussion of Native American resources, including traditional cultural properties, and Appendix C, which includes a discussion of Tribal consultation undertaken for the PEIS.) In a few instances, no information about cultural resources within a specific corridor was available. By combining the historic and prehistoric contexts with the information collected from cultural resources managers, it is possible to get an understanding of the current level of knowledge of cultural resources for

FIGURE 3.10-1 Major Cultural Areas and National Historic Trails in the 11 Western States

TABLE 3.10-3 Major Culture Areas and Historic Period Site Types (AD 1550 to present) Listed by State

State	Proposed Corridor Area (acres)	Culture Areas	Range of Historic Resources
Arizona	288,703	Southwest, Great Basin	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, CCC camps, and railroads.
California	309,499	California, Great Basin	Missions, towns, forts, mining-related sites, logging-related sites, agricultural sites, railroads, CCC camps, and historic trails.
Colorado	268,223	Great Basin, Plains, Southwest	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, CCC camps, and railroads.
Idaho	186,346	Great Basin, Plateau	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, and railroads.
Montana	52,748	Plains, Plateau, Great Basin	Fur trade sites, trading posts, military outposts, historic trails, farming sites, ranching sites, mining sites, and railroads.
Nevada	1,034,446	Great Basin	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, and railroads.
New Mexico	126,697	Southwest, Plains	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, and railroads.
Oregon	240,245	Great Basin, Plateau, Northwest Coast	Fur trade sites, trading posts, military outposts, historic trails, farming sites, ranching sites, homesteads, Civilian Conservation Corps sites, logging sites, mining sites, and railroads.
Utah	335,148	Great Basin	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, and railroads.
Washington	7,871	Northwest Coast, Plateau	Fur trade sites, trading posts, logging sites, sawmills, agricultural sites, fishing-related sites, and historic trails.
Wyoming	196,902	Great Basin, Plains	Historic trails, fur trade sites, agricultural sites, ranching sites, mining-related sites, logging sites, military outposts, and railroads.

most states. Only project-specific investigations would identify the actual cultural resources within a proposed corridor.

3.10.4 What Are the Potential Effects to Cultural Resources of the Alternatives, and How Do They Compare?

3.10.4.1 No Action Alternative

Under No Action, no Section 368 energy corridors would be designated. Proposed energy development projects would follow existing siting and development requirements and procedures. Siting would be driven by the needs of the developer, with cultural resources in proposed ROWs being considered by federal agencies during the NEPA or other permitting process. Preexisting designated energy corridors would be available for use in siting.

Under No Action, energy transport ROWs are not as likely to be colocated, but would rather be implemented within individual project-specific ROWs, each with its own access roads and support facilities (such as electrical substations or pump stations). Cultural resources within each project ROW could be impacted as a result of development. Some cultural resources could be placed under direct threat just as a result of access. The authorization and development of multiple ROWs could result in increased access to previously inaccessible cultural resources, which could, in turn, lead to illegal looting, erosion, disturbance, and other alteration of those resources.

3.10.4.2 The Proposed Action

The designation of energy corridors through land use plan amendments is not expected to affect cultural resources in the 11 western states.

In the second step of the siting process (Section 2.2.1.2), information pertaining to cultural resources located in the preliminary corridors was collected from the affected states. Table 3.10-4 presents the information collected in this effort. (See Appendix T for a more detailed discussion of the data request.) Based on this information, some corridor locations were altered to avoid key cultural resource areas. Unfortunately, much of the information collected was not of sufficient detail or breadth for use in siting the corridors; however, the information does illustrate the current level of knowledge of cultural resources in the vicinity of the corridors (see Section 1.9.3 for a discussion on how this information was considered), and is presented here to demonstrate the potential occurrence of cultural resources within any West-wide network of energy corridors. Table 3.10-4 indicates the reported number of cultural resources found within 1 mile of the preliminary corridor centerlines for each state and the reported percentage of this land for each state that has been previously surveyed for cultural resources. In most cases, data was available for only a portion of a state or corridor.

Table 3.10-4 shows that an average of only 7% of the land within 1-mile of the corridor centerlines has been surveyed for cultural resources. It is almost certain that additional cultural resources exist in the unexamined sections of the proposed corridors. In addition, the historical significance of most cultural resources that have been identified in these areas is unknown. The surveys indicate only if a cultural resource is present.

Respondents to the data request also indicated that several historic districts and areas having a high potential sensitivity for cultural resources would likely be crossed by the corridors proposed at the July 2006 data call. Sensitivity refers to the likelihood of the presence of cultural resources based on environmental factors such as water or landforms used by prehistoric people rather than specific knowledge of resources being present. A primary conclusion drawn from the data request was that most of the cultural resources

TABLE 3.10-4 Cultural Resource Site and Survey Information Reported for the Proposed Section 368 Energy Corridors[a]

State	Data Source	Corridor Acres	Surveyed Acres	Corridor Surveyed	Cultural Resources	NRHP Eligible
Arizona	SHPO/FS	1,087,674	61,785	6%	2,641	1,332[b]
California	SHPO/BLM/FS	1,270,259	53,305	4%	2,182	2[c]
Colorado	SHPO/FS	686,052	275,885	40%	2,101	5[c]
Idaho	SHPO/FS	653,389	NDR		975	4[c]
Montana	FS (Custer NF)	402,301	946	<1%	14	2[c]
Nevada	SHPO/BLM/FS	2,257,029	15,115	<1%	2,495	20
New Mexico	BLM	669,590	39,130	6%	1,147	6[c]
Oregon	SHPO	1,116,005	NDR		719	4[c]
Utah	SHPO	965,530	228,083	23%	1,230	449
Washington	NDR	135,649	NDR	NDR	NDR	4[c]
Wyoming	SHPO	807,119	NDR	NDR	5,341	1,041

[a] Data collected based on July 2006 preliminary corridor locations. See Appendix T for more information on the data collected for this table.

[b] Includes both cultural resources that are eligible for the NRHP and those that are unevaluated.`

[c] Resources listed on the *National Register of Historic Places*.

within the proposed corridors have yet to be identified. It is also clear that mitigation measures for cultural resources will be a necessary consideration of any future development. (See Appendix V for a list of the NRHP-listed properties within one mile of the corridor centerlines.)

Traditional cultural properties of interest to Native Americans may occur within the corridors, and will need to be identified during consultation with affected Tribes at the project development stage. Though some Tribes did identify such resources for avoidance during corridor siting, others preferred to wait until actual projects are proposed. (See Appendix C for a discussion of the Native American consultations undertaken for the PEIS.)

All six of the cultural areas identified in Section 3.10.3 — Great Basin, Southwest, California, Plains, Plateau, and Northwest Coast — contain proposed corridors (see Figure 3.10-2 and Table 3.10-5). There is the potential for any of the cultural resource types identified in Tables 3.10-2 and 3.10-3 and Appendix U to be present. The Great Basin region has the highest concentration of proposed

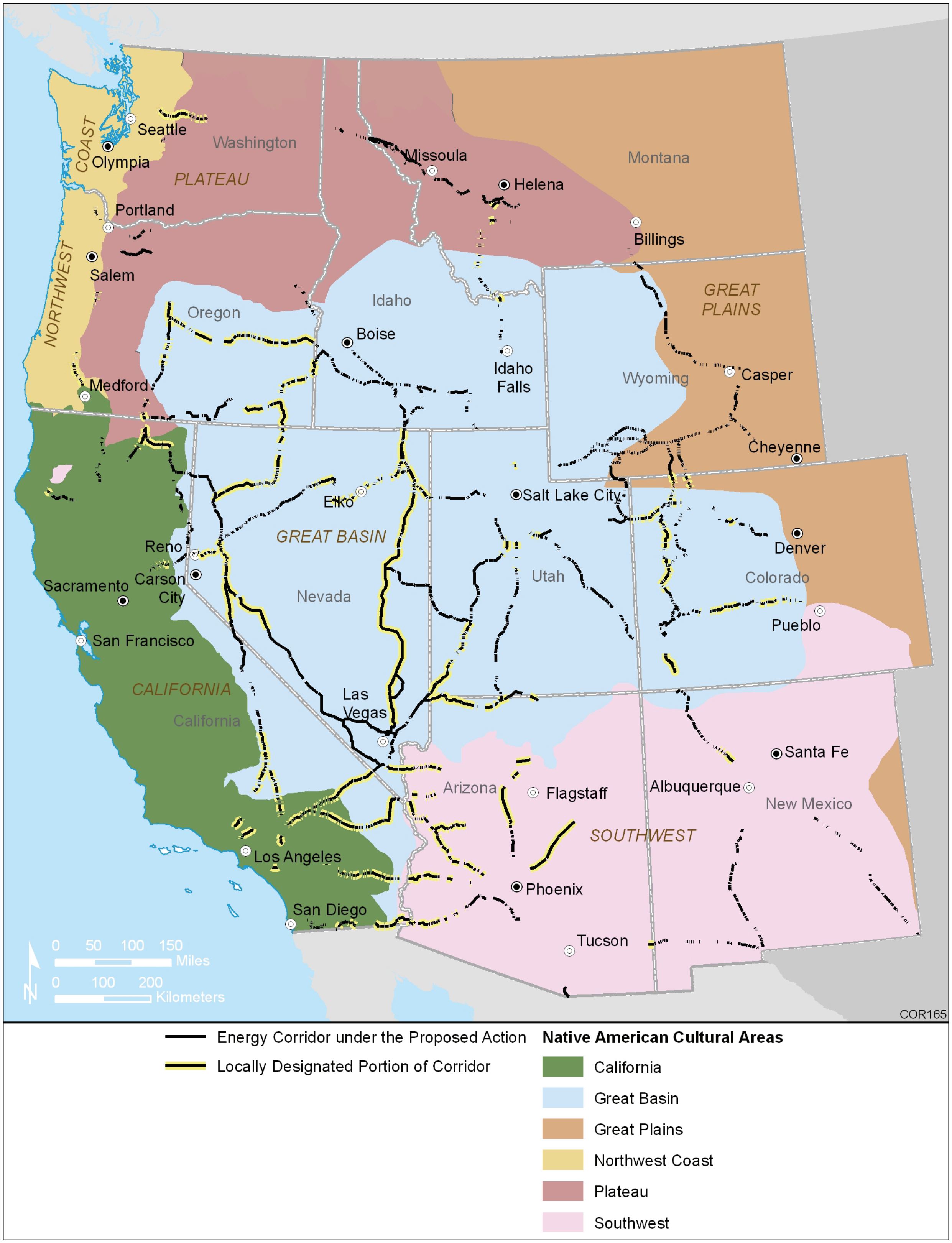

FIGURE 3.10-2 Map Showing Relationships between the Proposed Action and the Cultural Areas in the 11 Western States

TABLE 3.10-5 Corridor Segments and Culture Areas by State

State	Corridor Segment	Culture Area
Arizona		
	27-41	Southwest
	30-52	Southwest
	41-46	Southwest
	41-47	Southwest
	46-269	Southwest
	46-270	Southwest
	47-68	Southwest
	47-231	Southwest
	61-207	Southwest
	62-211	Southwest
	68-116	Great Basin
	81-213	Southwest
	113-116	Great Basin
	115-208	Southwest
	115-238	Southwest
	116-206	Great Basin
	234-235	Southwest
California		
	3-8	California; Plateau
	6-15	California; Great Basin
	7-8	Plateau
	8-104	California; Plateau
	15-104	California
	16-104	California
	18-23	Great Basin
	23-25	Great Basin
	23-106	California; Great Basin
	27-41	California; Great Basin; Southwest
	27-225	California; Great Basin
	27-266	California
	30-52	California; Southwest
	41-47	Southwest
	101-263	California
	107-268	California
	108-267	California
	115-238	California; Southwest
	236-237	California
	261-262	California
	264-265	California
Colorado		
	73-133	Great Basin
	87-277	Great Basin; Plains
	126-133	Great Basin
	130-131 (N)	Great Basin
	130-131 (S)	Great Basin
	130-274	Great Basin

TABLE 3.10-5 (Cont.)

State	Corridor Segment	Culture Area
	131-134	Great Basin
	132-133	Great Basin; Plains
	132-136	Great Basin
	132-276	Great Basin
	133-142	Great Basin
	134-136	Great Basin
	134-139	Great Basin
	136-139	Great Basin
	136-277	Great Basin
	138-143	Great Basin; Plains
	139-277	Great Basin
	144-275	Great Basin; Plains
Idaho		
	11-228	Great Basin
	24-228	Great Basin
	29-36	Great Basin
	36-112	Great Basin
	36-226	Great Basin
	36-228	Great Basin
	49-112	Great Basin
	49-202	Great Basin
	50-203	Great Basin
	50-260	Great Basin
	111-226	Great Basin
	112-226	Great Basin
	229-254	Plateau
	252-253	Great Basin
Montana		
	50-51	Great Basin
	50-203	Great Basin
	51-204	Plateau
	51-205	Plateau
	79-216	Plains
	229-254	Plateau
Nevada		
	6-15	Great Basin
	15-17	Great Basin
	15-104	Great Basin
	16-17	Great Basin
	16-24	Great Basin
	16-104	Great Basin
	17-18	Great Basin
	17-35	Great Basin
	18-23	Great Basin
	18-224	Great Basin
	27-41	Great Basin
	27-225	Great Basin
	35-43	Great Basin

TABLE 3.10-5 (Cont.)

State	Corridor Segment	Culture Area
	35-111	Great Basin
	37-39	Great Basin
	37-223 (N)	Great Basin
	37-223 (S)	Great Basin
	37-232	Great Basin
	39-113	Great Basin
	39-231	Great Basin
	43-44	Great Basin
	43-111	Great Basin
	44-110	Great Basin
	44-239	Great Basin
	47-231	Great Basin
	110-114	Great Basin
	110-233	Great Basin
	111-226	Great Basin
	113-114	Great Basin
	113-116	Great Basin
	223-224	Great Basin
	224-225	Great Basin
	225-231	Great Basin
	232-233 (E)	Great Basin
	232-233 (W)	Great Basin
New Mexico		
	80-273	Southwest
	81-213	Southwest
	81-272	Southwest
	89-271	Southwest
Oregon		
	4-247	Plateau
	5-201	Northwest Coast
	7-8	Plateau
	7-11	Plateau; Great Basin
	7-24	Great Basin
	10-246	Plateau
	11-103	Plateau
	11-228	Great Basin
	16-24	Great Basin
	24-228	Great Basin
	230-248	Plateau
	250-251	Plateau; Great Basin
Utah		
	44-239	Great Basin
	66-209	Great Basin
	66-212	Great Basin
	66-259	Great Basin
	68-116	Great Basin
	110-114	Great Basin
	113-114	Great Basin

TABLE 3.10-5 (Cont.)

State	Corridor Segment	Culture Area
	113-116	Great Basin
	114-241	Great Basin
	116-206	Great Basin
	126-133	Great Basin
	126-218	Great Basin
	126-258	Great Basin
	256-257	Great Basin
Washington		
	102-105	Northwest Coast; Plateau
	244-245	Plateau
Wyoming		
	55-240	Great Basin
	73-129	Plains
	73-133	Plains
	73-138	Plains
	78-138	Plains
	78-85	Plains
	78-255	Plains
	79-216	Plains; Great Basin
	121-220	Great Basin
	121-221	Great Basin
	121-240	Great Basin
	126-218	Great Basin
	129-218	Great Basin; Plains
	129-221	Plains
	138-143	Plains
	218-240	Great Basin
	219-220	Great Basin
	220-221	Plains

corridors, thus making cultural resources in this region more likely to be present. Examples of the prehistoric era cultural resources in the Great Basin include open campsites, pithouse villages, plant processing sites, and lithic processing sites.

Some of the types of historic era cultural resources associated with the Great Basin include historic trails, fur trade sites, ranching sites, agricultural sites, mining-related sites, and logging sites. Large portions of the California and Plains cultural areas are privately held and are not subject to corridor designation.

National historic trails would be crossed by energy corridors under the Proposed Action. Table 3.10-6 identifies the trails that would be crossed. Historic trails, while covering long distances, do not retain their integrity in all locations. Each federal administering agency of a national historic trail has inventoried high potential sites and segments associated with the trail. High potential sites and segments are defined in 16 UCS 1251 as those resources and features that embody the historic and prehistoric values which characterize the trail. Among these, the administering agency may then set priorities as to which are the most vulnerable and which the most important to preserve. The locations where corridors approach within 5 miles of such high priority sites or segments are identified in Appendix S. Attempts were

TABLE 3.10-6 National Historic Trails Likely to Be Crossed by the Proposed Corridors

State	Trail(s)
Arizona	Juan Batista de Anza Old Spanish Trail
California	California Juan Batista de Anza Old Spanish
Colorado	Old Spanish
Idaho	California Nez Perce Oregon
Montana	Lewis and Clark Nez Perce
Nevada	California Old Spanish Pony Express
New Mexico	El Camino Real de Tierra Adentro Old Spanish
Oregon	California Lewis and Clark Oregon
Utah	California Old Spanish Pony Express
Wyoming	California Cherokee Mormon Oregon Overland Pony Express
Washington	Lewis and Clark

made during siting to avoid crossing pristine sections of national historic trails. Many trails are crossed by the proposed corridors in locations where current infrastructure is present, in an attempt to minimize future issues. Designation of the proposed energy corridors is not expected to directly affect national historic trails.

3.10.5 Following Corridor Designation, What Types of Impacts Could Result to Cultural Resources with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

3.10.5.1 What Are the Usual Impacts to Cultural Resources of Building and Operating Energy Transport Projects?

Direct and indirect impacts to cultural resources can be determined only on a project-specific basis for which the anticipated parameters of an undertaking are known. However, certain activities associated with development of an energy transport project have a high potential to impact cultural resources. Earthmoving activities (e.g., grading and digging) have the highest potential for disturbing or destroying significant cultural resources, while pedestrian and vehicular traffic and indirect impacts of earthmoving activities, such as soil erosion, may also have an effect. Visual impacts on significant cultural resources, such as sacred landscapes, historic trails, and other viewsheds, may also occur. Table 3.10-7 lists common types of cultural resources, the types of activities that impact the resources, and common mitigation for these impacts.

Project area preparations have the greatest potential for direct impacts to cultural resources; these activities tend to disturb larger areas than construction activities. Vehicular traffic and ground clearing (such as the removal of vegetative cover) can directly affect cultural resources, if they are present in the project area, by compacting soils, potentially crushing artifacts, and disturbing historic features (e.g., trails); vibrations may compromise various site types such as deteriorated structures,

TABLE 3.10-7 Cultural Resource Types, Impacts, and Mitigation from Energy Development

Cultural Resource Types	Examples	Impacts	Mitigation
Archaeological sites	Prehistoric activity center, prehistoric village site, historic cabin, railroad camps	*Surface:* Material collected or removed. Mixing with other materials from same areas. Crushing of artifacts from heavy machinery. *Subsurface:* Material excavated and removed, material being redeposited.	Avoidance, consultation with appropriate stakeholders, scientific excavation of portions of an archaeological site, complete excavation of an archaeological site, monitoring of development to minimize effects.
Structures	Prehistoric Pueblo dwellings, bridges, historic farmsteads or ranches, prehistoric cliff dwellings	Portions of key structures being removed or demolished; alteration of the setting could reduce character of dwelling, vibrations from heavy machinery could compromise structural stability.	Avoidance, documentation of structure, stabilization and rehabilitation of a structure, move structures to a new location.
Landscape	National historic trails, prehistoric trails and roads, mining districts, battlefields	Intrusion of modern development into an area with integrity, earthmoving that could remove evidence of past activities.	Avoidance, placement of development to minimize effect on landscape, limit type of development to low visibility types.
District	Historic districts, archaeological districts	Removal or alteration of key components to a district, earthmoving activities that could destroy surface or subsurface evidence of past activities, intrusion of modern development in a area that retains historic character.	Avoidance, placement of development to minimize effect on district, documentation of district prior to modification, stabilization of components of district.
Traditional cultural property[a]	Resource collection areas, mountain or river area, burials	Removal of specific plant resources, alteration of animal migration routes, unauthorized removal of funerary object, intrusions of modern development into a sacred landscape.	Mitigation may not be possible; consultation with affected community or Tribe, avoidance, replanting in new locations of specific resources, restrict the type of development to minimize visibility, monitoring by Native Americans to protect key resources.

[a] See Table 3.11-4 for a more detailed description of Tribal traditional cultural properties.

displacing cultural material from its original context. Preparations are more likely to impact surface features of a cultural resource than subsurface features. These activities could also impact areas of interest to Native Americans, such as sacred areas or areas used for harvesting traditional resources, such as medicinal plants. Indirect effects on cultural resources could occur through an increased potential for soil erosion as a result of these activities. Other possible impacts could involve the collection of artifacts by workers, or amateur collectors gaining access to areas that may have been previously inaccessible to the public. Although the activities that occur during initial site development are characterized as temporary actions, cultural resources are nonrenewable and, once impacted (i.e., removed or damaged), cannot be recovered and returned to their proper context.

The construction of a new transmission line or a pipeline has the potential to adversely affect cultural resources, because of the ground disturbance during this phase. The amount of area disturbed could be considerable (generally double the normal ROW) and could destroy cultural resources. Construction activities have a greater potential for disturbing subsurface features of a cultural resource. As previously stated, an indirect effect of ground disturbance could be soil erosion, which could also impact cultural resources outside the construction footprint. There is a potential for greater impacts to subsurface cultural resources with a pipeline construction project due to the larger area excavated compared to that needed for a transmission line. The need for pump stations associated with pipelines requires that more area be modified than is needed for transmission line substations. Access roads along a transmission or pipeline route could provide access to areas that might have been previously inaccessible.

Any increase in the presence of humans in an uncontrolled and unmonitored environment containing significant cultural resources increases the potential for adverse impacts caused by looting (unauthorized collection of artifacts), vandalism, and inadvertent destruction to unrecognized resources. In addition, visual impacts on cultural resources could occur during the construction phase. Large areas of exposed ground surface, increases in dust, and the presence of large-scale machinery, equipment, and vehicles could contribute to adverse impacts on cultural resources (e.g., those with a landscape component that contributes to their significance, such as a historic trail or sacred landscape).

The potential for impacts resulting from operation are primarily limited to those caused through the access to remote areas provided by access roads. Nevertheless, human presence increases the likelihood of unauthorized collection of artifacts and vandalism, as well as inadvertent destruction of unrecognized resources. In addition, there may be visual impacts on the resources, since the visible transmission line towers may be perceived as intrusions on sacred or historical landscapes. If the development site would need to be expanded during operation, the impacts would be similar to those associated with construction.

3.10.5.2 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Cultural Resources?

Project-specific development is subject to compliance under Section 106 of the NHPA. Compliance includes consultation with the appropriate SHPO(s), affected Tribes, and other stakeholders to identify, evaluate, and avoid, minimize, or mitigate adverse impacts to historic properties. Tribal consultation is also necessary to establish whether the project is likely to disturb traditional cultural properties, graves, and funerary objects; affect access rights to particular locations; disrupt traditional cultural practices; and/or visually impact areas important to the Tribe(s).

IOPs will be followed for all projects utilizing the Section 368 corridors. IOPs that directly concern the consideration of cultural resources are found in Section 2.4.1 under the headings of cultural resources, visual resources, and Tribal traditional cultural resources.

Mitigation plans regarding effects to historic properties shall be developed in consultation with SHPOs, federally recognized Tribes, and other relevant parties as designated in the Section 106 regulations, and should be included as part of the CRMP identified in the IOPs (Section 2.4.1). Mitigation measures may include the following actions as appropriate:

- Mitigating potential visual impacts from development on or near national historic trails that are eligible for listing on the NRHP may include avoiding linear projects parallel to a trail, restricting the width of a working ROW within a visual buffer on either side of a trail, and minimizing impacts by crossing at 90° to the trail. When possible, the proposed disturbance should be relocated to where it would be less visible from the trail (i.e., behind a rise). Special rehabilitation measures such as revegetation may help reduce the visual impacts on the trail. Also, special interpretive measures (such as signage) may be appropriate.

- Avoidance of impacts to historic properties is the preferred mitigation option.

- When looting, vandalism, erosion, or other indirect effects might occur as the result of project development, the mitigation plan should establish a monitoring program and identify other measures, as appropriate.

- Where looting and vandalism are issues, mitigation measures involving educating workers and the public regarding the consequences of unauthorized collection of artifacts and destruction of property on public land may be appropriate. Periodic surveillance of significant cultural resources in the vicinity of development projects may also help curtail potential looting/vandalism and erosion impacts. If impacts are recognized early, additional actions should be taken before the resource is destroyed.

- Where development places historic properties at risk from vandalism and looting, as determined by the authorizing officers during the NEPA analysis, project proponents may contribute to a mitigation fund to be used to mitigate these activities, including, but not limited to, support for a local site steward or other monitoring programs; signage, fencing, vegetation screens, or other protective measures; and interpretation of project findings to encourage local awareness and protection of historic properties. Measures taken should be established during the Section 106 process, subject to approval of the POC, and they should be appropriate to the resources to be protected and local circumstances.

- When cumulative and indirect effects are identified as issues in the CRMP, project proponents may contribute to a cumulative and indirect effects fund to mitigate these effects. These measures should be established during the Section 106 process and should be subject to the approval of the POC. Such funds may be used to monitor and identify long-term and cumulative effects of development on certain types of resources (e.g., the effects of vibrations from traffic on historic properties such as rock art panels) and for other actions or studies that improve understanding of indirect and cumulative effects and/or provide relief from them. When appropriate, such funds may be expended to develop historic context statements as a basis for identifying significant indirect and cumulative effects and appropriate mitigation and management efforts for them. Contributions should be proportionate to the expected effects and possible mitigation measures, and may be collected from successive project proponents as the corridors are developed.

- When a pipeline project crosses high priority segments of national historic trails and national scenic trails, subsurface directional drilling should be used.

- When a corridor crosses or comes within 5 miles of a high-potential segment or a high-potential site of a national historic trail, the authorizing agency must consult with the appropriate SHPO, the land managing agency (if other than the authorizing agency), and the federal administrator of the trail to determine if the historic property would be impacted.

- Off-site mitigation should be an option when it benefits historic properties and is approved by the agency POC in consultation with SHPOs and other appropriate parties. A further discussion of offsite mitigation and other mitigation strategies can be found in ACHP 2007.

3.11 TRIBALLY SENSITIVE RESOURCES

3.11.1 What Are the Resources Important to Tribes Associated with Corridors in the 11 Western States?

This section discusses resources important to Native American Tribes. While Tribally sensitive resources are often equated with cultural resources important to Tribes, Tribes have interests beyond cultural resources, including economic development, access to energy resources, health, safety, environmental justice, and protection of the environment. While these interests are common to all segments of American society, and are treated in other sections of this PEIS, federal laws such as NEPA, FLPMA, and NFMA require federal agencies to consult with affected federally recognized Native American Tribes regarding environmental and land management issues and to take into account Native American concerns including, but not restricted to, cultural resources.

3.11.1.1 What Resources Are Important to Tribes?

Text Box 3.11-1
What Constitutes a Tribe?

As used in most U.S. laws, the term "Indian Tribe" means any Indian or Alaska Native Tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian Tribe (25 USC 479a).

This section deals with resources important to Native Americans because they have strong ties to their ancestral lands. Federally recognized Tribes have a unique relationship with the federal government, based on their original sovereign and independent status as defined in treaties, statutes, Executive Orders, and court decisions. The federal government is required to take the desires and interests of federally recognized Native American Tribes into account in proposed actions that could affect their interests. The designation of energy corridors is such an action.

Resources important to Tribes fall into several categories with distinct management requirements derived from federal legislation, Executive Orders, and court decisions (see Table 3.11-1). These resources may be distinguished based on whether they are located on Tribal lands or on federal lands; and whether they are Tribal assets or are non-assets that legally must be managed in consultation with Tribes.

TABLE 3.11-1 Resources Important to Tribes

Resource Type	Description
Archaeological sites	The physical remains of human activities including artifacts, structures, and special use sites. All prehistoric and some historic archaeological sites in the United States are associated with ancestral Native American populations. These sites often include a buried component.
Indian trust assets (ITAs)	Lands, natural resources, or other assets held in trust or restricted against alienation by the United States for Native American Tribes or individual Native Americans (DOI 2000).
Indian trust resources	Those natural resources, either on or off Indian lands, retained by or reserved by or for Indian Tribes through treaties, statutes, judicial decisions, and Executive Orders, which are protected by a fiduciary obligation on the part of the United States (DOI 2008).
NAGPRA remains	Human remains and grave goods associated with Native American burials on federal lands.
Properties of traditional religious and cultural importance to an Indian Tribe	Often referred to as “traditional cultural properties,” these features may be eligible for listing on the NRHP. They include sacred sites, burial grounds, ancestral sites, traditional gathering places, and culturally important landscapes and natural resources (36 CFR 800.16(l)(1)).
Sacred sites	Any specific location on federal land that is identified by an Indian Tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion (GSA 1999).
Tribal lands	All lands within the exterior boundaries of an Indian reservation and all dependent Indian communities (36 CFR 800.16(x)).
Treaty rights	Rights reserved to Native Americans by treaties, including hunting, fishing, gathering, and mineral rights.
Traditional cultural properties	Properties eligible for inclusion in the NRHP because of their association with cultural practices or beliefs of a living community that are rooted in the community’s history and are important in maintaining the continuing cultural identity of the community (Parker and King 1998).

Tribal lands include “all lands within the exterior boundaries of an Indian reservation and all dependent Indian communities” (36 CFR 800.16(x)). This PEIS proposes no energy corridors on Tribal lands. Resources on Tribal lands would be affected by the proposed corridor designations only insofar that the locations at which the corridor approach or abut Tribal land boundaries constrain the siting of energy rights-of-way on Tribal lands.

Assets are anything owned that has monetary value. Indian trust assets (ITAs) are assets held in trust or restricted against alienation by the United States for Native American Tribes or individual Native Americans. Most, but not all, Tribal assets are located on Tribal lands and would not be directly affected by the proposed corridors. ITAs should be distinguished from Indian trust resources. Trust resources refer to "natural resources, either on or off Indian lands, retained by or reserved by or for Indian Tribes through treaties, statutes, judicial decisions, and Executive Orders, and are protected by a fiduciary obligation on the part of the United States" (DOI Secretarial Order No. 3206, January 16, 2008). These are resources to which access is guaranteed by treaty rights. Often these are important subsistence resources such as fish, game, and important plants, but may also include reserved mineral rights.

In general, cultural resources important to Tribes located on federal lands, unless specifically reserved in treaties or statutes, are neither Indian trust assets nor Indian trust resources (see Section 3.10). Federal regulations characterize them as "properties of traditional religious and cultural importance to an Indian Tribe" (36 CFR 300.16(1)(1). They are to be managed by federal agencies in consultation with affected federally recognized Tribes.

When discussing cultural resources important to Tribes, it is necessary to take a broad view of what is cultural. As discussed in Section 3.11.1.4, Native Americans often take a holistic view of their environment. Western distinctions between "cultural" and "natural," and between "sacred" and "profane" may be meaningless to them. Cultural resources important to Tribes include cemeteries, camp sites, and dwelling places associated with Tribal ancestors; traditional hunting, fishing, and gathering places; traditionally important plant and animal species and their habitats; and sacred places, landscapes, and resources important to the free practice of traditional Native American religions and the preservation of traditional Native American cultures. Cultural resources become trust resources only when a fiduciary obligation on the part of the United States has been defined in treaties, statues, or Executive Orders. For example, a treaty may guarantee to Native Americans the right to exploit fisheries or minerals on lands they are ceding. In addition to resources guaranteed through treaties, NAGPRA establishes Native Americans as owners of Native American burials and associated artifacts on federal lands and requires that they be repatriated in consultation with the affected Tribal group.

3.11.1.2 What Is the Legal Framework for Considering Resources Important to Tribes?

The U.S. government has a unique relationship with American Indian Tribes as set forth in the U.S. Constitution, treaties, statutes, Executive Orders, and federal court decisions. Since the formation of the Union, the United States has recognized Indian Tribes as domestic dependent nations under its protection. As domestic dependent nations, Indian Tribes exercise inherent sovereign powers over their members and territories (E.O. 13175) and may retain reserved rights beyond current reservation boundaries. Before the arrival of European immigrants, Native American Tribal Nations were sovereign entities governing themselves. The U.S. Constitution recognizes them as such. Treaties concluded between the U.S. government and Tribal Nations, while usually ceding land to the United States, may include rights that the Tribes reserved to themselves, such as access to traditional resources. The terms of these treaties are binding unless specifically abrogated by Congress and take precedent over state law. Many of the lands ceded by Tribes remain in federal hands and would be crossed by the energy corridors proposed in this document.[11]

Apart from reserved treaty rights, Native Americans form part of the cultural fabric of the United States. Under the Constitution, as

[11] Tribes may have retained reserved rights to traditional resources on these lands.

reaffirmed by the American Indian Religious Freedom Act (AIRFA), they are guaranteed the right to freely exercise their traditional religions. This necessarily requires access to sacred sites now on federal land. Places, features, and objects of historical or cultural importance to Tribes are eligible for listing on the NRHP. Because of their sovereign status, consultation with Native American Tribes is a form of government-to-government consultation. Tribal consultation regarding proposed energy corridors is detailed in Appendix C.

The special relationship between the federal government and Tribal Nations is expressed in numerous laws that require consultation with Tribes before actions are taken that could affect Tribal resources. Table 3.11-1 provides a list of these laws and orders. In general, these laws apply to federally recognized Tribes as determined by the Secretary of the Interior (25 USC 479a-1). These laws are not confined to cultural resources issues alone. Laws such as NEPA, FLPMA, and NFMA require consultation regarding environmental and land management issues as well.

The most significant statutes and Executive Orders relevant to Tribally sensitive cultural resources on federal lands are NAGPRA; AIRFA; E.O. 13007, "Indian Sacred Sites;" NHPA; and the Archaeological Resources Protection Act of 1979 (ARPA) (Table 3.11-2). NAGPRA establishes that Native American burials, funerary objects, and sacred objects, or objects of cultural patrimony on federal lands belong to Native American Tribes. They belong first to lineal descendants and secondarily to the affiliated Tribe. Objects of cultural patrimony belong to the Tribe as a whole and cannot be sold, appropriated, or conveyed away from the group even by a member of the group. AIRFA and E.O. 13007 reaffirm Native American rights to practice their traditional culture, and require federal agencies to allow Native Americans access to their sacred places on federal land whenever possible and to consult with the affected Tribes whenever a planned action has the potential to affect a Native American sacred site on federal land. NHPA confirms that historic properties of religious and cultural significance to an Indian Tribe may be found to be historically significant and eligible for the NRHP and that Native American cultural authorities must be consulted when evaluating these sites for significance (Parker and King 1988). In addition, NHPA authorizes all federally recognized Indian Tribes to assume any or all of the functions of a SHPO with respect to Tribal land and to designate a Tribal historic preservation officer (THPO).[12] In addition to managing historic resources on Tribal lands, THPOs may also have information on resources important to Tribes on federal lands beyond reservation boundaries. NAGPRA and ARPA require notification of affected Tribes before excavation that could disturb sacred or culturally significant sites on federal land.

3.11.1.3 How Are Tribally Sensitive Resources on Federal Lands Managed?

Federal agencies must take into account the effects of proposed actions on Native American Trust assets and resources as well as Tribally sensitive cultural resources. In recognition of Tribes as governmental sovereigns, government-to-government consultations must be undertaken

Text Box 3.11-2
Why Do Native American Tribes Have a Special Status?

Unlike other units of government within the United States, Tribes are "dependent domestic nations" with sovereignty recognized in the Constitution and treaties negotiated over the years. In these treaties, the United States did not grant rights to the Tribes; rather Tribes reserved rights they had in their preexisting status as sovereign nations.

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[12] In addition to managing historic resources on Tribal lands.

TABLE 3.11-2 Tribal Resources Laws and Regulations

Law or Order Name	Intent of Law or Order
National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470)	This law creates the legal framework for considering the effects of federal undertakings on cultural resources. It declares that traditional Native American properties may be included in the NRHP and requires consultation with relevant Native American Tribes' traditional cultural authorities regarding the status of potentially affected properties.
National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq.)	Implementing regulations (40 CFR 1500–1509) for studies assessing environmental effects of a project or program require agencies to invite Tribes to participate in the scoping process and to consult with Tribes early on when their involvement is reasonably foreseeable.
Federal Land Policy and Management Act (FLPMA) of 1976 (43 USC 1701)	FLPMA requires the Secretaries of Interior and Agriculture to consider the policies of land resource management programs on Tribal lands that have been developed and approved by Tribes when developing or revising agency land use plans.
National Forest Management Act (NFMA) of 1976 (16 USC 472 et seq.)	NFMA directs the U.S. Department of Agriculture's Forest Service to consult with and coordinate forest planning with Tribes.
American Indian Religious Freedom Act (AIRFA) of 1978 (42 USC 1996)	AIRFA protects the right of Native Americans to believe, express, and practice their traditional religions and to have necessary access to their sacred places on federal land. It requires consultation with Native American organizations if an agency action will affect a sacred site on federal lands.
Archaeological Resources Protection (ARPA) Act of 1979 (16 USC 470aa-mm)	ARPA establishes a permit process for the excavation or removal of any archaeological resources from federal lands. It requires notification of the relevant Tribes if the permit may result in harm to, disturbance to, or destruction of any Tribal religious or cultural site.
Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC 3002)	NAGPRA requires federal agencies to consult with the appropriate Native American Tribes prior to the intentional excavation of Native American human remains and funerary objects and to report unintentionally excavated human remains on federal land to the affected Tribe. It establishes lineal descendants as the owners of cultural items and requires the repatriation of human remains found on agency lands.
Federally Recognized Tribe List Act of 1994 (25 USC 479a-1)	This act requires the Secretary of the Interior to publish a list of all Indian Tribes which the Secretary recognizes to be eligible for the special programs and services provided by the United States to "Indians because of their status as Indians" annually.

TABLE 3.11-2 (Cont.)

Law or Order Name	Intent of Law or Order
Executive Order 13007, "Indian Sacred Sites" (1996)	E.O. 13007 requires that a federal agency allow Native Americans to worship at sacred sites located on federal property, to give notice to and consult with Tribes when planning actions that might affect these sites.
Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments" (2000)	E.O. 13175 requires federal agencies to develop an "accountable process" for insuring meaningful and timely input by Tribal officials in the development of legislation and regulatory policies that have Tribal implications.

to inform Tribal governments of the potential effects of a proposed action on trust assets and Resources and to cooperatively devise appropriate mitigating strategies whenever necessary. Tribal consultation undertaken for this PEIS is described in Appendix C.

Resources on federal lands that are important to Tribes are managed through the application of the principles of government-to-government consultation expressed in the above laws. Federal agencies have published guidance on how to appropriately include the stewardship of Tribally sensitive resources on the lands they manage. These manuals and guides include procedures for consultation, access to sacred sites, the treatment of Tribal burials, and the repatriation of cultural patrimony. The BLM has produced relevant manuals and handbooks in its 8100 series. Forest Service Manual 1500, *External Relations*, and Handbook 1509.13, *American Indian and Alaska Native Relations Handbook*, discuss Native American issues. The DOD Instruction 4715.3, "Environmental Conservation Program," commits the DOD to follow applicable federal laws and regulations regarding resources important to Tribes. Individual services have issued internal guidance as well.

Federal land managing agencies throughout the western states have active Tribal liaison programs. Through these programs, land managers establish relationships to local Tribes. These established relationships allow local national forest and BLM personnel to understand local Native American values, concerns, and priorities. Questions of access and protection and mitigation are usually negotiated locally. Local NHPA Section 106 and 110 inventories include properties of traditional religious and cultural importance to an Indian Tribe, often classified as traditional cultural properties, or TCPs. However, whenever Tribes consider the resources to be sacred, they are usually not willing to specify their exact location, particularly if the resources are not immediately threatened.

3.11.1.4 Tribally Sensitive Resources in the West

There are 250 federally recognized Tribes with ancestral ties to the 11 western states (see Appendix C). While Tribes have many concerns in common, each Tribe has its own unique set of concerns as well. Concerns commonly expressed in communications from the Tribes regarding this PEIS included: how the designation would affect access to energy on reservation lands; how corridor designation would affect Tribal plans for the development of local energy resources; the effect of corridor development on safety and hazardous material spills; the effect of corridor development on the environment; the effect of corridor development on tourism; the effect of corridor development on fisheries; the effect of corridor designation and development on resources reserved by treaty; and the effect of corridor designation and development on cultural resources. While the distinction between natural and cultural resources may not always be valid in a Tribal context, it is clear that there is an economic or subsistence component to many of the resources important to Tribes. Where treaties guarantee access to specific fisheries on ceded lands, Tribes are concerned with maintenance and management of those fisheries, including the maintenance of water quality. Tribes may also be concerned with the management of plant and animal species that form part of their traditional subsistence base. Other concerns are more overtly economic such as the management of mineral rights with respect to coal beds on ceded lands.

Each Tribe recognizes natural features, natural resources, and artifacts important to its cultural traditions and identity. The specifics of the culturally important resources vary from Tribe to Tribe, depending on its environment, worldview, and other cultural factors. Nonetheless, it is possible to identify general similarities in Native American perspectives and to discuss in broad terms the types of sites and resources that have cultural importance to western Tribes.

Native Americans often take a holistic view of the world, in which each part is seen in relation to the whole. They are less likely to divide the world around them into separate distinct units. Distinctions between the sacred and the secular may be meaningless to them. They are likely to take a view of their environment in which natural features, considered inanimate by Western cultures, are seen as imbued with a life force, having a will, and being connected to the whole. The taking of game or the gathering of plants or other natural resources may be seen as both a sacred and a secular act (Stoffle et al. 1990). A Native American sacred place need not have any signs of human occupation or modification. It is as likely to be a landscape or natural feature such as a mountain or river, as a confined, easily mapped location. Locations of traditional activities are likely to be important both culturally and spiritually. Tribes often express ties to the land, expressed as sacred trusts, particularly to lands where their ancestors are buried.

Of the 250 Tribes contacted by the WWEC project, 80 entered into some level of consultation with agency representatives (Appendix C). Of these, only a few provided information concerning properties of traditional religious and cultural importance. Many took the view that the designation of corridors alone would not directly affect important resources, but emphasized their right to be consulted if actual development projects were being planned within the corridors. Others were concerned with the location at which designated corridors abutted or approached Tribal lands. The location at which a corridor approached reservation boundaries could constrain the location of energy rights-of-way on Indian lands, possibly affecting important resources and assets adversely.

Those properties and resources that were reported included sacred mountains, concentrations of rock art, ritually important locations, areas where burials were likely, traditional plant resource gathering areas, important fisheries, and traditional game species. These are typical of Tribal resources found throughout the West. Commonly reported properties of traditional religious and cultural importance are described below. It is likely that resources important to Tribes occur within the proposed corridors.

Indian trust assets and resources include natural resources. Indian trust assets include natural resources held in trust and restricted against alienation by the United States for Native Americans. Indian trust resources are natural resources retained by or reserved by or for Tribes through treaties, statutes, judicial decisions, and Executive Orders, which are protected by a fiduciary obligation on the part of the United States. An asset may be thought of as a property with monetary value, such as a coal bed, whereas a reserved resource is a resource such as a fishery, game species, or harvesting area to which access is reserved. Some examples are given below:

Traditional fisheries are particularly important to groups living along major river systems like the Columbia River in the Northwest and Sacramento and San Joaquin Rivers in California's Central Valley. Prized culturally important fishing locations are among the reserved rights included in most Northwest treaties. Maintenance of the fishery at those locations involves management of river systems, the fish resource, and water quality, as well a protection of particular locations along the river. Tidal zone resources were often managed incorporating prescribed ritual harvesting practices and the elimination of competitor species (Field 2002).

Traditional plant gathering areas include locations of culturally important plant resources. They may be plant resources gathered for food, such as pine nuts, acorns, seed bearing grasses, or camas roots. Often these resources are traditionally managed by weeding, watering, burning, pruning, and transplanting — activities that require unimpeded access. Harvests are often communal efforts giving the location social and cultural importance as well. Other plants have medicinal or ritual importance and continue to be harvested. Plants that are ritual necessities are considered sacred resources. Plants are also gathered for fiber, construction, woodworking, and fuel. Each of these activities could have a sacred as well as a profane or mundane component (Stoffle et al. 1990).

Culturally significant animal species even if protected by state and federal law may be accessible to Native American Tribes through treaty rights or federal law, to meet subsistence or ceremonial requirements.

Habitats of culturally significant animals include both food animals and animals that are ritually important, playing a role in the mythology of the group. Seen from a holistic perspective, even subsistence resources have cultural and religious importance and are approached reverentially, even if they are being killed. One consulting Tribal Nation noted that energy corridors often follow game migration routes.

Cultural resources include many of the natural resources discussed above, when they are integral parts of a Tribal culture. They also include places and artifacts of human use and/or manufacture.

Sacred places and landscapes include areas associated with important ceremonies and rituals and culturally important practices. These include natural features such as mountains, rivers, lakes, springs, canyons, and old growth forests. They may be the backdrop for traditional lore. They may act as retreats for prayer or figure in important rites of passage such as marriages or vision quests. They may or may not include shrines discernable to outsiders. An environment unsullied by modern development may be critical to their sacred nature, such as views of a sacred mountain or valley, or the quiet and solitude in an important grove of old growth forest (Gulliford, 2000; Little et al. 2001).

Rock art panels, including both petroglyphs and pictographs, often have a sacred character, as they link contemporary groups with the past. The figures may express important symbolism not readily revealed to outsiders. As with other traditional resources, they are seen holistically as part of an encompassing landscape.

Burials and funerary objects are important Tribal resources tying modern groups to their progenitors and to the land. They are one aspect of things that make the land sacred. Native American groups practiced a variety of methods for the disposal of their dead. Whatever the method, Tribes are usually sensitive to disturbance of their ancestors' final resting places by outsiders, including through scientific excavation.

Archaeological sites, particularly those that can be associated with ancestral populations, have cultural importance to Native American Tribes. They tie the group ritually, culturally, and historically to the landscape. Native Americans may be hesitant to allow excavation of ritually important locations, particularly by outsiders.

3.11.2 How Were the Potential Effects of Corridor Designation to Resources Important to Tribes Evaluated?

The potential effects of corridor designation on resources important to Tribes were evaluated through a survey of ethnographic literature on Tribal groups in the West and consultation with cultural authorities within those Tribes. The ethnographic survey identified general patterns in each of six widely recognized cultural areas (see Section 3.10 and Appendix U). As already noted, Tribes are often reticent to identify traditional use areas and sacred landscapes unless they perceive that these resources are directly threatened. Most of the groups entering into consultation preferred to wait until specific development plans are proposed before identifying culturally sensitive areas. During the siting process, local knowledge of culturally sensitive areas was solicited from agency field offices. Wherever possible, corridors were sited to avoid known Tribal resources (Section 1.9.3).

Tribes are much less reticent to discuss economic and environmental concerns. These include the effects of corridor designation on the economic development of Tribal lands, ripple effects of corridor designation on federal lands adjacent to Tribal lands, and on trust assets and trust resources. The potential effects on these resources were evaluated in consultation with Native American Tribes, whenever Tribal concerns were raised.

It is likely that Tribal resources are present within the proposed corridors. Only a small fraction of the corridors have been surveyed for cultural resources (see Section 3.10). Any or all of the abovementioned resource types could occur in any of the proposed corridors. Therefore, the impact of designation can only be treated generically.

Section 368 of EPAct is concerned only with the designation of energy corridors on federally managed lands. Energy ROWs crossing Tribal lands are considered under Section 1813 of EPAct and are not dealt with in this PEIS. However, some of the Section 368 corridors proposed for federally managed lands abut or approach Tribal lands. These are listed in Table 3.11-3. It is likely that developers proposing rights-of-way in these corridors will also seek to develop energy transmission facilities on adjoining Tribal lands. Such development could affect Tribal trust assets. The location at which proposed corridors approach or abut Tribal lands is thus of concern to Tribes. In all, 24 Tribal reservations are approached by the corridors proposed here. In every case but one, these corridors approach an existing Tribally designated corridor (11) or existing ROW (20) on Tribal lands. Corridors on Tribal lands are designated by the Tribes themselves to meet their own needs. They may or may not be identical in size or use to the energy corridors proposed in this PEIS.

If project proponents desiring to make use of the Section 368 corridors also wish to extend energy transmission facilities onto or across Tribal lands, project applicants would secure access to Tribal lands in the same manner that they currently obtain access to those lands, independent of the federal corridor designations. Tribes would not be compelled to allow the development of energy rights-of-way on their own lands. Rights-of-way would be negotiated between energy developers and individual Tribal governments. All federally licensed, permitted, or approved rights-of-way would be subject to Section 106 of the NHPA whether on federal, state, private, or Tribal lands as well as local Tribal regulations and procedures. Any adverse effects on cultural resources important to Tribes would be mitigated in consultation with the affected Tribes.

TABLE 3.11-3 Tribal Lands Approached by the Proposed Section 368 Energy Corridors

Reservation	Approaching Segment	Corridor Directly Abuts	Existing ROW	Existing Local Corridor
Arizona				
Hualapai Reservation	47-231	Yes	Elec.	Yes
Kaibab Reservation	113-116	Yes	Elec.	Yes
Navajo Reservation	47-68 & 68-116	Yes	Elec.	No
San Xavier Reservation	234-235	No	Elec., railroad	No
Tohono O'odham Reservation	115-208	No	Elec.	No
California				
Agua Caliente Reservation	30-52	No	Elec., nat. gas, road	No
Kumeyaay Campo Reservation	115-238	Yes	Elec., road	No
Kumeyaay La Posta Reservation	115-238	No	Elec., road	No
Fort Yuma Quechan Reservation	115-238	Yes	Elec., road	No
Colorado				
Southern Ute Reservation	80-273	Yes	Nat. gas	No
Montana				
Crow Reservation	79-216	No	Nat. gas	No
Nevada				
Moapa River Reservation	37-232	Yes	None	Yes
Pyramid Lake Reservation	15-17	Yes	None	Yes
Te-Moak Western Shoshone (Elko Band)	17-35	Yes	Road	Yes
Te-Moak Western Shoshone (Wells Colony)	17-35	Yes	Elec., road	Yes
Walker River Reservation	17-18	Yes	Elec.	Yes
Walker River Reservation	18-224	Yes	None	Yes
New Mexico				
Zia Pueblo	80-273	Yes	Nat. gas, elec., road	Yes
Oregon				
Warm Springs Reservation	230-248	No	Nat. gas pending	No
Utah				
Uintah and Ouray Reservation (Ute)	126-258	No	Elec., road	No

3.11.3 What Are the Potential Effects of the Alternatives to Resources Important to Tribes and How Do They Compare?

The potential effects to Tribally sensitive cultural resources are similar to those identified for ecological resources in Section 3.8.3, visual resources in Section 3.9.3, and cultural resources in Section 3.10.4. Since the Proposed Action does not involve any construction or project development, no impacts to Tribal resources are anticipated.

3.11.3.1 No Action Alternative

Under No Action, no West-wide system of energy corridors would be designated. Energy projects would be developed following procedures, policies, and requirements now in place for each of the federal land managing agencies and identified in existing federal land use management plans. Colocation of transmission lines and pipelines would not be consistently encouraged. Since colocation would be less likely, ROWs would be more likely to be more widely dispersed, potentially affecting a larger number of resources over a wider area than under the Proposed Action. Impacts on resources important to Tribes would remain unchanged.

3.11.3.2 The Proposed Action

Under the Proposed Action, selected corridors on federal lands would be designated as Section 368 energy corridors. The location of known Tribal resources was taken into account during the corridor siting process. There would be no impact from designation. However, there may be impacts from project development subsequent to designation. If energy transport systems are developed, they would be more likely to be colocated within designated corridors. The effects of development are discussed in Section 3.11.4.1. These effects would be more restricted in area, but more intensive than under the No Action Alternative.

3.11.3.3 Mitigation Measures

Consultation with the affected Tribe(s) is required to devise appropriate mitigation measures for Tribal resources. Avoidance is often the preferred mitigation, although other options may be available.

3.11.4 Following Corridor Designation, What Types of Impacts Could Result to Resources Important to Tribes with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

3.11.4.1 What Are the Usual Impacts to Tribal Resources of Building, Operating, and Decommissioning Energy Transport Projects?

The impacts discussed here are the potential impacts of future energy development on resources important to Tribes. These would be expected from development operation and decommissioning of energy transport facilities anywhere in the 11 western states. Project-specific analyses would be required before development could occur within the corridors. These resources tend to be fragile. For example, noise from construction of a pipeline or transmission line could reduce the quality of a sacred place, as could the visual impact of a completed transmission line. The very presence of a pipeline or transmission line may degrade a sacred landscape. Culturally important plant species may be susceptible to disturbances in their local environments. Major earthmoving activities, particularly during the construction of pipelines, could have major impacts on habitation sites, use places, and structures. The access roads used to maintain the lines in remote areas increase access to those areas. Increased human presence may degrade the solitude of a sacred or ceremonial location, and also make vandalism (the intentional destruction or removal of culturally important sites and artifacts) and unintentional degradation of Tribal resources more likely. Some potential impacts are summarized in Table 3.11-4.

TABLE 3.11-4 Impacts to Tribally Sensitive Resources

Resource Type	Examples	Typical Impacting Factors
Sacred sites	Sacred mountains, rock formations, rivers, old growth forests, springs, burials, ceremonial resource collection area, rock art, cairns	Visual intrusions, noise, ground disturbance, increased access, vandalism, erosion, access may be impeded by pipelines
Plant harvesting areas	Food plants (nuts, fruits, roots, seed-bearing grasses), medicinal plants (teas, poultices, washes), fuel, construction, manufacture, ritually important plants	Herbicide application, grading, vegetation clearing, erosion, trampling
Animal habitat	Food animals, ritually important animals (totems)	Increased human presence, increased access for hunting, pipelines may hinder migration routes
Fishing areas	Fishing platforms, riverside, lakeside	Erosion and potential decline in water quality from land clearing and earthmoving, increased access
Rock art	Petroglyphs, pictographs	Blasting, vandalism, loss of context
Cultural patrimony	Sacred/culturally important artifacts	Displacement, vandalism
Burial sites	Stone-lined burials, cave burials, simple burials	Earthmoving activities, land clearing/erosion, increased access/vandalism
Archaeological sites	Dwelling sites, campsites, ritual structures (sweat lodges, kivas)	Earthmoving activities, land clearing/erosion, increased access/vandalism

3.11.4.2 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Resources Important to Tribes?

As with other resources, recognition and avoidance coupled with timely and meaningful consultation with Native American Tribes are the fundamental means of maximizing mitigation of adverse effects on resources important to Tribes. It should be noted, however, that even with survey and consultation, not all impacts to Tribally sensitive resources can be fully mitigated.

Some specific mitigation measures are listed below:

- The lead agency will consult with Native American governments early in the planning process to identify issues and areas of concern regarding any proposed energy transport project. Such consultation is required by the NHPA and other authorities and is necessary to determine whether construction and operation of the project are likely to disturb Tribally sensitive resources, impede access to culturally important locations, disrupt traditional cultural practices, impede the movements of animals important to Tribes, or visually impact culturally important landscapes. It may be possible to negotiate a mutually acceptable means of minimizing adverse effects to resources important to Tribes.

- Archaeological surveys and record searches required by Section 106 of the NHPA (see Section 3.10.1) may identify Native American archaeological or other culturally important sites (Parker and King 1998). Consultation with appropriate Native American governments and cultural authorities is required by federal law to validate and determine the importance of identified resources. Appropriate mitigation steps such as avoidance, removal, repatriation, or curation should be determined through this consultation.

- It may not be possible to fully mitigate impacts to sacred areas. Impacts may involve visual impacts to important viewsheds and landscapes. Avoidance is the best policy in these cases. If avoidance is not possible, timely and meaningful consultation with the affected Tribe(s) may result in a mutually acceptable plan to maximize mitigation. Such a plan can include monitoring of construction or operation activities by Native American authorities.

- Springs are commonly sacred and culturally important places, particularly in arid regions. They should be avoided whenever possible. If it is necessary for construction, maintenance, or operation activities to take place in proximity to springs, appropriate measures, such as the use of geotextiles or silt fencing, should be taken to prevent the silt from degrading of water sources (see Section 3.5.4.2). The effectiveness of these mitigating barriers should be monitored. Particulars should be determined in consultation with the appropriate Native American Tribe(s).

- When it is impossible to avoid culturally important plant resources, it may be acceptable to compensate by protecting an equally large tract of the resource elsewhere, or to transplant and establish an equal amount of the resource that will be destroyed to a new appropriate location (Stoffle et al. 1990). Consultations should be undertaken with the affected Tribe(s) to determine whether this is acceptable. Most commonly, monitoring of a transplanted population would be required.

- Avoidance is the preferred mitigation of impacts on Tribal burial sites, but this is not always possible. Consultation with the lineal descendants or Tribal affiliates of the deceased should be undertaken before removing a known burial. Remains and objects should be protected and repatriated according to NAGPRA statutory procedures and regulations. Unanticipated burials are always possible. A contingency plan for dealing with unanticipated burials and funerary goods encountered during construction, maintenance, or operation of an energy transport facility should be developed as part of the CRMP for that project in consultation with the appropriate Tribal governments and cultural authorities well in advance of construction.

- It may not be possible to completely avoid the habitat of culturally important animals. However, energy transport facilities should be designed to minimize impacts to game trails, migration routes, and nesting and breeding areas of Tribally important species. Mitigation and monitoring procedures should be developed in consultation with the affected Tribe(s).

- Traditional Tribal fishing locations should be avoided. When projects cross waters traditionally used for Tribal fishing or waters tributary to those waters, care should be taken to preserve the quality of the waters. Riprap, geotextiles, silt fencing, or other suitable means should be employed to prevent silting and erosion at stream crossings (see Section 3.5.4.2). Mitigating procedures and monitoring should be determined in consultation with the affected Native American Tribe(s).

- Archaeological sites created by ancestral Native American populations should be avoided whenever possible. Mitigation by scientific excavation may not always be acceptable to the affected descendant Native American population. Consultation with the affiliated Tribe(s) should be undertaken when planning excavation. Monitoring or participation by Tribal representatives may be acceptable, as may repatriation or approved curation of artifacts considered to be cultural patrimony.

- Panels of petroglyphs and/or pictographs tend to be relatively immobile. Avoidance is the best mitigation. Such panels may be just one component of a larger sacred landscape, and simple avoidance may not be sufficient. Mitigation plans for rock art should be formulated in consultation with the appropriate Tribal cultural authorities.

- Prior to construction, training should be provided to contractor personnel whose activities or responsibilities could impact Tribal resources during construction. Monitoring or participation by Tribal representatives in coordination with the project's environmental compliance officer and other inspectors, the contractor's construction field supervisor(s), and all construction personnel would be expected to play an important role in keeping impacts to Tribal resources as minor as possible.

3.12 SOCIOECONOMIC CONDITIONS

3.12.1 What Are the Current Socioeconomic Conditions of the 11 Western States?

The socioeconomic environment potentially affected by corridor designation and the future development of energy transport projects on federal land includes 11 western states.[13] In the following sections, nine key measures of economic development are described. These are employment, unemployment, personal income, state sales tax and income tax revenues, population, available housing, and local government expenditures and employment. The projected data are presented for each state for 2007 and for a recently preceding period. Forecasts for each measure are based on population forecasts produced by the U.S. Bureau of the Census (2006c) for the period 2004 to 2030. In addition to their use in this PEIS, these data should also be used as the basis for the description of the affected environment at the implementation stage for individual energy transport projects.

3.12.1.1 Employment

In 2003, almost 53% (14.4 million) of all employment in the 11 western states (27.2 million) was concentrated in California (Table 3.12-1). Employment in Arizona, Colorado, and Washington stood at 2.3 million, 2.2 million, and 2.7 million, respectively; the remaining seven states supported less than 2 million jobs each. Employment in the 11 western states as a whole is projected to increase to 28.7 million in 2007.

[13] The socioeconomic environment also includes a number of Tribal groups and lands (see Appendixes C and K).

Over the period 1990 to 2003, annual employment growth rates were higher in Nevada (at 4.4%), Arizona (3.4%), and Utah (3.1%) than elsewhere in the 11 western states. At 1.1%, growth rates in California were somewhat less than the average rate of 1.8%.

3.12.1.2 Unemployment

In the majority of the states, unemployment rates declined over the period 1996 to 2006 (Table 3.12-2). Current unemployment rates in Colorado (4.3%) and Oregon (5.5%) are slightly higher than the corresponding average for the preceding 10-year period. With the exception of California, relatively small labor forces exist in each of the states. However, there are fairly large numbers of local workers who are presently unemployed in each state and therefore potentially available to work on the proposed energy corridor developments within the states.

3.12.1.3 Personal Income

California generated more than 57% of total personal income in the 11-state region, producing more than $1.3 trillion in 2004 (Table 3.12-3). The state is expected to generate $1.4 trillion in 2007. For the 11 western states as a whole, personal income is expected to rise from $2.3 trillion in 2004 to $2.4 trillion in 2007.

Annual growth in personal income for the period 1990 to 2004 was highest in Nevada at 5.8%. Elsewhere in the 11-state region, personal income growth rates in Arizona (4.4%), Colorado (4.2%), and Utah (4.0%) were all more than one percentage point higher than the 11-state average rate of 2.8%.

3.12.1.4 Sales Tax Revenues

Total sales tax revenues for the 9 states that levy a sales tax are projected to grow from $90.9 billion in 2002 to $97.5 billion in 2007 (Table 3.12-4). Growth is also expected for each individual state over the period of 2002 through 2007, with revenues in the largest sales tax-generating state, California, projected to reach $52.1 billion in 2007.

Higher than average annual growth in sales tax revenues during the period of 1992 to 2002 occurred in Nevada (7.8%), Wyoming (6.8%), Arizona (6.4%), Utah (5.6%), Idaho (5.4%), and Colorado (5.1%). The average annual growth rate for the nine states with a sales tax as a whole during the period of 1992 to 2000 was 3.8%.

3.12.1.5 Income Tax Revenues

In 2002, California generated 74% of total state income tax revenues in the 11-state region, producing $39.5 billion (Table 3.12-5). Oregon is the second-largest state income tax producer with $4.7 billion in 2002. Revenues for the entire region are projected to decrease from $55.1 billion in 2002 to $54.0 billion in 2007. Revenues of $38.6 billion are expected in California in 2007 (a $900 million decrease from 2002).

The majority of the 11 states experienced moderately large annual increases in state income tax revenues during the 1990s. Growth rates in California (5.2%), Colorado (5.1%), New Mexico (5.8%), and Utah (5.4%) were all higher than the average for the 11-state region of 5.0%. Relatively slow growth in revenues was experienced in Montana (3.9%).

3.12.1.6 Population

Total population in the 11 western states stood at 61.3 million in 2000 and is expected to reach 67.6 million by 2007 (Table 3.12-6). Population in the region is concentrated in California, which, at 33.9 million, had more than 55% of the region's total population in 2000. Population in California is expected to increase to 36.9 million by 2007. With the exception of

TABLE 3.12-1 State Employment (millions, except where noted)

	1990	2003	Annual Growth Rate 1990–2003 (%)	2007 (projected)
Arizona	1.5	2.3	3.4	2.5
California	12.5	14.4	1.1	15.1
Colorado	1.5	2.2	2.7	2.2
Idaho	0.4	0.6	3.1	0.6
Montana	0.3	0.4	2.3	0.4
Nevada	0.6	1.1	4.4	1.2
New Mexico	0.6	0.8	2.3	0.8
Oregon	1.2	1.6	1.7	1.6
Utah	0.7	1.1	3.1	1.1
Washington	2.1	2.7	1.7	2.8
Wyoming	0.2	0.3	1.8	0.3
Total	21.7	27.2	1.8	28.7

Source: U.S. Department of Labor (2006a).

TABLE 3.12-2 Unemployment Data

	Average Unemployment Rate 1996–2006 (%)	Current Unemployment Rate (%)[a]	Number of Unemployed Persons by State[a]
Arizona	4.5	4.1	119,600
California	6.3	4.8	847,500
Colorado	4.1	4.3	111,600
Idaho	4.2	3.2	24,500
Montana	4.3	3.4	17,300
Nevada	4.3	3.8	48,000
New Mexico	5.8	4.8	45,700
Oregon	5.3	5.5	102,500
Utah	5.3	3.4	44,900
Washington	5.4	4.6	152,100
Wyoming	5.8	2.9	8,400
Total			1,522,100

[a] Data for current unemployment rates and the numbers of unemployed persons are as of March 2006.

Source: U.S. Department of Labor (2006b).

TABLE 3.12-3 State Personal Income (in $ billions 2005, except where noted)

	1990	2004	Annual Growth Rate 1990–2004 (%)	2007 (projected)
Arizona	93.6	170.1	4.4	183.3
California	968.7	1,305.1	2.2	1,350.1
Colorado	96.8	171.8	4.2	176.7
Idaho	23.8	38.8	3.6	40.6
Montana	18.5	26.5	2.6	27.1
Nevada	37.1	81.5	5.8	88.5
New Mexico	33.9	51.5	3.0	52.9
Oregon	77.0	113.5	2.8	117.0
Utah	38.6	66.6	4.0	69.5
Washington	145.5	224.9	3.2	231.7
Wyoming	12.2	17.9	2.8	18.2
Total	1,545.7	2,268.1	2.8	2,355.5

Source: U.S. Department of Commerce (2006).

TABLE 3.12-4 State Sales Tax Revenues (in $ billions 2005, except where noted)

	1992	2002	Annual Growth Rate 1992–2002 (%)	2007 (projected)
Arizona	4.7	8.7	6.4	9.9
California	36.8	49.1	2.9	52.1
Colorado	3.6	5.9	5.1	6.2
Idaho	0.9	1.5	5.4	1.7
Montana[a]	0.0	0.0	NA[b]	0.0
Nevada	2.3	5.0	7.8	5.8
New Mexico	2.2	2.9	2.7	3.0
Oregon[a]	0.0	0.0	NA	0.0
Utah	1.7	3.0	5.6	3.2
Washington	10.2	14.1	3.3	14.8
Wyoming	0.4	0.8	6.8	0.8
Total	62.8	90.9	3.8	97.5

[a] Montana and Oregon do not currently levy a sales tax.

[b] NA = not applicable.

Source: U.S. Bureau of the Census (2006a).

TABLE 3.12-5 State Income Tax Revenues (in $ billions 2005, except where noted)

	1992	2002	Annual Growth Rate 1992–2002 (%)	2007
Arizona	1.7	2.5	3.8	2.6
California	23.7	39.5	5.2	38.6
Colorado	2.2	3.7	5.1	3.6
Idaho	0.7	1.0	2.8	1.0
Montana	0.4	0.7	3.9	0.6
Nevada[a]	0.0	0.0	NA[b]	0.0
New Mexico	0.6	1.1	5.8	1.1
Oregon	3.1	4.7	4.4	4.6
Utah	1.1	1.8	5.4	1.8
Washington[a]	0.0	0.0	NA	0.0
Wyoming[a]	0.0	0.0	NA	0.0
Total	33.5	55.0	5.0	53.9

[a] There are currently no state income taxes in Nevada, Washington, or Wyoming.

[b] NA = not applicable.

Source: U.S. Bureau of the Census (2006a).

TABLE 3.12-6 State Population (in millions, except where noted)

	1990	2000	Annual Growth Rate 1990–2000 (%)	2007 (projected)
Arizona	3.7	5.1	3.4	6.2
California	29.8	33.9	1.3	36.9
Colorado	3.3	4.3	2.7	4.7
Idaho	1.0	1.3	2.5	1.5
Montana	0.8	0.9	1.2	0.9
Nevada	1.2	2.0	5.2	2.5
New Mexico	1.5	1.8	1.8	1.9
Oregon	2.8	3.4	1.9	3.7
Utah	1.7	2.2	2.6	2.5
Washington	4.9	5.9	1.9	6.3
Wyoming	0.5	0.5	0.8	0.5
Total	51.2	61.3	2.3	67.6

Sources: U.S. Bureau of the Census (2006b, 2006c).

Washington (5.9 million) and Arizona (5.1 million), each of the remaining states had less than 5 million persons in 2000.

Population in the 11 western states grew at an annual average rate of 2.3% over the period from 1990 to 2000. Growth within the region was fairly uneven over the period, with relatively high annual growth rates in Nevada (5.2%) and Arizona (3.4%). Growth rates in Colorado, Idaho, and Utah were all close to the average for the region, with lower than average rates in the remaining states.

3.12.1.7 Vacant Rental Housing

With the largest population in the 11-state region, California also has the largest housing market and the largest number of vacant rental housing units (Table 3.12-7). Vacant rental units in the state stood at 190,000 in 2000 (55.1% of the 11-state total) and are expected to reach 206,000 in 2007. Elsewhere in the region, Arizona (61,900 units) and Washington (50,800) had larger numbers of vacant rental units. The number of units in the region as a whole stood at 470,300 in 2000, and is expected to reach 518,300 by 2007.

There was a slight decline in the number of vacant rental units over the period of 1990 to 2000, with an overall annual growth rate of –1.4%. A number of states, notably Colorado (–5.3%), California (–3.5%), Wyoming (–2.3%), and Arizona (–1.9%), have seen higher than average declines in vacant units, while other states, notably Oregon (5.7%), Nevada (5.1%), and Idaho (3.1%), have experienced relatively large increases in vacant rental units.

TABLE 3.12-7 Vacant Rental Housing Units (in thousands, except where noted)

	1990	2000	Annual Growth Rate 1990–2000 (%)	2007 (projected)
Arizona	75.0	61.9	–1.9	73.7
California	271.9	190.0	–3.5	205.8
Colorado	55.3	31.9	–5.3	34.1
Idaho	7.9	10.6	3.1	11.8
Montana	9.6	9.2	–0.5	9.7
Nevada	19.2	31.7	5.1	38.4
New Mexico	20.2	26.7	2.8	28.4
Oregon	21.6	37.5	5.7	40.2
Utah	14.7	14.0	–0.7	15.3
Washington	40.6	50.8	2.3	54.5
Wyoming	7.8	6.2	–2.3	6.5
Total	543.8	470.5	–1.4	518.4

Source: U.S. Bureau of the Census (2006b).

3.12.1.8 State and Local Government Expenditures

The distribution of funding for state and local government services is concentrated in California, with $356.1 billion in government expenditures in 2002, which represented almost 60% of all government expenditures in the 11-state region (Table 3.12-8). Expenditures in California are expected to reach almost $378 billion in 2007. Other states with fairly large state and local governments are Washington ($59.0 billion), Arizona ($39.2 billion), Colorado ($37.3 billion), and Oregon ($30.6 billion). Expenditures in the 11-state region were $594.5 billion in 2002 and are expected to reach $634.8 billion by 2007.

Annual growth rates in state and local government expenditures have increased fairly rapidly throughout the region, with an overall annual average rate of 4.9% over the period of 1992 to 2002. A number of states, notably Nevada (7.0%) and Utah (6.0%), were more than one percentage point higher than the regional average, while growth rates in Montana (3.5%) and Wyoming (3.4%) were relatively low during the period.

3.12.1.9 State and Local Government Employment

In addition to a higher share of total state sales and income tax revenues collected by the 11 western states, California's share of state and local government employment in 2005 (52.9%) was similar to the state's share of total population in the region (55.2%) (Table 3.12-9). Government employment in the state stood at 1.7 million in 2005, and was projected to reach 1.8 million in 2007. Other states with fairly large totals of government employees in 2005 were Washington (329,900), Arizona (281,800), and Colorado (250,100). Total employment in the 11-state region was more than 3.3 million in 2005 and is expected to exceed 3.4 million in 2007 (Table 3.12-9).

TABLE 3.12-8 Total Local Government Expenditures (in $ billions 2005, except where noted)

	1992	2002	Annual Growth Rate 1992–2002 (%)	2007
Arizona	22.6	39.2	5.6	44.6
California	225.8	356.1	4.7	377.8
Colorado	21.4	37.3	5.7	39.6
Idaho	5.2	9.1	5.9	9.9
Montana	4.8	6.7	3.5	7.0
Nevada	8.9	17.6	7.0	20.4
New Mexico	9.4	15.3	5.0	16.0
Oregon	19.2	30.6	4.8	32.2
Utah	10.1	18.1	6.0	19.6
Washington	38.7	59.0	4.3	62.0
Wyoming	3.9	5.5	3.4	5.7
Total	370.0	594.5	4.9	634.8

Source: U.S. Bureau of the Census (2006a).

TABLE 3.12-9 Total Local Government Employment (in thousands, except where noted)

	1995	2005	Annual Growth Rate 1995–2005 (%)	2007
Arizona	218.8	281.8	2.6	296.2
California	1,479.6	1,771.3	1.8	1,811.6
Colorado	204.9	250.1	2.0	254.7
Idaho	67.1	77.2	1.4	79.6
Montana	56.3	55.5	–0.1	56.4
Nevada	73.5	100.4	3.2	106.0
New Mexico	110.7	128.1	1.5	130.4
Oregon	166.1	182.4	0.9	186.2
Utah	104.8	127.7	2.0	131.4
Washington	283.2	329.9	1.5	336.6
Wyoming	37.9	43.8	1.4	44.2
Total	2,802.9	3,348.2	1.8	3,433.3

Source: U.S. Bureau of the Census (2006a).

Growth in government employment in the 11 states has been varied over the period of 1995 to 2005. While the average for the region stood at 1.8% over the period, governments in Nevada, for example, increased their employment by 3.2%, with a smaller increase in Arizona (2.6%). The majority of the states were within half a percentage point of the regional average, while Oregon (0.9%) saw slower growth and Montana (–0.1%) experienced declining government employment.

3.12.1.10 Recreation and Public Land Use

Public land in the 11 western states has agricultural, mineral and energy resource extraction and distribution, and military uses, among several others (see Section 3.2 for a discussion of these land uses). Considerable portions of public land in some states have multiple economic uses, with numerous economic activities sharing or coexisting on land in specific locations (Table 3.12-10). Recreation is of particular importance in many areas where designated corridors may be located, as various natural, ecological, and cultural resources attract visitors who use these resources for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing.

Although visitation statistics are collected by the major federal land administering agencies for the more popular recreational activities and locations (see Tables 3.2-19, 3.2-20, and 3.2-21), the numbers of visitors to specific locations in the vicinity of the proposed corridors are not available, meaning that the value of all of these recreational resources in these areas cannot be estimated using a statistical approach.

Economic Valuation of Public Lands Used for Recreation. A simple way to quantify the value of recreation on public land would be to measure the revenue generated by user fees

TABLE 3.12-10 Economic Use of Public Lands (millions of acres)[a]

	Grazing	Timber Production[b]	Energy Production[c]	ROWs	Recreation[d]	Military
State						
Arizona	11.5	2.4	0.0	0.3	21.0	4.4
California	8.2	10.1	0.2	0.2	40.2	3.9
Colorado	7.7	8.0	1.4	0.2	26.5	0.5
Idaho	11.8	12.6	0.0	0.3	34.3	0.1
Montana	8.1	12.4	0.8	0.2	34.2	0.0
Nevada	45.8	0.3	0.3	0.6	14.9	3.4
New Mexico	12.6	2.8	3.9	0.4	13.9	3.5
Oregon	13.6	14.4	0.1	2.5	31.7	0.1
Utah	22.1	3.6	1.1	0.4	18.5	1.8
Washington	0.0	0.0	0.0	0.0	11.6	1.0
Wyoming	17.5	4.1	4.0	0.3	14.3	0.0
Total	158.9	70.7	11.9	5.5	261.0	18.6

[a] Categories of economic use are not necessarily exclusive, with public land often managed to support multiple economic uses.

[b] Land leased for timber production by BLM and FS.

[c] Land leased for oil, gas, geothermal, and coal production, and other uses.

[d] Includes land managed by the BLM, BOR, NPS, and USFWS.

and other charges for public use. However, visitation statistics are often incomplete, and in many cases federal and state agencies do not charge visitors a fee for entrance to recreational resources on public lands, and where these are charged, they may be nominal compared to the value of the visit to recreational users. Recreation undertaken using privately owned facilities, such as golf clubs, horse ranches, or fishing on private waters has a quantifiable market value, with the user paying rates for visiting these facilities that reflect the value of the resource to its owners and the cost of providing access to it to visitors. With the majority of recreation in the immediate vicinity of proposed corridor locations likely to occur on public lands, however, the economic value of these resources is more difficult to quantify, as no valuation of the use of these resources can be made through the marketplace.

A number of methods have been used to provide a determination of the use value of non-marketed recreational goods, or the value of a recreational resource on public lands that may be for used for recreation. As recreational resources on public land are scarce, and recreational activities provide enjoyment and satisfaction, the amount visitors would pay over the actual cost of using these resources represents the value of the benefit of these resources to the public. One method of estimating the net willingness to pay, or consumer surplus, associated with resources on public lands used for recreation is the travel cost method. This method uses the variation in the cost of traveling different distances and the number of trips taken over each distance as a way to represent the demand for recreational resources in any given location (Loomis and Walsh 1997).

In addition to use values, a certain portion of the value of resources used for recreation may lie in the passive use of a resource, or the extent of the availability of the resource to current and future generations. Attempts to establish passive use values, or the willingness to pay for, or accept compensation for the loss of, different levels of non-marketed recreational resources on public lands have used contingent valuation methods, which rely on telephone interviews or questionnaire surveys. Typically, a description of a particular resource is presented to respondents, who are then asked to place a dollar value on their use of the resource, or on the preservation of the resource (Loomis 2000).

Although the travel cost and contingent valuation methods have weaknesses, particularly with regard to the accuracy of questions asked and respondents' self-reporting errors, both have been used widely by government agencies in benefit-cost analyses of outdoor recreation. The U.S. Bureau of Reclamation, for example, used contingent valuation to place a value of the impact of hydropower activities in Utah and Colorado on fishing and rafting (BOR 1996), the U.S. Department of the Interior used the method in establishing the value of natural resources damaged by oil spills in Alaska (DOI 1994), and various state agencies have used the travel cost and contingent valuation methods for valuing wildlife-related recreation (Loomis 2000).

Loomis (2000) reports the results of various studies that used survey data and travel cost and contingent valuation methods to estimate the value of recreation in wilderness areas in Colorado and Wyoming. Based on data reported in these studies, the average value per day of visiting a wilderness area for recreation was estimated to be $26 (1996 dollars), meaning that a visitor would be willing to pay this amount over trip travel cost rather than lose a day visiting an area for recreation. Multiplying this number by the number of visitors to a specific wilderness resource would give the value of the resource to the public (Loomis 2000).

Contingent valuation has also been used to establish the willingness to pay to preserve existing wilderness areas and additional acreage that might be designated as wilderness. Based on two surveys of Colorado and Utah residents, Walsh (1984) and Pope and Jones (1990) found that passive use values varied with the level of wilderness already designated in a state, but at a decreasing rate. Passive use value was also found to represent about half of the economic value of a resource, equaling the use value of the resource to a household as a place for recreation. The same surveys found that residents in Colorado and Utah and in the rest of the United States would pay between $220 per additional acre, if 5 to 10 million acres of wilderness resources were to be preserved in the two states, and $1,246 per acre if only 1.2 million additional acres were preserved. Passive use values in the western United States were estimated to be $168 per acre, or about $7.2 billion when applied to all wilderness land in the West.

Economic Impact of Recreational Activities. The economic value of recreation in each state in which the proposed corridors are located can be estimated by measuring the impact recreation has on the economy of each state by identifying sectors in each state economy in which expenditures on recreational activities occur (see Table 3.12-11). Although not all activities in these sectors are directly related to recreation on federal lands, with some activity also occurring on private land (dude ranches, golf courses, bowling alleys, movie theaters, etc.), it is likely that the majority of individuals drawn to recreational activities in these sectors are primarily attracted by the prospect of visiting recreational resources located on adjacent federal land.

Expenditures associated with recreational activities form an important part of the economies of the states in which they are located. In 2004, there were more than

TABLE 3.12-11 State Recreation Sector[a] Activity, 2004

State	Employment	Share of State Employment	Income ($m)
Arizona	273,983	12.0%	4,794
California	1,730,357	12.0%	35,173
Colorado	294,604	13.7%	5,362
Idaho	69,129	12.1%	880
Montana	66,108	16.5%	874
Nevada	265,717	24.4%	6,678
New Mexico	96,818	12.5%	1,387
Oregon	186,251	11.9%	3,111
Utah	119,943	11.2%	1,739
Washington	312,811	11.8%	6,078
Wyoming	34,872	13.9%	467

[a] The recreation sector includes amusement and recreation services, automotive rental, eating and drinking places, hotels and lodging places, museums and historic sites, RV parks and campsites, scenic tours, sporting goods retailers.

1.7 million people employed in California in the various sectors identified as recreation, constituting 12% of total state employment (Table 3.12-11). Recreation spending also produced more than $35 billion in income in the state in 2004. Recreational activities in Washington supported 312, 811 jobs in 2004 and produced $6.1 billion in income, with smaller totals in Colorado (294,604 jobs and $5.4 billion in income), Arizona (273,983 jobs and $$4.8 billion in income), and Nevada (265,717 jobs and $6.7 billion in income). Recreation employment in most of the 11 western states was between 11% and 14% of total state employment, with higher shares in Nevada (24%) and Montana (17%).

3.12.2 How Were Potential Impacts of Corridor Designation to Socioeconomic Conditions Evaluated?

As changes in land use plans on federal land to allow energy transport facility construction under No Action and the designation of energy corridors under the Proposed Action would not result in any physical change in the natural environment, the socioeconomic impacts of land use plan changes and corridor designation are limited. Evaluation of the main impacts on property values on private land and on restrictions on other economic uses of designated energy corridor land was undertaken qualitatively based on experience analyzing other energy development projects.

3.12.3 What Are the Potential Effects to Socioeconomic Conditions of the Alternatives, and How Do They Compare?

3.12.3.1 No Action Alternative

Under No Action, utilities would continue to pursue the siting, construction, operation, and decommissioning of energy transport projects independently of an expedited process for the development of transport facilities on federal land. Although individual projects may involve construction on federal land with no corridor designation or coordinated permitting process for the approval of energy transport projects, the timing and scale of socioeconomic impacts and the extent to which federal land might be used for energy development are not known. The local impacts of land use plan changes to allow the development of energy transport projects, including changes in property values on private land and restrictions on other uses of federal lands, and the subsequent socioeconomic impacts of construction, operation, and decommissioning of energy facilities would be evaluated at the project-specific level, and would incorporate by reference the data, methods, and discussion of impacts of the construction and operation of four types of energy transport systems presented in Appendix W, over given lengths of federal land shown in Appendix G.

3.12.3.2 The Proposed Action

Under the Proposed Action, utilities would benefit from an expedited permitting process and the colocation of auxiliary facilities and other related infrastructure in designated corridors. However, as corridor designation would not entail the construction, operation, and decommissioning of energy transport facilities, the impact of designation of federal land as part of energy transport corridors would likely be limited to changes in property values on private land and restrictions on existing or additional uses of federal lands.

Changes in property values may occur on private land adjacent to designated corridors, on private land that might be used to connect designated corridors where contiguous parcels of federal land are not available, in communities where the visual impacts of energy transport projects may affect the resale value of land, or where construction access and operations activities produce local road congestion, affecting property values. The precise nature of the impact of designation on property values would depend on the range of alternate uses of specific land parcels available to landowners' current property values and the perceived value of costs (visual impacts, traffic congestion, noise and dust pollution, electromagnetic field effects) and benefits (infrastructure upgrades, utility hookups, cheap and reliable energy supplies, local tax revenues) from proximity to a designated corridor that may be used for energy development to potential purchases of property owned by individuals residing in local communities. As there are a range of socioeconomic environments and land use types along designated corridors in each of the 11 western states, the impacts of designation on property values would likely vary by location.

Designation of federal lands for energy transport corridors may restrict existing or other additional uses of federal lands, particularly agriculture, logging, ranching, mining and minerals extraction, tourism, and recreation, if land parcels are partially or exclusively reserved for energy corridor development. The impacts would also vary by location along proposed corridors, depending on land use types impacted, which would affect minerals extraction and rangeland agriculture, for example, and geomorphological characteristics, which would affect tourism and recreation.

Even with corridor designation on federal land, utilities may choose not to use a designated corridor for specific energy projects, preferring the siting of facilities independently of an expedited process, meaning that it is difficult to predict the impacts on property values in the vicinity of designated corridors and on other economic uses of federal land.

3.12.3.3 How Do the Potential Effects Compare between the Alternatives?

As the impacts of each alternative on property values on private land and other economic uses of federal lands would likely be related to the amount of federal land anticipated to be needed for energy transport development, the impacts of each alternative can be compared on this basis.

Under the No Action Alternative, the absence of an expedited permitting process may mean less federal land would be utilized compared to the other alternatives if energy transport projects would be more easily permitted on private land, or may mean that more federal land is used if facilities cannot take advantage of colocation, as would be the case with an expedited process. As the location and timing of land use changes under No Action cannot be anticipated in the absence of corridor designation, the impacts of this alternative would be unpredictable. Under the Proposed Action, corridor designation would make clear the location of potential energy developments and would likely mean more federal land would be designated for energy transport development than under No Action. Based simply on the amount of federal land involved in designation, impacts to other economic uses of public lands would probably be larger under the Proposed Action than for the No Action Alternative. Impacts of corridor designation under the Proposed Action on property values cannot be determined.

3.12.4 Following Corridor Designation, What Types of Impacts Could Result to Socioeconomic Conditions with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

3.12.4.1 What Are the Usual Impacts to Socioeconomic Conditions of Building and Operating Energy Transport Projects?

Economic and fiscal impacts of energy transport project construction, operation, and decommissioning in each state include direct impacts, which include the construction expenditures and employment associated with building and decommissioning the transmission lines, pipeline systems, and ancillary facilities, and indirect effects, which include the subsequent impacts in each state resulting from the spending of project wages and salaries, as well as from expenditures related to the procurement of material and equipment and the collection of sales and income tax revenues. The construction, operation, and decommissioning of energy transport projects under each alternative would produce employment and generate income and state tax revenues and would likely require the in-migration of workers for certain occupational categories, which in turn would affect rental housing markets and create the need for additional state and local government expenditures and employment. Development may also affect property values on private land in the vicinity of energy transport developments and other economic uses of public land, if transport projects preclude activities such as agriculture, logging, ranching, mining and minerals extraction, tourism, and recreation.

In addition to the economic and fiscal impacts of corridor development, there may be social impacts that may occur as a result of energy corridor development and the associated in-migration of population into small rural communities during project construction. These may include increases in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction and social change.

The precise magnitude and timing of the socioeconomic impacts of corridor designation and the location and size of the resulting construction and operation of energy facilities are not known at this time. These would be evaluated at the project-specific level and would incorporate by reference the data, methods, and discussion of impacts of the construction and operation of four types of energy transport systems over given lengths of federal land shown in Appendix G.

3.12.4.2 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Socioeconomic Conditions?

Under each of the alternatives, mitigation of socioeconomic impacts is unlikely to be required. Although future construction of energy transport projects within the proposed corridors or in No Action ROWs is likely to require some in-migration of workers and family members from outside each state, the number of in-migrants arriving in each state is likely to be small, and not likely to create impacts to rental housing markets, and likely to require only small increases in local government expenditures and employment.

3.13 ENVIRONMENTAL JUSTICE

Executive Order 12898 (February 16, 1994) requires federal agencies to include environmental justice as a part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations. Assessment of the potential environmental justice impacts associated with the proposed energy transport corridor designation followed guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997a). In addition to their use in this PEIS, the data and methods used in this section should also be used at the implementation stage for individual energy transport projects.

3.13.1 What Environmental Justice Populations Would Be Associated with Energy Corridor Development in the 11 Western States?

Demographic data from the 2000 census (U.S. Bureau of the Census 2006b) was used to describe the geographic distribution of minority and low-income populations in the affected area. The following definitions were used to define minority and low-income individuals.

Minorities. Individuals identifying themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

Beginning with the 2000 census, the census form allows individuals to designate, where appropriate, multiple population group categories to reflect their ethnic or racial origin(s). In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of their racial origins. The term "minority" includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or Other Race (U.S. Bureau of the Census 2006b).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applied both criteria in using the Census Bureau data for census block groups, wherein consideration was given to the minority population that is both more than 50% of the population of the affected area and 20 percentage points higher than the minority population percentage in the state (the reference geographic unit).

Low-income population. Individuals were included who fell below the poverty line. The poverty line takes into account family size and the ages of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882 (U.S. Bureau of the Census 2006b). For any given family below the poverty line, all family members are considered as being below the poverty line, for the purposes of analysis.

The CEQ guidance proposed that low-income populations should be identified where either (1) the low-income population of the affected area exceeds 50%, or (2) the low-income population percentage of the affected area is meaningfully greater than the low-income population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applied both criteria in using the Census Bureau data for census block groups, wherein consideration was given to the low-income population that is both more than 50% of the population of the affected area and 20 percentage points higher than the low-income population percentage in the state (the reference geographic unit).

Data in Table 3.13-1 shows the minority and low-income composition of the total population located in a 2-mile buffer zone associated with the proposed energy corridors in the 11 western states, based on 2000 census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

There are a large number of minority individuals located within the 2-mile buffer zone in some of the 11 western states that would potentially host energy transport system developments on federal lands. In New Mexico, 56% of the population residing within the 2-mile buffer are classified as minority, with 38% in the California buffer, 31% in Arizona, and 25% in Nevada. While the state percentage of minority individuals in the buffer does not exceed the state average by 20 percentage points or more in any of the 11 states, the number of minority persons within the buffer in New Mexico exceeds 50% of the total population, meaning that the buffer in this state has a minority population defined by CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more in any of the states, and does not exceed 50% of the total population in any of the states, which means that there are no low-income populations in any of the 11 western states, according to CEQ guidelines.

3.13.2 How Were the Potential Effects of Corridor Designation on Environmental Justice Evaluated?

Evaluation of the potential impacts of energy transport corridor designation involved (1) an assessment as to whether the impacts of construction, operation, and decommissioning would produce impacts that are high and adverse, and (2) a determination as to whether any high and adverse impacts would disproportionately affect minority and low-income populations. In the event that impacts were found to be high and adverse, disproportionality would be determined by comparing the proximity of impacts to the locations of low-income and minority populations. If impacts are not high and adverse, there can be no disproportionate impacts on minority and low-income populations.

As changes in land use on federal land to allow energy transport facility development under No Action and the designation of energy corridors under the Proposed Action would not result in any physical change in the natural environment, the impacts of land use changes and corridor designation that might affect environmental justice are limited. Evaluation of access to ecological resources that may be of cultural or religious significance, changes in property values on private land, and restrictions on other economic uses of rezoned or designated energy corridor land was undertaken qualitatively based on experience analyzing other energy projects.

TABLE 3.13-1 Corridor and Corridor Buffer Minority and Low-Income Populations Located in a 2-Mile Buffer Zone Associated with the Proposed Energy Corridors

	Arizona	California	Colorado	Idaho	Montana	Nevada
Total Population	185,072	391,506	113,594	122,417	47,520	383,964
White, Non-Hispanic	127,565	242,620	100,008	106,757	44,645	287,643
Hispanic or Latino	45,559	102,635	10,274	12,174	755	56,603
Non-Hispanic or Latino Minorities	11,948	46,251	3,312	3,486	2,120	39,718
One Race	9,708	37,526	1,840	1,939	1,432	31,374
Black or African American	1,024	20,642	363	231	74	10,253
American Indian or Alaskan Native	7,465	4,898	920	819	1,127	7,479
Asian	899	10,351	373	736	187	11,695
Native Hawaiian or Other Pacific Islander	179	691	86	62	16	1,400
Some Other Race	141	944	98	91	28	547
Two or More Races	2,240	8,725	1,472	1,547	688	8,344
Total Minority	57,570	148,886	13,586	15,660	2,875	96,321
Low-Income	29,837	46,084	11,072	14,887	4,965	35,560
Percent Minority	31.1	38.0	12.0	12.8	6.1	25.1
Percent Low-Income	16.1	11.8	9.7	12.2	10.4	9.3
State Percent Minority	36.2	53.3	25.5	12.0	10.5	34.8
State Percent Low-Income	13.9	14.2	9.3	11.8	14.6	10.5

TABLE 3.13-1 (Cont.)

	New Mexico	Oregon	Utah	Washington	Wyoming
Total Population	118,110	120,364	131,957	11,901	67,966
White, Non-Hispanic	51,584	107,512	119,609	10,163	59,996
Hispanic or Latino	52,319	6,671	7,938	1,341	5,899
Non-Hispanic or Latino Minorities	14,207	6,181	4,410	397	2,071
One Race	12,860	3,821	3,076	213	2,055
Black or African American	641	519	394	22	252
American Indian or Alaskan Native	11,556	2,192	1,922	109	650
Asian	492	840	517	64	234
Native Hawaiian or Other Pacific Islander	35	122	157	9	31
Some Other Race	136	148	86	9	88
Two or More Races	1,347	2,360	1,334	184	816
Total Minority	66,526	12,852	12,348	1,738	7,970
Low-Income	27,581	13,487	12,527	1,261	7,226
Percent Minority	56.3	10.7	9.4	14.6	11.7
Percent Low-Income	23.4	11.2	9.5	10.6	10.6
State Percent Minority	55.3	16.5	14.7	21.1	11.1
State Percent Low-Income	18.4	11.6	9.4	10.6	11.4

Source: U.S. Bureau of the Census (2006b).

3.13.3 What Are the Potential Effects to Environmental Justice of the Alternatives, and How Do They Compare?

3.13.3.1 No Action Alternative

Under No Action, utilities would continue to pursue the siting, construction, operation, and decommissioning of energy transport projects independently of an expedited process for the development of transport facilities on federal land. Although individual projects may involve construction on federal land with no corridor designation and a coordinated permitting process for the approval of energy transport projects, the timing and scale of environmental justice impacts, the extent to which federal land might be used for energy development, and the location of this land are not known at this time. The local impacts of land use plan changes to allow the development of energy transport projects, including changes in access to ecological resources that may be of cultural or religious significance, changes in property values on private land and restrictions on other uses of federal lands, and the subsequent socioeconomic impacts of construction and operation of energy facilities on federal and private land would be evaluated at the project-specific level.

3.13.3.2 The Proposed Action

Under the Proposed Action, utilities would benefit from an expedited permitting process and the colocation of auxiliary facilities and other related infrastructure in designated corridors. Although corridor designation would not entail the construction, operation, and decommissioning of energy transport facilities, corridor designation for energy transport facilities might impact access to certain animals or vegetation types that may be of cultural or religious significance to certain population groups or form the basis for subsistence agriculture. The curtailment of various economic uses of federal lands with energy corridor designation, such as leasing for mineral, energy, and forestry resource development, may also affect minority and low-income populations if minority and low-income individuals involved in specific resource developments are concentrated in impacted local communities.

Property value impacts on private land in the vicinity of corridor developments may also affect minority and low-income populations, depending on the extent to which these population groups are concentrated in impacted local communities. Changes in property values may occur on private land adjacent to designated corridors, on private land that might be used to connect designated corridors where contiguous parcels of federal land are not available, in communities where the visual impacts of energy transport projects may affect the resale value of land, or where construction access and operations activities produce local road congestion, affecting property values. The precise nature of the impact of designation on property values would depend on the range of alternate uses of specific land parcels available to landowners' current property values and the perceived value of costs (visual impacts, traffic congestion, noise and dust pollution, electromagnetic field effects) and benefits (infrastructure upgrades, utility hookups, cheap and reliable energy supplies, local tax revenues) from proximity to a designated corridor that may be used for energy development to potential purchasers of property owned by minority and low-income individuals in local communities. As there are a range of socioeconomic environments and land use types along designated corridors in each of the 11 western states, the potential impacts on property values would likely vary by location.

With the exception of the minority population in New Mexico, the minority and low-income populations in each of the 11 western states are neither more than 50% of the population of the buffer area, nor 20 percentage points higher than the minority population percentage in each state, meaning that if impacts of corridor designation under the Proposed Action were found to be high and adverse, with the exception of the minority population in New Mexico, impacts to environmental justice populations would not be disproportionate.

3.13.3.3 How Do the Potential Effects Compare between the Alternatives?

As the impacts of each alternative on property values on private land and other economic uses of public lands would be related to the amount of land it is anticipated would be needed for energy transport development, the environmental justice impacts of each alternative can be compared on this basis.

Under the No Action Alternative, the absence of an expedited permitting process may mean less federal land would be utilized compared to the other alternative if energy transport projects would be more easily permitted on private land, or it may mean that more federal land is used if facilities cannot take advantage of colocation, as would be the case with a coordinated process. As the location and timing of zoning changes under No Action cannot be anticipated in the absence of corridor designation, the potential impacts of future project development under this alternative would be unpredictable. Under the Proposed Action, corridor designation would make clear the preferred location of potential energy transport developments on federal lands, although the timing of any actual project development would also be unpredictable. Thus, impacts of corridor designation under the Proposed Action on property values cannot be determined.

Even with corridor designation on federal land, utilities may choose not to use a designated corridor for specific energy projects, preferring the siting of facilities independent of an expedited process, meaning that predicting the impacts on resources that may be of cultural or religious significance, impacts on property values, and impacts on other economic uses in the designated corridors under the Proposed Action is difficult. With the exception of the minority population in New Mexico, the minority and low-income population in each of the 11 western states is neither more than 50% of the population of the corridor and buffer area nor 20 percentage points higher than the minority population percentage in each state, meaning that if impacts of corridor designation under the Proposed Action were found to be high and adverse, with the exception of impacts to the minority population in designated corridors and buffers in New Mexico, there would be no disproportionate impacts to minority and low-income populations.

3.13.4 Following Corridor Designation, What Types of Impacts Could Result to Environmental Justice with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

In addition to impacts on accessibility to ecological or cultural resources, property values, and other economic issues on federal land, the analysis of the environmental justice impacts of construction and operation of energy transport projects would consider the following impacts: noise and dust generated during the construction and decommissioning of the electrical and pipeline facilities, noise and EMF effects associated with energy project operations, and the visual impacts of electricity transmission towers and other energy facilities.

Noise and dust impacts generated during the construction and decommissioning of energy transport systems and other facilities would likely be minimal, given the typically small amount of land that is disturbed and the relative remoteness of the locations of the energy corridors. A more significant issue may be impacts from the access roads that would be required during construction for the delivery of equipment and materials to energy project sites. There may be environmental justice issues associated with the construction of any type of energy transport projects within designated corridors or project ROWs, depending on such factors as the various terrains across which these roads would be constructed, access road lengths, the lengths of time the roads would be used for construction traffic, and the proximity of access roads to minority and low-income populations.

A major potential environmental justice impact of energy transport project development and operation might be the visual impact of the electricity transmission towers and other infrastructure associated with each energy transport project. Although a preliminary screening process excluded development on federal lands that are designated as being of scenic quality or interest, energy transport projects may potentially alter scenic quality in areas of traditional or cultural significance to minority and low-income populations. Impacts from project operation could also create an environmental justice issue if noise impacts from an energy transport project are significant. The extent to which noise is an issue would depend on the number of towers and other facilities in any specific energy project (see Section 3.7), the exact location of infrastructure relative to areas of traditional or cultural significance, and the block groups with communities where low-income or minority populations are disproportionately represented.

3.13.5 What Measures Would Mitigate the Potential Environmental Justice Impacts under the Alternatives?

The mitigation of environmental justice impacts associated with the visual impacts of electricity transmission lines may include siting the towers and other facilities to minimize contrast with scenic views, using appropriate construction materials that minimize scenic contrast, and avoiding construction near traditional and cultural sites that are important to low-income and minority populations. A more complete listing of possible mitigation measures is presented in Section 3.9.

Noise and dust impacts during the construction of energy transport projects and noise and EMF effects during project operation or impacts to property values and to other economic uses of federal land during construction or operation would not likely produce impacts that are high and adverse to the general population. Similar impacts to minority and low-income populations would also be expected, with no additional mitigation required. Noise and dust impacts during construction, particularly those associated with the construction of access roads, could be reduced using standard mitigation methods (see Sections 3.7 and 3.6, respectively), while noise and EMF effects during project operation would be minimal because of the remote locations of the majority of the energy corridor projects.

Mitigation measures to address any environmental justice impacts of specific corridor developments will be included as part of site-specific NEPA analyses of individual energy transmission projects.

3.14 HEALTH AND SAFETY

3.14.1 What Are the Potential Health and Safety Impacts Associated with Corridors in the 11 Western States?

The designation of Section 368 energy corridors would not in itself result in any health and safety impacts or concerns. Public and worker health and safety issues and concerns materialize only with the construction of energy transport projects within designated corridors and adjacent private parcels or within ROWs developed under the No Action Alternative.

3.14.2 How Were Potential Health and Safety Impacts Evaluated?

The energy transport systems considered eligible for introduction into designated energy corridors include high-voltage (i.e., greater than 69 kV) electricity transmission and natural gas, liquid petroleum, and hydrogen transport via pipeline. With the exception of hydrogen transport, the transport over long distances of electricity, natural gas, and liquid petroleum products (crude oils as well as petroleum distillate fuels and petrochemical feedstocks) all involve well-developed and well-understood technologies.

There is a very large body of practical experience in the design, installation, and operation of each of these technologies. The health and safety aspects of each technology are also addressed in regulations promulgated by various federal and state agencies as well as in accepted industry standards and practices. While the primary purpose of these regulations and protocols is to ensure the safe construction and safe and reliable operation of these energy transport systems, there are also controls in place to mitigate health or safety aspects to the public (e.g., control access to hazardous areas) and to educate the public on potential hazards (e.g., required warning signage). Consequently, a careful review of the industry responses to those regulations and industry protocols constitutes a reliable methodology for identifying potential or expected health and safety impacts of each individual technology.

The evaluation methodology for identifying health and safety concerns for long-distance hydrogen pipelines is somewhat different since very little empirical data are available for this technology. While it is intuitive that the initial design basis for long-distance hydrogen pipelines will be derived largely from experiences in the design, installation, and operation of natural gas and liquid petroleum pipelines, unique properties of hydrogen will dictate modifications to component design as well as the development of unique construction and operating techniques for long-distance hydrogen pipelines.

Because this is an emerging technology, certain critical design factors that can greatly influence health and safety, such as expected system operating pressures (which may be substantially higher than those for natural gas transport) have not yet reached consensus. Additionally, material research that is currently under way to identify unique requirements for mainline pipe and other system components for successful transport of hydrogen may also dictate unique construction and operating strategies. Consequently, the evaluation of health and safety concerns for hydrogen pipelines begins by considering those concerns associated with natural gas pipeline design, construction, and operation that are most likely to also be associated with hydrogen pipelines and then goes on to review the state of research and development into design and construction of long-distance hydrogen transport systems to identify additional unique health and safety concerns that may materialize.

A different approach is also required to identify those health and safety impacts that are unique to the juxtaposition of different energy transport technologies within energy corridors. Here, the body of practical experience is somewhat limited, although many of the interferences that exist between transport technologies and that can reduce the reliability of adjacent systems or lead to or exacerbate health or safety impacts have already been identified, and adjustments to design and operational procedures have been incorporated into industry standards and practices to account for and mitigate these interferences and impacts. And while there are myriad examples of the safe and reliable coexistence of energy transport technologies in close proximity, not all permutations of technology juxtapositions have generated sufficient amounts of data to support in-depth study or summary determinations on related health and safety impacts.

Likewise, there is limited experience in increased health and safety impacts resulting from off-normal events when two or more energy transport systems are colocated, although intuitively, increases in the scope and severity of impacts from off-normal events and the complexity of the response action would result from the involvement or near presence of another energy technology. Therefore, identification of the health and safety impacts that derive solely from the proximate existence of other energy transport technologies requires not only reviewing the current literature for explicit examples but also deliberately considering (1) how events that occur in one transport technology may affect adjacent technologies and (2) how to infer additional health and safety impacts from these interferences.

3.14.3 What Are the Potential Effects to Health and Safety of the Alternatives, and How Do They Compare?

3.14.3.1 No Action Alternative

Under the No Action Alternative, energy transport projects would be sited and implemented in project-specific ROWs on both private and public lands. Each type of project (transmission line or pipeline) would have unique health and safety concerns associated with construction, operation, and decommissioning (see Section 3.14.4 below). The majority of these concerns extend primarily or exclusively to the workforces needed for construction, operation, and decommissioning. Some of these health and safety concerns may also impact the public in all phases of the project's life cycle, although the severity of a majority of those impacts to the public decreases rapidly as the distance from the energy transport system increases.

Transmission lines and pipelines are all subject to federal (FERC, Department of Transportation's Office of Pipeline Safety [DOT/OPS], OSHA, EPA) and state regulations that focus on the protection of workers and the protection of public health and the environment. The regulations promulgated by these agencies incorporate design and/or operating requirements intended specifically to avoid or mitigate impacts to health and safety. Likewise, nonenforceable industry standards are based largely on ensuring safe construction and reliable (i.e., safe) operation. Energy transport projects installed under No Action would be subject to these applicable and relevant regulations and industry standards. Under the No Action Alternative, it is reasonable to conclude that all relevant regulations and industry standards and practices would be applied uniformly and equitably to all projects, regardless of location. Consequently, there would be no significant differences to health and safety impacts under No Action for routine construction, operation, and decommissioning of any of the energy transport systems that may be developed in designated corridors.

Development of energy transport projects within the designated energy corridors is assumed to occur from the corridor centerlines outward, although some projects may be placed at or near the edges of the corridors. Development from the centerline outward would preserve, to the greatest extent and for the longest period of time possible, buffer zones at the outer edges of the designated corridors. It is assumed that these vacant buffer zones would remain and that land use within the zones would continue to be under the control of the federal lands agencies in these locations, which would prevent incompatible land uses or uses that would increase impacts on the public. Such buffer zones have the effect not only of reducing the severity of construction- and routine operations-related health and safety impacts on the nearest public receptor, but also reducing the severity of impacts from off-normal events such as ground faults, fires, or explosions.

Under No Action, minimum distances to public receptors or compatible land uses in areas proximate to energy systems cannot be guaranteed. Developers would seek to secure construction ROWs that are only as wide as needed to establish the area needed for construction. Similarly, requested operating ROWs can be expected to be only as wide as needed to ensure adequate access and reliable operation free of interferences. Consequently, for projects occurring on federal land under the No Action Alternative, it is likely that ROWs would be only as wide as necessary; however, federal land managers would nevertheless be in a position to control adjacent land usage to ensure adequate separation to the nearest public receptor. However, for ROWs established on private lands under the No Action Alternative, there is no mechanism in place to guarantee minimum safe distances to public receptors or compatible land uses in areas proximate to energy systems.

Thus, under No Action, regulatory controls and industry standards would still be fully in effect regardless of where energy transport projects are located; therefore, no changes to the health and safety impacts on workers are anticipated. However, there is a slightly increased potential for increased impacts on nearby public receptors in those situations (or locations) where ideal buffer zones and compatible land uses would not be maintained.

The development of an energy transport system project in areas with high potential for geologic hazard may increase the likelihood of a hazardous occurrence. While implementation of the projects would result in more individual ROWs, the potential for increased geologic hazard risks along these ROWs would depend on the specific locations of each project and its surrounding geologic environment.

3.14.3.2 The Proposed Action

The simple designation of energy corridors and subsequent land use plan amendments under the Proposed Action are not expected to affect health and safety. Health and safety considerations and impacts would arise only with the construction and subsequent operation and eventual decommissioning of energy transport projects within the designated corridors or on adjacent private lands through which those energy transport systems pass. Potential impacts would be associated primarily with the nature of the activity, rather than the location in which that activity is conducted. Consequently, health and safety aspects and impacts associated with these activities are largely aspatial and would not be substantially affected by specific locations. Nevertheless, as discussed below, there are some health and safety considerations that are either aggravated by, or uniquely affected by, natural circumstantial factors that may be present in some designated corridors.

Potential health and safety impacts from project construction and operation would occur regardless of considerations of land ownership or the designation status of the corridor segment in which the activity is taking place. However, formal corridor designations offer the best guarantee of comprehensive and equitable treatment of health and safety matters anywhere within the designated corridor through the application of appropriate federal lease stipulations or IOPs that may, in some instances, establish controls beyond those already in place in regulation or industry standards and practices. However, similar controls may not necessarily be in place for those segments of energy transport systems that extend into adjacent private lands.

Although activities related to construction, installation, operation, and decommissioning of energy transport projects display the potential for many common impacts regardless of the locations at which such activities take place, additional concerns or aggravated impacts may arise due to the presence of circumstantial factors. For example, construction activities in rugged terrain or in areas of heightened potential for natural hazards such as landslides and earthquakes impose additional unique hazards and increase the potential for impacts to occur. Often, such circumstances will dictate the use of unconventional construction techniques (e.g., airlift helicopters for transporting materials to remote locations), introducing additional health and safety impacts unique to such unconventional techniques.

In such areas, it is reasonable to expect that industry design, installation, and operating standards and procedures would be modified to account for the additional hazards to protect worker safety and to preserve long-term system integrity and reliability. The natural hazards that might be encountered in pursuit of the Proposed Action and thus would result in project-specific health and safety issues are discussed below. Each of these hazards has the potential to cause major structural damage to an energy transport project. However, the likelihood and magnitude of health and safety impacts from such natural events can only be evaluated at the project-specific level.

The risks that would be associated with geologic hazards under the Proposed Action hazards are site-specific and depend completely on the locations of individual projects, the type of energy transport project, and the local geologic setting. The following subsections describe the geologic hazards along the designated corridors under the Proposed Action on a regional basis. The common impacts caused by the geologic hazards are related to the threat of potential spills and fires if the integrity of the infrastructures is damaged. The magnitude of the impacts depends on the magnitudes of the spills and/or fires, implementation of the contingency plan, and the mitigation measures implemented after the hazards occur.

Higher levels of impacts would result from higher totals of miles affected within different categories of hazard zones. It should be noted that additional project sites that are not located in the designated corridors under the Proposed Action may exist on nonfederal lands. Similar geologic hazards could occur. They are not evaluated in this PEIS because the locations of these sites have not been decided. The evaluation should be addressed at the project level.

Volcanic Hazards. Figure 3.14-1 shows the locations of volcanoes younger than late Pleistocene within 20 miles of the designated corridors under the Proposed Action. California, Oregon, and Utah have the highest number of volcanoes located near the designated corridors (Figure 3.14-1) and the highest number of designated corridor acres likely to be affected by the volcanoes (Table 3.14-1). The numbers of volcanoes and/or volcanic fields and acres of nearby designated corridor likely affected are 11 volcanoes/volcanic fields and 149,630 acres in California, 8 volcanoes/volcanic fields and 55,170 acres in Oregon, 4 volcanoes/volcanic fields and 35,760 acres in Utah, 2 volcanoes/volcanic fields and 13,060 acres in Idaho, 2 volcanoes/volcanic fields and 11,730 acres in Nevada, and 1 volcanic field and 1,070 acres in Arizona.

Seismic Hazards. Low levels of ground-shaking hazards (with peak horizontal ground acceleration between >0.1 and 0.2 g) occur in 8 of the 11 western states (except Arizona, Colorado, and New Mexico). The five states with the highest total acres of designated corridors in low-level ground-shaking hazard areas are Nevada (128,812 acres), California (184,020 acres), Utah (20,178 acres), Montana (13,473 acres), and Oregon (11,934 acres) (Table 3.14-2). Other states affected by low-level ground-shaking hazards have no more than 3,970 acres of designated corridor intercepted (Washington). Figure 3.14-2 shows the ground-shaking hazards in the 11 western states.

In addition to low-level ground-shaking hazards, California also has 246,236 acres of designated corridors in intermediate (with peak horizontal ground acceleration between >0.2 and 0.4 g) and 25,439 acres in high (with peak horizontal ground acceleration between >0.4 and 1 g) ground-shaking hazards zones. Nevada has 215,341 acres of designated corridors in the intermediate ground-shaking hazards zone (Table 3.14-2).

Liquefaction. In eastern California, about 9,216 acres of the designated corridors are in an intermediate liquefaction hazard zone (fluvial

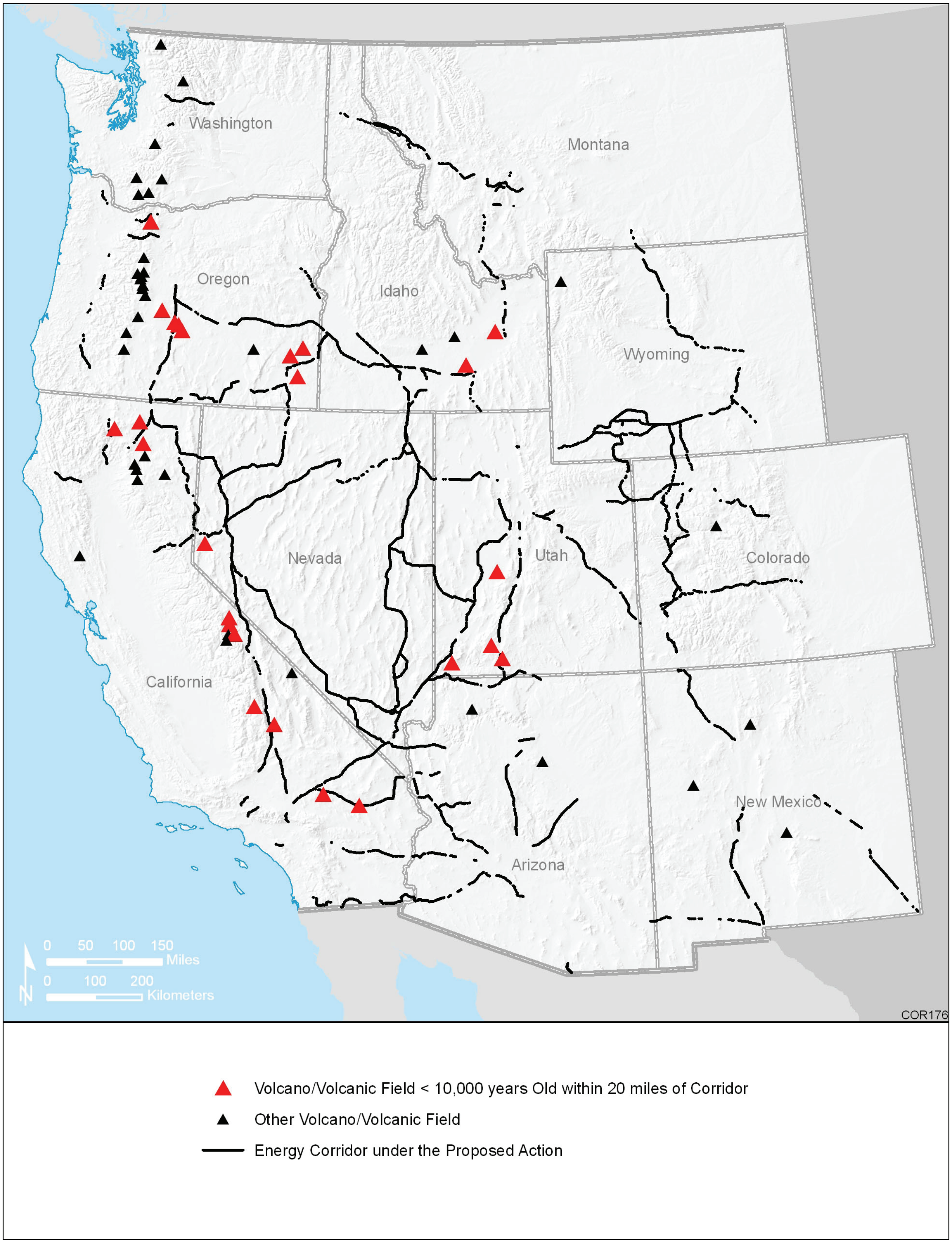

FIGURE 3.14-1 Locations of Active Volcanoes and the Designated Corridors

TABLE 3.14-1 Designated Corridor Segments and Acres of Segments within the Influence of Nearby Active Volcanoes under the Proposed Action

State	Segment	Volcano Name	Proposed Action Corridor Acres	Volcano Type
Arizona	113-116	Santa Clara	1,068	Volcanic field
California	27-41	Amboy	39,279	Cinder cone
California	3-8	Brushy Butte	5,659	Shield volcano
California	18-23	Coso Volcanic Field	27,449	Lava domes
California	23-106	Coso Volcanic Field	7,441	Lava domes
California	23-25	Coso Volcanic Field	2,830	Lava domes
California	18-23	Golden Trout Creek	6,043	Volcanic field
California	27-225	Lavic Lake	7,952	Volcanic field
California	27-266	Lavic Lake	8,361	Volcanic field
California	27-41	Lavic Lake	21,454	Volcanic field
California	18-23	Long Valley	1,518	Caldera
California	3-8	Medicine Lake	11,104	Shield volcano
California	8-104	Medicine Lake	4,926	Shield volcano
California	18-23	Mono Craters	1,430	Lava domes
California	18-23	Mono Lake Volcanic Field	1,838	Cinder cones
California	261-262	Shasta	1,772	Stratovolcano
California	6-15	Steamboat Springs	577	Lava domes
Idaho	50-203	Hell's Half Acre	2,927	Shield volcano
Idaho	49-112	Wapi Lava Field	9,817	Shield volcano
Idaho	49-202	Wapi Lava Field	312	Shield volcano
Nevada	18-23	Mono Lake Volcanic Field	2,432	Cinder cones
Nevada	15-17	Steamboat Springs	8,646	Lava domes
Nevada	6-15	Steamboat Springs	648	Lava domes
Oregon	7-11	Devils Garden	7,754	Volcanic field
Oregon	7-11	Four Craters Lava Field	6,183	Volcanic field
Oregon	10-246	Hood	3,046	Stratovolcano
Oregon	230-248	Hood	7,465	Stratovolcano
Oregon	16-24	Jackies Butte	1,399	Volcanic field
Oregon	24-228	Jackies Butte	6,723	Volcanic field
Oregon	7-24	Jackies Butte	588	Volcanic field
Oregon	24-228	Jordan Craters	4,830	Volcanic field
Oregon	7-11	Newberry Volcano	4,878	Shield volcano
Oregon	24-228	Saddle Butte	5,773	Volcanic field
Oregon	7-11	Squaw Ridge Lava Field	6,532	Volcanic field
Utah	116-206	Bald Knoll	6,470	Cinder cones
Utah	114-241	Black Rock Desert	1,580	Volcanic field
Utah	116-206	Markagunt Plateau	5,440	Volcanic field
Utah	113-114	Santa Clara	15,859	Volcanic field
Utah	113-116	Santa Clara	6,407	Volcanic field

TABLE 3.14-2 Designated Corridor Lengths Intercepted by Various Ground-Shaking Zones with a 10% Probability of Exceedance in 50 Years under the Proposed Action

	Lengths of Corridor Intercepted by Various Ground-Shaking Zones (acres)		
	Peak Horizontal Ground Acceleration (g)		
States	>0.1–0.2	>0.2–0.4	>0.4–1.0
California	184,020	246,236	25,439
Idaho	3,765		
Montana	13,473		
Nevada	128,812	215,341	
Oregon	11,934		
Utah	20,178		
Washington	3,964		
Wyoming	1,978		
Total	368,123	461,576	25,439

sediment intercepting the intermediate ground-shaking risk zone) and 889 acres in a high liquefaction hazard zone (fluvial sediment intercepting the high ground-shaking risk zone) (Table 3.14-3 and Figure 3.14-3). Low-level liquefaction hazard areas intercepted by the designated corridors occur in Arizona (6,090 acres), California (3,530 acres), Montana (1,190 acres), Nevada (13,720 acres), New Mexico (630 acres),Oregon (330 acres), Utah (8,890 acres), and Wyoming (590 acres) (Table 3.14-3). Their locations are shown in Figure 3.14-3.

Surface Rupture. Figure 3.14-4 shows the designated corridors that cross surface ruptures (or faults) younger than Later Pleistocene (<130,000 years before present). Table 3.14-4 lists the affected designated corridor segments. Most of the ruptures, a total of 72 out of 75, are Holocene and Late Pleistocene in age. There are only three historical faults less than 150 years in age. These occur in the Owens Valley fault zone and as unnamed faults in volcanic tablelands located in California and the Olinghouse fault zone in Nevada. Many of the faults may be crossed by the designated corridors several times (Table 3.14-4). Younger faults are more likely to be reactivated when earthquakes occur.

Most of the designated corridor-fault crossings occur in California (16) and Nevada (44). A few designated corridor-fault crossings occur in Arizona (4), Colorado (2), New Mexico (3), Oregon (2), and Utah (4) (Table 3.14-4).

Landslide Hazards. The locations where the designated corridors cross potential landslide areas are shown in Figure 3.14-5 and listed in Table 3.14-5. Those states with high total acres of corridors crossing high-incidence and high-susceptibility/moderate incidence landslide zones include Arizona (2,100 acres), California (10,890 acres), Colorado (67,800 acres), Nevada (4,490 acres), Oregon (2,010 acres), Utah (19,700 acres), and Wyoming (1,260 acres). Idaho also has designated corridors that cross high-incidence landslide zones but to a lesser

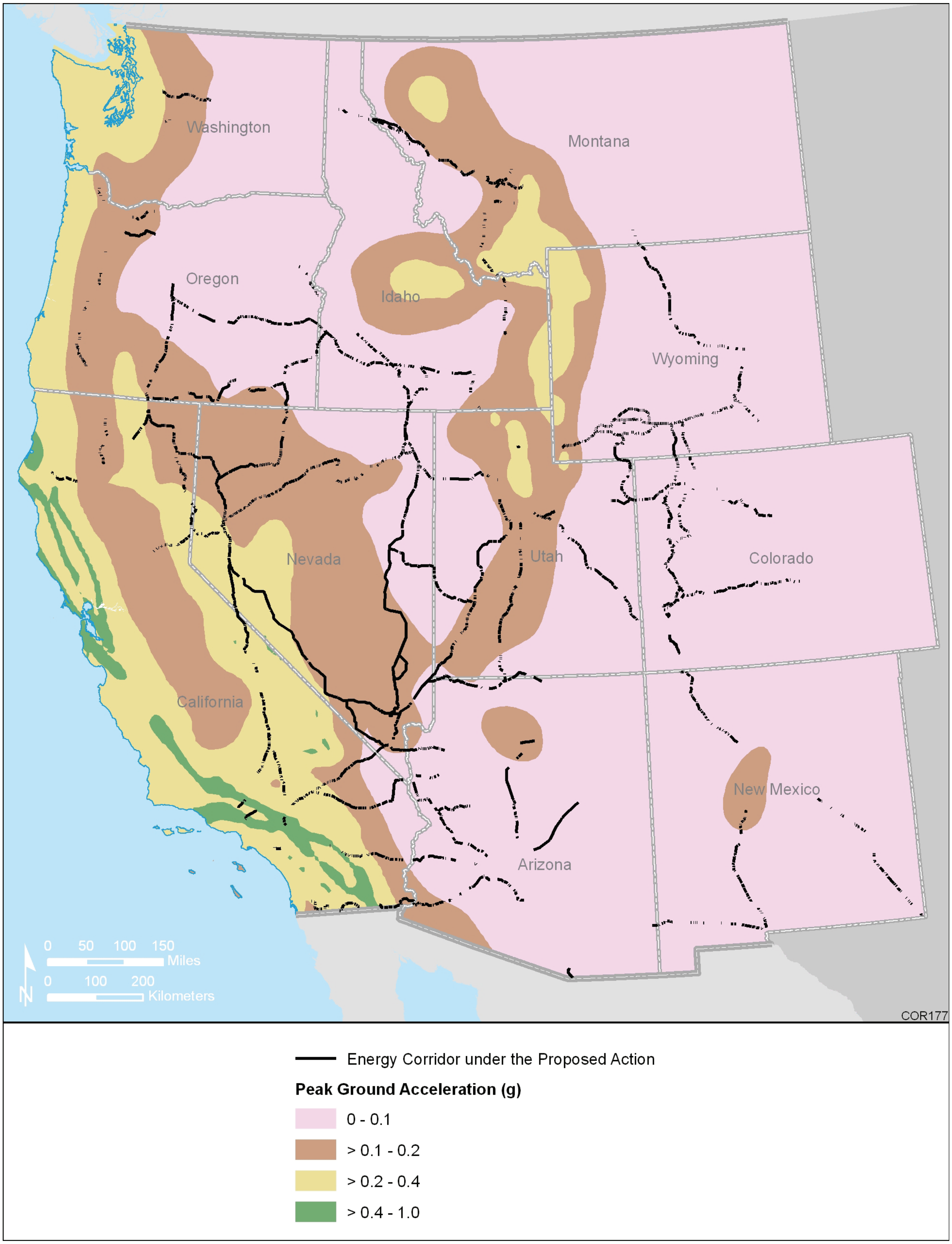

FIGURE 3.14-2 Locations of Various Ground-Shaking Zones with a 10% Probability of Exceedance in 50 Years under the Proposed Action

TABLE 3.14-3 Liquefaction Potential within the Designated Corridors under the Proposed Action

	Designated Corridor Acres per Potential Liquefaction Levels		
State	High	Intermediate	Low
Arizona			6,090
California	889	9,216	3,530
Colorado			0
Idaho			0
Montana			1,190
Nevada			13,720
New Mexico			630
Oregon			330
Utah			8,890
Washington			0
Wyoming			590

extent (Table 3.14-5). Several states have a relatively high amount of designated corridors that intercept moderate-incidence high-susceptibility/low-incidence, and moderate-susceptibility/low-incidence landslide zones, including Arizona (7,340 acres), California (19,170 acres) Colorado (183,950 acres), Montana (9,820 acres), Nevada (22,990 acres), Oregon (17,900 acres), Utah (21,880 acres), and Wyoming (44,570 acres).

3.14.4 Following Corridor Designation, What Types of Health and Safety Impacts Could Result with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

3.14.4.1 What Are the Usual Impacts to Health and Safety of Building and Operating Energy Transport Projects?

Although each of the energy transport systems is unique in its function, some common aspects are shared among the transport systems with respect to construction, operation, and decommissioning. For example, construction of any buried pipeline will involve similar activities of site clearing and preparation, excavation, and mainline pipe installation and burial, regardless of whether the pipeline carries gases or liquids. Construction of electrical towers also shares some of those activities (e.g., excavations for tower foundations). Consequently, it follows that there would be similar health and safety impacts common to the construction, installation, and decommissioning phases of the life cycles of each of the energy transport systems. Although the specific construction and operation activity dictates the majority of the health and safety considerations, circumstantial factors such as the size and complexity of the construction activities (including the potential for simultaneous construction of adjacent energy transport systems), weather extremes, rugged terrain, or remoteness of locations can aggravate them.

Detailed health and safety plans would typically address such factors and special arrangements (e.g., facilitated access to emergency medical attention) can ameliorate their impacts to a satisfactory extent. The

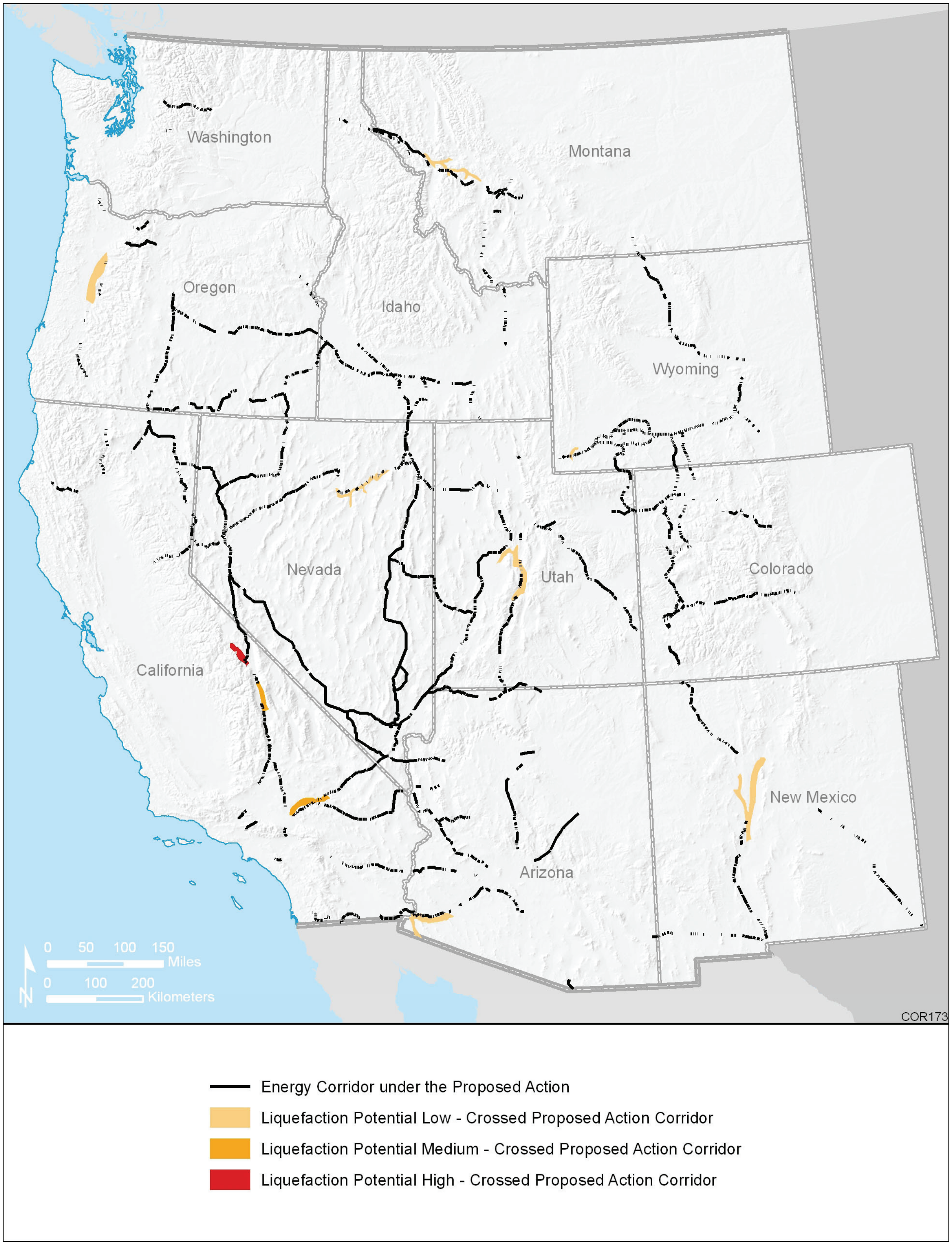

FIGURE 3.14-3 Liquefaction Hazards in the 11 Western States under the Proposed Action

FIGURE 3.14-4 Surface Ruptures (Faults) Crossed by the Designated Corridors under the Proposed Action

TABLE 3.14-4 Designated Corridor Segments Crossed by Surface Ruptures Younger Than Late Pleistocene (<130,000 years before present) under the Proposed Action

Segment	State	Fault Name	Age (in years)
113-116	Arizona	Dutchman Draw fault	<130,000
113-116	Arizona	Hurricane fault zone, Anderson Junction section	<130,000
113-116	Arizona	Washington fault zone, Mokaac section	<130,000
113-116	Arizona	Washington fault zone, northern section	<130,000
23-25	California	Garlock fault zone, Central Garlock section	<15,000
23-106	California	Garlock fault zone, Western Garlock section	<15,000
15-104	California	Honey Lake fault zone	<130,000
8-104	California	Likely fault zone	<130,000
18-23	California	Little Lake fault zone	<15,000
3-8	California	Mayfield fault zone	<15,000
18-23	California	Owens Valley fault zone, 1822 Rupture section	<150
18-23	California	Owens Valley fault zone, Keough Hot Springs section	<15,000
30-52	California	San Andreas fault zone, Coachella section	<15,000
264-265	California	San Andreas fault zone, Mojave section	<130,000
108-267	California	San Andreas fault zone, San Bernardino Mountains section	<15,000
30-52	California	San Andreas fault zone, San Bernardino Mountains section	<15,000
108-267	California	San Jacinto fault zone, San Bernardino section	<15,000
108-267	California	Sierra Madre fault zone, Cucamonga section	<15,000
18-23	California	Southern Sierra Navada fault zone, Haiwee Reservoir section	<130,000
18-23	California	Southern Sierra Navada fault zone, Haiwee Reservoir section	<15,000
23-106	California	Southern Sierra Navada fault zone, Haiwee Reservoir section	<130,000
23-106	California	Southern Sierra Navada fault zone, Haiwee Reservoir section	<15,000
23-25	California	Southern Sierra Navada fault zone, Haiwee Reservoir section	<130,000
18-23	California	Unnamed faults in Volcanic Tablelands	<15,000
18-23	California	Unnamed faults in Volcanic Tablelands	<150
15-104	California	Warm Springs Valley fault zone	<15,000
134-136	Colorado	Roubideau Creek fault	<15,000
144-275	Colorado	Williams Fork Mountains fault	<15,000
18-224	Nevada	Ash Meadows fault zone	<130,000
18-224	Nevada	Bare Mountain fault	<130,000
18-224	Nevada	Benton Spring fault	<130,000
18-224	Nevada	Benton Spring fault	<15,000
16-24	Nevada	Black Rock fault zone	<15,000
17-35	Nevada	Buffalo Mountain fault	<130,000
39-113	Nevada	California Wash fault	<15,000
17-18	Nevada	Carson lineament	<15,000
110-114	Nevada	Central Steptoe fault zone	<130,000
110-233	Nevada	Dry Lake fault	<130,000
17-35	Nevada	Edna Mountain fault	<130,000
43-44	Nevada	Goshute Valley fault zone	<130,000
17-35	Nevada	Granite Springs Valley fault zone	<15,000
17-35	Nevada	Grass Valley fault zone	<15,000
17-18	Nevada	Hot Springs Mountain fault zone	<15,000

TABLE 3.14-4 (Cont.)

Segment	State	Fault Name	Age (in years)
18-224	Nevada	Indian Head fault	<15,000
232-233 (W)	Nevada	Maynard Lake fault	<130,000
15-104	Nevada	North Peavine Mountain fault zone	<130,000
17-35	Nevada	Northern Snake Mountains fault	<130,000
15-17	Nevada	Olinghouse fault zone	<150
18-224	Nevada	Paymaster Ridge fault	<130,000
44-239	Nevada	Pilot Creek Valley fault	<130,000
18-224	Nevada	Rock Valley fault zone	<130,000
17-35	Nevada	Ruby Mountains fault zone	<15,000
17-35	Nevada	Sheep Creek Range western faults	<130,000
110-233	Nevada	Silver King Pass fault	<130,000
110-114	Nevada	Snake Valley fault	<15,000
17-35	Nevada	Southeastern Sheep Creek Range fault	<130,000
110-114	Nevada	Southern Snake Range fault zone	<130,000
110-114	Nevada	Southern Spring Valley fault zone	<15,000
110-114	Nevada	Steptoe Valley fault system	<130,000
44-110	Nevada	Steptoe Valley fault system	<130,000
18-224	Nevada	Stonewall Flat faults	<130,000
110-233	Nevada	The Cove fault	<130,000
17-18	Nevada	Unnamed fault zone in Dead Camel Mountains	<15,000
15-17	Nevada	Unnamed fault zone near Little Valley	<15,000
17-35	Nevada	Unnamed fault zone near North Valley	<130,000
17-35	Nevada	Unnamed fault zone on northwest side of Trinity Range	<15,000
18-23	Nevada	Unnamed faults near Alkali Valley	<130,000
16-104	Nevada	Unnamed faults near Squaw Valley	<130,000
17-35	Nevada	Unnamed faults north of Ellison siding	<15,000
43-44	Nevada	Unnamed faults north of Pequop Mountains	<130,000
15-104	Nevada	Warm Springs Valley fault zone	<15,000
18-224	Nevada	Wassuk Range fault zone	<15,000
224-225	Nevada	West Spring Mountains fault	<15,000
17-35	Nevada	Western Humboldt Range fault zone	<15,000
81-272	New Mexico	Black Hill fault	<130,000
81-272	New Mexico	La Jencia fault, southern section	<15,000
81-213	New Mexico	West Florida Mountains fault	<130,000
16-24	Oregon	Santa Rosa Range fault system, Owyhee River section	<15,000
16-24	Oregon	Santa Rosa Range fault system, Quinn River section	<15,000
114-241	Utah	Drum Mountains fault zone	<15,000
44-239	Utah	Oquirrh fault zone	<15,000
110-114	Utah	Southern Snake Range fault zone	<130,000
256-257	Utah	Wasatch fault zone, Weber section	<15,000

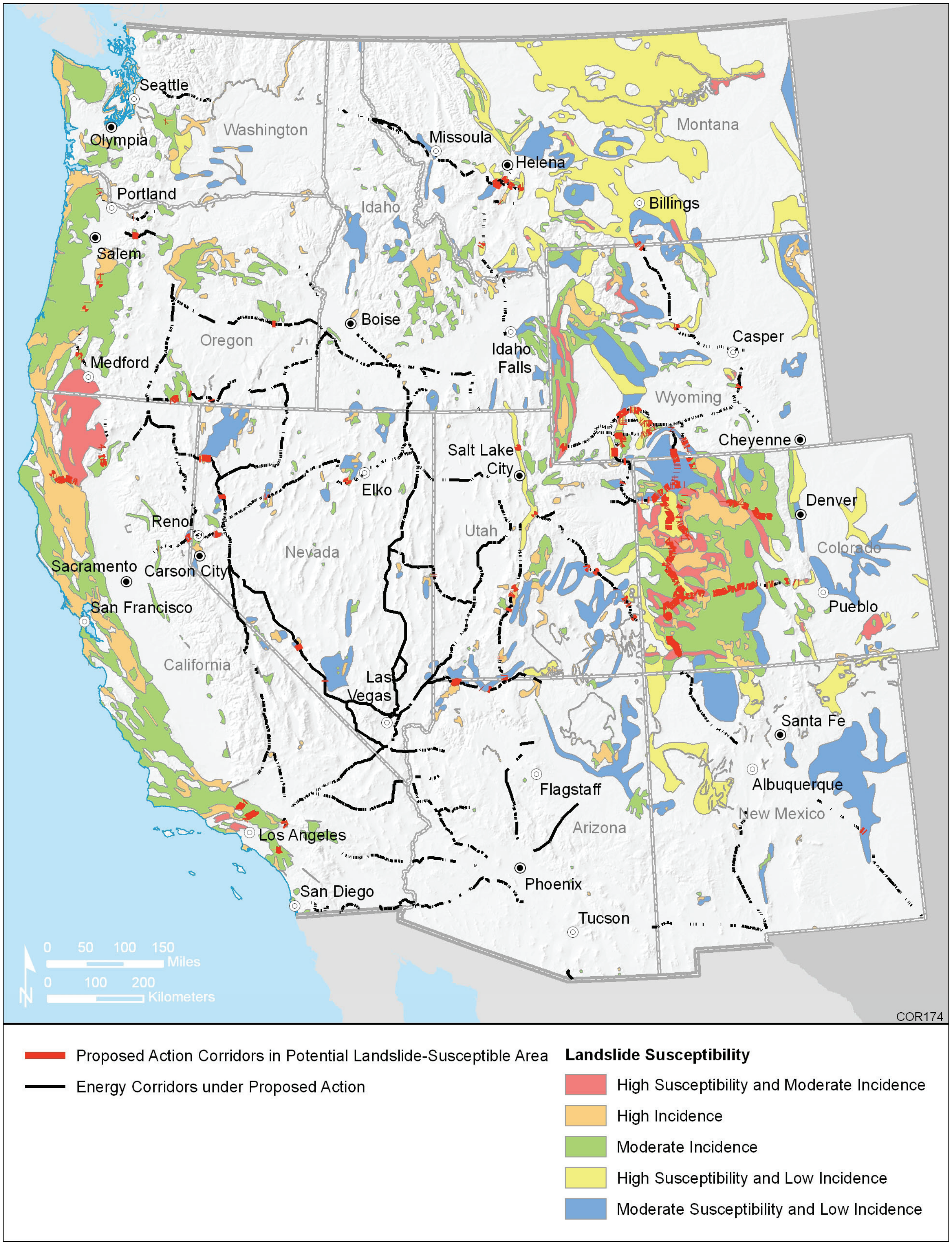

FIGURE 3.14-5 Potential Landslide Areas Crossed by the Designated Corridors under the Proposed Action

TABLE 3.14-5 Potential Landslide Areas Crossed by the Designated Corridors under the Proposed Action

State	Types	Total Acres
Arizona	High Incidence	2,100
	Moderate Susceptibility / Low Incidence	7,340
California	High Susceptibility / Moderate Incidence	2,840
	High Incidence	8,050
	Moderate Incidence	16,100
	Moderate Susceptibility / Low Incidence	3,070
Colorado	High Susceptibility / Moderate Incidence	55,330
	High Incidence	12,470
	Moderate Incidence	105,650
	High Susceptibility / Low Incidence	51,970
	Moderate Susceptibility / Low Incidence	26,330
Idaho	High Incidence	20
Montana	Moderate Incidence	340
	High Susceptibility / Low Incidence	3,020
	Moderate Susceptibility / Low Incidence	6,460
Nevada	High Incidence	4,490
	Moderate Incidence	6,650
	Moderate Susceptibility / Low Incidence	16,340
New Mexico	Moderate Susceptibility / Low Incidence	2,010
Oregon	High Incidence	2,010
	Moderate Incidence	17,900
Utah	High Incidence	19,700
	Moderate Incidence	2,120
	High Susceptibility / Low Incidence	5,890
	Moderate Susceptibility / Low Incidence	13,870
Washington	Moderate Incidence	1,340
Wyoming	High Susceptibility / Moderate Incidence	1,260
	Moderate Incidence	9,210
	High Susceptibility / Low Incidence	20,360
	Moderate Susceptibility / Low Incidence	15,020

construction workforce would absorb the majority of impacts related to construction and decommissioning. However, transportation of heavy or oversize loads and the movement of construction vehicles along public roadways impose potential safety impacts on the public during the construction and decommissioning phases (and also during major repair, replacement, or technology upgrade activities that may occur during the operating phase).

In addition to health and safety impacts associated with actual activities related to site preparation, construction, installation, and operation of any given energy transport system, overarching health and safety considerations result from the fact that such activities will be conducted largely in outdoor environments, some of them being rugged and remote. Exposure to the extremes and exigencies of weather, involving both temperatures and storms, will impact construction and operating workforces. Likewise, exposure to harmful plants and interactions with dangerous animals and insects will be ever-present hazards for both workforces. Such inherent hazards exist irrespective of the alternative under which an energy transport system is being constructed or operated. Tables 3.14-6 and 3.14-7 provide an enumeration of the major health and safety issues associated with the construction of pipelines and high-voltage electricity transmission systems, respectively.

The majority of health and safety impacts that would occur from routine operations are largely unique to each energy transport system; for example, electricity transmission line workers experience exposures to energized systems and working at heights, while gas and liquid petroleum pipeline workers experience exposures to hazardous or flammable materials or high operating pressures. However, exposure to weather extremes will be common to workers on any of the hypothetical projects, and common health and safety impacts would be imposed on all pipeline workers during repair or replacement of mainline pipes and on all construction workers during decommissioning of any of the energy transport systems, where the potential impacts would be virtually identical to those experienced during initial construction. Tables 3.14-8 and 3.14-9 display the major health and safety issues associated with the routine operation of pipelines and high-voltage electricity transmission systems, respectively.

Another important consideration is the effect on health and safety during the simultaneous construction of multiple energy transport systems within a corridor. While the construction-related impacts for each individual transport system would be unchanged, the increased level of construction activity within a relatively limited area has the potential to result in additional or aggravated impacts. For example, the potential for traffic accidents would increase dramatically as the number of construction and hauling vehicles increases on roads accessing the corridor segment where simultaneous construction activities are occurring. In fact, it is reasonable to expect that safety considerations, when combined with the reality of having limited capacities to support logistical activities (such as transporting materials to the general area), would necessarily limit or constrain simultaneous and proximate construction activities, and thus ameliorate increased health and safety impacts. The anticipated increases in health and safety impacts would be imposed largely on the construction crews involved; however, safety impacts to the public could also be expected from increased construction-related traffic where the transport of work crews and materials to and from the corridor relies on public roadways.

As noted above, simultaneous construction activities on adjacent ROWs have the potential of increasing the risk of accidents because they would add to the overall scale and complexity of construction activities within a relatively small geographic area. Other impacts are also anticipated. Simultaneous construction, especially in relatively remote areas, would result in a short-term but severe workforce drain. If such workforce shortages are overcome by hiring less experienced or poorly trained

TABLE 3.14-6 Major Health and Safety Hazards Associated with Pipeline Construction

Activity	Generic Hazard	Control
Clearing ROW and constructing access roads	Physical hazards from use of heavy equipment, power saws; falling trees and branches; exposure to herbicides; bee stings and animal bites; noise exposure; trips and falls, eye pokes; heat and cold stress; smoke inhalation	Employee training; health and safety plan; daily safety briefing; use of personal protective equipment (PPE); safeguards on equipment; safe practices for downing trees; safe operation of equipment; approved herbicide application procedures; first aid; burn permit/waste management plan
Construction and use of temporary power and/or energy systems used during construction activities	Employee injury and property damage from contact with hazardous energy sources (electrical, thermal, mechanical, etc.)	Electrical safety program; appropriate design and installation of temporary systems
Working on electrical equipment and systems	Employee contact with live electricity and energized equipment	Electrical safety program; PPE program; appropriately designed electrical devices
Exposure to hazardous materials/chemicals	Employee contact with hazardous materials/chemicals as a result of accidental releases	PPE program; spill/emergency response plans, equipment; worker training
Exposure to hazardous waste	Personnel who are working with or have the potential to be exposed to contaminated soil, groundwater, or debris during construction	Hazardous waste management program
Confined space entry	Employee injury from physical and chemical hazards; dangerous atmospheres	Permit-required, confined-space entry program; air monitoring programs; PPE program; respiratory protection program
General construction activity: power tools	Employee injury from hand and portable power tools	Hand and portable power tool safety program; PPE program
General construction activity: walking/working on surfaces	Employee injury/property damage from inadequate walking and work surfaces	Housekeeping and material handling and storage program
General construction activity: noise	Employee exposure to occupational noise	Hearing conservation program; PPE program
General construction activity: material handling	Employee injury from improper lifting and carrying of materials and equipment	Back injury prevention program; use of appropriate lifting/rigging devices and equipment
General construction activity: impacts	Employee injury to head, eye/face, hand, body, foot, and skin	PPE program

TABLE 3.14-6 (Cont.)

Activity	Generic Hazard	Control
General construction activity: dusts, vapors, fumes	Employee exposure to hazardous gases, vapors, dusts, and fumes	Hazard communication program; respiratory protection program; PPE program; air monitoring program; fugitive dust management plans
General construction activity: hoisting and lifting	Employee injury or property damage from falling loads; injury or damage from contact with derrick or crane	Hoisting and rigging program; employee awareness training; PPE
General construction activity: various hazards	Employee exposure to various hazards; reporting of hazardous conditions during construction	Injury and illness prevention program
General construction activity: heat/cold stress	Heat and cold stress; weather extremes	Heat and cold stress monitoring and control program; shelter from weather extremes; appropriate clothing
General construction activity: fall potential	Fall potential resulting from working in rugged areas	General safety program; safety harnesses
General construction activity: trenching and excavation	Employee injury resulting from trench wall collapse; injury from trenching excavating equipment	Proper bracing of trench walls; trench stabilization techniques; employee training programs; rescue response plans, equipment, and training
General construction activity: welding	Employee exposure to compressed gases (welding gases)	Hazard communication program; compressed gas storage, handling, and use training
General construction activity: working near/in water	Employee exposure to water (watercrossings)	Special construction techniques and training; special personal protective devices
Construction and testing of high-pressure natural gas systems	Employee injury and property damage due to failure of pressurized system components or unexpected release of pressure	Pressure vessel and pipeline safety program; electrical safety program
Dangerous animals/insects	Bites and injuries sustained from contact with dangerous animals, insects, and plants	Hazard awareness training; protective clothing; pest and vegetation control programs; dangerous animal management programs; on-site first-aid capabilities

TABLE 3.14-7 Major Health and Safety Hazards Associated with Construction of High-Voltage Electricity Transmission Systems

Activity	Generic Hazard	Control
Clearing ROW and constructing access roads	Physical hazards from use of heavy equipment, power saws; falling trees and branches; exposure to herbicides; bee stings and animal bites; noise exposure; trips and falls; eye pokes; heat and cold stress; smoke inhalation	Training; health and safety plan; daily safety briefing; use of PPE; safeguards on equipment; safe practices for downing trees; safe operation of equipment; approved herbicide application procedures; first aid; burn permit/waste management plan
Installing transmission line support towers	Heavy equipment operation, crane operation; overhead work/falling items; falls from height	Licensed equipment operators; work area controls; PPE/hard hats; safety equipment
Stringing conductors	Rotating equipment; lines under tension; suspended loads; overhead work/falling items	Work area controls; PPE; safety equipment
River crossings	Work near or in streams: drowning hazard	Safety equipment; monitors
Installing AC mitigation	Heavy equipment operation; buried utilities; falls in trenches	Trenching/confined space entry plan; ground surveys
Building substations	General construction hazards; working around live electricity and energized equipment; exposure to hazardous materials	Electrical safety plan; hazardous materials safety plan
Confined space entry (equipment vaults)	Employee injury from physical and chemical hazards; dangerous atmospheres	Permit required; confined space entry program; air monitoring program; PPE program; respiratory protection program
General construction activity: power tools	Employee injury from hand and portable power tools	Hand and portable power tool safety program; PPE program
General construction activity: walking/working on surfaces	Employee injury/property damage from inadequate walking and work surfaces	Housekeeping and material handling and storage program
General construction activity: noise	Employee exposure to occupational noise	Hearing conservation program; PPE program
General construction activity: material handling	Employee injury from improper lifting and carrying of materials and equipment	Back injury prevention program
General construction activity: impacts	Employee injury to head, eye/face, hand, body, foot, and skin	PPE program

TABLE 3.14-7 (Cont.)

Activity	Generic Hazard	Control
General construction activity: dusts, vapors, fumes	Employee exposure to hazardous gases, vapors, dusts, and fumes	Hazard communication program; respiratory protection program; PPE program; air monitoring program; fugitive dust management plans
General construction activity: various hazards	Employee exposure to various hazards; reporting of hazardous conditions during construction	Injury and illness prevention program
General construction activity: heat/cold stress	Heat and cold stress; weather extremes	Heat and cold stress monitoring and control program; shelter from weather extremes; appropriate clothing
General construction activity: fall potential	Fall potential resulting from working in rugged areas	General safety program; safety harnesses; employee training programs; rescue response plans, equipment, and training
General construction activity: welding	Employee exposure to compressed gases (welding gases) (compressed air-driven tools and equipment)	Hazard communication program; compressed gas storage, handling, and use training
General construction activity: working near/in water	Employee exposure to water (watercrossings)	Special construction techniques and training; special personal protective devices
Installation and testing of gas-filled equipment	Employee injury and property damage due to failure of pressurized system components or unexpected release of pressure	Gas-filled equipment safety program; electrical safety program
Dangerous animals/insects	Bites and injuries sustained from contact with dangerous animals, insects, and plants	Hazard awareness training; protective clothing; pest and vegetation control programs; dangerous animal management programs; on-site first-aid capabilities

workers, an increase in the potential for accidents could result. Such potential increases in accident potential would be ameliorated by comprehensive worker training and controlled procedures. Increased activity levels because of simultaneous construction in an area have been known to result in an increase in intrusions by unauthorized and untrained individuals into active construction and laydown areas, also increasing the potential for accidents. Finally, the increase in transportation density on existing roadways would increase the potential for vehicle accidents.

Although the majority of health and safety impacts from the routine operation of electricity transmission systems affect only the operator's workforce, some potential impacts to the public would result from the electromagnetic fields that are generated coincident to the transmission of high-voltage alternating current (AC) electricity.

TABLE 3.14-8 Health and Safety Hazards Associated with Pipeline Operations

Activity	Generic Hazard	Control
Motor vehicle and heavy equipment use	Employee injury and property damage from collisions between people and equipment	Motor vehicle and heavy equipment safety program
Forklift operations	Same as heavy equipment use	Forklift operation program
Trenching and excavation during pipeline repair/replacement activities	Employee injury and property damage from the collapse of trenches and excavations	Excavation/trenching program
Working at elevated locations	Falls from the same level and elevated areas	Fall protection program; scaffolding/ladder safety program
Use of cranes, derricks, or other lifting devices	Property damage from falling loads; employee injuries from falling loads; injuries and property damage from contact with crane or derrick	Crane and material handling program
Working with flammable and combustible gases (natural gas) and flammable liquid fuels	Fire/spills; accidental exposures	Fire protection and prevention program; Emergency response plans, equipment, and first responder training; hazard communication program; personal protective equipment (PPE)
Working with hazardous materials	Employee injury due to ingestion, inhalation, dermal contact	Hazard communication program; PPE; engineered barriers
Hot work (including cutting and welding)	Employee injury and property damage from fire; exposure to fumes during cutting and welding; ocular exposure to ultraviolet and infrared radiation during cutting and welding	Hot work safety program; respiratory protection program; employee exposure monitoring program; PPE program; fire protection and prevention program
Troubleshooting and maintenance of pipeline systems and general operational activities	Employee injury and property damage from contact with hazardous energy sources (electrical, thermal, mechanical, etc.); employee exposure to gases maintained at high pressures (natural gas and hydrogen pipeline systems only)	Electrical safety program; high pressure gas training
Working on electrical equipment and systems	Employee contact with live electricity	Electrical safety program; PPE program
Confined space entry	Employee injury from physical and chemical hazards and life-threatening atmospheres	Permit required; confined-space entry program; PPE; respirator program

TABLE 3.14-8 (Cont.)

Activity	Generic Hazard	Control
General pipeline operation activities: power tools	Employee injuries from hand and portable power tools	Hand and portable power tool safety program; PPE program
General pipeline operation activities: walking/working on surfaces	Employee injury and property damage from inadequate walking and work surfaces	Housekeeping and material handling and storage program
General pipeline operation activities: noise	Employee overexposure to occupational noise	Hearing conservation program; PPE program
General pipeline operation activities: material handling	Employee injury from improper lifting and carrying of materials and equipment	Back injury prevention program
General pipeline operation activities: hazardous chemicals	Employee overexposure to hazardous gases, vapors, dusts, and fumes	Hazard communication program; respiratory protection program; PPE program; employee exposure monitoring program
General pipeline operation activities: various hazardous conditions	Reporting and repair of hazardous conditions	Injury and illness prevention program
General pipeline operation activities: heat/cold stress	Heat and cold stress	Heat and cold stress monitoring and control program
General pipeline operation activities: ergonomics	Ergonomic injuries	Ergonomic awareness program
Maintenance and repair of natural gas system: compressed gases	Employee injury and property damage due to failure of pressurized system components or unexpected release of pressure	Pressure vessel and pipeline safety program; electrical safety program
Maintenance and repair of natural gas system: compressed gases, flammable materials	Employee injury and property damage due to natural gas ignition and fire	Emergency action program/plan; risk management plan

The potential health effects from exposure to EMFs generated by high-voltage AC current have been studied for several decades (BPA 1996). However, while the ability of an EMF to interact with matter within living cells is known, these interactions are quite weak, and there is no known mechanism by which these interactions might affect biology or health. Large numbers of epidemiological and laboratory studies have not been able to identify a causative mechanism nor any verified health effects. However, because of the possible existence of an as yet unidentified mechanism and because an association has been observed between some health effects (e.g., leukemia) and EMF exposure in some but not in a majority of studies, this area of research is ongoing. To further add perspective to this issue, EMF

TABLE 3.14-9 Health and Safety Hazards Associated with Operation of High-Voltage Electricity Transmission Systems

Activity	Generic Hazard	Control
Alternating current (AC) flow	EMF exposure	Line routing; ROW spacing; clearances; de-energizing when possible
Induced currents	Corrosion of adjacent pipelines and other metallic buried infrastructure	Monitoring; cathodic protection systems; pipe coatings
Induced voltages	Shock hazards	AC mitigation installation; use of ground fault mats; grounding of metallic equipment and objects
ROW maintenance/hot work repairs	Heavy equipment operation; power saw operation; falling trees, branches; exposure to herbicides; working around energized transmission lines and shock hazards	Health and safety plan; daily briefings; licensed operators; safeguards on equipment; PPE and safety equipment; electrical safety plan and procedures
Transmission line maintenance	Falls from heights; shock hazards; risks of helicopter/airplane operation	Training; safety equipment; work in good weather
Inspections conducted on the ground	Weather extremes; rugged terrain; dangerous animals, insects, and plants	Heat and cold stress monitoring and control program; hazard awareness training; protective clothing; pest and vegetation control programs; dangerous animal management programs; on-site first-aid capabilities

around high-voltage AC transmission lines weakens with distance from the conductors and approaches background levels within several hundred feet. Exposure levels to members of the public are typically comparable to those from many common household appliances, such as televisions, refrigerators, and fluorescent lights (BPA 1996).

Finally, the potential for fires may also be affected by corridor development. Both positive and adverse impacts are possible. Clearing and maintaining a ROW through a wooded area (e.g., especially one containing high-fire-risk species such as pinion juniper) can result in the creation of a man-made firebreak. Clearing mainline ROWs and certain functional areas, such as electrical substations and pump and compressor stations, for operational safety can also reduce the amount of fuel available within the ROW for fires. However, potential impacts would also include an increased risk of fires because of the use of flammable fuels and hazardous materials during construction or decommissioning, spills or releases of flammable commodities from operational pipelines, and the operation of internal combustion sources (e.g., vehicle engines) and external combustion sources (e.g., boilers) during construction and decommissioning phases and, to a lesser extent, during operating phases of any of the energy transport systems that might be located within the corridor.

Vegetation management would also increase the risk of fire or facilitate the spread of fire. A ROW cleared of native vegetation that subsequently becomes populated by certain invasive species would result in increased risks of both initiation and spread of fire. For example, if invasive annual grasses (e.g., cheatgrass) were allowed to invade and populate a ROW, the risk of fires in that ROW might be more than the risks in the undisturbed ROW.[14] Fire risks might increase because of the presence of certain structures associated with energy transport systems. Tall electricity transmission towers and communication towers, as well as structures that are substantially taller than surrounding vegetation, represent an increased potential for lightning strikes (however, standard practice would require that all such structures be grounded). Ground faults or arcing from energized electricity conductors and substation equipment also represent an increased potential for fire.

The presence of high-voltage electricity transmission lines would, in some instances, increase the risk to personnel fighting fires in areas proximate to the transmission lines. The powerlines and their support towers would represent obstacles to safe staging of fire-fighting equipment (including air tankers), and damage to towers or power conductors due to exposure to intense heat from an adjacent fire could cause wholesale failure of the transmission system involving electrical arcing to ground that would jeopardize fire-fighting personnel and equipment in the immediate vicinity.

3.14.4.2 Impacts from Environmental and Circumstantial Factors

The health and safety issues discussed in the above paragraphs do not result from corridor designation. Instead, they derive largely from anthropogenic activities related to corridor development (including the siting), construction, installation, and operation of energy transport systems. However, additional health and safety hazards also exist, deriving from environmental factors that may exist in some portions of the designated energy corridors. These environmental factors include geologic conditions, especially those suggestive of inherent instability such as volcanic and seismic activity and earthquake and/or landslide potential.

Not only does the existence of such conditions suggest the potential for impacts on individuals and/or structures, the manner in which energy transport projects are constructed and installed can exacerbate the potential for such impacts to occur. Such destabilizing events can impact construction and/or operating workforces directly if they were present in the affected area at the time of the event, or indirectly, by causing catastrophic damage to the energy transport facilities and related structures. Environmental impacts would also likely result in either scenario. Detailed descriptions of where within the 11-state study area the potential for such events exists have been provided above. Discussions of the nature of the anticipated impacts from natural events are provided in the following paragraphs.

Volcanic Hazards. The potential for volcanic hazards originates from potential future volcanic activities in areas within or near the designated corridors as well as the energy transport project sites on nonfederal lands that have not been designated, which would affect the integrity of the facilities in the corridors. Volcanic hazards take different forms. Direct blasts are among the most destructive of volcanic phenomena. Flows of hot melted rock (lava) can destroy structures along its path. Debris avalanches moving down slopes of a volcano can also be catastrophic. Pyroclastic flows of massive, hot, dry rock fragments on a volcano's flanks and debris flows of water-saturated debris down valleys can travel great distances and at great speeds, creating great destructive forces along their paths. The physical impacts of falling fragments of lava or rock and ash (tephra fall) that are blasted into the air by volcanic explosions can cause serious property

[14] See Section 3.8 for additional discussions on impacts to ROWs from invasive species.

Text Box 3.14-1
What Are the Health Effects of Exposure to Electromagnetic Fields?

At present, there is no scientific consensus regarding a cause-effect relationship between continued exposure to EMFs and adverse health consequences. However, the potential for chronic effects from these fields continues to be studied extensively. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the DOE. The report by NIEHS (1999) contains the following conclusion:

"The scientific evidence suggesting that ELF-EMF [extremely low frequency-electromagnetic field] exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects have been reported. No indication of increased leukemias in experimental animals has been observed….

"The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or noncancer health outcomes provide sufficient evidence of a risk to currently warrant concern."

A study recently released by the World Health Organization (WHO 2007) has come to similar conclusions regarding the health effects of EMF exposure and expresses similar levels of concern and advocates continuation of similar types of research. Major conclusions of the study include that the categorization of ELF electromagnetic fields (here defined as 0 to 100 Hz; in the United States, a high-voltage alternating current alternates at 60 Hz) as a possible human carcinogen should be retained while additional studies are completed and available data are reviewed. Chronic exposures to ELF electromagnetic fields have not been shown to represent a health hazard. Although acute exposures have been shown to have biological effects, limiting exposures to levels at or below standards established by the International Commission on Non-Ionizing Radiation Protection and the Institute of Electrical and Electronics Engineers (ICNIRP 1998; IEEE 2002) provides sufficient protection against these effects. Conformance with these and other applicable safety standards will be required of all occupants of designated energy corridors on federal lands.

damage. Other volcanic-associated hazards include fires, floods produced by the exceedingly rapid melting of snow and ice during eruptions, and earthquakes.

The potential for volcanic hazard depends on several factors: the likelihood of eruption, the distance from a volcanic vent, the type of volcano, the topography near a volcano, and the scale of an eruption (Wolfe and Pierson 1995; Hyde and Crandell 1978; Miller 1989). A volcano is more likely to erupt if it has been active historically or during the Holocene time (within the last 10,000 years) as opposed to a volcano with much older eruption records. Potential hazards tend to be greatest the closer one is to a volcano vent, the steep slopes near a volcano, and along valleys leading from a volcano. Volcanoes with silicic magma are more explosive than volcanoes with basaltic magma; thus, the former create a larger hazard potential. In addition, the size of an eruption, while not predictable, is proportional to the hazard potential.

Earthquake Hazards. Earthquakes produce a variety of hazards, including strong ground shaking, liquefaction, landslides (described in the next section), soil compaction, and surface fault rupture (FEMA 2004). These hazards affect the integrity of facilities and can potentially cause fires in the designated corridors as well as the energy transport project sites on nonfederal lands that have not been designated. Ground shaking produces inertia forces on structures. Depending on the inertial properties of the structures, the mechanical strengths of the structural materials, the connections of different components of the structures, and their geometric shapes, the damage from earthquakes can include: separation of the structures from their foundations, structure collapses, and/or buckling (Bertero 1997). Liquefaction normally occurs when saturated sandy and/or silty material is under intense ground shaking. Liquefied sands and silts lose their bearing capacity, thus damaging the structures above. Loose natural sediment and poorly compacted fill can cause soil compaction during ground shaking. Due to the spatial variations of soil properties, differential settlements may occur, causing damage to structures.

Earthquakes may reactivate surface ruptures and cause displacements. The displacements can shear, compress, or pull structures, if they are built directly astride the faults. Significant structural damage can result if the displacement is large. Surface rupturing (or faulting) commonly recurs along existing fault traces. Younger faults are likely to be more active than older faults.

Seismic hazards generally depend on the distance from the epicenter of an earthquake and the magnitude of the earthquake. In evaluating seismic hazards, the frequency of earthquakes along a fault must be considered. Areas underlain by unconsolidated sediment, such as areas along streams and rivers and near the coast, are more susceptible to earthquake hazards.

Landslide Hazards. A landslide is defined here as the downhill movement of geologic material by the force of gravity. They range from rock falls, catastrophic rock avalanches, and debris flows, to deep-seated landslides of weathered and unconsolidated material. Landslides commonly occur in weak geologic material, such as weathered and fractured rocks and unconsolidated sediment, and on steep slopes (although saturated debris flows can occur on gentler slopes). Fine-grained clastic rocks (especially those that are poorly consolidated) and highly fractured rocks are especially susceptible to sliding, particularly at times of intense or sustained rainfall (Radbruch-Hall et al. 1982).

Landslides are commonly triggered by heavy rains and/or rapid snowmelts, volcanic eruptions, earthquakes, and toe-cutting on unstable slopes by natural erosion or human activities. Numerous examples can be found in the 11-state area. In the Rocky Mountains and Pacific Coast regions, the dynamic tectonic environment has recreated rugged terrains. Numerous faults spread across the regions. Landslides were widely reported in Utah and southern California from 1982 to 1984 and from 1997 to 1998 during the abnormally high precipitation related to El Nino effects (Baum and Fleming 1988; Chleborad 2000; Spiker and Gori 2003; Witkind 1986; Giraud 2005). Numerous landslides were triggered by the 1964 Alaska earthquake. Rapidly moving landslides (debris avalanches) are common on slopes of volcanoes during their eruptions (Hoblitt et al. 1998). Wildfires in southern California denuded vegetation, making hillsides susceptible to debris flow by winter rainstorms. In addition, human activities can induce landslides, as when roads and structures are built without adequate lateral supports or proper drainage.

The impact of the energy transport project sites on the potential for landslides is through construction and decommissioning activities.

Such activities include vegetation clearing, changing drainage patterns, grading slopes inadequately, removing existing toe supports of steep slopes, or blasting during land development and road and facility construction. The modification of land surfaces can facilitate water infiltration in rainstorms and snowmelts, thus allowing pore pressure buildup in the subsurface, making it easier for the slopes to fail. In landslide-prone areas, removing the toe supports of slopes can also trigger or reactivate landslide.

The impacts of landslides on the environment include changes in (1) local topography, (2) land surface drainage, (3) streams and valleys downgradient of the landslides, (4) forest destruction, and (5) stream habitat deterioration (Schuster and Highland 2001). When a landslide is significant, natural drainages can be blocked or dammed by landslide material, forming a temporary lake behind the dam that floods the area upstream of the dam (Witkind 1986). A failure of the dam eventually would send a surge of floodwater and sediments downstream. The magnitude of the impact depends on the location and magnitude of the landslides.

While construction and decommissioning activities can induce landslides, naturally occurring landslides can adversely affect the integrity of structures on energy transport project sites. Losses of properties and infrastructures may result from direct debris impact, sediment burial, and erosion along the paths of the landslides. The damage to structures may, in turn, cause environmental impacts, such as spills of petroleum products.

3.14.4.3 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Health and Safety?

Mitigation of Construction-Related Hazards. Mitigation of impacts from construction would be accomplished in large part through the required implementation of plans and administrative and engineering controls designed to comply with state and federal regulations, conform to accepted industry standards and practices, or satisfy lease stipulations. That is, mitigation would be an integral part of normal construction practices under controls required by prevailing regulations and guidelines. The magnitude of specific impacts to be mitigated might vary somewhat under the various alternatives, but the nature of the corresponding applicable mitigative measures used would be quite similar under both alternatives and would depend on the specific activities involved, site conditions, and specific circumstances encountered at the time of construction. The latter factors would include the specific physical conditions encountered along a particular route, including soil, geologic, hydrologic, and biologic conditions and specific circumstances at the time of construction, including the time of year, weather conditions, and other construction projects that might be occurring in the vicinity.

The majority of hazards present depend on specific construction activities, rather than on the types of energy transport systems; thus, most anticipated impacts would be common for the various systems. Common activities include land clearing (grubbing), excavation, land reclamation, operation of heavy equipment, use of hand tools, and use of energized equipment. Electricity transmission line construction might also involve the use of helicopters to install towers, work at heights, and work with specialized conductor-stringing equipment. Pipeline construction in remote areas may also need to resort to airlifting components and construction equipment to the ROW. Pipeline construction would involve a great deal more excavation, soil management, and welding, and would involve a generally greater overall effort than electricity transmission line construction. Although the majority of construction activities will occur within the construction ROW within the designated corridor, some activities involving material laydown and storage areas would occur off-ROW and would have the potential to impact the public. Hazards to the public would also be associated with construction traffic, loss of utility services if accidentally severed, and risks from unauthorized access to construction worksites and material storage and laydown areas.

Construction hazards would be mitigated primarily through the implementation of plans and controls designed to guarantee compliance with applicable state and federal regulations, guidelines, and practices as stipulated under an overarching health and safety plan for approved projects. This plan would identify all construction project risks to workers and the public and would list required or appropriate good practices, protections, and countermeasures necessary to minimize risks to the degree practicable. In some instances, additional plans would also be warranted. For example, hazardous material and hazardous waste management, storm water management, transportation of materials, equipment and workforce, fire safety, vegetation management, and emergency response would all typically be addressed in respective plans.

Those plans would establish procedures for both routine and off-normal operations based on applicable regulations, permit conditions, or applicable federal or state agency guidance; assign responsibilities; establish appropriate mitigation strategies; and introduce mechanisms for auditing plan conformance and evaluating the effectiveness and sufficiency of both engineering and administrative controls. As noted in the above discussion of alternatives, the adoption of uniform corridor designations would tend to assure consistent application of a high level of hazard mitigation, as requirements would be developed at a programmatic level for application to individual projects in the corridor. Such programmatic requirements might include additional requirements imposed by the managing federal agencies beyond those that would ordinarily be required for similar projects.

Mitigation of Operation-Related Impacts. Mitigation of operation-related impacts from energy transport systems would be accomplished primarily through design considerations of the routes, ROWs, and facilities making up the systems and through the development and implementation of various operating plans. Similar to those plans developed to support construction, plans developed for operation would address critical aspects of operation including, but not limited to, hazardous material and waste management, storm water management, and monitoring for external impacting factors (e.g., seismic activity, landslides, etc.). Operating plans would establish detailed procedures, assign responsibilities, and establish self-auditing processes for evaluating overall effectiveness and sufficiency of operations.

Mitigation strategies would be developed for both routine and off-normal operating conditions. Under normal operating conditions, health and safety impacts to the public from any of the approved systems would be minimal. No active mitigation would be required. Mitigation of impacts under failure modes for the various systems, however, would involve both design considerations and active emergency response measures. The nature, design, and effectiveness of such measures would, in any case, vary substantially from place to place, and would be further affected by the nature of the alternative under which systems are built.

Impacts from accidents and other fault modes in electrical, natural gas, oil, or hydrogen transport systems would depend on the nature of the failure, its time and location, and regional factors. The ability of system operators and public emergency response agencies to correct and mitigate failures would depend on the severity of the failure, available corrective actions, and the location of the affected facilities in relation to populated areas and to emergency services. The speed and effectiveness of mitigation would also depend on the ability of failures to be detected. The primary means of detection would be through supervisory control and data acquisition (SCADA) systems. Secondary detection and confirmation would be through public reporting of accidents, fires, or loss of service.

The loss of function of transport systems would have impacts outside the immediate location of accidents due to the potential loss of critical services and energy supplies to whole regions of the country. The mitigation of these impacts would also depend on design considerations, in this case, system design and response effectiveness. System reliability designs would consider alternate supplies, routes, redundancies, and workarounds to address local failures. SCADA systems and technologies, again, would play an important role in the ability of the system to maintain functionality in the event of a failure in part of the system.

Mitigation of impacts due to transport system failures would vary somewhat under the proposed alternatives, as the nature of the alternatives suggests different levels of coordination of operation, and thus response to failures of the component systems making up the alternatives. Under the alternative that includes corridor designation, the Proposed Action, a more coordinated detection and response function might be possible for transport systems than in the absence of such designation under No Action. Such coordination might involve shared, and thus more frequent, inspections; shared, and thus improved, access roads; mutual notification of operators in an affected area; and coordinated response plans.

Design considerations would also mitigate impacts from failures under the Proposed Action. Transport systems built in designated corridors would be strategically placed to minimize impacts from failures from individual systems and to minimize the possibility of a failure in one system from causing a failure in one or more other systems. This benefit would be achieved though a system of restrictions and preferences for the coplacement of multiple systems in a designated corridor. It would be expected that a more nearly optimal placing of transport systems to assure system reliability and to minimize cascading impacts would be possible under corridor designation than under the absence of such a designation.

Mitigation of Impacts during Decommissioning. Decommissioning involves activities similar to construction, and thus presents many of the same health and safety hazards. These hazards mainly affect workers, but some, including increased construction traffic and the presence of potentially hazardous work areas for intruders, also affect members of the public, albeit at low risk levels. However, decommissioning phases are expected to last for shorter periods of time than the construction phase and may involve fewer specific steps, since some portions of energy transport systems that are below grade (e.g., tower foundations, mainline pipe) may be simply cleaned and abandoned in place rather than removed. Such a strategy would not only reduce the duration of the decommissioning activity as well as the extent of health and safety impacts, but would also be less disruptive of ecosystems that had reestablished after disruptions occurring during original construction.

As with construction, worker health and safety risks associated with decommissioning would be mitigated through the implementation of an overarching health and safety plan. The health and safety plan would include a comprehensive list of hazards and identification of procedures, protections, and countermeasures designed to reduce them to the lowest level practicable. As with the construction phase, additional companion plans addressing certain aspects of decommissioning may also be warranted. In most instances, virtually an identical array of plans and controls would be established as were in place for the construction phase. For example, a traffic management plan to minimize risks to workers and the public may be warranted. Specific plans for addressing unique hazards associated with the use of explosives, other hazardous materials, or fuels, or from working around electricity, also would be prepared. Provisions to protect unauthorized access by intruders during off-hours would also be included as a measure to protect the public.

Finally, as with the construction phase, the majority of the activities would occur within the ROW, and their related health and safety impacts would be imposed primarily on the deconstruction workforce. However, impacts to the public would also occur from activities occurring off the ROW such as at off-ROW material storage and component dismantlement and salvage recycling operations and as a result of deconstruction-related traffic on public roadways. Impacts to the public would also occur from unauthorized access to deconstruction worksites and off-ROW storage and recycling facilities.

As is the case for construction, the adoption of uniform corridor designations under the Proposed Action would encourage a comprehensive approach to hazard mitigation during decommissioning, and thus would be a benefit of programmatic level management of projects in the corridor. A set of uniform requirements would tend to cover gaps in health and safety impact mitigation programs that might appear if projects were developed in the absence of corridor designations.

Mitigation Measures for Geologic Hazards. Identifying areas with potential geologic hazards is critical in a project. Experienced engineering geologists can achieve the objective by conducting appropriate site-specific geologic studies.

Projects being planned in areas with geologic hazards would need special engineering consideration and designs. Depending on the type of potential geologic hazards (e.g., ground shaking, liquefaction, landslides, etc.), the designs may vary and should address specific needs for structural supports.

In addition, unstable slopes and local factors that could induce slope instability (such as groundwater conditions, precipitation, earthquake activities, slope angles, and dip angles of geologic strata) should be identified during the planning phase of individual projects. Creating excessive slopes during excavation and blasting operations should be avoided. In cases where geologic hazard areas are unavoidable, contingency plans should be prepared for each area where potential pipeline spills might occur because of geologic hazards. Such plans, for example, might include the addition of extra mainline valves positioned to isolate susceptible pipeline segments, thus limiting the amount of commodity in jeopardy of release, should system integrity be compromised.

3.14.4.4 What about Protecting Critical Infrastructure?

Owners and operators of critical infrastructure are responsible for ensuring the operability and reliability of their systems. To do so, they must evaluate the impacts on their system from all credible events, including natural disasters (landslides, earthquakes, storms, etc.) as well as mechanical failure, human error, sabotage, cyber attack, or deliberate destructive acts of both domestic and international origin, recognizing intrinsic system vulnerabilities, the realistic potential for each event/threat, and the consequences that may result. Regulations promulgated by various federal and state oversight agencies confirm those inherent responsibilities through a variety of prescribed actions and system performance requirements designed to protect the public and/or the environment from adverse consequences of disruptions or failures and to provide for system reliability and resiliency. Regulations and directives promulgated by the Department of Transportation's OPS and the FERC are two examples of such regulatory programs. Special system designs, construction techniques, advanced communication and system monitoring capabilities, and other preemptive protective measures have been developed to meet the prescriptive and performance-based requirements of those regulations. Myriad "best industry practices" have also been developed that are designed to further ensure system reliability and to minimize interruptions in service. Applicants for corridor leases will be expected to conform to all applicable regulations and best industry practices. Beyond regulatory compliance and best industry practices, however, members of the interstate pipeline and bulk electricity transmission industries, in partnerships with federal, state, local, Tribal, and international governments, have committed to engage in additional efforts to address the impact of terrorism on the critical infrastructure and key resources (CI/KRs) they control.

Homeland Security Presidential Directive 7 (HSPD-7),[15] signed by President Bush on December 17, 2003, establishes a national policy that affirms the responsibility of federal departments and agencies to identify and prioritize United States CI/KRs and to protect them from terrorist attacks. Under that Directive, "federal departments and agencies will identify, prioritize, and coordinate the protection of critical infrastructure and key resources in order to prevent, deter, and mitigate the effects of deliberate efforts to destroy, incapacitate, or exploit them. Federal departments and agencies will work with state and local governments and the private sector to accomplish this objective."

The coordinated effort directed by HSPD-7 manifests itself in the June 2006 publication of the National Infrastructure Protection Plan (NIPP), the development of which was coordinated by the Department of Homeland Security (DHS).[16] The NIPP is comprised of seventeen SSPs, each addressing a category of CI/KRs. Although there are many dependencies and interdependencies among all of the CI/KR sectors, and the NIPP relies on and expects coordination and integration in the implementation of all of the SSPs, two SSPs are especially relevant to protection of critical infrastructures within Section 368-designated energy corridors; the SSP for energy and the SSP for transportation systems, both published in May 2007. DOE's Office of Energy Efficiency and Electricity Reliability serves as the sector-specific agency (SSA) for energy, and is primarily responsible for the development and implementation of the energy SSP. The Transportation Security Administration (TSA) of DHS serves a similar function for the transportation SSP (TSSP).[17]

The energy SSP addresses the production, refining, storage, and distribution of oil and gas and electric power (except for power produced by hydroelectric and commercial nuclear power plants). The transportation SSP addresses the movement of people and the transport of goods by all modes of transportation and especially addresses the transport of hazardous materials (including crude oil, natural gas, and refined petroleum products) by all modes of transport, including pipelines. Pipelines are addressed in the transportation SSP as a mode of transportation; however, pipelines are also an integral part of the energy sector. As a result, unique partnerships have been struck between private sector representatives and representatives of both SSAs to ensure coordinated implementation of both SSPs. Because of the intrinsic complexity of the transportation sector, implementation of the TSSP involved establishing individual implementation strategies for each transportation mode, each appearing as an annex to the TSSP. The Pipeline Modal

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15 The December 17, 2003, HSPD-7 is available at http://www.whitehouse.gov/news/releases/2003/12/20031217-5.html.

16 The NIPP is available at http://www.dhs.gov/xlibrary/assets/NIPP_Plan.pdf.

17 A redacted version of the energy SSP is available at http://www.oe.energy.gov/DocumentsandMedia/Energy_SSP_Public.pdf. The public version of the transportation SSP is available at http://www.tsa.gov/assets/pdf/transportation_base_plan_appendixes.pdf.

Annex was developed using structural elements from both the energy and transportation SSPs.[18]

Section 5 of HSPD-7 states: "While it is not possible to protect or eliminate the vulnerability of all critical infrastructure and key resources throughout the country, strategic improvements in security can make it more difficult for attacks to succeed and can lessen the impact of attacks that may occur. In addition to strategic security enhancements, tactical security improvements can be rapidly implemented to deter, mitigate, or neutralize potential attacks." The NIPP provides the basic framework for establishing national priorities for goals and requirements for CI/KR protection to ensure the most efficient path is selected for reducing vulnerabilities, deterring threats, and minimizing consequences. Because resources are finite and the task is immense, decisions must be made within a risk management framework. The energy and transportation SSPs establish appropriate risk management frameworks to meet their respective goals and objectives. Although DOE and DOT are the SSAs explicitly directed to develop and implement the SSPs that most directly address the CI/KRs in designated corridors, HSPD-7 obligates all federal agencies to cooperate with those efforts.

Although it is important for the public to be informed as to the commitment and basic structural approach of the national integrated effort to address terrorism, the specific strategies and tactics that emerge cannot be shared for obvious reasons. So, while some protective measures and activities are obvious (e.g., fencing around electric substations and switchyards, routine surveillance and inspections), other measures must remain covert to maintain their effectiveness. At the programmatic level of analysis addressed in this PEIS, it is premature to develop specific anti-terrorist strategies and tactics for protecting CI/KRs in designated corridors. However, a newly added IOP for project planning ensures that applicants will be full participants in the implementation of applicable SSP objectives and programs.

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[18] The Pipeline Modal Annex to the TSSP is available at http://www.tsa.gov/assets/pdf/modal_annex_pipeline.pdf.

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