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OFFICE OF ELECTRIC POWER REGULATION

DRAFT ENVIRONMENTAL IMPACT STATEMENT

SUSITNA HYDROELECTRIC PROJECT
FERC NO. 7114 - ALASKA

Volume 6.

Appendix L. Recreation Resources

Appendix M. Visual Resources

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TABLE OF CONTENTS (Cont'd)

L.2.2.3.3 Northern Study Area . . . L-39
L.2.2.3.4 Other Alternative Power Transmission Routes . . . L-39
L.2.2.4 Alternative Borrow Sites . . . L-39
L.2.3 Non-Susitna Generation Alternatives . . . L-39
L.2.3.1 Natural-Gas-Fired Generation Scenario . . . L-39
L.2.3.2 Coal-Fired Generation Scenario . . . L-39
L.2.3.3 Combined Hydro-Thermal Generation Scenario . . . L-40
L.2.4 Comparison of Alternatives . . . L-40
L.2.4.1 Susitna Development Alternatives . . . L-40
L.2.4.2 Non-Susitna Generation Alternatives . . . L-41
L.3 MITIGATION . . . L-42
REFERENCES . . . L-43

APPENDIX M. VISUAL RESOURCES
M.1 VISUAL RESOURCE ANALYSIS CRITERIA . . . M-3
M.2 AFFECTED ENVIRONMENT . . . M-3
M.2.1 Proposed Project . . . M-4
M.2.1.1 Upper and Middle Susitna River Basin . . . M-4
M.2.1.1.1 Landscape Character Types . . . M-5
M.2.1.1.2 Prominent Natural Features . . . M-5
M.2.1.1.3 Significant Viewsheds, Vista Points, and Travel Routes . . . M-20
M.2.1.2 Power Transmission Line Corridor . . . M-20
M.2.1.2.1 Landscape Character Types . . . M-20
M.2.1.2.2 Prominent Natural Features . . . M-21
M.2.1.2.3 Significant Viewsheds, Vista Points, and Travel Routes . . . M-21
M.2.2 Susitna Development Alternatives . . . M-36
M.2.2.1 Alternative Dam Locations and Designs . . . M-36
M.2.2.2 Alternative Access Routes . . . M-36
M.2.2.3 Alternative Power Transmission Line Routes . . . M-36
M.2.2.4 Alternative Borrow Sites . . . M-37
M.2.3 Non-Susitna Generation Alternatives . . . M-37
M.2.3.1 Natural-Gas-Fired Generation Scenario . . . M-37
M.2.3.1.1 Beluga and Chuitna Rivers . . . M-37
M.2.3.1.2 Kenai Peninsula . . . M-37
M.2.3.1.3 Anchorage . . . M-38
M.2.3.2 Coal-Fired Generation Scenario . . . M-38
M.2.3.2.1 Nenana . . . M-38
M.2.3.2.2 Willow . . . M-38
M.2.3.2.3 Cook Inlet . . . M-38
M.2.3.3 Combined Hydro-Thermal Generation Scenario . . . M-38
M.2.3.3.1 Chakachamna Lake . . . M-38
M.2.3.3.2 Browne . . . M-39
M.2.3.3.3 Keetna . . . M-39
M.2.3.3.4 Snow . . . M-39
M.2.3.3.5 Johnson . . . M-39
M.2.3.3.6 Nenana, Chuitna River and Anchorage . . . M-39
M.3 ENVIRONMENTAL IMPACTS . . . M-39
M.3.1 Proposed Project . . . M-39
M.3.1.1 Watana Development . . . M-40
M.3.1.1.1 Construction . . . M-40
M.3.1.1.2 Operation . . . M-40
M.3.1.2 Devil Canyon Development . . . M-43
M.3.1.2.1 Construction . . . M-43
M.3.1.2.2 Operation . . . M-43
M.3.1.3 Access Routes . . . M-49
M.3.1.3.1 Denali Highway-to-Watana Route . . . M-49
M.3.1.3.2 Watana-to-Devil Canyon Route . . . M-49
M.3.1.3.3 Rail Access to Devil Canyon . . . M-53
M.3.1.4 Power Transmission Facilities . . . M-53
M.3.1.4.1 Dams-to-Gold Creek Segment . . . M-53
M.3.1.4.2 Gold Creek-to-Fairbanks Segment . . . M-53
M.3.1.4.3 Gold Creek-to-Anchorage Segment . . . M-65
M.3.2 Susitna Development Alternatives . . . M-65
M.3.2.1 Alternative Dam Locations and Designs . . . M-65
M.3.2.2 Alternative Access Routes . . . M-66
M.3.2.3 Alternative Power Transmission Line Routes . . . M-66
M.3.2.4 Alternative Borrow Sites . . . M-66
M.3.3 Non-Susitna Generation Alternatives . . . M-66
M.3.3.1 Natural-Gas-Fired Generation Scenario . . . M-66
M.3.3.2 Coal-Fired Generation Scenario . . . M-68

TABLE OF CONTENTS (Cont'd)

M.3.3.3 Combined Hydro-Thermal Generation Scenario M-68
M.3.4 Comparison of Alternatives M-68
M.3.4.1 Susitna Development Alternatives M-68
M.3.4.2 Power Generation Scenarios M-69
M.4 MITIGATION M-69
M.4.1 Mitigative Measures Proposed by the Applicant M-69
M.4.1.1 Additional Study M-69
M.4.1.2 Best Development Practices M-70
M.4.1.3 Creative Engineering Design M-71
M.4.1.4 Use of Form, Line, Color, or Textures M-71
M.4.2 Additional Mitigative Measures Recommended by the Staff M-71
REFERENCES M-72

LIST OF FIGURES

Figure — Page

COVER PHOTO: Artist's Rendition of the Proposed Watana Dam and Reservoir

APPENDIX L. RECREATION RESOURCES

L-1 Schematic Representation of Recreation Features in the Susitna Project Recreation Area L-15

APPENDIX M. VISUAL RESOURCES

M-1 Landscape Character Types and Prominent Natural Features of the Upper and Middle Susitna River Basin M-12
M-2 Photos of the Upper and Middle Susitna Basin Landscape Character Types M-13
M-3 Selected Photos of Prominent Natural Features Located within the Upper and Middle Susitna River Basin M-16
M-4 Landscape Character Types and Prominent Natural Features Along the Fairbanks-to-Healy Segment of the Proposed Transmission Line Corridor M-28
M-5 Landscape Character Types and Prominent Natural Features Along the Healy-to-Gold Creek Segment of the Proposed Transmission Line Corridor M-29
M-6 Landscape Character Types and Prominent Natural Features Along the Gold Creek-to-Willow Segment of the Proposed Transmission Line Corridor M-30
M-7 Landscape Character Types and Prominent Natural Features Along the Willow-to-Anchorage Segment of the Proposed Transmission Line Corridor M-31
M-8 Photos of the Landscape Character Types Along the Proposed Transmission Line Corridor M-32
M-9 Photos of Selected Prominent Natural Features Located within the Proposed Transmission Line Corridor Area M-35
M-10 Artist's Photo Rendition of the Proposed Watana Dam M-41
M-11 Photo of Existing Susitna River Valley and Artist's Rendition of the Proposed Watana Reservoir at Mid-Drawdown M-42
M-12 Examples of Slope/Slide Problems Around a Reservoir M-44
M-13 Photo of Proposed Site of the Construction Camp/Permanent Village Area and Artist's Rendition of Permanent Watana Settlement M-45
M-14 Significant Views and Visual Resource Impacts within the Watana and Devil Canyon Dam Facilities and Village Area M-47
M-15 Artist's Photo Rendition of the Proposed Devil Canyon Dam and Reservoir M-48
M-16 Significant Views and Visual Resource Impacts Along the Proposed Road and Rail Access Routes M-52
M-17 Artist's Rendition of the Proposed Devil Canyon High-Level Suspension Bridge . . . M-60
M-18 Significant Views and Visual Resource Impacts Along the Proposed Fairbanks-to-Healy Transmission Line Segment M-61
M-19 Significant Views and Visual Resource Impacts Along the Proposed Healy-to-Gold Creek and Dams-to-Gold Creek Transmission Line Segments M-62
M-20 Significant Views and Visual Resource Impacts Along the Proposed Gold Creek-to-Willow Transmission Line Segment M-63
M-21 Significant Views and Visual Resource Impacts Along the Proposed Willow-to-Anchorage Transmission Line Segment M-64
M-22 Aerial View of Existing Transmission Line Similar in Size and Tower Design to that of the Proposed Susitna Transmission Line System M-65

LIST OF TABLES

Table		Page
APPENDIX L.	RECREATION RESOURCES	
L-1	Characteristics of Alaskan National Wildlife Refuges	L-4
L-2	Characteristics of the National Park Units in Alaska	L-6
L-3	Acreages Within Units of the State Park System, Differentiated by Park District	L-7
L-4	Inventory and User Capacities of Existing Recreation Facilities and Land Ownership of Recreation Areas in Alaska	L-8
L-5	Favorite Outdoor Recreation Activities	L-9
L-6	Average Annual Recreation Occasions per Participating Adult by Activity and Region	L-10
L-7	Regional Inventories of Public Recreation Facilities Provided by Governmental Agencies of Alaska, 1977	L-12
L-8	Principal Preferences of Outdoor Recreationists Residing in Southcentral Alaska	L-13
L-9	Trails in the Susitna Project Recreation Study Area	L-18
L-10	Features of the Applicant's Proposed Recreation Plan	L-37
APPENDIX M.	VISUAL RESOURCES	
M-1	Distance Viewing Criteria	M-4
M-2	Descriptions of Landscape Character Types within the Upper and Middle Susitna River Basin	M-6
M-3	Descriptions of Landscape Character Types Along the Proposed Power Transmission Line Corridor	M-22
M-4	Significant Views and Visual Resource Impacts within the Watana and Devil Canyon Dam Facilities and Village Area	M-46
M-5	Significant Views and Visual Resource Impacts Along the Proposed Road and Rail Access Routes	M-50
M-6	Significant Views and Visual Resource Impacts Along the Proposed Transmission Line Corridor	M-54
M-7	Significant Views and Visual Resource Impact Areas Along the Alternative Power Transmission Route Segments	M-67

DRAFT ENVIRONMENTAL IMPACT STATEMENT

SUSITNA HYDROELECTRIC PROJECT, FERC NO. 7114

APPENDIX L

RECREATION RESOURCES

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APPENDIX L. RECREATION RESOURCES

L.1 AFFECTED ENVIRONMENT

L.1.1 Introduction

L.1.1.1 Historical Perspective

The vast area of Alaskan lands and waters and the pronounced diversity of climate, landscape, vegetation, resident and migrant wildlife, and human cultural lifestyles contribute to an abundance of outdoor recreational opportunities within the state. The current recreation resource base strongly reflects land-use designations of the recent past; however, the establishment of some major recreation areas predates the granting of statehood to Alaska in 1959. One of the earliest and most significant areas to be established was the Tongass National Forest, between 1902 and 1909 (Selkregg, 1974); the Tongass is the largest national forest in the nation. Other areas established in the early part of the century include Mt. McKinley National Park, 1917; Katmai National Monument, 1918; and Glacier Bay National Monument, 1925 (Selkregg, 1974). These three units of the National Parks System have since been renamed Denali National Park and Preserve, Katmai National Park and Preserve, and Glacier Bay National Park and Preserve, respectively (National Park Service, 1982).

Officially recognized in 1959, the Constitution of the State of Alaska authorized the state legislature to establish a state park system (Park Planning Section, 1982a). This authorization was implemented in the Alaska Land Act of 1959, which provided that areas of more than 640 acres [260 hectares (ha)] could not be closed to multiple use, except by act of the legislature. The Federal Omnibus Act of 1959 transferred 32 parcels [each less than 640 acres (260 ha)] to the state, with management responsibilities delegated to the Alaska Department of Natural Resources. Other Alaskan legislation in 1959 included an appropriation of $75,000 for forestry and park activities. In 1960, legislation included appropriations for the development of the state park system. However, capital appropriations never exceeded $50,000 until fiscal 1967. State legislators authorized a $900,000 bond issue in 1966 in order to match Federal grant funds available through the Federal Land and Water Conservation Fund Act. An additional bond issue was authorized in 1970, and the state park system was expanded to include nearly 1 million acres (0.4 million ha). The 1970 legislation also included establishment of a separate Division of Parks within the Department of Natural Resources. Another principal addition to the system occurred in 1979 with the establishment of the 1.5 million-acre (0.6 million-ha) Wood River-Tikchik State Park. As of 1982, the state park system comprised more than 80 units consisting of about 3 million acres (1.2 million ha) of state land (Park Planning Section, 1982a).

The most recent and by far the most dramatic increase in dedicated recreation resource areas of Alaska occurred with passage of the Alaska National Interest Lands Conservation Act (Public Law 96-487) of 1980. Lands within the National Park System increased by about 43.6 million acres (17.6 million ha) (General Accounting Office, 1982). The National Wildlife Refuge System was expanded by about 53.7 million acres (21.7 million ha), and about 3.3 million acres (1.3 million ha) were added to two existing national forests. Other dedications included creation of a National Conservation Area [1.2 million acres (0.5 million ha)] and a National Recreation Area [1 million acres (0.4 million ha)]. Federal acquisitions attributable to the Act involved a total of 103.3 million acres (41.8 million ha). For perspective, this acreage represents about 27.5% of Alaskan land and slightly exceeds the area of California.

L.1.1.2 Statewide Overview

L.1.1.2.1 Recreation Resource Areas

FEDERAL RESOURCE AREAS

The greatest proportion of the Federal recreation resource base consists of national wildlife refuges. Administered by the U.S. Fish and Wildlife Service, the refuges range from the 0.7 million-acre (0.3 million-ha) Tetlin National Refuge to the vast 19.6 million-acre (7.9 million-ha) Yukon Delta National Wildlife Refuge (Alaska Northwest Publishing, 1982). The area of the Arctic National Wildlife Refuge in northeastern Alaska compares closely with that of the Yukon Delta Refuge. The cumulative area of the 16 national refuges is about 76 million acres (31 million ha) (General Accounting Office, 1982), about 20% of the acreage in Alaska. Characteristics of the refuges are summarized in Table L-1.

Table L-1. Characteristics of Alaskan National Wildlife Refuges

National Refuge	General Location	Acreage	Distinctive Wildlife
Alaska Maritime	5 units - Alaska Peninsula, Aleutian Islands, Bering Sea, Chukchi Sea, Gulf of Alaska	3,548,956	Sea birds, sea lions, sea otters, harbor seals
Alaska Peninsula	Alaska Peninsula	3,500,000	Brown bears, caribou, moose, sea otters, peregrine falcons
Arctic	Extreme Northeastern Alaska	18,054,624	Caribou, polar bears, brown bears, wolves, Dall's sheep, peregrine falcons
Becharof	Alaska Peninsula	1,200,000	Brown bears, bald eagles
Innoko	Near Koyukuk	3,850,000	Migratory birds, beavers
Izembek	Alaska Peninsula	320,893	Black brant, brown bears
Kanuti	Near Allakaket	1,430,000	Migratory waterbirds, furbearers, moose
Kenai	Kenai Peninsula	1,970,000	Moose, salmon, mountain goats, Dall's sheep, bears
Kodiak	Kodiak Island	3,555,000	Wolves, caribou
Koyukuk	Huslia	3,555,000	Wolves, caribou
Nowitna	Near Tanana	1,560,000	Migratory waterfowl, caribou, moose, bears, furbearers
Selawik	Near Kotzebue	2,150,000	Migratory waterbirds
Tetlin	Northway	700,000	Migratory waterfowl, Dall's sheep
Togiak	Inland from Togiak	4,105,000	Nearly every major wildlife species in Alaska
Yukon Delta	Yukon River Delta area, Nunivak Island	19,624,458	Migratory birds, musk ox on the Island
Yukon Flats	Fort Yukon	8,630,000	Waterfowl

Conversion: To convert acres to hectares, multiply by 0.405.

Source: Alaska Northwest Publishing Company (1982).

Units of the National Park System established in Alaska include parks, preserves, monuments, and historic parks. Collectively, these areas are comprised of about 51 million acres (21 million ha), equivalent to about 14% of the area in the state (National Park Service, 1982). Though typically large, units of the system range from the 108-acre (44-ha) Sitka National Historic Park to the 12.3 million-acre (4.98 million-ha) Wrangell-St. Elias National Park and Preserve. The latter is the largest unit of the National Park System (National Park Service, 1982). Characteristics of the national park units in Alaska are summarized in Table L-2.

The two national forests managed by the U.S. Forest Service also contribute substantially to the outdoor recreation resource base of Alaska. The Tongass National Forest of Southeastern Alaska and Chugach National Forest of South-central Alaska are the nation's largest and second largest national forests, respectively (Alaska Northwest Publishing, 1982); the combined area is 23.3 million acres (9.4 million ha), equivalent to about 6% of the area in the state (General Accounting Office, 1982). About 23% of the national forest lands have been assigned wilderness status, as have large acreages within various national wildlife refuges and national park units in Alaska. The total acreage of designated wilderness areas in Alaska managed by the U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service is about 56.4 million acres (22.8 million ha), or about 15% of the area in Alaska.

The Bureau of Land Management administers the White Mountain National Recreation Area and the Steese National Conservation Area, which are located in Central Alaska to the north and northeast, respectively, of Fairbanks. The combined area is about 2.2 million acres (0.9 million ha). The Bureau of Land Management and National Park Service also manage about 434,000 acres (176,000 ha) of lands that border units of the Wild and Scenic Rivers System located outside the boundaries of Federally dedicated areas. For the most part, however, the 3,232 miles (mi) [5,200 kilometers (km)] of Alaskan waterways within the Wild and Scenic Rivers System are located within national parks, refuges, and other Federal lands noted above (National Park Service, 1982). In summary, the areas administered by the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, and Bureau of Land Management comprise a total of about 153 million acres (62 million ha) (General Accounting Office, 1982), which is about 41% of Alaskan land, and for perspective, equivalent to about 90% of the area of Texas. As of December 1981, the Bureau of Land Management also administered an additional 121 million acres (49 million ha) of public domain lands, thereby contributing to outdoor recreation opportunities with multiple-use management practices.

STATE RESOURCE AREAS

The Alaska Department of Fish and Game and the Alaska Division of Parks are the principal agencies administering recreation resources on state lands of Alaska. The Department of Fish and Game manages about 1.77 million acres (0.72 million ha) of state land comprising 8 State Game Refuges, 2 State Game Sanctuaries, and 11 Critical Habitat Areas (Alaska Division of Parks, 1981). The cumulative area of the State Game Refuges is 689,000 acres (280,000 ha), that for the State Game Sanctuaries is about 104,000 acres (42,000 ha), and that for Critical Habitat Areas is about 977,000 acres (395,000 ha). Management objectives entail protection of wildlife and wildlife habitats, with special provisions for wildlife viewing and hunting and other recreation uses.

Administered by the Alaska Division of Parks, the State Park System included 82 park units as of January 1982 (Park Planning Section, 1982b). Five of the units are state parks, the smallest of which is the 6,045-acre (2,446-ha) Chilkat State Park located near Haines in Southeast Alaska, and the largest of which is the 1.4 million-acre (0.6 million-ha) Wood-Tikchik State Park located near Dillingham in Southwest Alaska. Other units of the State Park System include State Recreation Areas (generally of substantial size) and State Recreation Sites, Historic Parks, and Historic Sites (all relatively small areas). Collectively, units of the system comprise about 2.97 million acres (1.20 million ha). Information concerning these units is summarized in Table L-3.

Additional units are proposed for inclusion in the State Park System, including State Trails, State Recreation Rivers, and State Preserves. However, the State Park System is currently subject to "a dynamic period of change reflecting larger changes occurring in the state's economy and land ownership" (Park Planning Section, 1982a). In part, uncertainties concerning land ownership stem from the Alaska Statehood Act, which provided for the State of Alaska to select 104.45 million acres (42.27 million ha) of land primarily from the public domain (Selkregg, 1974). Additionally, the Alaska Native Claims Settlement Act of 1971 provided for the selection of 44 million acres (18 million ha) of Federal land by Alaska Natives (General Accounting Office, 1982). In neither case have land selections been completed. Thus, the manner in which land selections may affect some existing units as well as planned developments of the State Park System is not now foreseeable.

OTHER RECREATION RESOURCE AREAS

Local outdoor recreation activities primarily involve use of municipal or community park sites. The collective area devoted to municipal parks in Alaska is 7,883 acres (3,190 ha), with about

Table L-2. Characteristics of the National Park Units in Alaska

National Park Unit	General Location	Acreage	Distinctive Features
Aniakchak National Monument and Preserve	Alaska Peninsula	517,000	Evidence of volcanic activity, crater lake, and waterfall
Bering Land Bridge National Preserve	Seward Peninsula	2,457,000	Remnant land bridge, archeological and paleontologic resources, volcanics
Cap Krusenstern National Monument	Near Noatak	560,000	Archeological sites reveal Eskimo cultures dating back 4,000 years
Denali National Park and Preserve	Near Cantwell	5,695,493	Mount McKinley, large glaciers, caribou, Dall's sheep, moose, brown bear, wolves
Gates of the Arctic National Park and Preserve	Anaktuvuk Pass	7,952,000	North of the Arctic Circle, "greatest remaining wilderness in North America," rugged mountain scenery
Glacier Bay National Park and Preserve	Near Haines	3,275,146	Great tidewater glaciers, ice to lush temperate rainforest, large variety of animals
Katmai National Park and Preserve	Alaska Peninsula	3,955,373	Abundance of wildlife, renowned sport fishing, wild rivers, "Valley of Ten Thousand Smokes"
Kenai Fjords National Park	Near Seward	567,000	Harding Icefield, 1 of 4 major ice caps in U.S., deep glacial valleys, rainforest, abundant marine and bird life
Klondike Gold Rush National Historic Park	Skagway	11,745	Historic buildings and portions of Chilkoot and White Pass Trails prominent in 1898 gold rush
Kobuk Valley National Park	Kobuk	1,710,000	Rich variety of arctic wildlife, Great Kobuk Sand Dunes, archeological sites, wild river
Lake Clark National Park and Preserve	Near Kustatan	4,013,000	In heart of Chigmit Mountains, rugged scenery, most important salmon spawning area in North America
Noatak National Preserve	Upstream from Noatak	6,460,000	Largest undisturbed mountain-ringed basin in nation, very diverse flora and fauna, archeological sites
Sitka National Historic Park	Near Sitka	108	Battleground marking the last major Tlingit Indian resistance to Russian colonization
Wrangell-St. Elias National Park and Preserve	Wrangell, Chugach and St. Elias Mountains	12,318,000	Largest unit of the National Park System, "mountain kingdon of North America," wild rivers, wildlife
Yukon-Charlie Rivers National Preserve	Eagle	1,713,000	Numerous cabins and relics from the 1898 gold rush, paleontologic and archeological sites, wild river

Conversion: To convert acres to hectares, multiply by 0.405.

Source: National Park Service (1982).

Table L-3. Acreages Within Units of the State Park System, Differentiated by Park District†[1]

District	Recreation Sites	Parks	Recreation Areas	Historical Parks	Historical Sites	Total
Southeast	345	6,045	-	11	52	6,453
Copper Basin	2,082	-	-	-	-	2,082
Mat-Su	1,303	421,120	22,685	271	-	445,379
Chugach	141	495,000	-	-	-	495,141
Interior	1,519	-	254,848	-	10	256,377
Kenai	1,478	328,290	10,294	-	-	340,062
Southwest	204	1,428,320	-	-	-	1,428,524

†[1] Information current as of June 1981.

Conversion: To convert acres to hectares, multiply by 0.405.

Source: Modified from Alaska Division of Parks (1981).

52% of this acreage located in Anchorage (Alaska Division of Parks, 1981). School sites usable as parks account for an additional 2,000 acres (810 ha). Further, some military reservations include small park acreages that serve the general public as well as military personnel.

In areas of concentrated recreational activity, private groups may provide services such as fly-in guided tours to remote private lodges (Park Planning Section, 1982b). Specific information on such activities is very limited, but the demands for, and providers of, the various services are increasing (Alaska Division of Parks, 1981).

Lands selected by Alaska Natives also represent a very substantial recreation resource base. However, the extent to which these lands will be open to public recreation is as yet unknown.

L.1.1.2.2 Recreation Facilities and Activities

All public recreation areas and facilities administered by Federal, state, and local governmental agencies were inventoried in a statewide survey conducted in 1977 (Alaska Division of Parks, 1981). Results are summarized in Table L-4. Aside from the "Military" category shown in the table, the acreages administered by the various other agencies have been updated to reflect 1980 estimates (Alaska Division of Parks, 1981). Other information shown in the table includes the estimated capacity of some of the recreation facilities. [The capacity is indicated as "PAOT" (persons at-one-time). For example, the total developed capacities of the 1,270 camping units administered by Federal agencies are rated to adequately service a total of 6,299 PAOT.]

Recreation use patterns and preferences vary significantly in different regions of Alaska (Joint Federal-State Land Use Planning Commission, 1979). For example, residents of Southeast Alaska commonly travel from the main communities by boat or plane to favorite fishing coves or to remote hunting areas. In contrast, the Kenai Peninsula is invaded on summer weekends by numerous Anchorage residents who overcrowd the campgrounds and waysides during the salmon season. Residents of Fairbanks and other interior communities, on the other hand, are less interested in new recreation developments because they are still able to disperse to public lands to participate in a variety of activities. While these characterizations may be somewhat extreme, regional differences do exist, as will be evident in the following discussion.

One of the principal and more comprehensive sources of information concerning various aspects of outdoor recreation in Alaska is the Alaska Public Survey (Alaska Division of Parks, 1981). The survey was a multiagency effort based on 2,888 interviews with householders in the Southeast, Southcentral, and Interior regions of Alaska (Clark and Johnson, 1981). Individuals over 18 years old were randomly chosen for interviews, and each interview was completed in one hour. A total of 67 communities were represented.

The result of the survey is an extensive computer data base available for use by both resource managers and private citizens to analyze a wide range of resource problems. Information presented in Table L-5 is derived from the data base. As the table shows, fishing is the most favored outdoor recreation activity in Southeast and Southcentral Alaska, while tent camping is the favorite activity in the Interior region. Overall, trail-related activities are among the more popular activities. Table L-6, also based on survey results, provides information indicating the number of times per year that an average individual participates in a given activity.

Table L-4. Inventory and User Capacities of Existing Recreation Facilities and Land Ownership of Recreation Areas in Alaska

Facilities	Federal		Military		State		Local		School Sites	
	Number	PAOT†[1]	Number	PAOT	Number	PAOT	Number	PAOT	Number	PAOT
Camping units	1,270	6,299	229	824	1,218	4,384	477	1,717	-	-
Remote cabins	221	1,135	30	180	2	8	3	6	-	-
Picnic tables	270	1,368	34	161	1,747	8,735	323	1,583	-	-
Picnic shelters	22	220	1	10	32	320	-	-	-	-
Clam beaches (miles)	-	-	-	-	28	-	-	-	-	-
Boat launches	34	34	4	4	26	26	12	12	-	-
Boat moorages	-	-	25	25	-	-	4,378	4,378	-	-
Canoe trails (miles)	332	1,932	-	-	47	280	26	160	-	-
Horse trails (miles)	214	1,070	49	240	8	40	-	-	-	-
Walk/run trails (miles)	973	9,730	-	-	443	4,430	23	230	-	-
Bicycle trails (miles)	-	-	1	10	-	-	76	760	-	-
ATV/ORV†[2] trails (miles)	535	2,130	70	280	142	670	14	104	-	-
X-C†[3] ski trails (miles)	101	1,010	132	1,320	256	2,510	80	800	-	-
Dog-mushing trails (miles)	-	-	-	-	750	3,000	-	-	-	-
Ski lifts/tows	6	-	15	-	-	-	4	-	-	-
Golf courses	-	-	1	-	-	-	4 Loc/ (Pvt)	-	-	-
Tennis courts	-	-	23	-	-	-	59	-	40	-
Basketball courts	-	-	14	-	-	-	20	-	223	-
Volleyball courts	-	-	11	-	-	-	9	-	72	-
Swimming pools	-	-	2	-	10	-	7	-	11	-
Softball/baseball fields	-	-	41	-	-	-	75	-	69	-
Soccer/football fields	-	-	14	-	-	-	12	-	20	-
Track and field	-	-	4	-	-	-	5	-	13	-
Target shooting ranges	-	-	4	-	3	-	1	-	4	-
Ice skating rinks	-	-	12	-	-	-	20	-	81	-
Land Ownership (acres)	153 million		N/A†[4]		4.7 million		7,883		2,000	

†[1] PAOT = Persons at one time.

†[2] All-terrain vehicles/off-road vehicles.

†[3] Cross-Country.

†[4] N/A = Not Available.

Conversion: To convert miles to kilometers, multiply by 1.61; to convert acres to hectares, multiply by 0.405.

Source: Modified from Alaska Division of Parks (1981).

Table L-5. Favorite Outdoor Recreation Activities†[1]

	Southeast	Southcentral	Interior	Three-Region Average, %
Fishing	24%	24%	10%	22%
Tent camping	3	9	13	9
Hunting	6	6	10	6
Motorboating	10	5	4	6
Hiking/walking/running†[2]	13	5	9	5
Beachcombing	13	5	--	5
Baseball/softball	3	4	5	4
Bicycling†[2]	2	3	6	4
Cross-country skiing†[2]	2	4	5	4
Alpine skiing	2	4	2	4
Winter ORV†[2]	1	3	3	2
Swimming	2	2	2	2
Flying for pleasure	1	2	--	2
Summer ORV†[2]	1	2	--	2
Traveling/sightseeing	2	2	--	2
Horseback riding†[2]	1	2	--	2
Other†[3]				

†[1] Percentage of respondents selecting the specified activity as their first preference.

†[2] Trail-related activities.

†[3] Twenty-five other activities were listed and represented 1% or less each.

Source: Alaska Division of Parks (1981).

Table L-6. Average Annual Recreation Occasions per Participating Adult by Activity and Region

Activities	Number of Times per Year			
	Southeast	Southcentral	Interior	Three-Region Average
Driving for pleasure	21.8	18.3	16.3	18.7
Walking/running for pleasure	17.9	13.3	7.2	12.9
Bicycling	9.1	12.5	12.8	11.7
Fishing (freshwater)	3.1	7.5	14.6	8.2
Motorboating	6.0	5.3	11.0	6.9
Swimming	2.4	4.1	15.6	6.6
Snowmobiling/other winter ORV	1.9	4.4	11.2	5.5
Cross-country skiing	1.6	5.0	10.0	5.4
Motorcycling/other summer ORV	2.0	5.1	8.1	5.1
Baseball/softball	4.2	4.8	5.8	4.9
Attending sports, entertainment	5.8	3.8	5.5	4.7
Sledding/tobagganing	4.6	4.5	3.4	4.3
Tent camping	1.5	3.6	7.6	4.1
Hiking with pack	3.9	2.9	4.2	3.5
Target shooting	3.4	3.3	1.4	2.9
Football/soccer	1.6	2.9	3.4	2.7
Kayaking/canoeing	1.0	3.1	3.4	2.7
Outdoor tennis/badminton	1.9	3.5	1.2	2.5
Flying for pleasure	1.0	3.3	2.1	2.4
Outdoor basketball	2.3	2.0	2.4	2.2
Recreation vehicle camping	0.2	3.1	2.1	2.1
Alpine skiing	2.1	2.6	0.8	2.0
Outdoor hockey	0.01	1.2	2.8	1.3
Sailing	0.2	1.2	1.1	0.9
Horseback riding	0.2	1.0	1.0	0.8
Waterskiing	0.2	0.5	0.7	0.5
Golfing	0.0	0.6	0.1	0.3
Hang gliding	0.0	0.1	0.0	0.1
Other inland activities	2.5	2.6	2.4	2.5

Source: Modified from Alaska Division of Parks (1981).

The two tables indicate the wide variety of recreation opportunities available, and cross comparisons within and between tables provide insight as to the patterns and preferences of recreation participation. Comparable data for the more sparsely populated regions and for out-of-state tourists are not available; however, it seems unlikely that the results would differ substantially from the three-region averages.

L.1.2 Proposed Project

L.1.2.1 Regional Setting

As delineated in state park plans, the Southcentral Region of Alaska is bounded by the divide of the Alaska Range on the north and encompasses Kodiak Island on the south (Park Planning Section, 1982b). The eastern boundary of the region corresponds with the Alaska-Yukon border, and the western limits correspond with the western boundaries of the Matanuska-Susitna and Kenai Peninsula boroughs. The western limits of the region also include portions of Denali National Park and Preserve and intercept eastern portions of the Lake Clark and Katmai National Park and Preserve. Other national park units within the Southcentral Region include the Kenai Fjords National Park and most of the vast Wrangell-St. Elias National Park and Preserve. The Chugach National Forest is entirely within the region, as are the Kenai and Kodiak National Wildlife Refuges. Aside from small island units of the Alaska Maritime National Wildlife Refuge, the collective area of the Federal refuge, park, and forest units located wholly or partially within the Southcentral Region exceeds 30 million acres (12 million ha). These dedicated Federal holdings are described further in Section L.1.1.2 and Tables L-1 and L-2.

Other Federally managed areas of the Southcentral Region include large acreages of public domain administered by the Bureau of Land Management in accord with the concept of multiple use of land resources. Provisions for outdoor recreation are integral considerations in land-use planning. Land management units administered by the Bureau are differentiated into four units called "planning blocks", which may consist of one or more separate land parcels (U.S. Bureau of Land Management, 1980). Two of the planning blocks are the Columbia and Bering blocks, located immediately inland of Prince William Sound, in mountainous terrain primarily covered with active glacial ice fields. The combined acreage of the two blocks is about 1.1 million acres (0.4 million ha). The other two planning blocks administered by the Bureau are the Denali Block, encompassing 3.73 million acres (1.51 million ha), and the Tiekel Block, consisting of 0.52 million acres (0.21 million ha) (U.S. Bureau of Land Management, 1982). The Denali Block occurs as an irregular tract between Paxson and Cantwell and is generally bisected by the Denali Highway. The Tiekel Block is located on both sides of the Richardson Highway, about 32 mi (51 km) south of Glennallen.

The Bureau also administers those portions of the Gulkana and Delta rivers that have been designated as units of the Wild and Scenic Rivers System. These river segments parallel portions of the Richardson Highway to the east and north, respectively, of the Susitna River Basin.

The Alaska Division of Parks is the principal state agency administering recreation resource areas in the Southcentral Region. Furthermore, the Division's efforts in developing resource sites are strongly focused in this region. For example, of the 82 park units in the State Park System in 1982, 53 were in the Southcentral Region (Park Planning Section, 1982b). The units are characterized as follows:

Units	Number	Acreage
State Parks	3	1,244,614
State Historical Parks	3	496
State Recreation Areas	13	34,022
State Recreation Sites	33	4,394
State Trails	1	--
Totals	53	1,283,526

The concentration of state park units in the Southcentral Region appears to relate strongly to two factors. First, more than half of residents of Alaska live in this region. Second, the transportation system of the region is more extensively developed than that of other regions of the state (Park Planning Section, 1982b). Furthermore, an overview of the distribution of state park units within the Southcentral Region reveals a marked concentration of recreation development adjacent to population centers and along major highways.

Information relative to the regional distribution of recreational facilities as gathered in the 1977 recreation survey is presented in Table L-7. As indicated, for 18 of the 25 categories listed, 60% or more of the recreational facilities are located in Southcentral Alaska. This

Table L-7. Regional Inventories of Public Recreation Facilities Provided by Governmental Agencies of Alaska, 1977†[1]

Facilities	Number of Facilities by Region				
	Southcentral	Southeast	Interior	Southwest Northwest	Total
Camping units	2,328	351	484	31	3,194
Remote cabins	70	149	33	-	252
Picnic tables	1,185	332	767	20	2,304
Picnic shelters	16	30	9	-	55
Boat launches	79	38	44	1	162
Boat moorages	1,723	2,759	-	1	4,483
Canoe trails (miles)	339	34	22	-	395
Horse trails (miles)	271	-	-	-	271
Walk/run trails (miles)	944	409	84	2	1,439
Bicycle trails (miles)	76	-	1	-	77
ATV/ORV†[2] trails (miles)	702	-	59	-	761
X-C†[3] ski trails (miles)	523	2	44	-	569
Dog-mushing trails (miles)	450	-	300	-	750
Ski lifts/tows	11	7	7	-	25
Golf courses	5	-	-	-	5
Tennis courts	89	20	13	-	122
Basketball courts	183	35	38	-	256
Volleyball courts	62	19	11	-	92
Swimming pools	13	2	15	-	30
Softball/baseball fields	134	27	20	4	185
Soccer/football fields	32	8	6	-	46
Track and field	14	4	2	2	22
Target shooting ranges	9	2	1	-	12
Ice skating rinks	106	2	5	-	113
Playgrounds	215	20	11	-	246

†[1] Does not include privately owned facilities.

†[2] All-terrain vehicles/off-road vehicles.

†[3] Cross-country.

Conversion: To convert miles to kilometers, multiply by 1.61.

Source: Alaska Division of Parks (1981).

concentration reflects the higher population density, better developed highway network, and high proportion of state park units in the Southcentral Region. Additionally, the concentration may reflect an increasing preference by Alaskans to use recreational resources that are close to home or readily accessible (Park Planning Section, 1982b).

The Alaska Public Survey of 1981 provided information concerning preferences and priorities of Southcentral Alaskans with respect to outdoor recreation activities. The results are summarized in Table L-8. As Part A of the table indicates, the recreation activity in which adults in Southcentral Alaska most frequently participate is driving for pleasure; second is walking and running for pleasure. The frequency for adults of the Southcentral Region who participate in these two activities average 18.3 and 13.3 times per year, respectively (Alaska Division of Parks, 1981). A comparable number was reported for bicycling (12.5 times per year). Numbers for all other reported activities were 7.5 or less times per year.

Table L-8. Principal Preferences of Outdoor Recreationists Residing in Southcentral Alaska†[1]

A. Activities in Which Adults Most Frequently Participate

Driving for pleasure
Walking/running for pleasure
Fishing
Audience for outdoor sports
Tent camping
Motorboating
Bicycling
Cross-country skiing
Target shooting
Recreational vehicle camping

B. Activities in Which Adults Would Like to Participate More Often

Fishing
Camping (general, tent)
Motorboating
Hnting
Hiking
Alpine skiing
Flying
Driving for pleasure
Recreational vehicle camping
Bicycling

C. Activities Rated as Favorite by Adults

Fishing
Tent camping
Walking/running for pleasure
Hunting
Motorboating
Beachcombing
Playing softball/baseball
Cross-country skiing
Alpine skiing
Bicycling

†[1] Based on responses by adults participating in the Alaska Public Survey.

Source: Park Planning Section, 1982b.

Part B of Table L-8 indicates activities in which adults would prefer to participate more often. The preferences were fishing (25%), tent camping (12%), motorboating (8%), and hunting (7%). An additional 8% of the respondents said they would prefer to participate in more trail-related activities (Alaska Division of Parks, 1981).

Favorite recreation activities of adults within the Southcentral Region are listed in Part C of Table L-8. Additional information is presented in Table L-5. As the tables show, 24% of the total survey respondents in the Southcentral Region identified fishing as their favorite outdoor recreation activity. The second most favorite activity was tent camping at 9%. Comparable percentages (by activity) for the Interior and Southeast Regions provide a basis for comparison (Table L-5). For example, fishing was identified as the favorite outdoor activity by 24% of the survey respondents in the Southeast and Southcentral Regions of Alaska. A comparable percent for the Interior Region is only 10%.

L.1.2.2 Upper and Middle Susitna River Basin

L.1.2.2.1 Existing Conditions

The proposed Watana and Devil Canyon dam sites and access routes are located in a remote area of limited accessibility. None of the public agencies provides sites or facilities for an organized outdoor recreation program in the area. Nor is the area as a whole nor portions thereof known to be under consideration for inclusion as a dedicated recreation resource area, such as part of

the Wild and Scenic Rivers System, the National Trails System , or as a Wilderness Area (Terrestrial Environmental Specialists, 1982). A schematic representation of recreational features in the proposed project area is presented in Figure L-1.

A total of 120 building sites have been inventoried in the proposed project area--three privately owned lodges and most of the rest are private cabins (Exhibit E, Vol. 8, Chap. 9, Table E.9.5). Some of these building sites involve multiple complexes, although the majority are isolated structures. The lodges are primarily base camps for fishing and hunting activities. Opportunities for sport fishing are abundant, and both sport and trophy hunting occur; the more popular big game species are Dall's sheep, moose, caribou, black bear, and brown bear (Exhibit E, Vol. 5A, Chap. 2, Sec. 2.2).* The lodges typically serve 20 to 30 guests at one time, with a total for all lodges of about 120 guests per year (Exhibit E, Vol. 5A, Chap. 2, Sec. 2.2). The lodges also serve river travelers, boaters, and other participants in trail-related activities. The principal mode of travel to the lodges is airplane.

Stephan Lake Lodge, located by Stephan Lake, is 14 mi (23 km) southwest of the proposed Watana dam site. It is the largest of the three lodge complexes, consisting of ten main structures and seven additional outlying cabins. It is also the most intensively used, serving a predominantly European clientele (Terrestrial Environmental Specialists, 1982). High Lake Lodge is located at High Lake, 6 mi (10 km) northeast of the proposed Devil Canyon dam site. It is the second largest lodge complex in the area, comprising 11 structures. Tsusena Lake Lodge is located 8 mi (13 km) north of the proposed Watana dam site and adjacent to Tsusena Lake. The lodge complex consists of three structures used primarily by lodge owners and their families and friends (Terrestrial Environmental Specialists, 1982).

In addition to the lodges, there are numerous individually owned cabins scattered throughout the proposed project area. Some of these cabins are located in clusters, such as those around Watana and Clarence lakes, while others are located in relatively remote areas. These cabins are used for a variety of activities, but about 50 units have been identified as providing shelter specifically for hunters and fishermen (Exhibit E, Vol. 8, Chap. 9, Table E.9.5). A few of the cabins are permanent residences, but most are used on a seasonal basis.

The major recreation resource areas in the vicinity of the proposed project location are Denali State Park and Denali National Park and Preserve. The northeastern portion of Denali State Park is within 10 mi (16 km) of the Devil Canyon project boundary (Alaska Division of Parks, 1975). Comprising over 324,000 acres (131,000 ha) (Exhibit E, Vol. 5a, Chap. 2, Sec. 2.1.3), the Denali State Park is accessible by air, major highway, and railroad. The park is bounded on the east by the Alaskan Railroad and traversed by the Parks Highway for about 37 mi (60 km). An estimated 519,000 travelers passed through and/or used conveniences of the park in 1981 (Exhibit E, Vol. 5a, Chap. 2, Sec. 2.1.3). Developed facilities in Denali State Park are concentrated in the Byers Lake area, the location of a campground with 61 camping units and 15 picnicking units (Alaska Northwest Publishing, 1982). In addition to the developed facilities, numerous opportunities prevail for hiking, skiing, snowshoeing, snowmobiling, and river touring (Land and Resource Planning Section, 1980).

Denali State Park abuts the Denali National Park and Preserve on both the west and north. This vast park and preserve unit comprises 6.03 million acres (2.44 million ha), approximately equivalent to the area of Vermont (National Park Service, 1982). About 31%, or 1.9 million acres (0.8 million ha), of the park is officially designated as wilderness area. Major access routes include the Parks and Denali highways and the Alaskan Railroad; air service is also available. Denali National Park and Preserve constitute the most popular attraction in the region for both residents and out-of-state visitors; over 250,000 visitations were reported in 1981 (Exhibit E, Vol. 5a, Chap. 2, Sec. 2.1.3). Developments within this national park unit include seven campgrounds comprising a total of 225 camping units (Denali National Park and Preserve, 1983). Other accommodations include lodging units, dining facilities, gift shop, gas station, lounge and saloon, grocery store, and photo shops. A wide variety of recreation opportunities are available, including hiking, backpacking, mountain climbing, skiing, hunting, fishing, and snowmobiling. A principal feature of this national park unit is Mt. McKinley, the highest mountain peak in North America, cresting at 20,320 feet (ft) [6,200 meters (m)] MSL. A diversity of wildlife and landscape settings contribute to the attractiveness of the area.

Along the Parks Highway and the Alaskan Railroad, numerous private developments supplement the recreational opportunities in the area. These developments are primarily service oriented, providing accommodations to tourists and travelers and also serving as staging areas for individuals en route to more remote recreation areas.

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*Throughout this document, references to specific "Exhibits" are to the exhibits submitted to FERC as part of Alaska Power Authority's Susitna Hydroelectric Project License Application. References to specific "Appendices" (App.) are to the appendices provided in Volumes 2 through 7 of this Draft Environmental Impact Statement.

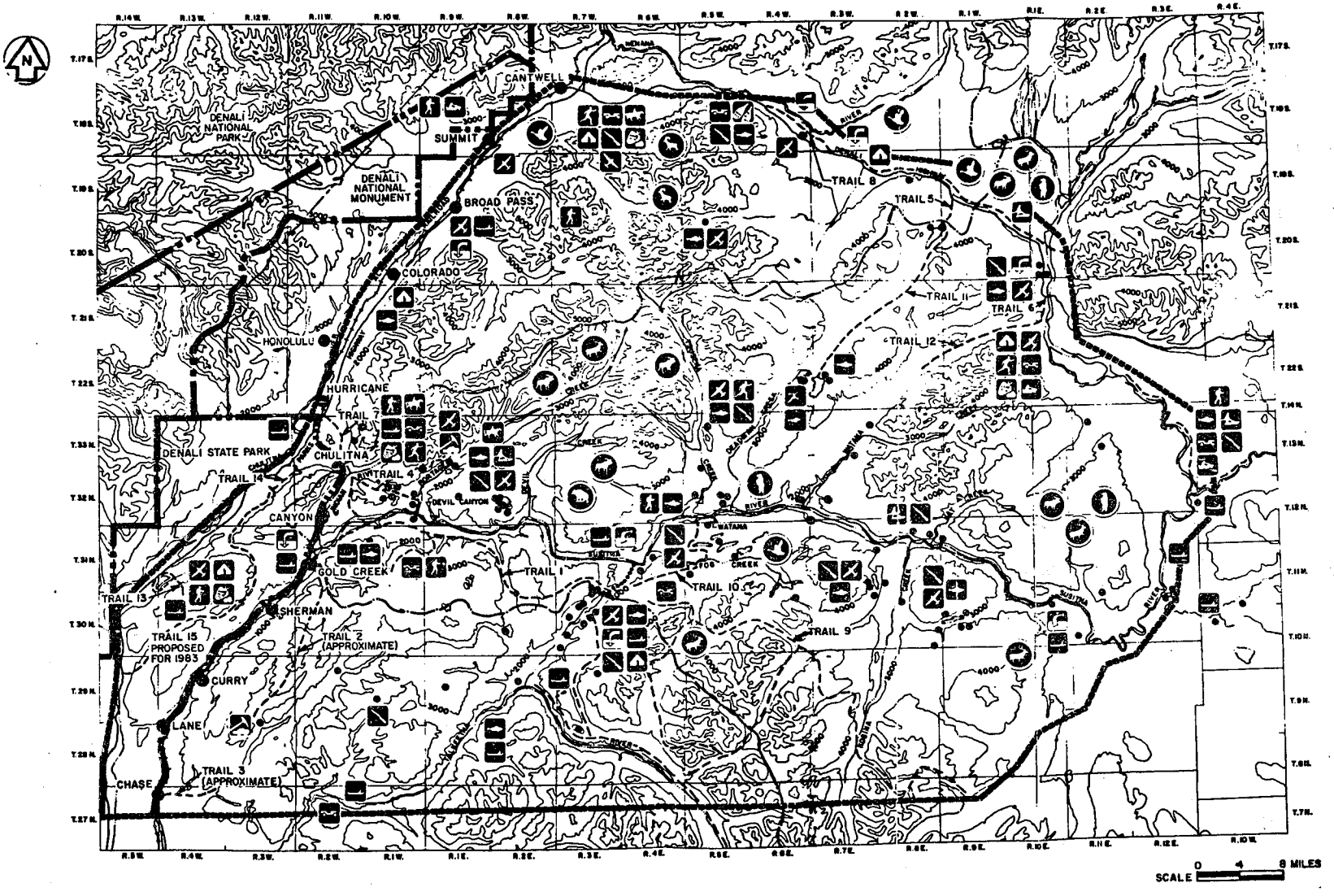

Figure L-1. Schematic Representation of Recreation Features in the Susitna Project Recreation Area. (See next page for legend.) [Source: Exhibit E, Vol. 8, Chap. 7, Fig. E.7.4, Revised June 1983]

Figure L-1. Continued

Along the Denali Highway, several private developments serve recreational interests. Along the segment north of the proposed dam sites, for example, are the privately owned lodges Adventures Unlimited, Gracious House, and the Susitna River Lodge. Farther to the east, a variety of accommodations are offered, particularly in the Tangle Lakes area located some 20 mi (32 km) west of Paxson. Facilities and services include two lodges, a large campground, and guiding service (Interior Region Reconnaissance Section, 1981). Tangle Lakes is also a put-in point for float trips on the Delta River, a designated Wild and Scenic River. The Tangle Lakes area is within the boundaries of the Tangle Lakes Archeological District, listed on the National Register of Historic Places (Alaska Dept. of Transportation and Public Facilities, 1981).

The Bureau of Land Management maintains several small recreation sites along the Denali Highway; the principal site adjacent to the proposed project area is a 31-unit campground located at the junction of the Denali Highway and Brushkana Creek (Exhibit E, Vol. 5A, Chap. 2, Sec. 2.2). The Bureau also maintains a boat launch at the Susitna River crossing and a small campground at Clearwater Creek. Other Bureau lands along the Denali Highway and adjacent to the project area have been designated by the Bureau for recreation but are essentially undeveloped at this time (Kuklok et al., 1982).

Plans for upgrading the Denali Highway have been proposed (Alaska Dept. of Transportation and Public Facilities, 1981). Integral with the plans is the proposition that the Denali Highway be nominated for status as a National Scenic Highway. Current information indicates that this proposition has been denied (Alaska Land Use Council, 1983).

The boat launch site at the junction of the Susitna River and Denali Highway is a popular access point for river recreation. River runners can follow the Susitna River to Vee Canyon and portage to Clarence Lake, or divert from the Susitna River, and power upstream on the Tyone River and ultimately reach Lake Louise, which is accessible by land from the Glenn Highway. Other river travel opportunities in the proposed project area entail floating on Stephan Lake and down Prairie Creek to the confluence with the Talkeetna River, which has been proposed for designation as a State Recreation River (Park Planning Section, 1982b), or white-water kayaking on the Class VI rapids of Devil Canyon (Exhibit E, Vol. 5a, Chap. 2, Sec. 2.2).

The existing network of trails within the project area have been built primarily for access by miners, trappers, hunters, and fishermen (Exhibit E, Vol. 5a, Chap. 2, Sec. 2.2). Information about the various trails is summarized in Table L-9, and is keyed to Fig. L-1. While the access network precludes certain modes of transport, the various trails provide opportunities for activities such as hiking, skiing, snowmobiling, off-road vehicle pleasure driving, wildlife viewing, and dogsledding.

L.1.2.2.2 Potential Future Developments

The status of future recreational resource developments in the upper and middle Susitna River Basin remains uncertain. The extent to which Alaskan Natives and Alaskan Native Corporations may choose to develop their lands for recreation use is not yet known. It seems reasonable to expect that the Bureau of Land Management, the National Park Service, the U.S. Fish and Wildlife Service, the U.S. Forest Service, and other Federal agencies would focus primarily on enhancing their existing facilities. On the other hand, the Alaska Division of Parks appears to have adopted a relatively aggressive position in responding to potential future needs. The position of the Division of Parks can be illustrated by reference to the Southcentral Region recreation plan for 1982-1992 (Park Planning Section, 1982b). The Division currently administers 53 state park units in that area. Potential additions to the state park system include 31 "proposed" units; an additional 13 units are classified "future considerations". The Southcentral Region plan also provides for acquisitions to and intensified development of some existing park units. Recommended actions near the proposed project area include establishing the Talkeetna as a State Recreation River, adding the Indian River area to Denali State Park, conducting a feasibility study of the Tokositna project (a proposed resort development of statewide significance), and developing a complete trail program and management plan.

L.1.2.3 Lower Susitna Basin and Cook Inlet Area

The number of state park units in the vicinity of Anchorage illustrates the tendency for concentrated recreational development around major population centers. The resident population of Anchorage is 173,017, about 43% of the total population of Alaska (Park Planning Section, 1982b). Immediately east of Anchorage is the Chugach State Park, a major recreation resource area comprising 405,204 acres (164,000 ha) (Alaska Northwest Publishing, 1982). Extensive developed facilities are available, as well as opportunities for a variety of dispersed recreation activities (Alaska Division of Parks, 1980).

Recreation resources of Anchorage include 4,100 acres (1,660 ha) of municipal parks (Alaska Division of Parks, 1981). The Goose Bay, Palmer Hay Flats, and Susitna Flats state game refuges, administered by the Alaska Department of Fish and Game, are in the vicinity of Anchorage. Federally sponsored recreation sites in the area are located at Ft. Richardson and

Table L-9. Trails in the Susitna Project Recreation Study Area†[1]

Trail	Beginning	Middle	End	Years Used	Use
1. Cat, ORV	Gold Creek		Devil Canyon	1950s - present	
2. Cat, ORV	Gold Creek	Ridge top west of VABM Clear	Confluence of John & Chunilna Creeks	1961 - present	
3. Cat	Alaska Railroad mile 232		Chunilna Creek	1957 - present	
4. Packhorse, Old Sled Road	Chunilna	Portage Creek	Mermaid Lake	1920s - present	
5. ATV	Denali Highway	Butte Lake	Tsusena Lake	1950s - present	
6. Snodgrass Lake Trail	Denali Highway		Snodgrass Lake		Foot, snowmobile, skis
7. Portage Creek Trail	Chunilna		Portage Creek		Sled road foot use
8. Susitna River Trail	Near Cantwell		To Maclaren River		Dry, snowmobiles and foot
9. Talkeetna Trails	Random throughout the southern area of the study area				Unknown
10. Stephan Lake Trail	Susitna River		Stephan Lake		Best portaging
11. Big Lake Trail	Denali Highway Near Butte Lake		Big Deadman Lakes		Biking & off-road vehicles
12. Butte Creek Trail	Denali Highway near the Susitna Bridge		Butte Creek drainage		Off-road vehicles & hiking
13. Byers Lake Trail	Byers Lake		Same (loop)		Hiking
14. Little Coal Creek	Parks Highway		Curry Ridge		Hiking
15. Curry Ridge Trail	Park Highway at Little Coal Creek		Parks Highway at Troublesome Creek Crossing		Hiking; to be built in 1983

†[1] Existing trails are shown in Fig. L-1.

Source: Modified from Exhibit E, Vol. 8, Chap. 7, Table E.7.6.

the Elmendorf Air Force Base, where some developed facilities and areas are open to limited recreation use by the general public (Park Planning Section, 1982b).

Twenty-one state park units are located on the Kenai Peninsula, primarily along the western edge of the peninsula (Park Planning Section, 1982b). The concentration of parks reflects a strong demand for recreation opportunities, as indicated by park planning documents (Park Planning Section, 1982b). To some extent, it may also reflect ready access by both water and land routes (the Seward and Sterling highways). The widely diverse environmental setting of the peninsula includes coastal environment, freshwater lakes and rivers, marine and mountain settings, and active glaciers. Major Federal recreation resource areas bordering portions of Cook Inlet include the Chugach National Forest, Kenai National Wildlife Refuge, and Lake Clark National Park (see Sec. L.1.1.2.1).

The segment of the Glenn Highway from Palmer to Glennallen and the Richardson Highway southerly from Glennallen constitute the primary access for 16 units of the state park system. Located at varying distances from the major highway, most of these park units are classified as State Recreation Sites (Alaska Northwest Publishing, 1982). All of the units are relatively small, the largest comprising 600 acres (240 ha).

The several state park units along the Parks Highway include the Denali State Park, Willow Creek State Recreation Area, Nancy Lake State Recreation Area, and Nancy Lake State Recreation Site (Park Planning Section, 1982b). The two Nancy Lake park units are contiguous.

L.1.2.4 Transmission Line Corridors

Environmental criteria used in selecting the route for the proposed transmission line corridor included avoidance of existing or proposed developed areas, heavily timbered areas, private land, wildlife refuges, and parks paralleling existing transmission lines when feasible; and selecting for gentle relief (Exhibit B, Table B.38). The corridor traverses a 3,520-acre (1,425-ha) tract proposed for addition to the Willow Creek State Recreation Area (Park Planning Section, 1982b) and passes near the Nancy Lake State Recreation Area. However, the corridor does not encroach on any of the major existing recreational resource areas, with exception of the northeast corner of the Susitna Flats State Game Refuge, which would be traversed for a distance of 5 mi (8 km) (Exhibit E, Vol. 8, Chap. 9, Fig. E.9.10).

The transmission line corridor between the proposed dam sites and the Gold Creek switchyard (segments AJCD, Fig. 2-14) traverses area characterized by low-intensity recreational activities, primarily hunting and fishing. The corridor also intercepts and/or parallels off-road vehicle routes, snowmobile trails, and hiking paths, particularly in the Gold Creek area. It is notable that the Dams-to-Gold Creek corridor passes within 1 mi (1.6 km) of the High Lake Lodge. Like High Lake, other lakes in this area are also popular recreation sites and are accessible primarily by float plane (Acres American, 1982). Segments of the Susitna River, Tsusena and Devil creeks, and about 14 other minor waterways are also within the proposed transmission line corridor. The Susitna River and Tsusena Creek support a variety of game fish and are also used for other water-based recreation activities.

Recreation opportunities in the vicinity of the proposed Gold Creek-to-Fairbanks transmission line corridor (segments ABC, Fig. 2-15) include a variety of low-density activities such as hunting, fishing, hiking, and other trail-related activities. A few isolated residential/recreational cabins occur along the corridor, but there are no significant privately developed recreation facilities. In addition to intersecting a few recreation trails, unimproved roads, and secondary highways, the proposed corridor variously parallels and intersects the Parks Highway and Alaska Railroad, which constitute the major travel routes of the sightseeing public. The corridor intersects the Parks Highway at the three locations and the Alaska Railroad at two locations. The corridor also crosses the Denali Highway east of Cantwell. River routes traversed by the proposed corridor include the Nenana (three locations), Susitna, Indian, Jack, Tanana, Yanert Fork of the Nenana, and the East and Middle Forks of the Chulitna River. The Nenana, Susitna, and Tanana rivers are particularly popular waterways for river travelers, as well as for anglers and other participants in water-based recreation activities. Over 80 smaller waterways are also traversed by the proposed corridor.

The Gold Creek-to-Anchorage corridor of the Susitna transmission system would encroach on the Susitna Flats State Game Refuge, as well as on sensitive areas to the southwest of Willow and in the vicinity and to the south of the Nancy Lake State Recreation Area (segments ADFC, Fig.2-16). Residential/recreational cabins are common around the lakes in this area, where access is primarily by float planes. Also, there are many established recreation trails in the area, particularly to the east of the Susitna Flats Game Refuge. Trails traversed by the proposed transmission corridor include the Iditarod Dogsled Racing Trail.

In the Anchorage area, the proposed corridor parallels an existing transmission line. Major travel routes that intercept the proposed corridor include the Alaska Railroad and the Glenn and Davis highways. Major waterways traversed by the proposed corridor include the Little Susitna,

Kashwitna, and Talkeetna rivers; all support substantial sport fishing activities. One of the largest silver salmon runs in Southcentral Alaska occurs in the Little Susitna River (Alaska Northwest Publishing, 1983).

L.1.3 Susitna Development Alternatives

L.1.3.1 Alternative Dam Locations and Designs

Recreation resources associated with the alternative dam locations and designs (Fig. 2-17) are similar to the resources of the proposed Susitna project. There are no dedicated recreation resource areas nor developed recreation sites or facilities, and the locations are characterized by low-density, dispersed recreation activities (and trail-related recreation). Accordingly, the discussion of recreation resources presented in Section L.1.2.2 is also applicable to the Susitna development alternatives.

L.1.3.2 Alternative Access Routes

No dedicated recreation or conservation areas occur in the proposed alternative access routes (Fig. 2-13). Recreational opportunities are limited to low-density activities such as hunting and fishing and to trail-related activities. Thus, while certain factors such as game and fish resources and socioeconomic aspects were considered, the Applicant indicates that recreation resources were essentially eliminated as criteria for designating and evaluating of alternative access routes (Exhibit E, Vol. 9, Chap. 10, p. E-10-49).

L.1.3.3 Alternative Power Transmission Routes

L.1.3.3.1 Central Study Area

Initially, 15 transmission line routes were identified within the central study area [Exhibit E, Vol. 9, Chap. 10, Sec. 2.4(b)]. However, eight of the corridors were deemed unacceptable because of technical and/or economic considerations. Successive screening and comparisons further reduced the number of possibilities to four [Exhibit B, Vol. 2, Sec. 2.7(d)]: Corridor 1 (segments ABCD), Corridor 3 (AJCF), Corridor 13 (ABCF), and Corridor 14 (AJCD) (Fig. 2-14). No developed or dedicated public recreation resource areas occur within or adjacent to these four corridors; public recreation opportunities are limited to low-density activities such as hunting and fishing and to trail-related activities. However, segment CD (common to Corridors 1 and 14) does parallel an off-road vehicle trail extending from Gold Creek to a location near the proposed Devil Canyon dam site [Exhibit B, Vol. 2, Sec. 2.7(d)]. This trail would facilitate access for construction and maintenance of transmission facilities, whereas construction of facilities in segment CF (common to Corridors 3 and 13), would require development of access roads. Consequently, Corridors 3 and 13 were eliminated from further consideration. After Corridor 14 (AJCD) was selected as the proposed route by the Applicant [Exhibit B, Vol. 2, Sec. 2.7(d)], the remaining Corridor 1 was designated as an alternative route.

It should be noted that segment ABC of Corridor 1 is not far from privately developed recreation facilities, including Stephan Lake Lodge and several cabins in the Stephan Lake and Fog Lakes areas. Developed transmission facilities in this portion of Corridor 1 would be observable from vantage points at or near these sites.

L.1.3.3.2 Southern Study Area

Corridor 2 (ADFC) was selected as the proposed route between the Willow substation and Anchorage (Fig. 2-16). The two alternative corridors are discussed below.

ALTERNATIVE CORRIDOR 1 (Segments ABC)

No major dedicated recreation resource areas are traversed by Corridor 1 (ABC). However, several small recreation sites are nearby. The Willow Creek State Recreation area abuts the western boundary of the Willow Creek substation (Park Planning Section, 1982b). Within or immediately peripheral to the boundaries of the corridor, in the Palmer-Wasilla area are the Kepler-Bradley State Recreation Area, Finger Lake State Recreation Site, Matanuska Valley Colony Farm State Historic Site, and Gooding Lake. Gooding Lake is an established bird-watching area (Exhibit E, Vol. 9, Chap. 10, Sec. 2.4.6). From the Eklutna Powerhouse into Anchorage, Corridor 1 parallels existing transmission line rights-of-way (Exhibit B, Vol. 2, Sec. 2.7). Public recreation areas near these existing rights-of-way include Peters Creek and Mirror Lake state recreation sites, Eagle River campground, and the Thunder Bird Falls turnout; sites and facilities of the more urbanized settings within and north of Anchorage have not been identified.

Major tourist routes that intersect Corridor 1 include the Glenn Highway (at five locations), the George Parks Highway, and the Alaska Railroad. Secondary roads that intersect Corridor 1 include the Willow Creek (Hatcher Pass) Road, which is the only road access to Independence Mine State Historical Park (Park Planning Section, 1982b). Recreation trails paralleling and/or

intersecting Corridor 1 include the Iditarod Trail, an historic route and the scene of the annual Iditarod Dogsled Race.

A total of 33 waterways intersect Corridor 1: 5 rivers and 28 creeks (Exhibit E, Vol. 9, Chap. 10, Table E.10.21). These waterways afford opportunities for a variety of recreation activities. The river systems include the Matanuska, Knik, Eklutna, Eagle, and Little Susitna rivers. The Eklutna and Eagle rivers originate in Chugach State Park and are readily accessible for river recreation enthusiasts. The Little Susitna is a popular river touring route; from a launch near Houston, river travelers can tour downstream and either portage to Skeetna in the southern part of the Nancy Lakes area or continue downstream. The Little Susitna is notable for one of the largest silver salmon runs in Southcentral Alaska (Alaska Northwest Publishing, 1983). The river has been proposed for State Recreation River status (Park Planning Section, 1982b).

ALTERNATE CORRIDOR 3 (Segments AEFC)

Corridor 3 includes segment FC, which is part of the proposed Corridor 2. Thus, the alternative corridor is essentially segment AEF (Fig. 2-16). The corridor traverses Nancy Lake State Recreation Area for a distance of about 9 mi (15 km). Readily accessible from the George Parks Highway, this major recreation area affords opportunities for a wide variety of activities. Summer activities include picnicking, camping, hiking, fishing, canoeing, motorboating, and nature study. Winter activities include dogsledding, cross-country skiing, snowmobiling, snowshoeing, and ice fishing. The four largest lakes (Red Shirt, Butterfly, Lynn, and Nancy lakes) in the area support lake trout, rainbow trout, whitefish, and Dolly Varden. In recent years, the area around Nancy Lakes has experienced a recreational cabin boom (U.S. Dept. of Agriculture, 1981). Several lakeside developments, typically accessed by float planes, occur within or immediately adjacent to the corridor.

Corridor 3 intersects two principal tourist routes: the George Parks Highway and the Alaska Railroad near Willow. The corridor also intersects and/or parallels the Nancy Lake Parkway and recreation trails in Nancy Lake State Recreation Area, as well as recreation trails further to the south, including the Iditarod Dogsled Racing Trail. Waterways intersecting and/or paralleling the corridor include several creeks and the Little Susitna River.

L.1.3.3.3 Northern Study Area

The proposed corridor between the Healy substation and Fairbanks is discussed in Section L.1.2.4. The three alternatives are discussed below.

ALTERNATIVE CORRIDOR 2 (Segments ABDC)

Segment AB of the proposed Corridor 1 (ABC) is common to Corridor 2 (ABDC). Thus, the alternative route is essentially segment BDC. No significant public or private recreation developments occur in or adjacent to the corridor; however it does intersect the George Parks Highway near Fairbanks and parallels or intersects a few established recreation trails. Land-based recreation opportunities consist of dispersed activities such as hunting, cross-country skiing, snowmobiling, hiking, and operation of off-road vehicles.

The corridor also intersects several creeks and the Tatlanika, Wood, and Tanana rivers. The Tanana, in particular, affords a variety of recreational activities, including some provided by commercial interests. River excursions on sternwheeler craft are available on a regular basis (Alaska Northwest Publishing, 1982). Moreover, one of the annual festive events in the Fairbanks-Nenana area is River Daze, featuring a raft race down the Tanana River from Fairbanks to Nenana.

ALTERNATIVE CORRIDOR 3 (Segments AECD)

Corridor 3 consists of two main segments, AE and ECD (Fig. 2-15). From the Nenana River-Healy Creek confluence, segment AE generally parallels a road that extends easterly along the north bank of Healy Creek past the Suntrana, Usibelli, and Cripple Creek mining areas for a total of about 8 mi (13 km). This road is the only developed right-of-way in the vicinity of the 65-mi (105-km) segment AE. From the eastern terminus of the road, segment AE successively parallels the remaining upstream portion of Healy Creek, about 5 mi (8 km) of an established trail that crosses the divide between Healy and Cody creeks, the entire length of Cody Creek, and a portion of Wood River to a terminus north of Japan Hills. Only a few isolated cabins occur within this portion of segment AE. Recreational opportunities are limited to dispersed activities, primarily hunting and fishing. Healy Creek is a reported rafting area (Exhibit B, Vol. 2, Table B.41). However, no information is available about river recreational activities in the other waterways paralleling or intersecting segment AE. The remoteness of the general area is conducive only to minor recreation use.

From the northern terminus of segment AE near the Japan Hills, segment ECD of Corridor 3 extends northwesterly along the Wood River to a confluence with Fish Creek and then north across the

Wood and Tanana rivers to a terminus near Ester (Fig. 2-15), a total distance of 50 mi (80 km). North of the Tanana River travel routes intersecting corridor segment DC include several trails, the Chena Ridge Road, and the George Parks Highway. The Chena Ridge Road is a recommended route for viewing the City of Fairbanks and the Tanana River Valley (Alaska Northwest Publishing, 1983), while the George Parks Highway is a major tourist route. South of the Tanana River there are no developed access roads, trails, or recreation sites along the corridor. Thus, recreation opportunities are limited to dispersed activities. The flat wetlands south of Fairbanks are used for snowmobiling and related activities during the winter (Exhibit B, Vol. 2, Table B.41); but, for the most part, recreational use is low because of the remoteness of the area. Although the corridor segment intersects numerous creeks, river recreation activity is primarily limited to the Tanana River. Tanana River recreation was addressed briefly in the discussion of alternative Corridor 2.

ALTERNATE CORRIDOR 4 (Segment AEF)

Corridor 4 consists of two segments: AE and EF. Recreation resources and activities associated with segment AE were identified in the discussion of alternative Corridor 3 above. The discussion here is limited to segment EF. From a location north of the Japan Hills, segment EF extends due north across the Wood and Tanana rivers and into Fairbanks (Fig. 2-15), a distance of 40 mi (64 km). The corridor intersects an undetermined number of rights-of-way within Fairbanks (Exhibit B, Vol. 2, Table B.41).

Recreation resources and activities associated with segment EF at and south of the Tanana River are generally similar to those of segment ECD of Corridor 3. A minor difference can be noted in that segment EF intersects three established trails; thus, some trail-related recreation occurs along the corridor. Additionally, a few developed sites are located along the corridor, including a cabin in the Japan Hills area. Nevertheless, recreation use is limited because of the remoteness of the area.

L.1.3.3.4 Other Alternative Power Transmission Routes

Subsequent to submission of formal application for a license, the Applicant identified additional alternative transmission line segments, as shown in Drawings T-1, T-5, and T-6 of Wakefield (1983). Recreational resource areas and activities associated with these additional transmission routes are discussed below.

ANCHORAGE-WILLOW SEGMENTS (Drawing T-1)

Segments 1, 5, 8, 18, and 19 constitute a portion of the proposed transmission line corridor. Thus, recreation resource areas and activities associated with these segments were treated in Section L.1.2.4. Segments 2, 9, 11, 14, 16, and 17 constitute an alternative corridor whose recreation resource areas and activities are essentially similar to those of alternative Corridor 1 (see Sec. L.1.3.3.2).

Alternative segment 3 intersects the George Parks Highway and the Alaska Railroad (primary tourist routes). From the southern terminus of segment 3, segment 4 and segments 6 and 7 constitute two alternative routes around the Big Lake area, connecting with the proposed corridor west of the Knik Arm. Segment 4 intersects the Little Susitna River (river recreation corridor), the Iditarod Dog Sled Racing Trail, and several other recreation trails. Relatively numerous recreational cabins occur within or adjacent to corridor segment 4, including lakeside cabins in the Horseshoe Lake, Papoose Twins, and Carpenter Lake areas. Segment 6 also intersects the Little Susitna River, as well as the access road to the Beaver Lakes area, the access road to the Rocky Lake and Big Lake state recreation sites, and other recreation trails. Recreational cabins occur within and adjacent to segment 6, particularly in the Beaver Lakes area. Recreation resources associated with segment 7 include Goose Bay State Game Refuge, the Threemile Lake recreation area, private recreation sites, the Iditarod Dogsled Racing Trail, and several other recreation trails.

From the junction of segments 6 and 7, segment 10 extends easterly, connecting with other alternative segments in the Palmer area. Segment 10 intersects several recreation trails and tourist routes, including the Knik-Goose Bay Road, the Alaska Railroad, and Glenn Highway. Recreation sites located within or adjacent to corridor segment 10 includes the Lucile Lake area.

Other corridor segments in the Palmer area include Segments 12, 13, and 15. Tourist routes intersecting segment 12 include the Glenn Highway, the Alaska Railroad, Willow-Fishook Road, and Old Glenn Highway. Other recreation resources associated with corridor segment 12 are of minor importance. Segment 13 intersects the George Parks Highway and is adjacent to the Kepler-Bradley State Recreation area. Segment 15 closely parallels two major tourist routes: the Glenn Highway and the Alaska Railroad.

HEALY-ANDERSON SEGMENTS (Drawing T-5)

Corridor segments 1, 2, 5, 8, and 9 constitute a portion of the proposed corridor treated in Section L.1.2.4. Segments 3, 4, and 7 intersect with several creeks and a few established trails. The typical recreational use consists of low-density dispersed activities and minor trail-related recreation.

From a junction with segment 5, segment 10 closely parallels and then intersects three major recreation corridors: the Nenana River, the George Parks Highway, and the Alaska Railroad. It continues to parallel the George Parks Highway through the Anderson area. Segment 10 also intersects the access road to the Clear Mews development site, as well as several established trails.

ANDERSON-FAIRBANKS SEGMENTS (Drawing T-6)

Corridor segments 9, 12, 15, 17, 20, 22, and 25 constitute a portion of the proposed corridor discussed in Section L.1.2.4. Segments 11, 21, and 23 traverse areas of low recreational potential for other than dispersed recreation activities.

Major travel routes closely paralleled by segments 6A, 10, 14, and 18 include the George Parks Highway and the Alaska Railroad. Segment 14 also intersects the Tanana River, an important river recreation corridor. Segment 13 intersects the Tanana River as well as the George Parks Highway and an established sled road. From near Nenana, segments 16, 26, and 27 collectively intersect the Tenana River three times enroute to Fairbanks; recreational opportunities associated with these segments primarily consist of river touring and dispersed activities. The 2-mi (3-km) segment 6 intersects the George Parks Highway. From the junction of segments 6 and 6A at about 12 mi (19 km) northeast of Nenana, segments 19 and 24 closely parallel the Alaska Railroad en route to Fairbanks.

L.1.3.4 Alternative Borrow Sites

Currently, there are no developed recreation sites associated with the alternative borrow sites. Recreation use in these areas consists of dispersed activities, primarily low-density sport hunting and fishing, with some trail-related recreational activities. Thus, there is no substantive basis for differentiating recreation opportunities associated with the various borrow sites.

L.1.4 Non-Susitna Generation Alternatives

L.1.4.1 Natural-Gas-Fired Generation Scenario

L.1.4.1.1 Beluga and Chuitna Rivers Area

The Beluga and Chuitna rivers are located to the west of Cook Inlet, at closest distance about 50 mi (80 km) west of Anchorage. Although the local road and trail network is relatively well developed, the area is isolated from the major highway system during all but the winter season. Visitor access is primarily by float plane or wheeled aircraft. No substantial developed recreation sites occur in the immediate area. The nearest dedicated recreation and conservation areas are Lake Clark National Park and the Susitna Flats and Trading Bay state game refuges. Although relatively remote, areas inland from Cook Inlet are subject to considerable recreational activity (Bechtel, 1983).

Hunting and fishing are the principal dispersed recreation activities; others include hiking, camping, skiing, snowmobiling, and various water-based activities. Several anadromous species of salmon migrate up the McArthur, Beluga, Chakachatna, and Chuitna rivers, as well as associated tributaries. Thus, these waterways are popular sport fishing sites. Other fish species include Dolly Varden, rainbow trout, whitefish, grayling, and burbot. Big game species present in the area include moose, caribou, and brown and black bears; moose and black bear are relatively abundant. Wetlands and waterfowl habitat abound in the area, and waterfowl hunting is a popular recreation activity. The nearby Trading Bay State Game Refuge is the ninth most important waterfowl hunting area in the state (Bechtel, 1983).

L.1.4.1.2 Kenai

Much of the northwestern Kenai Peninsula is within the Kenai National Wildlife Refuge. The refuge includes designated wilderness area, as well as developed picnic sites, campgrounds, and other recreation facilities maintained by the U.S. Fish and Wildlife Service. On the northwest coastline of the Kenai Peninsula is the Captain Cook State Recreation Area, a 3,620-acre (1,465-ha) tract that includes three developed campgrounds (79 units), picnic sites, and other facilities (Alaska Northwest Publishing, 1982). Other developed public recreation areas include municipal parks in Kenai and Soldatna, as well as the Izaak Walton, Bernice Lake, and Kasilof River state recreation sites and the Johnson Lake and Clam Gulch state recreation areas. Both

these state recreation areas and other currently undeveloped sites are administered by the Alaska Division of Parks. Private establishments provide accommodations to travelers of the Sterling Highway and Kenai Spur Road, which are primary tourist routes.

Environmental settings in northwest Kenai are conducive to a wide range of dispersed recreation opportunities, including sightseeing, berrypicking, hiking, backpacking, primitive camping, boating, canoeing, river running, ski touring, snowmobiling, and mountain climbing. Hunting is enjoyed by many; moose are the more abundant of the big game species (Simmerman, 1983). Sport fishing is particularly popular; there are numerous opportunities for stream, river, and lake fishing, and the Kenai River near Soldatna is said to have some of the "world's best fishing" (Alaska Northwest Publishing, 1983).

L.1.4.1.3 Anchorage-Turnagain Arm

Outdoor recreation resource areas within the limits of Anchorage are numerous and markedly varied. Municipal holdings include parks, greenbelts, campgrounds, athletic fields, playgrounds, tennis courts, iceskating rinks, and bicycle trails, as well as a golf course and zoo (Alaska Northwest Publishing, 1983). Additionally, developed lake and streamside sites afford opportunities for a wide range of water-based recreation activities, including sport fishing. Public parks of the Anchorage area range from the relatively small Earthquake Park to the extensive Far North Bicentennial Park. The latter comprises 5,000 acres (2,020 ha) located southeast of downtown Anchorage. During winter, the entire park is available for cross-country skiing, except for marked dogsled and snowmobile trails (Alaska Northwest Publishing, 1983).

East of Anchorage is the 490,000-acre (198,000-ha) Chugach State Park, which consists of glaciated mountainous terrain with some active icefields (Alaska Division of Parks, 1980). A substantial portion of the park is zoned as wilderness area. Developed facilities include highway wayside areas, camp and picnic sites, and a visitors center; however, the overall use pattern for most of the park involves dispersed recreation (hunting, fishing, etc.) and trail-related activities such as hiking, backpacking, cross-country skiing, and snowmobiling. Southern portions of the park are accessible from trailheads along the Seward Highway, which traverses Potter Marsh and parallels most of the north shoreline of Turnagain Arm. The remainder of this shoreline (from the Knik Arm to the eastern limits of Potter Marsh) is included in the Potter Point State Game Refuge. Sport hunting is permitted in some areas, but the refuge is more notable for opportunities to observe the protected waterfowl, particularly during spring and fall migrations, and throughout the nesting season (Simmerman, 1983).

The eastern (upper) portion of Turnagain Arm is surrounded by the Chugach National Forest, except for small areas near Girdwood and Portage. Developed recreation sites accessible from Girdwood include the Alyeska resort, which features the largest ski area in Alaska (Alaska Northwest Publishing, 1983). In the Portage area, the U.S. Forest Service maintains a visitors center and related facilities at Portage Lake within view of the terminus of Portage Glacier. The Service also maintains three campgrounds along Portage Creek; the campgrounds include a total of 55 camp sites and 9 picnic units.

L.1.4.2 Coal-Fired Generation Scenario

L.1.4.2.1 Willow

Dedicated recreational areas near Willow include the Willow Creek State Recreation Area [240 acres (97 ha)], the relatively large [22,700 acre (9,200 ha)] Nancy Lake State Recreation Area, and the small Nancy Lake State Recreation Site with its well-developed picnic and camping area (Alaska Northwest Publishing, 1982).

Other recreation sites include Fingerlake, Rocky Lake, and two Big Lake state recreation sites, all within 20 mi (32 km) of Willow, which is located on the George Parks Highway. Several lodges and other establishments located along the George Parks Highway provide various accommodations for the touring public. It should be noted that a master plan has been prepared for a proposed expansion of the Willow Creek State Recreation Area (Park Planning Section, 1983). The proposed expansion would consist of about 3,450 acres (1,400 ha) extending west from the existing Willow Creek State Recreation Area to the Susitna River.

The numerous lakes and other landscape features around Willow have induced the development of numerous recreation cabins. Independence Mine State Historical Site is accessible from Willow Creek Road, which extends easterly up the drainage. Willow Creek is confluent with the Susitna River a few miles to the west; thus, both resident and anadromous fish species are present in the area. The more abundant of the big game species are moose and black bear.

L.1.4.2.2 Nenana

From near Cantwell, the George Parks Highway and the Alaska Railroad variously parallel and intersect the north-flowing Nenana River en route to a confluence with the Tanana River near the town of Nenana. Both rivers afford extensive opportunities for river recreation activities,

including river touring, boating, kayaking, and fishing. The Nenana River has been reported as a "general recreation area, intensively used" (Exhibit E, Vol. 8, Chap. 9, Fig. E.9.11). About 67 highway miles (108 km) up-river from Nenana is the entrance to the Denali National Park and Preserve, the only major developed recreation resource area in the vicinity of the Nenana River. Commercial interests provide scheduled float trips down-river from the park entrance (Alaska Northwest Publishing, 1983).

The George Parks Highway and Alaska Railroad are major tourist routes. Accordingly, establishments in Nenana, other communities, and individual private developments along these routes provide lodging, novelties, and other accommodations, including local guide and transport services to the touring public. Aside from tourist activities, local outdoor recreation is characterized by dispersed activities, primarily hunting and fishing. Semi-permanent camps are present in some of the better hunting and fishing areas (Hegg 1982). Principal big game species include moose, caribou, and black and brown bears. The more popular game fish species are grayling, whitefish, burbot, and lake trout (Alaska Northwest Publishing, 1983).

L.1.4.2.3 Cook Inlet Area

The recreational resources of the Cook Inlet area were discussed in Sections L.1.4.1.1, L.1.4.1.2, and L.1.4.1.3.

L.1.4.3 Combined Hydro-Thermal Generation Scenario

L.1.4.3.1 Chakachamna Lake

Located about 60 mi (96 km) west of Anchorage across Cook Inlet (Fig. 2-18), the Chakachamna project site is in a relatively remote area (Bechtel, 1983). The western boundary borders designated wilderness area of the Lake Clark National Park. The Trading Bay State Game Refuge is located downstream from Chakachamna Lake and includes uplands, tidal flats, and submerged lands. Although there are no developed public recreation sites in the area, recreation use is substantial and increasing.

Access to the project area is primarily by float plane and wheeled aircraft; boats are used less frequently. Internal travel is facilitated by access easements along the coast, lake shorelines, banks of major waterways, roads, and section lines of Federal lands (Bechtel, 1983). The principal recreation activities are fishing, hunting, hiking, and kayaking. Game fish include numerous resident and anadromous species. Big game species are represented by moose, barren-ground caribou, and black and brown bears. The nearby Trading Bay State Game Refuge is the ninth most important waterfowl hunting area in the state (Bechtel, 1983); 15 cabins have been erected on state and private lands within the refuge, primarily as shelter for waterfowl-hunting activities. Lake Chakachamna is a common staging area for initiating kayak trips.

L.1.4.3.2 Johnson River

The Johnson site is located on the Johnson River immediately above the confluence of the Johnson and Tanana rivers (Fig. 2-18). The Tanana is used for river recreation by the general public, as well as by commercial interests. Charter boat service for sightseeing on the Tanana River is available at Dot Lake, located upstream from the Johnson-Tanana River confluence (Alaska Northwest Publishing, 1983). The Alaska Highway generally parallels the Tanana River between Tok and Fairbanks and is extensively used by the auto touring public. Sightseeing in the Johnson River area is enhanced by opportunities to view local wildlife. Bands totaling about 500 buffalo roam the area between Delta Junction and the Johnson-Tanana confluence. Also, a herd of about 500 caribou inhabit the area, and Dall's sheep are frequently observed on mountains adjacent to the highway. Numerous private camping and lodging facilities are available for the touring public. In addition, the Alaska Division of Parks maintains developed campsites at several locations along or near the highway, including the Tok River, Moon Lake, Clearwater, and Donnelly Creek state recreation sites and the Quartz Lake and Harding Lake state recreation areas.

As is common in all of Alaska, hunting and fishing are among the more popular recreation activities. The more common big game species are black and brown bear, caribou, and moose. Licenses for hunting buffalo are acquired by lottery. Salmon and grayling are among the preferred game fish.

L.1.4.3.3 Keetna

The Keetna site is located on the Talkeetna River (Fig. 2-18), the headwaters area originating in the Talkeetna Mountains. The drainageway is relatively undeveloped; but a major trail, as well as lesser trails extending above and below the Keetna site, facilitates a wide range of trail-related activities such as skiing, hiking, camping, snowmobiling, ORV use, rock climbing, gold panning, and berry picking (Alaska Dept. of Natural Resources, 1982). However, the principal dispersed recreation activities are sport hunting and fishing. Substantial lands immediate to the Talkeetna River are prime moose harvesting areas (Alaska Dept. of Natural Resources,

1982). Caribou and black and brown bears also range through the area. Prime harvest area for Dall's sheep is extensive surrounding the headwaters of the Talkeetna River. The Talkeetna is also a popular fishing waterway for anadromous and freshwater fish.

The upper Talkeetna River, including the Prairie Creek tributary, represents some of the finest rafting and white-water kayaking areas in Alaska (Alaska Dept. of Natural Resources, 1982). Lower portions of the Talkeetna are excellent for canoeing. The Alaska Division of Parks has designated the Talkeetna River as a proposed State Recreation River (Park Planning Section, 1982b).

L.1.4.3.4 Snow

The Snow site is within the Chugach National Forest (Fig. 2-18). The U.S. Forest Service administers the Primrose Campground, located adjacent to the Seward Highway - Snow River crossing (Alaska Northwest Publishing, 1983). This developed campground consists of ten campsites and related facilities, including a boat launch. The Forest Service also maintains several hiking trails in the area. Developed pull-outs along Seward Highway provide opportunities for viewing wildlife and local landscapes. The Snow River flows west and north into the south end of Kenai Lake, located to the west of the highway. Guide and other services, as well as recreation equipment, are available from private establishments located at intervals along the highway. Game fish in the Snow River drainage include sockeye and coho salmon. The more common big game animals are moose and black bear. Dall's sheep also occur in the area (Exhibit E, Vol. 9, Chap. 10, p. E-10-12).

L.1.4.3.5 Browne

The Browne site is located north of Healy on the Nenana River (Fig. 2-18). The river is intensively used for river travel, recreation boating, canoeing, kayaking, and fishing (Exhibit E, Vol. 9, Chap. 9, Fig. E.9.11). Aside from the Denali National Park and Preserve, there are no significant developed recreational resource areas in the vicinity of the Browne project site. A few lodges and other private developments in the area provide local guide and transport services, novelties, and other accommodations to the touring public. However, local outdoor recreation is typically characterized by dispersed activities, primarily hunting and fishing. Semi-permanent camps are present in some of the more favorable and better known hunting and fishing areas (Hegg, 1982). Principal big game species are moose, caribou, and black and brown bears. There are no anadromous fish species in the Browne project area; the more common resident species are grayling, whitefish, burbot, and lake trout.

L.1.4.3.6 Nenana, Chuitna River, and Anchorage

Recreational opportunities in the Nenana, Chuitna River, and Anchorage areas are discussed in Sections L.1.4.2.2, L.1.4.1.1, and L.1.4.1.3, respectively.

L.2 ENVIRONMENTAL IMPACTS

L.2.1 Proposed Project

The development of the proposed project would have both direct and indirect impacts on recreation resources and use patterns. The establishment of the two reservoirs would directly and extensively alter the natural landscapes. Established use patterns, particularly those involving dispersed recreation activities, would be disrupted. Similarly, white-water resources and river-touring activities would be substantially impacted.

Among the more notable indirect effects on recreational resources would be displacement of wildlife populations and habitats during reservoir clearing, which in turn would reduce sport hunting opportunities within the project area. Fish populations and sport fishing would be similarly affected during in-stream construction and reservoir filling. The presence of large construction forces would indirectly impact recreation resources onsite as well as those in areas adjacent to the project sites. Construction personnel living onsite would cause increased pressure on local recreation resources, while commuting project personnel would compete with residents and tourists in local communities for lodging, recreation, opportunities, and services. Construction personnel would also generate increased demand for local recreation opportunities. This demand would be reinforced as access to project sites was opened to public use.

Aside from physical impacts, the development of the proposed project would result in impacts that are perceptual in nature. These perceptual impacts derive from conceived incompatibility within a given recreation setting; i.e., visual disharmony, disconcerting noise, and incongruity with wilderness environment. Judgments relative to the foregoing perceptions are strongly subjective and highly variable among individuals of the general public. For example, some individuals might forego recreation opportunities in the proposed project area to avoid being exposed to perceived disruptions of relatively undisturbed wilderness settings; others might

utilize the proposed reservoirs and access roads to facilitate expanded recreation opportunities. Further, some individuals participating in trail-related recreation might view the proposed transmission lines as unwelcome incursions into natural landscape settings; others might utilize the transmission line rights-of-way as access roads.

In recognition of these and other potential impacts, the Applicant has proposed a recreation development plan. This plan is described in Section 2.1.11 and further discussed in Section L.2.1.5.

L.2.1.1 Watana Development

L.2.1.1.1 Construction

No developed public recreation areas or facilities are located within the immediate vicinity of the proposed Watana site. Private developments are limited to lodge complexes and sparsely scattered cabins, shacks, and lean-tos, most of which are used as base stations for sport hunting and fishing as for well as river travel, hiking, cross-country skiing, snowmobiling, and other trail-related activities. Thus, project construction would primarily impact dispersed recreational opportunities in a wilderness setting. To a minor extent, the wilderness setting has already been modified in that a temporary field station is currently maintained near the proposed Watana dam site for personnel conducting research associated with the Watana project.

Construction activities in the vicinity of the dam site, upland borrow areas and quarry sites, and construction laydown areas and the development of the temporary construction camp/village and the permanent Watana townsite (see Sec. 2.1) would result in destruction of wildlife habitat and the displacement of wildlife species to adjoining undisturbed areas. Similarly, the vegetation clearing in the impoundment area of the proposed 38,000-acre (15,400-ha) Watana reservoir would result in considerable displacement of terrestrial wildlife (see Appendix K). Accordingly, the principal construction impacts on sport hunting would entail preemption of hunting area and increased hunting pressure in undisturbed habitats adjacent to the project area.

Initial construction activities would also adversely affect sport fishing activities. Construction of the coffer dams and river diversion tunnels as well as river dredging below and above the Watana dam site would result in damage to fish, reduced reproduction, and destroyed habitat. Additionally, runoff from impoundment clearings, disturbed construction sites, and dredging activities might cause significant turbidity and sedimentation in downstream aquatic habitats. Construction impacts on fish populations are more thoroughly discussed in Appendix I.

In addition to direct impacts from project construction, there would be significant indirect impacts attributable to construction personnel and their families housed at the Watana site. The temporary construction camp would include bachelor quarters for about 3000 workers and accommodations (including some recreation facilities) for about 300 families (Exhibit A, Vol. 1, Sec. 1.13). The Applicant proposes that developed road access from the Denali Highway to the Watana dam site, as well as all active work areas associated with development of the Watana impoundment, be unavailable for public recreation use during project construction (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1.3). Thus, increased levels of local sport hunting and fishing would be primarily attributable to off-duty personnel of the work force. The potential would exist for marked competition and confrontations between local residents and project personnel regarding the use of recreation resources in and adjacent to the project area, particularly during peak construction periods (1990-1991). To prevent local overharvests of game and fish populations, close cooperation will be maintained between the Applicant and the Board of Fisheries (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.4), the Alaska Department of Fish and Game, and the Board of Game (Schedule B, Supplemental Items, Vol. 2, Sec. 7, Comment D).

Competition for recreation opportunities would not be limited to the project area. Commuting and other project personnel would compete with residents of adjacent communities for use of local recreation sites and facilities, as well as for dispersed recreation opportunities. Tourist traffic could also be affected, particularly in smaller communities where lodging facilities would be unavailable because of the presence of commuter project personnel (see Appendix N).

Closing the Watana dam in 1991 and subsequent filling of the reservoir would affect recreation resources and/or activities both upstream and downstream of the dam site. Within the impoundment area, seven riverfront cabins (three in various stages of disrepair) would be inundated (Exhibit E, Vol. 8, Chap. 9, Table E.9.5). Also inundated would be prime fishing areas where clearwater streams such as Deadman, Watana, Kosina, Jay and Goose creeks become confluent with the Susitna River (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.3.1). Additionally, the Vee Canyon rapids would also be inundated; the rapids represent a significant white-water resource, and the canyon is a designated scenic resource area (see Appendix M). Low-flow releases from the Watana dam during reservoir filling would degrade the quality of boating and other river travel experiences in areas downstream from Devil Canyon, particularly during periods of low rainfall and surface runoff. Sport fishing might be similarly affected. Additional information on impacts to fish populations is presented in Appendix I.

L.2.1.1.2 Operation

The transition of the Watana project from developmental to operational status in 1994 would correspond with a marked reduction in onsite project personnel. For example, the peak onsite workforce is projected to include about 3500 construction personnel in 1990 (Exhibit E, Vol. 7, Chap. 5, Table E.5.25); in 1994 the onsite workforce would consist of about 145 operational personnel. This number would increase somewhat when the Devil Canyon project became operational in 2002, since the Devil Canyon facilities would be remotely operated from the Watana control station. In any event, the hunting and fishing pressures on local game and fish populations attributable to project personnel would be markedly less during project operation than the pressures that prevailed during project development. Operational personnel would be housed in a permanent townsite developed near the Watana dam. Facilities would include provisions for a wide range of recreation activities, thereby alleviating the need or desire for offsite recreation opportunities.

Concurrent with the decrease in project personnel following project construction, there would probably be an increase in the general populace visiting the area, since the project access road extending from the Denali Highway to the Watana dam site is expected to become available for general public use in 1993 (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1). Much of the public traffic would consist of sightseers, many of whom would view the Watana development as a principal point of interest. However, some of the touring public as well as hikers and other recreationists would undoubtedly consider the altered terrain and project structures an unwelcome intrusion in an otherwise natural landscape. Details concerning impacts on the visual resources of the Watana impoundment area are presented in Appendix M. The project access road would also be used to gain access to hunting and fishing areas in the Watana impoundment area, thereby contributing to increased competition for sport hunting and fishing opportunities (see Sec. L.2.1.3.1).

The proposed project operation would adversely affect various recreation activities and opportunities within the Watana impoundment. The substantial seasonal fluctuation in water levels would restrict the kinds of recreation facilities that could be developed at the land-water interface. At lower water levels, unsightly mudflats would be exposed, thereby discouraging or detracting from water-based recreation activities. High water levels and wind action would induce bank sloughing that would limit or restrict accessibility along the shoreline of the reservoir. Unstabilized banks would be unsightly and, in some cases, hazardous to the unwary recreationist.

Controlled water releases from the Watana dam would variously affect river recreation activities and opportunities in downstream areas. Free flow through the Devil Canyon rapids would cease, and the uniqueness of this white-water resource would be diminished. While controlled-flow conditions might be less hazardous, the rapids would likely be unavailable for public use following the start of construction at the Devil Canyon dam site in 1995 (Exhibit C, Vol. 1, Fig. C.2). Boating and other river recreational opportunities that are possible in some downstream areas only during high river flows would also be curtailed or eliminated. Additionally, the quantity, schedule, and temperature of releases would create a potential for changes in sport fish production and angling success in downstream stretches of the river, as well as in tributaries and interconnected lakes in the area. Additional information concerning the effects of releases from Watana dam on downstream fisheries is presented in Appendix I.

L.2.1.2 Devil Canyon Development

L.2.1.2.1 Construction

There is little to differentiate between the environmental settings and recreation opportunities of the proposed Devil Canyon and Watana impoundment areas (see Sec. L.2.1.1.1). Both areas are relatively remote and lack dedicated public recreation resources. Private recreation sites within the Devil Canyon impoundment area are limited to isolated lodges and cabins. There is concentration of cabin sites along Portage Creek, immediately downstream from the proposed Devil Canyon dam site (Exhibit E, Vol. 8, Chap. 9, Figure E.9.9), which would be relatively unaffected by the proposed project. Project construction would primarily impact dispersed recreational opportunities and river-touring activities. Construction for access to the dam site would be initiated in 1992 (Exhibit C, Vol. 1., Sec. 2), and onsite construction would begin in 1994.

The nearest developed public recreational area is Denali State Park, at closest distance about 10 mi (16 km) from the Devil Canyon project site. Despite this proximity, the Devil Canyon site is located in a relatively remote area. Currently, the principal access to the site is by means of an off-road vehicle trail extending easterly from Gold Creek. To support construction at the Devil Canyon site, a 14-mi (22-km) railroad spur would be built from Gold Creek to a railhead on the southern bank of the Susitna River at the project site. Additional access would involve building a suspension bridge across the Susitna River and constructing a 37-mi (60-km) access road across the uplands north of the river to connect with the Denali Highway-Watana access road (Fig. 2-11).

Accommodations that would be developed at the Devil Canyon project site include a temporary construction camp for 1,650 single workers and a temporary village to house 250 families (Exhibit A, Vol. 1, Sec. 7.13). Since neither the railway nor the access road would be a particularly convenient manner of entering or leaving the Devil Canyon site, and since a variety of onsite recreational facilities would be provided, it is expected that project personnel would not appreciably disrupt recreation use patterns in Denali State Park or other major developed public recreation sites in the surrounding area. However, competition for use of small local recreation sites such as the Brushkana Campground might be severe, as could be competition for local recreation-related housing (motels, cabins, etc.) (see Appendix N).

As currently planned, neither the access railroad from Gold Creek nor the Watana-Devil Canyon access road would be available for public use, pending a decision to be made following completion of project construction (Exhibit E, Vol. 8, Chap. 7, Secs. 3.1.4, 3.1.5). Accordingly, levels of participation in dispersed recreation during project construction would not be greatly altered; the increased activity would result primarily from off-duty project personnel. Given that construction of the Watana would essentially be completed prior to initial construction at Devil Canyon in 1994 (Figs. 2-8, 2-9) and assuming that the Denali Highway-Watana access road would be available for public use following Watana construction, much of the demand for public recreation opportunities would be focused on the Watana project area.

Construction activities in the vicinity of the main dam site and ancillary structures, the quarry and borrow sites, and the construction laydown and service areas and the development of temporary construction camp and village would result in the destruction of wildlife habitat and the displacement of wildlife to adjoining undisturbed areas. Similarly, clearing of vegetation in the impoundment area of the proposed 7,800-acre (3,155-ha) Devil Canyon reservoir would result in considerable displacement of terrestrial wildlife (see Appendix K). In terms of effects on recreation resources, the principal construction impacts would entail preemption of hunting area, and therefore decreased hunting opportunities and increased hunting pressure in undisturbed habitats adjacent to the project area.

Construction activities in the vicinity of the dam site might also have a minor impact on sport fishing activities. Construction of the cofferdams and the river diversion tunnel would result in some downstream turbidity and sedimentation. Excavation and blasting in the river channel required for construction of the arch and saddle dams might have similar effects (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.3.2). Excavation of construction materials from the upstream borrow area might be disruptive of fish populations in Cheechako Creek. Runoff from areas disturbed during vegetation clearing would also contribute to downstream turbidity and sedimentation. Construction impacts on fish populations at the dam site and downstream areas are more thoroughly discussed in Appendix I.

In addition to direct impact during project construction, there would be increased demand for sport hunting and fishing opportunities with resulting potential for competition between project personnel and sportsmen, similar to the issues discussed for the Watana dam site. As noted in Section L.2.1.1.1, the Applicant would work closely with appropriate regulatory, resource management, and law-enforcement agencies to prevent overutilization of local game and fish populations.

The closure of the Devil Canyon dam and reservoir filling would affect recreation resources and/or activities both upstream and downstream of the dam site. Within the impoundment area, the Devil Canyon rapids (Class VI waters) would be inundated; there are few comparable white-water runs in the world. Prime fishing areas and habitat where clearwater streams such as Tsusena and Fog Creeks become confluent with the Susitna River would also be inundated (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.3.2). Two riverfront cabins (one currently unused) would be inundated, as would one additional building site on which the cabin has collapsed and is no longer usable (Exhibit E, Vol. 8, Chap. 9, Table E.9.5). Thus the existing cabins would be unavailable for future recreation use. Wildlife game species inhabiting the previously cleared areas in the impoundment would perish or be displaced from the reservoir area.

Low-flow releases from the Devil Canyon dam during reservoir filling would curtail or degrade the quality of boating and other river-travel experiences in areas downstream from the dam site. However, these impacts would be transitory. Reservoir filling would occur in two stages, the first requiring about four weeks (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.3), the second five to eight weeks. Sport fishing would likewise be affected by the low-flow releases. Additional information on impacts to fish populations is presented in Appendix I.

L.2.1.2.2 Operation

The transition of the Devil Canyon project from developmental to operational status would correspond with a marked reduction in project personnel at the site. The Devil Canyon facilities would be remotely controlled from the Watana control station, and project personnel at the Devil Canyon site would be primarily limited to maintenance staff. All project personnel would be housed at the Watana townsite, and the temporary construction camp and village at the Devil

Canyon site would be dismantled and the building sites reclaimed (Exhibit E, Vol. 6A, Chap. 3, Sec. 3.4). As noted in Section L.2.1.1.2, the total manpower requirement for operation and maintenance of the Watana and Devil Canyon facilities is estimated at 170 employees. Thus the pressure on local game and fish populations, as well as the demand or need for other recreation opportunities attributable to project personnel, would be far less than during project construction.

Concurrent with the decrease in project personnel at the Devil Canyon site, there would probably be an increase in use by the general populace, especially if railway access to the site and the Watana-Devil Canyon access road became available for public use following project construction (Exhibit E, Vol. 8, Chap. 7, Secs. 3.1.3, 3.1.4). Most of the public traffic would consist of sightseers, many of whom would view the Devil Canyon development as a principal point of interest. However, some of the touring public might regard project features as an unwelcome contrast with adjacent natural landscapes. In any case, the Devil Canyon dam is but one of the features of overall development that would be expected to induce demand for additional recreation opportunities, as is indicated in the proposed recreation plan outlined in Section 2.1.11.

The proposed operation of the Devil Canyon facilities would cause fluctuations in water levels in the reservoir. The impacts on recreation opportunities and activities would be similar to those at the Watana reservoir, as described in Section L.2.1.1.2. However, because drawdowns in the Devil Canyon reservoir would be less severe and because the banks of the reservoir are steeper, the area of exposed mudflats would be markedly less at Devil Canyon than at Watana. Water levels within the Devil Canyon reservoir during August and early September would be 50 ft (15 m) lower than for the remainder of the year (Exhibit E, Vol. 5A, Chap. 2, Sec. 4.2.3), while water levels in the Watana reservoir would fluctuate up to 110 ft (34 m).

The schedule and quantity of downstream releases from the Devil Canyon dam would be comparable to those from the Watana dam prior to operation of the Devil Canyon facility in the year 2002. Thus the adverse conditions that would affect downstream boating and other river recreation during Watana operation would continue to prevail. However, releases from the Devil Canyon dam would result in slightly warmer river flows during the winter (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.3.2). Thus the river freezing front would be displaced further downstream, altering fish habitat conditions and creating the potential for adversely affecting sport fishing opportunities. Additional information concerning the effects of the temperature regime of downstream flows is presented in Appendix I.

L.2.1.3 Access Routes

L.2.1.3.1 Denali Highway-to-Watana Route

CONSTRUCTION

The proposed access road for the Watana development site would entail upgrading the 21-mi (34-km) segment of the Denali Highway extending easterly from Cantwell, and constructing of a 42-mi (68-km) road extending from the eastern terminus of highway improvement southerly to the Watana site. Associated work would include building a temporary construction camp near Brushkana Creek (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1.3), as well as excavating borrow sites and disposal areas along the Denali Highway-Watana access right-of-way (Exhibit E, Vol. 6A, Chap. 3, Sec. 2.3.3). Both the initial access and main access road are scheduled to be completed in less than two years (Fig. 2-8).

The principal effects on recreation opportunities resulting from the upgrading of the Denali Highway would involve highway travelers. Touring sightseers, recreationists proceeding to or returning from distant recreation sites or facilities, and other travelers would be inconvenienced by temporary traffic-pattern disruptions, irregular or rough road surfaces, etc. The cumulative effects of these conditions would be most severe during the peak recreation season. Further, the presence of road construction equipment, human activities, and disrupted terrain would detract from the esthetic quality of the highway right-of-way. Instream construction activities (bridgework, culverts, etc.) as well as runoff from other construction sites and disturbed surfaces would temporarily degrade fish habitat and increase downstream turbidity and sedimentation, potentially reducing opportunities for sport fishing activities. Additional information concerning affected streams and fish populations is presented in Appendix I.

Recreation use in the vicinity of the proposed Denali Highway-Watana access right-of-way currently consists of low-density dispersed activities, predominantly sport hunting and fishing. These prevailing activities could readily be absorbed or displaced to areas adjoining the access corridor; however, it remains that construction of the access road would result in some mortality and/or displacement as well as destroyed and/or altered habitats of terrestrial game animals and fish. Displaced individuals would contribute to increased intra- and interspecific stress in adjoining animal and fish populations, and the overall result would be some diminution in suitable habitat for, and success rates of individual sport hunting and fishing excursions. Additional information concerning the effects of access road construction on wildlife and fish populations is presented in Appendices K and I, respectively.

Some cross-country skiers, hikers, and other participants in dispersed recreation activities would consider the construction activities and Denali Highway-Watana access road as detracting from the otherwise natural wilderness setting. Details concerning adverse visual impacts associated with access road construction are discussed in Appendix M.

Given that the Denali Highway-Watana access road would be unavailable for public use during project construction, the upgrading of the 21-mi (34 km) segment of the Denali Highway east of Cantwell would promote auto-touring and related recreation opportunities along the Denali Highway extending easterly from the Watana cutoff. In addition to the general public, potential participants would include commuting project personnel residing in the Cantwell area, as well as project personnel housed at the Watana dam site. The increased traffic flow along the Denali Highway during the summer season would undoubtedly generate demand for, and increased participation in, recreation opportunities, thereby jeopardizing sensitive recreation resources that are currently unprotected. Additionally, existing recreation facilities would likely be overutilized. In this respect, it is notable that the Applicant's proposed recreation plan includes provisions for expanding the capacity of the Brushkana campground located 10 mi (16 km) east of the Watana cutoff (Sec. 2.1.11).

Since the Cantwell-to-Watana access routes would be cleared of snow during the winter season (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1.3), winter recreation opportunities would exist along the Denali Highway. The Watana cutoff would likely be used as a staging area for activities such as cross-country skiing and snowmobiling. The more accessible areas might be overused, and the remote wilderness settings degraded.

OPERATION

Recreation activities and use patterns established along the Denali Highway during Watana construction would likely continue during operation of the Watana facilities, as would the potential for impacts as previously discussed. However, if the Denali Highway-Watana access road was opened for general public use following Watana construction (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1.3), recreation use patterns in the project area would change substantially, since the access road would facilitate participation in a wide range of recreation opportunities.

In view of the popularity of pleasure driving in inland Alaska (Table L-6) most public users of the access road would be sightseers whose principal objective would be to view the Watana facilities and impoundment. Others would use the Watana dam site as a staging area for accessing more remote areas. A significant portion of the traffic would also be off-duty project personnel and families.

Assuming that sufficient public parking was available, some recreationists would utilize areas adjacent to the access road for activities such as hiking, hunting, and fishing. The principal impacts from such activities would be the degradation or overutilization of the recreation resources in the more accessible areas. Unless controlled, operators of off-road vehicles would divert from the access road seeking recreation opportunities in more remote areas, thereby disrupting roadside views and degrading wilderness settings en route to and at the point of destination.

The peak usage of the access road by recreationists would occur during the summer; however, the road would be cleared during the winter thus providing opportunities for winter sport activities. These activities might also contribute to overutilization of popular recreation sites and could degrade the wilderness character of remote areas.

L.2.1.3.2 Watana-to-Devil Canyon Route

CONSTRUCTION

From a junction on the Denali Highway-Watana access road, about 3 mi (5 km) north of the Watana dam site, the Watana-to-Devil Canyon access road would extend west and southerly to the Devil Canyon dam site and then across a high-level suspension bridge (also to be constructed) to a railhead on the southern side of the Susitna River. The distance from the railhead to the Watana dam site is about 37 miles (60 km) (Exhibit A, Vol. 1, Sec. 7.12). Construction of the Watana-Devil Canyon access road would be initiated in 1992 (Fig. 2-9).

The proposed Watana-Devil Canyon access route traverses remote area, except that it does extend to within 1 mi (1.6 km) of the High Lake Lodge. The lodge is currently accessible by float plane. Thus, construction of the proposed road would provide for overland access by developed road. On the other hand, the presence of the road and noise from construction and road traffic would significantly detract from the wilderness setting surrounding the lodge. Accordingly, the construction of the access road might be considered as a negative or positive impact, depending on the future plans of the lodge owners.

Recreation use in the vicinity of the proposed Watana-Devil Canyon access road currently consists of low-density dispersed activities, predominantly sport hunting and fishing. The conditions would be similar to those near the proposed Denali Highway-Watana access road, and the conclusions drawn in Section L.2.1.3.1 are therefore applicable here. Effects of access road construction on wildlife and fish populations are further discussed in the Appendices K and I, respectively.

Construction of the access road in some areas of rough terrain would entail cut-and-fill operations and excavation of several borrow sites. These activities would have adverse visual effects (see Appendix M).

Once completed, the Watana-Devil Creek access road would be closed to public use until the Devil Canyon facilities were operational in the year 2002 (Fig. 2-9). In the interim, off-duty construction personnel at the Devil Canyon site as well as operations and maintenance personnel at the Watana site would probably use the road for sightseeing and other trail-related recreational activities. The road would also be used for access to popular recreation sites, including prime hunting and fishing areas. Consequently, the recreation setting of some of the more accessible areas might be degraded, and local game and fish populations might be jeopardized. The degree to which project personnel might increase pressure on game and fish resources is discussed in Appendices K and I, respectively.

OPERATION

If the Watana-Devil Canyon access road was opened for general public use in 2002 when the Devil Canyon facilities became operational (Exhibit E, Chap. 7, Vol. 8, Sec. 3.1.4), another significant change in public recreation use patterns within the project area would occur. The changes would be similar to those discussed in reference to the Denali Highway-Watana access road (Sec. L.2.1.3.1). Construction personnel would have left the Devil Canyon dam site area, and project personnel using the access road would be limited a small operations and maintenance staff commuting to the Devil Canyon site from the permanent townsite at the Watana site. Thus, the general public would be the main users of the road, most of whom would be sightseers visiting the area to view the two dams and impoundments. The Devil Canyon Site, with its high arch concrete dam and high-level suspension bridge, would be expected to be the more attractive of the two dam sites.

Recreation opportunities (and the associated impacts) along the Watana-Devil Canyon access road would be similar to those mentioned with respect to the Denali Highway access (Sec. L.2.1.3.1). The Applicant's proposed recreation plan includes provisions for curtailing or minimizing any adverse impacts from these activities (see Sec. 2.1.11). For example, a monitoring phase provides for early detection of overuse and for the development of additional recreation sites and/or facilities as needed.

L.2.1.3.3 Rail Access to Devil Canyon

CONSTRUCTION

Railway access to the Devil Canyon dam site would entail constructing a railroad spur off the Alaska Railroad at Gold Creek which would extend east and northerly along the south bank of the Susitna River for a distance of about 14 mi (23 km). The spur would terminate at a railhead to be developed on the south bank and across the river from the Devil Canyon construction site. The railroad spur is to be completed by mid-1994 (Fig. 2-9).

Current public recreation use in the vicinity of the proposed rail access right-of-way consists of dispersed activities, primarily hunting and fishing. Effects on terrestrial game animals and fish populations, and the consequent impact on sport hunting and fishing, would be similar to those discussed in Section L.2.1.3.1 (see also Appendices K and I). Other recreation activities that occur in the vicinity of the proposed right-of-way include hiking, skiing, trail-related activities, and river touring. Depending on final alignment of the railroad spur, access construction might disrupt or displace local established trails or recreation patterns. Some hikers, skiers and other recreationists would be exposed to views in which the railroad and/or ongoing or residual construction impacts dominate the viewshed, thereby detracting from the quality of the recreational experience. Additional discussion of visual effects associated with construction of the proposed railroad development is presented in Appendix M. Construction noise might also have an adverse effect for recreationists near active construction sites.

Personnel associated with construction of the railroad spur would compete with local residents for the available recreational opportunities. However, this would be a transitory effect, since construction of the spur is scheduled to be completed over a two-year period. Even though completed in mid-1994, the spur railroad facilities would be unavailable for public use, pending completion of Devil Canyon construction (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1.5).

OPERATION

Following on-line operation of the Devil Canyon facilities, the spur railroad would no longer serve project functions (Exhibit E, Vol. 8, Chap. 7, Sec. 3.1.5). Although the railroad might become available for public use, no plans for intended use are specified. The phase 5 monitoring program of the Applicant's proposed recreation plan (Sec. 2.1.11) seems an appropriate forum for deliberating the potential utility of the railroad spur in 2002.

L.2.1.4 Power Transmission Facilities

L.2.1.4.1 Dams-to-Gold Creek Segment

CONSTRUCTION

The proposed transmission line rights-of-way extending between the dam sites and the Gold Creek switchyard do not encroach on any officially designated public recreation resources. Activities in the area traversed by the proposed lines are characterized by low-intensity dispersed recreation use, primarily hunting and fishing activities. The transmission line rights-of-way would, however, intercept and/or parallel unimproved vehicle trails and hiking trails, particularly in the Gold Creek area (Fig. L-1). Some recreationists, such as operators of off-road vehicles and snowmobiles, might welcome the opportunity for using the cleared rights-of-way for accessing previously remote areas, while other participants in dispersed recreation activities would regard the construction of the transmission lines as detracting from the natural landscape. In this respect, it is notable that the two Watana-to-Gold Creek transmission lines would bypass within 1 mi (1.6 km) of the privately owned High Lake Lodge (Exhibit E, Vol. 8, Chap. 7, Fig. E.7.14). Construction noise and dust might be a temporary nuisance, but the intrusion of the transmission lines in the natural landscape setting would be enduring and visible to people at or near the lodge.

Other lakes in the vicinity of High Lake Lodge are also popular sport-fishing areas, and like High Lake are accessible primarily by float plane. Thus the completed transmission lines might pose a hazard for unwary pilots, particularly during and immediately following transmission tower erection and line stringing.

The staged development of the Watana and Devil Canyon facilities would influence the manner and timing by which viewers would be affected by the adverse impacts of transmission line construction on natural landscape settings. For example, the Watana-Gold Creek transmission lines would be operational in mid 1994 (Fig. 2-8) which corresponds with the scheduled completion of the Watana-Devil Canyon access road and the Gold Creek-Devil Canyon railroad access (Exhibit C, Vol. 1, Fig. C.2). Thus the initial recreation users of these two access routes would observe the completed development of the Watana-to-Gold Creek transmission lines which would be wholly or partially visible from substantial segments of the access routes. Observers would essentially be limited to project personnel, since the access routes would be unavailable for public use during Devil Canyon construction. However, if the access routes were opened for public use when the Devil Canyon facilities became operational in 2003, the touring public would also be exposed to the effects of project transmission line facilities on the natural landscape settings. Additional discussion of esthetic impacts associated with transmission line construction is presented in Appendix M.

Right-of-way clearing and transmission line construction would alter wildlife habitat and disturb wildlife populations, adversely affecting local sport hunting. More detailed information concerning the effects of transmission line construction on wildlife populations is presented in Appendix K.

The transmission lines from the two dams to the Gold Creek switching station would traverse the Susitna River, Tsusena Creek, Devil Creek, and about 14 additional minor waterways (Exhibit E, Vol. 9, Chap. 10, Table E.10.22). In-stream activities, bank disturbance, and subsequent erosion resulting from transmission line construction might disrupt or alter fish habitat as well as increase turbidity and sedimentation in downstream areas, temporarily affecting local sport fishing opportunities. Additional information concerning the effects of transmission line construction on local fish populations is presented in Appendix I. Visual impacts would also result from the presence of the transmission lines, which would detract from the quality of other water-based recreation experiences, particularly in the case of the Susitna River crossing.

OPERATION

Routine maintenance of the operational transmission facilities generally would not be expected to directly affect recreation activities or resources. The adverse visual effects on landscape settings would, however, continue during the operational phase. Likewise, the transmission line corridors would continue to be used to access remote areas, and, in some cases, sensitive environmental settings might be degraded by excessive use.

L.2.1.4.2 Gold Creek-to-Fairbanks Segment

CONSTRUCTION

The proposed right-of-way for the Gold Creek-to-Fairbanks transmission facilities does not encroach on or traverse any officially designated public recreation resources. Similarly, no significant privately developed recreation facilities or areas are known to occur in proximity to, or to be traversed by, the proposed transmission line rights-of-way. However, some owners or users of recreation cabins and similar facilities adjacent to the transmission lines might be exposed to construction noise, dust, and other disturbances, including altered landscapes from the presence of the transmission lines. It should be noted that the proposed transmission line would parallel the Anchorage-Fairbanks Transmission Intertie (under construction) between Gold Creek and Healy. Thus the adverse visual effects on landscapes for this portion of the proposed transmission line would be additive to those associated with the Intertie, and somewhat less severe than for a new right-of-way.

Recreation opportunities in the vicinity of the transmission lines currently include a variety of dispersed recreation activities such as hunting, fishing, hiking, and trail-related travel. In some cases, construction personnel would temporarily increase the competition for local game and fish resources. Additionally, some recreation trails and patterns of cross-country travel might be temporarily disrupted because of transmission line construction. Some trail users, such as operators of off-road vehicles and snowmobiles, would use the transmission line right-of-way to access remote areas, in some cases jeopardizing the wilderness settings in affected areas. Other participants in dispersed recreation activities would avoid the transmission line corridors to avoid viewing disturbed landscapes.

The proposed transmission line would variously parallel or cross two major travel corridors: the Parks Highway (crossed by the route at three locations) and the Alaska Railroad (crossed at two locations). In addition, the line would cross the Denali Highway east of Cantwell. Thus sightseers would be exposed to numerous instances in which the transmission line would detract from natural landscape settings.

Views of river travelers would also be adversely affected. Construction of the proposed line would entail 10 river crossings: the Nenana River at three locations and the Susitna, Indian, Jack, Tanana, Yanert Fork of the Nenana, and East and Middle Forks of the Chulitna River at one location each. The Nenana, Susitna, and Tanana rivers are particularly popular routes for river travelers. Visual impacts are discussed in Appendix M.

The potential for right-of-way clearing and transmission line construction affecting local sport hunting opportunities is noted in Section L.2.1.4.1. Additional information concerning the effects of transmission line construction on wildlife populations is presented in Appendix K.

The development of the proposed Gold Creek-to-Fairbanks transmission lines would entail crossing seven rivers a total of ten times as well as over 80 additional waterway crossings, i.e., including creeks, tributaries of creeks, and multiple crossings of some streams (Exhibit G, Vol. 4, Plates G.38-52). Some of the impacts on stream fisheries that could result from transmission line construction at waterway crossings and the potential for diminished sport fishing opportunities are noted in Section L.2.1.4.1. Additional information concerning the effects of line construction on local fish populations is presented in Appendix I.

OPERATION

The direct effects of transmission line operation on recreation resources and activities are discussed in Section L.2.1.4.1. The potential for adverse impacts on terrestrial game species and fish populations is discussed in Appendices K and I, respectively.

L.2.1.4.3 Gold Creek-to-Anchorage Segment

CONSTRUCTION

The proposed Gold Creek-to-Anchorage transmission lines would not traverse or otherwise affect any officially designated public recreation resource areas except that the lines would cross the extreme northeastern portion of the Susitna Flats State Game Refuge for a distance of about 5 mi (8 km) (Exhibit E, Vol. 8, Chap. 9, Fig. E.9.10). For perspective, the State Game Refuge system included a total of 688,822 acres (278,760 ha) in 1981 (Alaska Division of Parks, 1981). Thus the acreage within the 400-ft (122-m) transmission line right-of-way represents less than 0.04% of the total area within the State Game Refuge system. The proposed transmission lines would traverse a 3,520-acre (1425-ha) area that has been proposed for incorporation into the Willow Creek State Recreation Area (Park Planning Section, 1982b). The proposed expansion area would be traversed for about 2 mi (3 km) (Exhibit G, Vol. 4, Plate G.34). No significant privately developed public recreation facilities or areas are known to occur in the proximity of the proposed transmission line rights-of-way.

Current recreation uses in the vicinity of the proposed transmission corridor include a variety of dispersed recreation activities such as hunting, fishing, hiking, and trail-related modes of travel. In some instances, construction personnel would temporarily increase the competition for local game and fish resources. Effects of right-of-way clearing and transmission line construction on local sport hunting are noted in Section L.2.1.4.1. The impact of transmission line construction on wildlife populations is also discussed in Appendix K. Certain recreation trails and patterns of cross-country travel might also be temporarily disrupted as a result of transmission line construction. On the other hand, portions of the transmission line right-of-way might be used to gain access to remote areas, resulting in overutilization of sensitive locations or otherwise detracting from the wilderness settings.

Numerous lakes adjacent to the proposed transmission lines are popular recreation spots and commonly are accessed by floatplane, particularly to the southwest of Willow and in the vicinity and south of the Nancy Lake State Recreation Area (Acres American, 1982). The transmission lines would pose a hazard for recreationists accessing nearby lakes by means of float plane. Furthermore, the relatively numerous owners or users of nearby private recreation cabins and facilities adjacent to the transmission line could be affected by construction noise, dust, and other unwelcome experiences, including altered landscapes resulting from the presence of the transmission lines.

The development of the proposed Gold Creek-to-Anchorage transmission lines would entail crossing 3 rivers and about 40 additional creeks and minor waterways (Exhibit G, Vol. 4, Plates G.0-38). Some of the impacts on stream fisheries resulting from transmission line construction at waterway crossings and the related potential for diminished sport fishing opportunities are discussed in Section L.2.1.4.1. Additional discussion of the effects of line construction on local fish populations is presented in Appendix I.

Travelers on the Parks Highway and the Alaska Railroad would view the Gold Creek-to-Anchorage transmission lines at intersections near Willow, while travelers proceeding northerly would view the lines from several vantage points between Willow and the Gold Creek area. In the latter case, however, visual effects would only be incremental, since the Willow-to-Gold Creek segment parallels the Anchorage-Fairbanks Transmission Intertie. The proposed transmission lines would also parallel or intersect numerous recreation trails, particularly in the area southwest of Willow and in the vicinity and south of the Nancy Lake area; one such major trail is the Iditarod Dogsled Racing Trail (Acres American, 1982). River travelers would also view the transmission lines since the transmission corridor intersects with the Talkeetna, Kashwitna, and Little Susitna rivers as well as other navigable waterways.

Project transmission lines in the Anchorage area would parallel existing transmission facilities, causing only incremental visual effects. However, several major travel routes would be paralleled or intersected by the transmission right-of-way, including the Alaska Railroad, the Glenn and Davis highways, and the Oilwell and Ski Bowl roads (Exhibit G, Vol. 4, Plate G.30). Additional discussion of esthetic impacts related to transmission line construction is presented in Appendix M.

OPERATION

The direct effects on recreation resources and activities resulting from operation of the transmission lines would be similar to those discussed in Section L.2.1.4.1. The potential for adverse impacts on terrestrial game and fish populations is discussed in Appendices K and I, respectively.

L.2.1.5 Proposed Recreation Plan

The Applicant has proposed to implement a recreation development plan to compensate for public recreation opportunities impacted by the Watana and Devil Canyon developments and to accommodate recreation demand induced by the proposed project. Details of the recreation plan are presented in Section 2.1.11. Selected features of the plan are identified in the following discussion.

The recreation plan provides for the implementation of a monitoring program and five phases of recreation development. The Applicant has currently committed only to development Phases 1 through 4 (Exhibit E, Vol. 8, Chap. 7, Sec. 6.2). Phase 1 and the monitoring program would begin with the Watana construction in 1985 (Fig. 2-8). Monitoring data would be assessed to identify any needed modifications in subsequent development phases. Phase 2 (as modified) would be implemented within three years of the assessment date. The evaluation of Phase 3 development would generally correspond with initial development at the Devil Canyon dam site in 1995, as based on Watana monitoring data. Phase 3 development (as modified) would be implemented within three years following 1995 (Exhibit E, Vol. 8, Chap. 7, Sec. 6.2.1). The evaluation of Phase Four would generally correspond with operation of the Devil Canyon facilities in 2003.

The features of Phases 2-4 could be considerably modified during the extended implementation schedule. Recreation demands are not likely to remain consistent throughout the period involved.

Further, landowners adjacent to project sites might elect to develop facilities to accommodate certain public recreation activities that are unforeseeable at present. The implementation of Phase 5 development would be contingent on a future assessment and on agreement between all parties involved, and only if additional recreation demand was established based on analysis of monitoring data. Table L-10 outlines various phases, site identifications, and recreation features of the recreation plan as currently proposed.

An appraisal of the proposed recreation developments indicates that with the exception of the two visitors centers, most of the recreation development involves construction of trails and trailside facilities. The Brushkana Campground is essentially a wayside area off the Denali Highway. The proposed trail-related developments reflect current recreation preferences, as established by results of the Alaska Public Survey (Division of Parks, 1981). Randomly selected residents of Southeastern Alaska were requested to indicate preferences for state park acquisition, development, and maintenance. Most of those surveyed expressed a desire for additional hiking trails, roadside campgrounds, and developed recreation areas. For example, preference relative to hiking trails was as follows: more hiking trails, 53%; more trailside developments, 31%; maintenance of existing trails only, 16%; and fewer hiking trails, 1% of the total respondents (Park Planning Section, 1983).

The Applicant's proposed recreation plan is consistent with the current recreation demands of Southcentral Alaska residents, as based on the Alaska Public Survey. Additionally, the monitoring data would be evaluated periodically to determine any change in the recreation demand.

L.2.2 Susitna Development Alternatives

L.2.2.1 Alternative Dam Locations and Designs

The locations of the alternative dam sites and design configurations are within the same general area as of the proposed project. No dedicated public recreation sites, facilities or conservation areas occur in the vicinity. Thus, the effects on recreation use patterns associated with development of one of the alternatives would be similar to those discussed in Sections L.2.1.1 and L.2.1.2; i.e., effects on sport hunting and fishing and other dispersed recreation including trail-related and river-touring activities. Although the kinds of recreation activities involved would be relatively similar, the extent of the effects on recreation opportunities would vary due to differences in area preempted for development of a given alternative system.

Development of the Watana I alternative would entail lowering the impoundment elevation to 2,100 ft (640 m), which would result in reducing the area preempted for dam and impoundment sites to about 28,300 acres (11,450 ha); of which about 24,000 acres (9,710 ha) would be inundated land area (Table 4-14). Given that the combined Watana-Devil Canyon configuration proposed by the Applicant would result in inundation of about 36,900 acres (14,930 ha), opting for construction of the Watana I-Devil Canyon alternative would inundate about 29,900 acres (12,100 ha), and result in about 7,000 acres (2,830 ha) remaining available for land-based recreation activities. Among other considerations, less wildlife would be displaced and pressure on sport game and fish resources in undisturbed adjacent areas would be less intense than would be the case for the Watana-Devil Canyon configuration as proposed by the Applicant.

The land requirement for the Watana I-Modified High Devil Canyon alternative would be approximately the same as for the Watana I-Devil Canyon alternative, and the effects on recreation resources and facilities would be similar, with one notable exception. Development of the Modified High Devil Canyon dam would inundate Tsusena Falls (Exhibit E, Vol. 9, Chap. 10, Table E.10.19). These falls would be unaffected by development of the proposed Watana-Devil Canyon configuration. However, the Modified High Devil Canyon alternative would obviate provisions of the proposed recreation plan (Sec. 2.1.11) for constructing an access trail to enable hiking sightseers to view the falls.

Land for the Watana I-Reregulating dam alternative would be less than for the other alternatives. Construction of the Reregulating dam would result in inundation of about 4,000 acres (1,600 ha), which in combination with Watana I would require a total of about 28,000 acres (11,300 ha). In comparison with the proposed project, the Watana I-Reregulating dam alternatives would leave an additional 8,900 acres (3,600 ha) of land available for dispersed recreation opportunities. Effects on sport hunting opportunities would be somewhat less than those mentioned in the preceding discussion of the Watana I-Devil Canyon alternative. Similar to the other alternatives, development of this alternative would result in inundation of the Vee Canyon Rapids. However, while the Reregulating dam would cause free-flow of the Devil Canyon rapids to cease, the rapids would not be inundated, as would the case for the other alternatives.

Since all of the alternatives represent variously smaller efforts than the proposed project, the construction work force would be correspondingly smaller. Thus competition for recreation resources and opportunities between project personnel and local residents would be less intense (see Appendix N).

Table L-10. Features of the Applicant's Proposed Recreation Plan

Feature	Description
Phase One	
Brushkana Camp	0.25 miles of road; 25 campsites; 3 single vault latrines; 1 bulletin board; 8 trash cans; and 1 water well.
Tyone/Susitna River confluence	1 shelter.
Butte Creek/Susitna	1 boat launch (Susitna bridge)
Middle Fork Chulitna	25 miles of primitive trail; trailhead; 2 overnight shelters; 6 parking spaces; trash cans; bulletin board; and signs.
Portal Entry	Explanatory entry sign and 2-3 car pullout.
Phase Two	
Watana Damsite Visitor Center	1 visitor exhibit building; 20 parking spaces; 2 single vault latrines; 1 interpretive trail; 4 picnic sites; and 1 bulletin board.
Watana Townsite	2 miles of primitive trail to Tsusena Falls; 1 trailhead; and parking.
Tsusena Creek	20 miles of primitive trail; 2 shelters; 1 trailhead; and 3 parking spaces.
Tsusena Butte	4 miles of primitive trail; primitive camp (2-4 capacity); 1 trailhead; and 6 parking spaces.
Deadman/Big Lake	4 miles of primitive trail, primitive campsite (5-6 capacity); 1 trailhead; and 6 parking spaces.
Clarence Lake	9 miles of primitive trail; and signs.
Watana Lake	3 miles of primitive trail; 1 footbridge; and 1 primitive campsite (2-3 capacity).
Phase Three	
Mid-Chulitna Mountains/ Deadman Mountain	15 miles of primitive trail; 1 primitive campsite (2-4 capacity); 1 trailhead; and 10 parking spaces.
Phase Four	
Devil Creek Drainage	9 miles of primitive trail; 1 trailhead; 5 parking spaces; 1 bench; and signs.
Devil Canyon Damsite Visitor Center	1 visitor center, 0.5 miles of trail; 1 shelter; 1 single vault latrine; 8 picnic sites; 15 parking spaces; 3 benches; and signs.
Mermaid Lake	8 campsites; 1 shelter; 2 single vault latrines; 1 water well; 1 bulletin board; 5 garbage cans; and signs.
Phase Five - To be developed only if demand requires	
Soule Creek	8 miles of primitive trail; primitive campsite (5-6 capacity); 1 trailhead; and 5 parking spaces.
Southern Chulitna Mountains	3 miles of primitive trail; primitive campsite (3-4 capacity); 1 trailhead; and 3 parking spaces.
Fog Lakes	15 miles of primitive trail; 15 unit campground; 1 single vault latrine, 15 parking spaces; 1 trailhead; and signs.
Stephan Lake	5 miles of primitive trail; 5 campsites, semi-primitive; signs; and canoe boat ramp.
Rehabilitation Sites	As appropriate.

Conversion: To convert miles to kilometers, multiply by 1.61.

Source: Applicant's Schedule B, Supplemental Items, Vol. 2, Sec. 7, Comment 91.

During the operation of each proposed alternative, water levels within the Watana I impoundment would undergo substantial seasonal fluctuations, with adverse effects on recreation opportunities similar to those discussed in Section L.2.1.2. Fluctuations in the Devil Canyon, Modified High Devil Canyon, and Reregulating impoundments would be less severe, with correspondingly less severe impacts on recreation activities, as noted in Section L.2.1.2.2.

L.2.2.2 Alternative Access Routes

No dedicated recreation or conservation areas occur in the vicinity of the alternative access rights-of-way. The areas are relatively remote, and characterized by low-density dispersed recreation activities. Nevertheless, clearing of the rights-of-way and road construction would sharply contrast with adjacent natural settings--a situation likely be objectionable to some recreationists--and could temporarily disrupt or displace hiking paths and unimproved trails. Fish populations would be at least temporarily impacted in sensitive areas requiring in-stream construction work, with a corresponding diminution of sport fishing opportunities. Also, distribution patterns of terrestrial game species would likely be altered, thereby affecting sport hunting opportunities.

Completion of a various access routes would increase accessibility to the project area. Unless controlled, the opportunistic sportsman could use the roads to access prime fishing or hunting areas otherwise accessible only with difficulty, thereby increasing the pressure on local sport game and fish resources. Other operators of off-road vehicles could divert from the access road, risking overutilization of choice recreation sites as well as jeopardizing wilderness recreation experiences in remote areas.

The potential for impacts on recreation opportunities would not be confined to the project area. Commuting and other project personnel would compete with local residents, tourists, and others for use of recreation facilities, lodging, and services in adjacent communities (Appendix N).

L.2.2.3 Alternative Power Transmission Routes

Most of the typical impacts on recreation resources and activities (dust emissions, construction noise, potential use of transmission lines as access corridors, etc.) related to transmission line construction and operation were discussed in Section L.2.1.4. Accordingly, the following discussion focuses on only those impacts associated with a given alternative transmission line.

L.2.2.3.1 Central Study Area

Following successive screening (Sec. L.1.3.3), four principal alternative corridors were identified between the Watana and Devil Canyon dam sites and the Gold Creek substation: Corridor 1 (ABCD), Corridor 3 (AJCF), Corridor 13 (ABCF), and Corridor 14 (AJCD) (Fig. 2-14). Since no dedicated recreation or conservation areas occur along these corridors, the principal people affected would be participants in low-density hunting and fishing and in trail-related and river-touring activities. In some cases, an isolated foot path or other trails might also be temporarily disrupted or displaced by transmission line construction.

The major impact of the transmission lines would be the visual impacts of their presence. All four corridors traverse remote terrain, although Corridor 2 bypasses within 1 mi (1.6 km) of the High Lake Lodge. However, this corridor was designated as the preferred route because it parallels an existing ORV trail for about 8 mi (13 km). The presence of this trail would eliminate the need for pioneer access. Tower structures erected in segment ABC of Corridor 1 would be observable from Stephan Lake Lodge and several recreation cabins in the Stephan Lake and Fog Lakes areas (se also Section L.1.3.3.D).

L.2.2.3.2 Southern Study Area

Two alternative Willow-to-Anchorage corridors were identified in the Southern Study area: Corridor 1 (ABC) and Corridor 3 (AEFC) (Fig. 2-16). Assuming that Corridor 1 would avoid dedicated or otherwise sensitive areas in the Palmer area. However, the transmission line would likely be visually intrusive from one or more of the following: Willow Creek and Kepler-Bradley State Recreation Areas, Finger Lake State Recreation Site, and Gooding Lake. From the Eklutna Powerhouse into Anchorage, Corridor 1 parallels an existing transmission line right-of-way. However, intrusive views of the alternative line could occur at Peters Creek and Mirror Lake State Recreation Sites; Eagle River Campground, and/or Thunder Bird Falls turnout. Views of the line would also occur from a number of major tourist routes, including the Alaska Railroad, Willow Creek Road, George Parks Highway, and the Glenn Highway (at five different locations). Additionally, the line would be visible from river travel routes, including the Little Susitna, Matanuska, Knik, Eklutna, and Eagle rivers.

Corridor 3 traverses Nancy Lake State Recreation area for about 9 mi (15 km). Assuming the final alignment would avoid encroachment on developed recreation facilities, the line would

nevertheless constitute a severe visual impact for many recreation users of the area. Several private owners of lakeside cabins in the vicinity and south of the Nancy Lakes area would be similarly affected. Moreover, a number of lakes in this area are accessed by float plane; thus the lines would create a degree of hazard to air travelers (see also Sec. L.1.3.3.2).

L.2.2.3.3 Northern Study Area

Three alternative corridors were identified in the Northern Study Area: Corridor 2 (segments ABDC), Corridor 3 (AEDC), and Corridor 4 (AEF) (Fig. 2-15). These corridors are described in Section L.1.3.3.3. No significant public or private recreation developments occur in or adjacent to the corridors. Developed structures are limited to a few isolated cabins. For the most part the corridors traverse remotc terrain where recreation use patterns consist of low-density dispersed recreation activities. In the Fairbanks area, however, all three corridors intersect the Tanana River, which is a major river-touring route. The George Parks and a few other major roads are also intersected. Therefore, highway and river travelers would be visually exposed to transmission lines within the alternative corridors.

L.2.2.3.4 Other Alternative Power Transmission Routes

Following formal application for license, the Applicant identified additional alternative transmission line segments. The segments are not arranged to depict corridors, but by selecting various combination of segments, numerous routes can be identified, including some which are very similar to those discussed in the preceeding sections. The lack of definitive alignments precludes specific assessment of impacts. However, generalized evaluations of potential effects on recreation resources and activities can be inferred from alternative segment descriptions presented in Section L.1.3.3.4.

L.2.2.4 Alternative Borrow Sites

No specific recreation resources or activities are associated with the alternative borrow sites. The recreation use pattern in the vicinity of the sites is that of low-density dispersed recreation. Thus the disposition of materials from the alternative borrow sites would not meaningfully affect current or foreseeable recreation opportunities.

L.2.3 Non-Susitna Generation Alternatives

L.2.3.1 Natural-Gas-Fired Generation Scenario

As indicated in Section L.1.4.1.1, the Beluga and Chuitna Rivers are in relatively remote areas, and recreation use patterns consist of dispersed recreation activities. Within this setting, it is unlikely that the development of five 200-MW combined cycle units would have a meaningful effect on contemporary recreation activities.

Much of the land area in the northwestern Kenai peninsula consists of dedicated recreation and conservation areas (Sec. L.1.4.1.3). Similarly, most of the land in the Anchorage-Turnagain Arm area is within either Chugach State Park or Chugach National Forest (Sec. L.1.4.13). Non-dedicated lands occur in the Portage, Girdwood, and Anchorage areas. However, since only about 5 acres (2 ha) are required for each 200-MW combined-cycle unit, the siting of two units near Kenai and one along the Turnagain Arm would have a minimal effect on recreation opportunities and experiences. In all cases, it is assumed the units would be located to minimize the length of utility and distribution corridors.

L.2.3.2 Coal-Fired Generation Scenario

Nenana is located on the Alaska Railroad and the George Parks Highway, both of which are major tourist routes. Aside from tourist-related recreation opportunities, the recreation use pattern in the Nenana area consists of low-density dispersed recreation activities, primarily hunting and fishing (Sec. L.1.4.2.2). Accordingly, three 200-MW coal fired units could be sited in the Nenana area without encroaching on any dedicated recreation areas (Sec. L.1.4.2.2). The major recreation-related impacts would include competition between project personnel, local residents, and tourists for recreation opportunities (hunting, fishing, etc.), services, and housing accommodations. Other impacts would derive from increased traffic (including traffic related to construction and, later, from coal and combustion waste transport), with attendant noise pollution. Following initial operation of the plants, the environmental setting in the area would be further degraded by emissions from the coal-fired plants.

The development of two 200-MW coal-fired plants at Willow would entail a scenario similar to that at Nenana, with the following exceptions. Willow is the focus of three major tourist routes: the Alaska Railroad, the George Parks Highways, and the Willow Creek (Hatcher Pass) Road, which is the principal access to Independence Mine State Historical Site. Siting of the two plants near Willow would have to be selective to avoid public, private, and commercial recreation resource areas, as well as establish recreation corridors such as Willow Creek, which

is a popular area for resident and anadromous fishing activities, boating, and river touring. Accordingly, competition for recreation resources and facilities would be keener at Willow than at Nenana.

L.2.3.3 Combined Hydro-Thermal Generation Scenario

Major impacts related to the alternative impoundments are identified as follows:

- Johnson River: Development of the impoundment at Johnson River would inundate a segment of the Alaska Highway (a major tourist route) and about 84,000 acres (34,000 ha) that currently provides opportunities for a wide variety of low-density dispersed recreation activities. The dam would also disrupt river touring on the Tanana by both commercial and private interests (Sec. L.1.4.3.2).

- Keetna: Creation of the Keetna impoundment would inundate about 4,800 acres (1,940 ha) and portions of a major off-road vehicle trail, as well as hiking trails used for a wide variety of dispersed recreation activities, primarily hunting and fishing. Some of the finest rafting and white-water kayaking in Alaska would also be inundated or disrupted. Moreover, substantial prime moose harvest area would be inundated adjacent to the Talkeetna River, which has been proposed for State Recreation River status.

- Snow River: The Snow River impoundment would inundate 2,600 acres (1,050 ha) as well as some facilities maintained by the U.S. Forest Service, which are relatively heavily used for dispersed recreation activities (Sec. L.1.4.3.4).

- Browne Site: Development of the Browne site would inundate about 10,640 acres (4,305 ha), as well as segments of the Alaska Railroad and the George Parks Highway, which are major tourist routes. The dam would also alter flows of the Nenana River, a notable river-touring route. The recreation use patterns in the inundated area consist of low-density dispersed recreation activities (Sec. L.1.4.3.5).

In addition to these major impacts on recreation resources, there would be a other impacts from the influx of project personnel prior to project construction. The consequences of these impacts would be of a similar nature (but on a smaller scale) to those discussed for the proposed project (Sec. L.2.1). In contrast with the foregoing, the development of the Chakachamna site would not be expected to result in significant impacts on recreation resources. The project would involve a lake-tap at Lake Chakachamna, and the recreation use pattern in the area consists of low-intensity dispersed recreation activities. Therefore impacts on public recreation would be of a minor nature.

The thermal units of this combined hydro-thermal scenario would include a 200-MW coal-fired unit at Nenana. Expected impacts on public recreation would be similar in kind but of lesser intensity than those discussed in Section L.2.3.2. Minor impacts on public recreation also would result from construction and operation of two 200-MW combined-cycle units at a Chuitna River site and a 70-MW combustion-turbine unit near Anchorage.

L.2.4 Comparison of Alternatives

L.2.4.1 Susitna Development Alternatives

The dam and impoundment sites for the Watana I-Devil Canyon alternative would require about 29,900 acres (12,100 ha) of land area (Table 4-14). The Watana-I-Modified High Devil Canyon alternative would require about the same area; however, the Modified High Devil Canyon option would result in the inundation of Tsusena Falls, which is a notable recreation resource area. The Watana I-tunnel Reregulating dam alternative would require about 27,000 acres (11,000 ha), or more than 2,000 acres (810 ha) less than either of the other two alternatives. Thus with this alternative, more area would remain available for dispersed recreation, less wildlife would be displaced, and sport hunting and fishing pressures would be less intense adjacent to the project area. Additionally, free-flow through Devil Canyon would cease; but the Devil Canyon rapids would not be inundated, as would be the case for the other two alternatives. Development of the proposed Watana and Devil Canyon impoundments would preempt about 37,000 acres (15,000 ha) of land (Table 4-14) currently used for dispersed recreation activities. The Tsusena Falls would not be affected, but the Devil Canyon white-water run would be inundated.

There are no dedicated recreation or conservation areas associated with the proposed or designated alternative access roads in the project area. Recreation use patterns throughout the areas traversed by all of the access rights-of-way consist of low-density dispersed recreation, including sport hunting and fishing, as well as trail-related and river-touring activities. Accordingly, differences in the recreation potentials associated with the proposed and alternative routes are indistinguishable.

The proposed rights-of-way for the principal alternative dam sites-to-Gold Creek transmission lines (including the proposed route) traverse relatively remote terrain used for low-density dispersed recreation. Recreation potential associated with the alternative transmission lines is similar, with the following exception: transmission facilities constructed within the alternative route that extends southwesterly across the Susitna River from the Watana dam site would constitute visual intrusion of distant landscape settings as viewed from Stephan Lake Lodge and recreation cabins in the Lake Stephan and Fog Lakes areas. Transmission facilities developed within the proposed route would pass within 2 mi (3.2 km) of the High Lake Lodge.

The proposed and two alternative corridors were identified for the proposed Willow-to-Anchorage transmission line connection (Fig. 2-16). The westernmost alternative corridor traverses Nancy Lake State Recreation area for about 9 mi (15 km), as well as traversing or passing near other sensitive areas (lakeside cabins, recreation trails, etc.) in the vicinity and to the south of the Nancy Lakes area. The proposed corridor traverses much the same area, with the important difference that the proposed corridor passes to the west of Nancy Lake State Recreation Area. The other alternative corridor extends east and south from Willow over relatively remote terrain to a location northwest of Palmer and then traverses or passes near a number of sensitive areas en route to Anchorage. This second corridor is almost twice as long as the western corridor. From the standpoint of avoiding impacts on recreation resource areas and facilities, neither of the alternatives is considered desirable.

Three alternative transmission line corridors and the proposed route were identified for the Healy-to-Fairbanks interconnect (Fig. 2-15). No dedicated recreation or conservation areas occur near the four alternative routes; all traverse remote terrain. Structures near the corridors are limited to a few isolated cabins; and, in all cases, recreation use patterns consist of very low-density dispersed recreation activities. The alternative corridor extending east of Healy to the Wood River and thence northernly through the Wood River Valley to Fairbanks is circuitous, traversing 115 mi (185 km) compared to 90 mi (145 km) for the proposed corridor. The proposed and one alternative corridor intersect and variously parallel the George Parks Highway between Healy and a location near the Browne station on the Alaska Railroad. However, it is likely that the shortest of the alternative corridors [86 mi (139 km)] would have the least impact on recreation opportunities.

The recreation use patterns in the vicinity of the borrow sites is typically low-density dispersed recreation activity. Since none of the sites represent significant recreation resource areas, there is no meaningful basis for differentiating between them.

L.2.4.2 Non-Susitna Generation Alternatives

The natural gas-fired generation scenario involves a small land requirement and relatively innocuous operational impacts. Thus, this scenario would seem the most compatible with respect to recreation resource areas.

The more severe impacts on recreation resources associated with the coal-fired generation scenario would occur in the Nenana and Willow areas. Nenana is located in a remote area where the relatively moderate land requirements for three 200-MW coal-fired plants [about 600 acres (245 ha)] would not be a significant problem. However, the recreation use pattern in the area is low-intensity dispersed recreation with very limited capacity for satisfying demand for developed recreation sites and facilities. Thus the presence of construction personnel would result in severe competition with tourists and local residents for recreation opportunities, services, and lodging. Pressure on recreation resources during development of two 200-MW coal-fired plants at Willow would likely be somewhat less intense, because of the existence of modest public and commercial developed recreation sites and facilities. Available recreation opportunities in the Palmer and Anchorage areas would also alleviate recreation demand in the Willow area.

Assuming that generation units of the coal-fired scenario would be sited to avoid or minimize impacts at developed recreation sites, comparing the potential effects on public recreation opportunities related to the coal-fired generation scenario with those associated with the proposed Susitna generation scenario primarily entails considerations of dispersed recreation activities. Dispersed recreation opportunities are not necessarily comparable on an acre-for-acre basis. However, the estimated land requirement for permanent facilities of the coal-fired scenario is 600 acres (240 ha) (Table 4-14), compared with about 37,000 acres (15,000 ha) required for dam sites, impoundments and other permanent facilities of the proposed project. Both scenarios would entail additional impacts on recreation resources, but the overall impacts related to the coal-fired scenario would be considerably less than those for the proposed project.

A principal disadvantage related to the development of the combined hydro-thermal generation scenario derives from the large land-requirement. For example, development of the Johnson site would entail inundation of a segment of the Alaska Highway and 84,000 acres (34,000 ha), much of which supports dispersed recreation activities. In comparison, the total land requirement for permanent facilities (dam sites, impoundment areas, and generating stations) of the proposed Susitna generation scenario is about 37,000 acres (15,000 ha). Other component units of the combined hydro-thermal generation scenario would further contribute to impacts on recreation

resources. Although the Snow site is relatively small, participation levels in recreation opportunities are relatively high there. Development of the Keetna site would impact several important recreation resources, including a notable white-water area, prime sport hunting and fishing, and wilderness recreation experiences; further, the Talkeetna area has been proposed as a State Recreation River.

L.3 MITIGATION

In part, the implementation of the Applicant's recreation plan (Sec. 2.1.11) would constitute mitigation for losses of recreation resources and opportunities related to development of the proposed project. The recreation plan also includes provisions for accommodating recreation demand that would be generated due to construction and operation of project facilities. The Staff considers the Applicant's proposed recreation plan to be reasonable mitigation for, and a prudent and systematic approach to, resolving recreation need and demand related to the proposed project.

Although not specifically identified as mitigative measures, several recommendations have been proposed by concerned resource agencies with respect to project related recreation needs. Recommendations, identified by the agency, are summarized as follows:

National Park Service (Welch, 1983)

(a) High quality motion pictures, with narrative, should be prepared to ensure a permanent film record of existing river conditions (Tyone-Susitna River confluence to Gold Creek), as well as corresponding records for construction and operational phases of the proposed project. These records would be used as interpretive tools at project visitor centers.

(b) Consideration should be given to providing public access to the Susitna River below the dam to enable use of the Devil Canyon white-water prior to the completion and operation of the Devil Canyon dam.

(c) Consideration should be given to providing public access from the project transportation corridor to Portage Creek for fishing and/or kayaking.

(d) Appropriate day use and/or overnight facilities should be considered for Gold Creek to accommodate backpackers entering the project area via the Devil Canyon dam construction right-of-way, as well as recreationists using the Alaska Railroad who wish to lay-over at Gold Creek.

(e) The status of Stephan Lake development should be elevated to Phase 1 implementation since negotiations for right-of-way could be lengthy. These negotiations should be resolved at an early date to ensure continued public use of the Stephan Lake-Prairie Creek corridor during project construction.

Alaska Department of Natural Resources (Wunnicke, 1983)

(a) Leasing, concession, or other arrangements should be executed for acquiring control of at least one public site of suitable size (40 acres or more) at Stephan Lake for camping and fishing, and to serve as a staging area for float trips down to the Talkeetna River.

(b) Legal access should be secured and a trail constructed from the reservoir to Stephan Lake.

(c) It is recommended that the recreation element of Exhibit E add three sites adjacent to the Alaska Railroad: Indian River, Gold Creek, and Curry. These sites would provide destination points for recreation users of the Alaska Railroad and a greater diversity of recreation opportunities.

In the following discussion, recommendations of the National Park Service (NPS) and the Alaska Department of Natural Resources (ADNR) are identified by letter notations used in the preceding listing of recommendations:

NPS (a) - The Applicant has agreed to consider preparation of a permanent film record to document development of the Susitna River and Reservoir system (Exhibit E, Vol. 10B, Chap. 11, App. 11J).

NPS (b), (c) - The project construction schedule and the Applicant's proposal that the general public would be excluded from construction sites and related access roads essentially precludes developing access to the Susitna River below the Watana dam site to allow temporary public use of the Devil Canyon white-water; i.e., the Denali Highway-Watana access road would not be available to the public before 1994, and construction at Devil Canyon would be initiated in 1994 (Exhibit C, Vol. 1, Figures C.1 and C.2). Similarly, the appropriate segment of the project transportation corridor for developing access to Portage Creek would not be available for public use before 2002. Whether such access to Portage Creek in 2002 would be needed or desirable is not foreseeable at this time.

NPS (d), ADNR (c) - The recommendations for recreation development at Gold Creek, Curry, and Indian River are not inconsistent with provisions of the Applicant's recreation plan. The plan is designed to allow for response to recreation demand related to the proposed project. Given that strong recreation demand would exist or develop at one or more of the recommended locations, subsequent phases of recreation development could be adjusted and the appropriate development undertaken to alleviate the indicated recreation demand.

NPS (e), ADNR (a), (b) - Aircraft access to Stephan Lake for rafting or kayaking the Stephan Lake-Prairie Creek-Talkeetna River corridor will continue (Exhibit E, Vol. 10B, Chap. 11, Append. 11.J). Developed recreation facilities at Stephan Lake are limited to sportsman's lodges, a commercial lodge, and private cabins used primarily as base stations for hunting and fishing excursions. Since access to Stephan Lake is primarily by means of aircraft, acquiring and developing a tract for recreation purposes would benefit only a select segment of the public. Accordingly, the Stephan Lake area is considered to be a low-priority development site, at least during the foreseeable future.

REFERENCES FOR APPENDIX L

Acres American, Inc. 1982. Susitna Hydroelectric Project, Transmission Line Selected Route, Final Draft. Prepared for the Alaska Power Authority.

Alaska Department of Transportation and Public Facilities. 1981. Denali Highway, Cantwell to Paxson, Environmental Assessment. 30 pp.

Alaska Department of Natural Resources. 1982. Land Use Issues and Preliminary Resource Inventory. Vol. 1. Planning Background Report. 199 pp.

Alaska Division of Parks. 1975. Denali State Park: A Master Plan. Alaska Department of Natural Resources. Anchorage. 49 pp.

Alaska Division of Parks. 1980. Chugach State Park Master Plan. Alaska Department of Natural Resources. Anchorage. 89 pp.

Alaska Division of Parks. 1981. Alaska Outdoor Recreation Plan, 1981-85. Alaska Department of Natural Resources. Anchorage. 91 pp.

Alaska Land Use Council. 1983. Draft Study to Determine the Desirability of Creating the Denali National Scenic Highway. An interagency study prepared prepared under the direction of the Alaska Land Use Council. 69 pp.

Alaska Northwest Publishing Co. 1982. The Alaska Almanac. Anchorage. 173 pp.

Alaska Northwest Publishing Co. 1983. The Milepost. Anchorage. 496 pp.

Alaska State Division of Tourism. 1983. Alaska Including Canada's Yukon. 63 pp.

Bechtel Civil & Minerals, Inc. 1983. Chakachamna Hydroelectric Project Interim Feasibility Assessment Report. Vol. II. Appendix to Section 6.0. Prepared for the Alaska Power Authority. 239 pp.

Clark, R.N. and D.R. Johnson. 1981. The Alaska public survey - a comprehensive assessment of recreational values and use patterns and natural resource management. pp. 115-119, In: Lime, D.W. (Technical Coordinator), Forest and River Recreation: Research Update Miscellaneous Publication 18-1982. Agricultural Experiment Station, University of Minnesota, St. Paul.

Denali National Park and Preserve. 1983. Denali Alpenglow. Vol. 5. Alaska Natural History Association, Anchorage. 12 pp.

General Accounting Office. 1982. Status of Federal Agencies Implementation of the Alaska National Interest Lands Conservation Act. Gaithersburg, MD. 37 pp.

Hegg, K.M. 1982. Timber Resources Statistics for the Kantishna Block, Tanana Inventory Units, Alaska, 1973. Resource Bulletin PNW-95. Pacific Northwest Forest and Range Experiment Station. Juneau. 32 pp.

Interior Region Reconnaissance Section. 1981. Denali Highway-Cantwell to Paxson. Location Study Report RS-0750(1). Department of Transportation and Public Facilities. Fairbanks. 24 pp.

Joint Federal-State Land Use Planning Commission for Alaska. 1979. Outdoor Recreation in Alaska: An Examination of Governmental Roles. Commission Study 36. 96 pp.

Kuklok, D.L. et al. 1982. Denali to Wrangell-St. Elias. Prepared in cooperation with the Land and Resource Planning Section Staff for Alaska Department of Natural Resources and Development, Land and Resource Planning Section, Anchorage. pp. D1 to D102.

Land and Resource Planning Section. 1980. Susitna Basin Land Use/Recreation Atlas. Alaska Department of Natural Resources in cooperation with Soil Conservation Service, U.S. Department of Agriculture.

National Park Service. 1982. Index. National Park System and Related Areas. U.S. Government Printing Office. Washington, DC. 94 pp.

Park Planning Section. 1982a. Alaska State Park System: Statewide Framework. Division of Parks, Alaska Department of Natural Resources. 39 pp.

Park Planning Section. 1982b. Alaska State Park System: South Central Region Plan. Alaska Division of Parks, Department of Natural Resources. 153 pp.

Park Planning Section. 1983. Master Plan for the Proposed Willow Creek State Recreation Area. Division of Parks, Alaska Department of Natural Resources. 86 pp.

Selkregg, L.L. 1974. Alaska Regional Profiles, Southcentral Region, Vol. 1. University of Alaska, Arctic Environmental Information and Data Center. Anchorage. 255 pp.

Simmerman, N.L. 1983. Alaska's Parklands, The Complete Guide. The Mountaineers. Seattle, WA. 336 pp.

Terrestrial Environmental Specialists, Inc. 1982. Susitna Hydroelectric Project, Environmental Studies, Subtask 7.08: Recreation Planning, Phase I Report. Prepared in cooperation with the University of Alaska for Acres American Inc. Buffalo, NY. 39 pp.

U.S. Bureau of Land Management. 1980. BLM Land Use Plan for Southcentral Alaska, A Summary. U.S. Department of the Interior. Anchorage. 39 pp.

U.S. Bureau of Land Management. 1982. Draft, An Amendment to the Southcentral Alaska Land-Use Plan for the Denali/Tiekel Planning Blocks. U.S. Department of the Interior. Anchorage. 186 pp.

U.S. Department of Agriculture. 1981. Willow Subbasin - Susitna River Basin Study - Alaska. Final Report. U.S. Department of Agriculture in cooperation with Alaska Department of Natural Resources, Alaska Department of Fish and Game, and U.S. Department of the Interior. 144 pp.

Wakefield, W.C., II. 1983. Memorandum with enclosures from W.C. Wakefield, II, Susitna Project Manager, to Susitna Advisory Committee (October 18).

Welch, B. 1983. Letter from B. Welch, Associate Regional Director, National Park Service, to Eric P. Yould, Executive Director, Alaska Power Authority (January 14).

Wunnicke, E.C. 1983. Letter from E.C. Wunnicke, Commissioner, Alaska Department of Natural Resources, to Eric P. Yould, Executive Director, Alaska Power Authority (January 13).

DRAFT ENVIRONMENTAL IMPACT STATEMENT

SUSITNA HYDROELECTRIC PROJECT, FERC NO. 7114

APPENDIX M

VISUAL RESOURCES

Prepared by

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APPENDIX M. VISUAL RESOURCES

M.1 VISUAL RESOURCE ANALYSIS CRITERIA

One consideration in the placement of project structures and transmission line towers should be to plan, design, and construct project features that to the extent possible would be in harmony with, or at least be subordinate to, the surrounding landscape (U.S. Forest Service, 1975). The three major objectives of the visual resource analysis and management approach are to (1) identify the existing visual resources in the project study areas, (2) determine the visual impacts of the proposed project and its alternatives on these resources, and (3) prepare a mitigative strategy to lessen the impact on any given visual resource. These objectives are accomplished in a three-step approach.

The first step involves identifying and characterizing the various types of landscapes; determining their quality and uniqueness in relation to the regional project area setting and within the state; quantifying site-specific prominent natural features within each given landscape type; and locating all significant viewsheds, vista points, and travel routes in the project area. Step 2 uses the data collected from step 1 to determine the effects that the project would have on the visual resources (general landscape and site-specific features) found within the project area. Impacts are determined by using state-of-the-art evaluation methods, such as the U.S. Forest Service (1973, 1974) visual management system. The final step (step 3) in the visual resource analysis is to develop a mitigation plan that will lessen the visual impacts caused by the proposed project. Visual impacts can often be minimized by (1) redesigning various project features (using form, line, color, and texture), (2) modifying or enhancing surrounding vegetation patterns, (3) taking into account the topographical features of the area, and (4) in some instances complete avoidance of visually sensitive areas.

Four visual elements compete for dominance in a landscape: (1) form, (2) line, (3) color, and (4) texture (U.S. Forest Service, 1973). These factors exert differing degrees of visual influence, power, and dominance (U.S. Forest Service, 1975). For example, the form of transmission line structures is usually geometric, forceful, and large. Secondly, the transmission line right-of-way generally has a linear impact because of cleared vegetation and straight distance of the line. Third, depending on lighting conditions, season of the year, and color of the materials that the towers and conductors are constructed of, transmission lines and towers may or may not be highly visible against the natural background. Finally, natural landscape textures can rarely be matched by utility structures.

For the project features and transmission line, it is important to analyze the surrounding topography, vegetation, and any unique features located within the upper and middle Susitna River Basin and the power transmission line corridor. In the following evaluation of the visual resources, a number of important factors were considered, including (1) expected image by the viewer, (2) importance of retention of the character of the area, (3) vantage point of viewer, (4) duration of the view, (5) number of viewers, and (6) viewing distance. Impacts in relation to viewing distances are described in terms of the foreground, middleground, and background criteria developed by the U.S. Forest Service (Table M-1).

Although quantitative procedures are used to the extent possible in this analysis, it must be recognized that certain aspects of any visual resource analysis and management system will remain subjective and rely on qualitative analysis due to variances in individual perception of any given aesthetic resource.

M.2 AFFECTED ENVIRONMENT

The areas that would be affected by the proposed Susitna Hydroelectric Project and its alternatives are located primarily in the Southcentral Region of Alaska. Some project features and transmission line corridors also extend into the Interior Region of the state.

The Southcentral Region is geographically bounded by the Alaska Range to the north and west, the Wrangell Mountains to the east, and the Chugach Mountains and Gulf of Alaska to the south. Much of the region is characterized by rugged, mountainous terrain. Mt. McKinley (west of the project area) is one of the state's most prominent geographical features. The region also contains plateaus, and broad river valleys, often with braided channel flows (Exhibit E, Vol. 8, Chap. 8, p. E-8-1).* The Anchorage area, with 173,000 residents (nearly half of the state's population),

*Throughout this document, references to specific "Exhibits" are to the exhibits submitted to FERC as part of Alaska Power Authority's Susitna Hydroelectric Project License Application. References to specific "Appendices" (App.) are to the appendices provided in Volumes 2 through 7 of this Draft Environmental Impact Statement.

Table M-1. Distance Viewing Criteria

Components	Foreground	Middleground	Background
Distance	0--¼-½ mi	¼-½--3-5 miles	3-5 miles--infinity
Sight capacity	Detail	Detail & general	General--no detail
Object viewed	Rock point	Entire ridge	System of ridges
Visual characteristics	Individual plants & species	Textures (conifers & hardwoods)	Patterns (light & dark)

Foreground Characteristics	Middleground Characteristics	Background Characteristics
Presence--the observer is in it.	Linkage between foreground and background parts of the landscape.	Simplification--outline shapes, little texture or detail apparent, objects viewed mostly as patterns of light and dark
Maximum discernment of detail--in proportion to time and speed.	Emergence of overall shapes and patterns	Strong discernment of aerial perspective--reduces color distinction, replaces them with values of blue and gray.
Scale--observer can feel a size relationship with the elements.	Visual simplification of vegetative surfaces into textures.	Discernment of entire landscape units--drainage patterns, vegetative patterns, landforms.
Discernment of color--intensity and value seen in maximum contrasts.	Presence of aerial perspective--softens color contrasts.	Individual visual impacts least apparent.
Discernment of other sensory experiences--sound, smell, and touch are most acute here.	Discernment of relation between landscape units	
Discernment of wind motion.		
Aerial perspective absent.		

Conversion: To convert miles to kilometers, multiply by 1.61.

Source: U.S. Forest Service (1973).

is located near the northeastern end of Cook Inlet. It is approximately 100 air miles (mi) [160 kilometers (km)] south of the proposed projects dam sites and is near the southern terminus of the proposed transmission line route. The region has diverse landscapes, including spruce-hemlock and spruce-hardwood forests, wetlands, moist and wet tundra, plateau upland, mountains, and a number of active glacier-bedded mountain valleys.

The Interior Region is bordered by the Brooks Range to the north, the Bering Sea to the west, the Canadian border to the east, and the Alaska Range to the south. Large portions of the area include braided and meandering rivers and streams. The Yukon River, which bisects the Interior Region, is probably the most prominent natural feature. River valleys are primarily vegetated with spruce-hardwood forests. The region also contains wetlands, treeless tundra, and brush covered highlands. There is an abundance of wildlife and fisheries resources within the region. Fairbanks (30,000 residents) is Alaska's second largest city; it is approximately 100 air mi (160 km) north of the proposed dam sites and is near the northern terminus of the proposed transmission line route.

M.2.1 Proposed Project

M.2.1.1 Upper and Middle Susitna River Basin

The sites of the proposed Watana and Devil Canyon hydroelectric dams and related facilities (e.g., reservoirs, construction camps, village, access roads) and the Watana-to-Gold Creek

transmission line corridor (37 mi, or 60 km) would be located within the upper and middle Susitna River Basin, which is part of the Southcentral Region of the state. This area is diverse in landscape character, essentially roadless, and sparsely inhabited. These factors contribute to an image of being natural without the presence of significant human intrusion and development. The major landscape character types; prominent natural features; and significant viewsheds, vista points, and travel routes within the upper and middle Susitna River Basin are described below.

M.2.1.1.1 Landscape Character Types

The upper and middle Susitna River Basin contains a variety of aesthetically distinct and diverse landscape types consisting of a mixture of various topographic (mountains, broad valleys), vegetation (woodlands, tundra, barren land), and water resource (rivers, waterfalls, rapids, lakes, and streams) features. These physical features are enhanced by other visual and aesthetic elements, such as atmospheric conditions, presence of wildlife, and natural scents and sounds. Viewer perspective of the various landscape types depends on the observer position, distance, angle, and illumination factors.

Landforms of the area are defined by three major elements: (1) the deeply incised Susitna River valley and its tributaries, (2) the northern Talkeetna and Chulitna mountains, and (3) the northern Talkeetna plateau (Terrestrial Environmental Specialists, 1982). The features, texture, and physical relief of the area are dominated by the northeastern trend of the northern Talkeetna plateau, low rounded mountains, and generally rolling highlands. These areas generally slope upward to meet adjacent landforms that are more rugged, higher, and mountainous. Landforms to the north are part of the Alaska Range, and the Mt. McKinley area is to the west. Landforms to the east consist of lower mountains and hills widely spaced on the plateau and flat terrain with numerous ponds (Terrestrial Environmental Specialists, 1982).

The vegetation is diverse and varies with elevation. Dense spruce-hardwood forests cover the lower drainage areas and slopes, while large areas of tundra vegetation cover the higher elevations. A variety of shrub-type vegetation occurs between the forest and tundra areas. (For a more detailed description, see Sec. 3.1.5 and Appendix J.) Color variation also enhances the aesthetic quality of the area. This is particularly true in the fall when the leaves of the deciduous trees turn color (yellow, orange, and red) and are contrasted against the dominant dark-green spruce. The tundra also undergoes brief color change in the autumn, and there can be considerable contrast against mountain backdrops and areas of open, blue sky. During the winter, partial and complete snow cover dominates the landscape.

The landforms, waterforms, vegetation, and views within the upper and middle Susitna River Basin are described in Table M-2. Principal project features located within the area are listed under the appropriate landscape character type in the table. These descriptions correspond to the landscape character types shown in Figure M-1. Photos for each landscape character type are presented in Figure M-2. Prominent natural features located within each specific landscape type are described in detail below.

M.2.1.1.2 Prominent Natural Features

A number of exceptional and other prominent natural features occur within the upper and middle Susitna River Basin. The V-shaped valleys of the Susitna River and its tributaries are visually prominent, and forested areas associated with the valleys form distinct paths of green through a predominantly tundra-type landscape. The Susitna River canyon is particularly prominent at and near Devil and Vee Canyons, where turbulent rapids, rock outcroppings, shear cliffs, and enclosed canyon walls predominate. There are numerous clear, fast-flowing mountain creeks within the upper and middle Susitna Basin. Some of these creeks flow over steep and rocky embankments, forming waterfalls and flumes. There are also numerous lakes in a variety of shapes and settings--from small, irregular-shaped lakes in woodland settings to larger glacial lakes and a complex set of fine, finger-shaped lakes set in a black spruce and shrub wetland area. Surrounding portions of the basin are higher mountain peaks and distant mountain ranges.

The prominent natural features within the basin are described below. The locations of these features are shown in Figure M-1 and cross referenced by alphabetical designation in the appropriate landscape character type description in Table M-2. Photos of selected prominent natural features are also included in Figure M-3. The following descriptions are based on information presented in Exhibit E (Vol. 8, Chap. 8) of the Applicant's application and in a land use analysis report prepared by Terrestrial Environmental Specialists, Inc. (1982), as well as on field verification by aerial and ground reconnaissance.

A. Devil's Club Falls: Devil's Club Falls is a scenic waterfall located near a proposed borrow area that is easily accessible from the Susitna River below the Devil Canyon rapids. (Unofficially named for the abundance of the plant devil's club that is present all the way up to the falls.)

Table M-2. Descriptions of Landscape Character Types (LCT) within the Upper and Middle Susitna River Basin

Landforms†[1]	Waterforms	Vegetation
1. MID-SUSITNA RIVER VALLEY LCT		
• Valley 2 to 6 mi in width with steep slopes. • Flat, terraced land adjacent to Indian River near Susitna confluence.	• Moderately braided, silt-laden river up to 0.5 mi wide. • Wetland areas, islands, sandbars, and cobbles are common adjacent to flat terraced areas. • Gold Creek tributary to Susitna flows through narrow forested canyon.	• Dense mixed forest of spruce and deciduous trees. • Tundra and brush species on steeper valley slopes. • Spruce green is most prominent color, small amount of yellow/gold color by deciduous trees in autumn. • Tundra cover provides good red/orange color tones in fall.
2. DEVIL CANYON LCT		
• Steep to vertical rock canyon walls with medium to dark-brown colors for several miles. Canyon is nearly 1,000 ft deep. • Predominantly incised valley for over 20 mi. • Giant rock shelves and angular boulders in river channel. • Canyon is a significant natural feature of Alaska.	• High volume and fixed channel river through deep canyon. • Contains an 11-mi stretch of world Class VI kayaking whitewater. • Portage, Cheechako, and Devil creeks are all notable, with steep to vertical canyoned tributaries. • Devil Creek Falls are the most scenic falls in basin.	• Slopes densely covered with mixture of spruce and deciduous trees with good fall color. • Small pure stands of poplar species provide interesting tree patterns in fall and winter. • High color contrast with foamy gray water.
3. TALKEETNA UPLANDS LCT		
• Flat to rolling upland plateau. • Primarily moderately steep to steep slopes. • Several knobs rise above 4,000 ft, with average elevation of 3,000 ft. • Drainages form deep, steep, sloped valleys and canyons. • Rugged rocky hilltops and outcroppings are common.	• Number of lakes 20 to 50 acres in size. • Massive areas of muskeg bogs. • Chunilna Creek is significant drainage in the area with many tributaries. • Many lakes are topographically enclosed.	• Moist and wet tundra is dominant. • Moderately dense spruce-deciduous tree cover primarily restricted to drainages. • Chunilna Creek valley is densely forested.
4. CHULITNA MOIST TUNDRA UPLANDS LCT		
• Wide variety of small- and large-scale topographic relief. • Large, well-defined and enclosed lake beds. • Long, flat, as well as rolling, terraces above the Susitna River, with variety of canyon sizes. • Dark-brown-colored rock outcrops common along the upper terrace, canyon and lake edges. • Several long, shallow valleys.	• Dozens of irregular-shaped lakes up to several hundred acres in size. • Bog and wetland areas common throughout. • Many small streams flow through canyons to Susitna River. • Landscape includes Indian River, Portage and Devil creeks.	• Upland area east of Portage Creek is predominantly tundra. • The upland area west of Portage Creek is covered with moderately dense spruce forest. • Willow and other shrub species are common in dense cover near banks of lakes and wetland areas. • Scattered and sparse stands of spruce are located east of Portage Creek, and mixed woods are in the creek valley. • Tundra colors are medium to dark green in spring and summer; bright red, burgundy, and yellow in fall; and gold and light brown during winter months when not covered by snow.
5. PORTAGE LOWLANDS LCT		
• Lower portion of Portage Creek forms distinct winding, fixed channel and steep-sloped valley. • Large eroded sidewalls are common on many hairpin turns in the river. • Flat terraced areas along upper creek are also common.	• Portage Creek is a very scenic, fast-flowing and clearwater tributary to Susitna below Devil Canyon. • Many small streams cascade into Portage Creek.	• Moderately dense spruce-deciduous forest covers most of valley up to average elevation of 2500 ft. • Bright-green spring foliage of deciduous trees provides color. • Well-mixed forest provides scenic fall color.

Views	Prominent Natural Features†[2]	Proposed Project Features
• Views directed within the river channel, valley slopes, and commonly snow-capped Chulitna Mountains to north	• Devil's Club Falls (unofficial name) (A) - scenic waterfall below Devil Canyon rapids.	• Rail spur. • Watana to Gold Creek transmission line. • Construction village and camp. • Gold Creek switching station.
• Views primarily restricted within the immediate canyon/valley. • Views are dramatic in the near-vertical rock canyon portions of the river valley.	• Devil Canyon and Rapids (B) - 10 mi of turbulent whitewater within scenic canyon gorge. • Devil Creek Falls (C) - 2 large waterfalls constricted by narrow opening between jagged rock walls plunge through crevasses and cascade to pool below.	• Devil Canyon dam site. • Devil Canyon impoundment. • Borrow site. • Access road. • Suspension bridge. • Watana to Gold Creek transmission line.
• Foreground and background views are scenic throughout most of landscape. • Panoramic views possible from higher points. • Chulitna and Talkeetna mountains and Alaska Range can be viewed. • Good views of Susitna and Talkeetna river valleys.	• Cheechako Falls (D) - series of 5 waterfalls set in steep gorge with rocky cliffs surrounded by thick mats of moss and other vegetation.	• None identified.
• Foreground and middleground views are scenic and common except in denser forested areas. • Vantage points are limitless. • Views of the Chulitna and Talkeetna mountains occur often, and views of Alaska Range are possible. • In late autumn, brilliant blue color of lakes provides sharp contrast to snow-covered landscape. • Scenic views to adjacent drainages.	• Swimming Bear Lake (unofficial name) (E) - Large alpine lake set in mat and cushion/sedge-grass tundra.	• Access route. • Watana-to-Gold Creek transmission line.
• Views generally restricted to deep and forested valley. • Forest views are in marked contrast to many locations in region. • Overall, combination of natural features provides very aesthetically pleasing environment.	• None identified.	• None identified.

Table M-2. Continued

Landforms†[1]	Waterforms	Vegetation
6. CHULITNA MOUNTAINS LCT		
• Over 900 mi² of rugged glacially carved mountains. • Narrow and broad V-shaped valleys with glaciers and permanent ice fields. • Rock glaciers. • Slopes rise steeply to over 6,000 ft in elevation. • Many extensive talus slopes.	• Cirque lakes of aqua-blue color. • 5 or 6 lakes several hundred acres in size; largest is in Caribou Pass. • The Jack, Middle, and East Fork Chulitna rivers and the Tsusena, Brushkana, Soule, Deadman, and Honolulu creeks are all significant drainages.	• Tundra and shrub species cover valley floors and slopes, creating interesting edge as they meet the barren, steeper rock slopes. • Scattered stands of spruce and deciduous trees along the Jack, Middle, and East Fork Chulitna rivers. • Green spruce-deciduous forest cover for over 20 mi along Tsusena Creek.
7. SUSITNA UPLAND TERRACE LCT		
• Terraced, flat to rolling terrain. • Slopes have gentle gradients. • Depressed lake basins.	• Large, linear, glaciated and irregular-shaped lakes; Stephan Lake is second largest in upper Susitna Basin. • Fog Lakes (5 adjacent lakes, each of several hundred acres) create unique pattern. • Fog Creek forms narrow and deeply incised canyon leaving the Fog Lakes area and flowing into Susitna River.	• Densely forested with spruce and some deciduous trees, except for 10-mi² area northeast of Fog Lakes that is predominantly tundra.
8. SUSITNA RIVER VALLEY LCT		
• Up to 4-mi-wide valley, broader than Devil Canyon area. • Occasional dark-colored rock outcrops or bluffs occur along valley; up river from Tsusena Creek on north side is shear cliff of light-colored rock, soil, and cobble. • River bottom also has low terrace before it rises steeply to the uplands.	• Mildly braided river with large islands of cobble and sand. • Fog, Tsusena, Deadman, Watana, Kosina, and Jay creeks--all significant and scenic tributaries to this portion of Susitna; all have steep and narrow canyons near their confluences with Susitna. • Tsusena, Deadman, and Watana creeks all have notable falls. • Confluence of clear water of the tributaries with the silt-laden river water is of visual interest.	• Moderately dense to dense spruce-deciduous forest covers much of river and tributary valleys; good autumn color. • Willow and other shrub species occur along river banks and terraces.
9. WET UPLAND TUNDRA LCT		
• Flat to rolling upland area with several large surficial creeks. • Gentle to moderately steep slopes from Chulitna highlands to the creeks. • Mildly to moderately depressed lake beds with adjacent glaciated bluffs and hills.	• Big Lake and Deadman Lake are largest lakes in upper basin; Big Lake covers 1,080 acres. • Deadman Creek is unique meandering watercourse. • Brushkana and Butte creeks are other significant drainages of the area. • Bogs and wetlands occur extensively.	• Wet tundra cover prevalent, with occasional stands of spruce. • Willow and other shrub species are common near creek banks, lake shores, and in wetland areas.

Views	Prominent Natural Features†[2]	Proposed Project Features
• Views are scenic almost everywhere. • Impressive and awesome natural features. • Mountain rock colors of light to dark gray (primarily talus slopes) and medium to dark brown (higher mountain tops) provide variety of textures and patterns with seasonal color changes of the tundra.	• Caribou Pass (F) - two long lakes surrounded by glaciated mountains in Caribou Pass. • Tsusena Lake and Butte (G) - lake at edge of Chulitna Mountains, created by an old moraine. Prominent butte rises 4,132 ft above the lake. • Chulitna Butte (H) - overlooks Alaska Railroad and communities; provides accessible viewpoint of project area from Parks Highway. • Deadman Mountain (I) - isolated mountain 5,525 ft high; overshadows Deadman and Big lakes.	• Access route. • Borrow sites.
• Views often restricted by forest cover and depressed lake beds; however, higher mountains (Talkeetna and Chulitna) still rise above the horizon. • Open vantage points are present for panoramic views.	• Stephan Lake (J) - over 4-mi-long lake at base of Talkeetna Mountains; lodges located in the vicinity; woods and tundra surround shoreline. • Fog Lakes (K) - series of 5 large, linear lakes on rolling to flat landscape with wetlands, tundra, and mixed forest.	• Borrow sites.
• Broad valley allows for expanded views; although mostly river and valley oriented, views out of valley are possible on longer straight portions of river, and mountain tops can be seen.	• Tsusena Creek Falls (L) - descends nearly 200 ft over steep, rocky cliff and cascades into large, rock-enclosed pool. • Deadman Creek Falls (M) - surges over incised channel and plummets over rocky slopes into a clean boulder-strewn pool.	• Watana dam site. • Watana to Gold Creek transmission line. • Borrow sites.
• Panoramic views of the Chulitna, Talkeetna, and Clearwater mountains and Alaska Range are possible. • In fall and early winter, ice forming on Deadman Creek creates very interesting patterns and textures. • Fall color of tundra, combined with all other natural features, is highly scenic.	• Big and Deadman lakes (N) - picturesquely situated between 3 large tundra-covered buttes, panoramic views of Susitna Basin, Alaska Range, and Deadman Mountain.	• Construction village and campsite. • Permanent townsite. • Permanent airstrip. • Borrow sites. • Access road.

Table M-2. Continued

Landforms†[1]	Waterforms	Vegetation
10. TALKEETNA MOUNTAINS LCT		
• Rugged and steeply sloped mountain range covering several thousand square miles. • Elevations over 8,000 ft. • Large glaciers, permanent ice fields, and other glacial features. • Large, moderately sloped terraces. • Long, narrow to broad V-shaped valleys. • Large talus slopes.	• Cirque lakes. • Numerous lakes up to several hundred acres in size. • Many rivers and creeks.	• Tundra and shrub occur throughout mountains, primarily below the steeper rocky slopes and peaks. • Dense spruce-deciduous forests cover river valleys except for drainages in northeastern area of range.
11. SUSITNA UPLANDS LCT		
• Terraced, flat and rolling terrain. • Elevations from 3,000 to 5,600 ft. • Slopes primarily flat to moderately steep. • Larger lake beds are depressed. • Stream valleys are broad and fixed channel. • Rock outcrops, cliffs, and rocky hilltops are common. Rock colors are light tan to dark brown.	• Numerous small lakes scattered throughout area in dense patterns. • Two largest lakes, Watana and Clarence, are narrow and linear; both cover several hundred acres. • Large number of small creeks. • Susitna tributaries, Kosina, Tsisi, Gilbert, and Goose creeks and the silt-laden Oshetna River, all scenic.	• Upland moist tundra and shrub species cover most of land except rocky areas. • Fall colors of massive tundra area create variety of patterns. • Sparse to moderately dense stands of spruce occur within some of the drainages.
12. VEE CANYON LCT		
• Steep and meandering river valley. • The ¼- to 1-mi wide valley rises over 500 ft from the river bottom. • Vee Canyon displays a unique, very tight, V-shaped rock feature in a double hairpin bend of the Susitna River; canyon is colorful. • Oshetna River, Goose Creek, and other smaller tributary creeks have deep valleys near their confluences with Susitna River.	• Susitna River flows very fast through fixed channel. • Well-known stretch of rough whitewater occurs through Vee Canyon. • River begins to meander several miles up river from Vee Canyon. • River area includes numerous islands and sandbars with a gravel cobble edge.	• Tundra, brush and rock slopes dominate southern side of canyon, while moderately dense to sparse spruce forests cover northside slopes and river bottom.
13. SUSITNA UPLAND RIVER VALLEY AND WET TUNDRA BASIN LCT		
• Low, flat, and rolling terraces above the banks of Susitna River.	• At this point, Susitna River is mildly to heavily braided and becomes more braided as it nears its glacial headwaters. • The river varies from 0.1 to over 1 mi wide. • Several hundred lakes ranging from very small to over 500 acres in size. • Significant tributaries include the Oshetna, Tyone, and Maclaren rivers and Clearwater, Butte, Windy, and Valdez creeks.	• Wet tundra is dominant vegetation type. • Sparse stands of spruce scattered throughout area. • Dense willow and other shrub types occur along the river and many lake banks. • In autumn, tundra foliage creates an extensive variety of colorful patterns over the landscape.

†[1] Numeric designations are keyed to landscape character photos provided in Figure M-2.

†[2] Letter designation following each prominent natural feature is keyed to the written description in Section M.2.1.1.2 an photos provided in Figure M-3.

Conversions: To convert feet to meters, multiply by 0.305;
To convert miles to kilometers, multiply by 1.61;
To convert square miles (mi^2) to square kilometers (km^2), multiply by 2.59;
To convert acres to hectares, multiply by 0.405.

Source: Exhibit E, Vol. 8, Chap. 8, and field verification through aerial and ground reconnaissance.

Views	Prominent Natural Features†[2]	Proposed Project Features
• Many views are scenic and limitless. • Views are panoramic to semi-enclosed, depending on viewer position.	• Clear Valley (O) - contains unusual flat surfaces raised off valley floor surrounded by meandering streams. • Spearpoint Falls (unofficial name) (P) - 4 waterfalls along small creek.	• None identified.
• Views are expansive. • Many areas at this same elevation and higher in the upper basin can be viewed from this high upland. • Views of Talkeetna are particularly scenic.	• Mt. Watana Cirque Lake (Q) - high, pristine cirque lake with scenic valley view. • Watana Lake (R) - 3,000 ft elevation with Mt. Watana rising directly to the west. • Mt. Watana Falls (S) - flows over deeply incised rock gorge on northern side of Mt. Watana.	• None identified.
• Views are restricted to foreground area due to deep and narrow nature of the canyon/valley. • Some of higher adjacent points can be seen from more open areas of the river. • Adjoining tributary canyons offer additional foreground views of interest.	• Vee Canyon (T) - deeply cut, double hairpin bend channel with stretch of whitewater.	• Watana dam impoundment.
• The wide-open character of the river basin allows scenic views of Alaska Range and Talkeetna Mountains. • Susitna and West Fork glaciers, the source of the Susitna River, can be seen from 30 to 50 mi distant. • Views in foreground not particularly scenic, except during fall tundra color.	• Tyone River (U) - clear, slow-flowing river; exceptional, prominent glacial remains and scenic white bluffs.	• None identified.

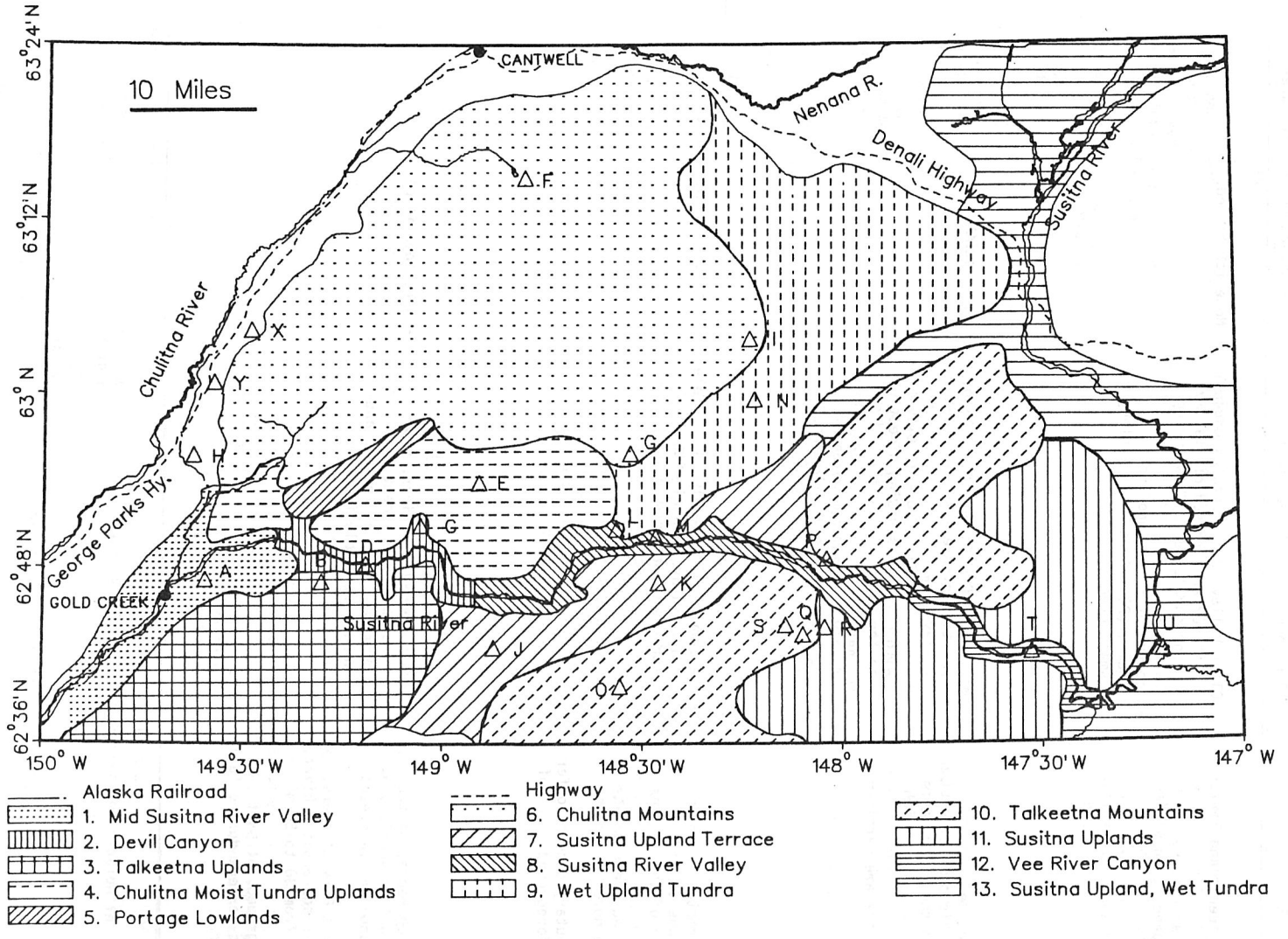
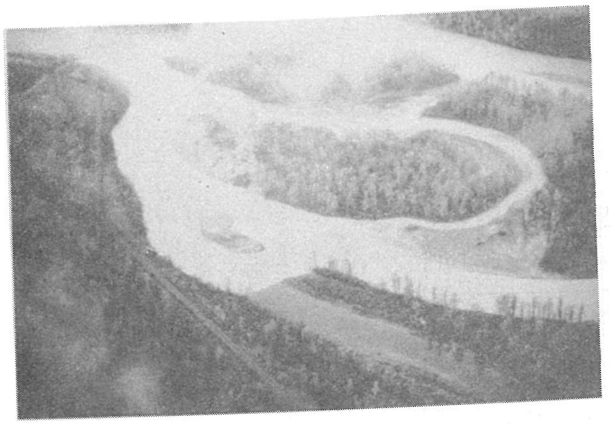
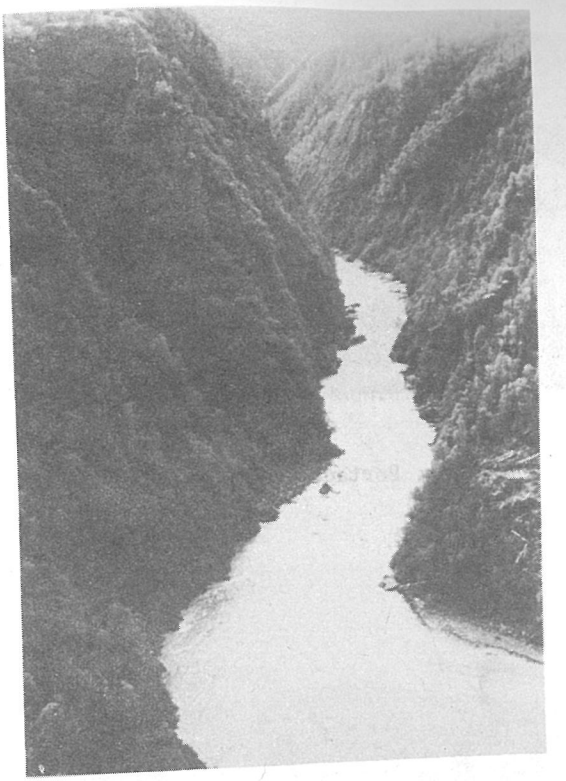


Figure M-1. Landscape Character Types and Prominent Natural Features of the Upper and Middle Susitna River Basin. (Numbers are keyed to the landscape character types listed in Table M-2. Letters are keyed to prominent natural features listed in that table and described in the text.) [Source: Exhibit E, Vol. 8, Chap. 8, Figs. E.8.3 and E.8.5]



1. Mid-Susitna River Valley LCT



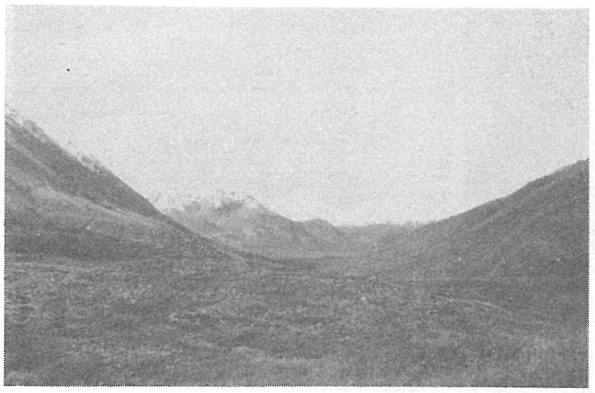
2. Devil Canyon LCT

3. Talkeetna Uplands LCT

4. Chulitna Moist Tundra Uplands LCT

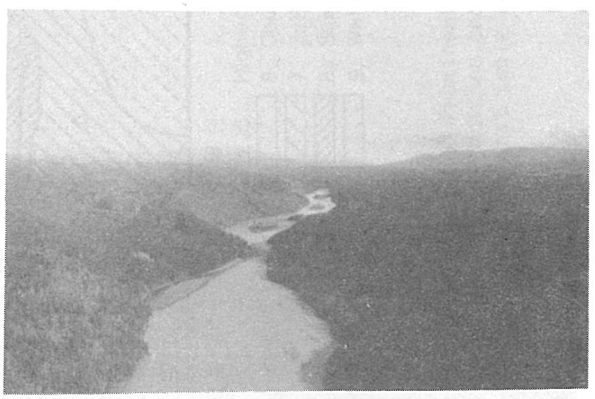
Figure M-2. Photos of the Upper and Middle Susitna Basin Landscape Character Types. (Numbers are keyed to Table M-2).

5. Portage Lowlands LCT



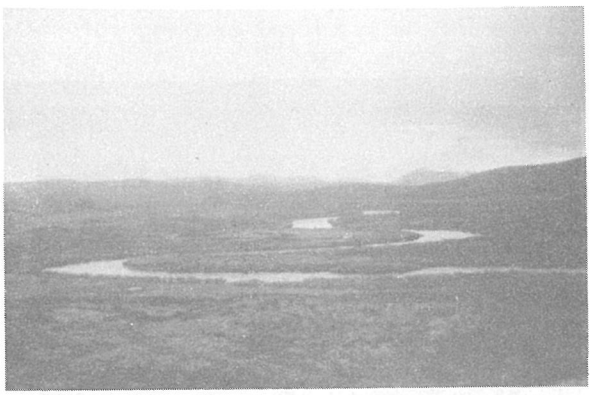
6. Chulitna Mountains LCT

7. Susitna Upland Terrace LCT



8. Susitna River Valley LCT

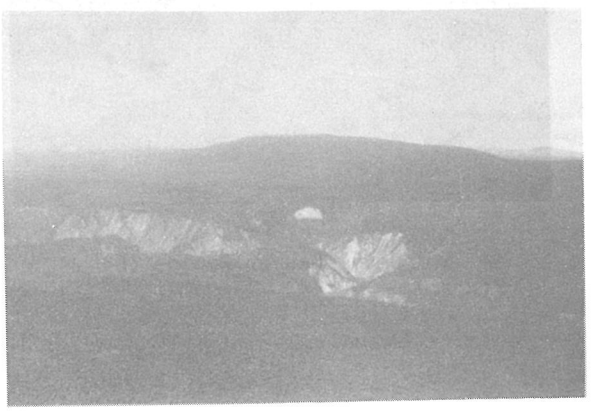
Figure M-2. Continued.



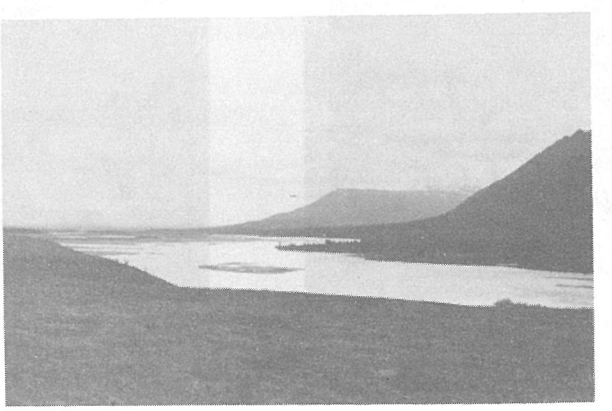
9. Wet Upland Tundra LCT

10. Talkeetna Mountains LCT

11. Susitna Uplands LCT

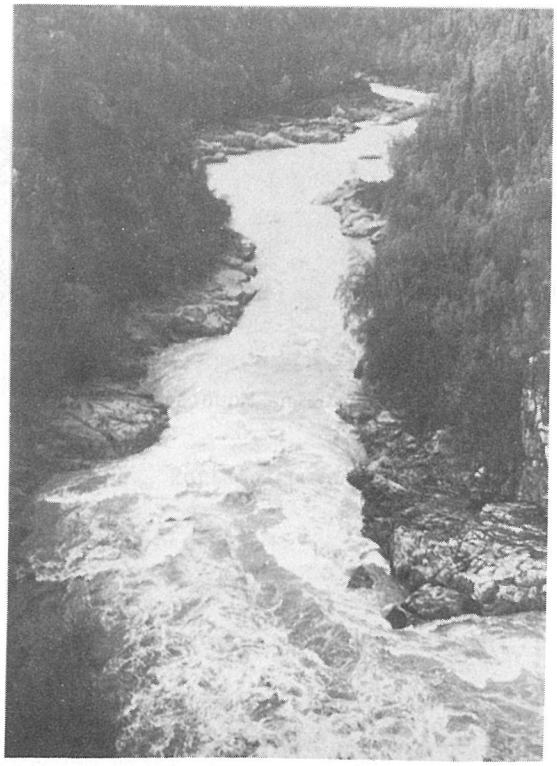


12. Vee Canyon LCT



13. Susitna Upland River Valley and Wet Tundra Basin LCT

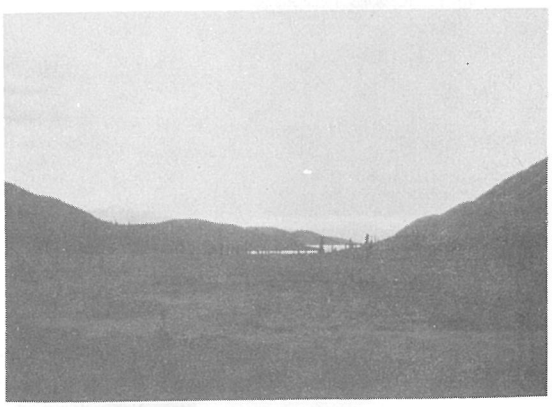
Figure M-2. Continued.



1. Devil Canyon Rapids (B)

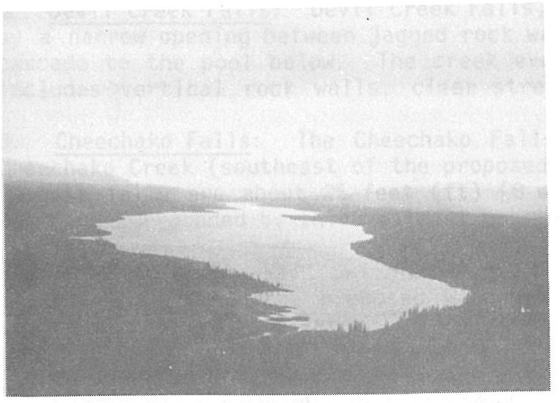
2. Devil Creek Falls (C)

3. Caribou Pass (F)

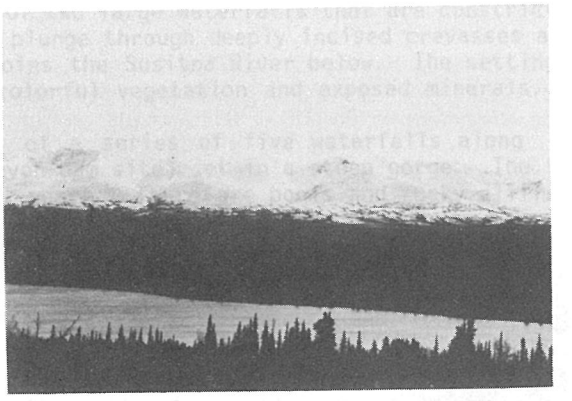


4. Tsusena Butte (Looking South Toward Tsusena Lake) (G)

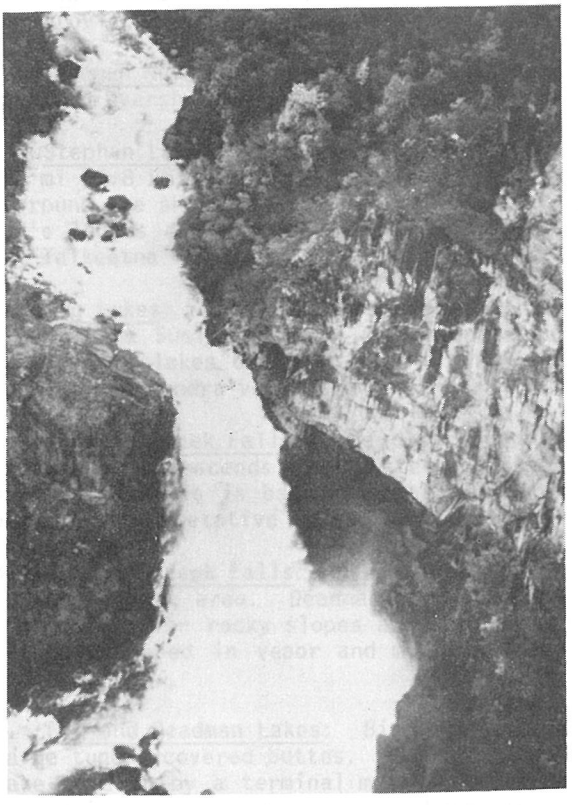
Figure M-3. Selected Photos of Prominent Natural Features Located within the Upper and Middle Susitna River Basin. (Letter designations after titles are keyed to text descriptions, Table M-2, and Fig. M-1.)



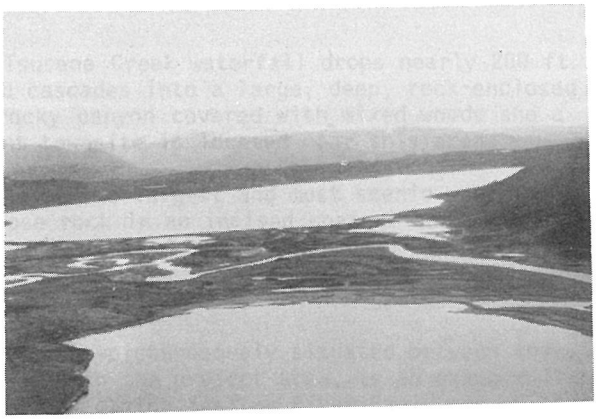
5. Stephan Lake (J)



6. Fog Lakes (K)



7. Deadman Creek Falls



8. Deadman Lake/Big Lake (N)

Figure M-3. Continued.

9. Watana Lake (R)

10. Vee Canyon (T)

Figure M-3. Continued.

B. Devil Canyon and Rapids: Devil Canyon is a steep-sided, nearly enclosed gorge. Its sides are alternating spruce-covered terraces and rock-bound walls. The canyon constricts the Susitna River channel to produce over 10 mi (16 km) of turbulent whitewater. The unusual geology, hydrology, and aesthetic character of the canyon makes it a notable natural feature not only within the proposed Devil Canyon dam site and impoundment area, but also in the entire state.

C. Devil Creek Falls: Devil Creek Falls, consists of two large waterfalls that are constricted by a narrow opening between jagged rock walls, then plunge through deeply incised crevasses and cascade to the pool below. The creek eventually joins the Susitna River below. The setting includes vertical rock walls, clear streams, and colorful vegetation and exposed minerals.

D. Cheechako Falls: The Cheechako Falls consists of a series of five waterfalls along Cheechako Creek (southeast of the proposed Devil Canyon dam site) set in a steep gorge. The two largest falls are about 25 feet (ft) [8 meters (m)] apart. There are pools and rocky cliffs that are surrounded by thick mats of moss and other vegetation.

E. Swimming Bear Lake: Swimming Bear Lake (unofficial name) is one of the higher lakes in the project area (near the proposed Watana-Devil Canyon access route). Located at 3,350 ft (1,021 m) MSL, it is a large alpine lake set in mat and cushion/sedge-grass tundra.

F. Caribou Pass: Two long lakes surrounded by glaciated mountains are located in Caribou Pass, which is a narrow valley. Wetlands and tundra cover the valley floor, where the middle fork of the Chulitna River headwaters is located.

G. Tsusena Butte and Tsusena Butte Lake: Located at the edge of the Chulitna Mountains, Tsusena Butte Lake was created by an old moraine and is one of the deepest lakes in the area [110 ft (34 m)]. The valley of Tsusena Creek shows evidence of its glacial past and includes a variety of tundra landscapes and colorful rock formations. The prominent Tsusena Butte rises 4,312 ft (1,314 m) above the lake.

H. Chulitna Butte: Chulitna Butte overlooks the Alaska Railroad's past and present communities and provides an accessible viewpoint of part of the project area from the George Parks Highway.

I. Deadman Mountain: Deadman Mountain reaches a height of 5,525 ft (1,684 m) MSL. This isolated mountain overshadows Deadman Lake and Big Lake.

J. Stephan Lake: Stephan Lake is a large lake at the base of the Talkeetna Mountains; it is 4.2 mi (6.8 km) long. Wetland and gently rolling hills covered with mixed woods and tundra surround the shoreline. The lake receives relatively high recreational use, and several sportsmen's lodges are located in the vicinity. It is the starting point for kayakers and rafters on the Talkeetna River.

K. Fog Lakes: The Fog Lakes are a series of five large, linear lakes located on the southern side of the Susitna River. The average surface area of each lake is 270 acres [110 hectares (ha)]. The lakes occur in a gently rolling to flat landscape that consists of wetlands, mixed forest, and tundra vegetation.

L. Tsusena Creek Falls: The clear and turbulent Tsusena Creek waterfall drops nearly 200 ft (60 m) as it descends over a steep, rocky cliff and cascades into a large, deep, rock-enclosed pool. The falls is backdropped by an impressive rocky canyon covered with mixed woods and a dense green vegetative cover. The proposed permanent townsite is located near this area.

M. Deadman Creek Falls: Deadman Creek Falls is one of the largest and most scenic waterfalls in the project area. Deadman Creek surges over loose rock in an incised channel and plummets vertically over rocky slopes and outcroppings into a clear, boulder-strewn pool. The falls are often enveloped in vapor and mist. These falls would be inundated by the proposed Watana reservoir.

N. Big and Deadman Lakes: Big Lake and Deadman Lake are picturesquely situated between three large tundra-covered buttes. Big Lake, the largest lake in the project area, is an example of a lake held in by a terminal moraine. The panoramic views of the Susitna River Basin and of the Alaska Range and nearby Deadman Mountain create an area notable for its scenic and geologic features.

O. Clear Valley: Clear Valley contains unusual, flat surfaces raised off the valley floor and surrounded by meandering streams. The dominant feature of this valley is its visual geological history, which is fairly young and contains good examples of lateral moraines. Clear Valley contrasts significantly with the surrounding viewscape.

P. Spearpoint Falls: The Spearpoint Falls comprises four waterfalls along a relatively small creek. The largest waterfall is below the others in a large, hollowed-out area. The falls are unofficially named for a spearpoint discovered in a nearby archaeological site.

Q. Mt. Watana Cirque Lake: The Mt. Watana cirque lake provides a scenic interpretation of the area's glacial history. The cirque contains a pristine lake, simple in outline and distinguished by the natural amphitheater formed on three sides by towering scree slopes. The remaining side provides a scenic view of the valley.

R. Watana Lake: Mount Watana, directly to the west, provides an aesthetically pleasing setting for the high [3,000 ft (900 m)] Watana Lake.

S. Mt. Watana Falls: A waterfall on the northern side of Mt. Watana flows over a deeply incised rock gorge interlaid with black and white marble. Barren tundra surrounds the falls, and a mist often hangs above it.

T. Vee Canyon: Vee Canyon includes a double hairpin bend, a deeply cut channel, and a stretch of white-water. The canyon walls consist of very steep rock ridges. The rock, often interlaid with marble and green schist, is unusually colorful. Vee canyon, with its more open walls, is more visible than Devil Canyon. It is a significant visual resource located within the proposed Watana reservoir area.

U. Tyone River: Near its confluence with the Susitna River, the slow-flowing, dark, and clear Tyone River is flanked on its southern shore by starkly contrasting chalk-colored cliffs. These cliffs are composed of lacustrine deposits left behind by an expansive preglacial lake, one of three such lakes of significant size recorded in Alaska.

M.2.1.1.3 Significant Viewsheds, Vista Points, and Travel Routes

Viewsheds, vista points, and travel routes are important components of visual resource evaluation. Significant viewsheds are those areas that can be looked toward or kept in sight by a viewer. Views into a viewshed can be distant and panoramic or can be near and somewhat confined, depending upon the vista point within the viewshed. A vista point is a relative position from which a viewer can observe various features within the viewshed area. Panoramic views are important for perceiving and experiencing the overall landscape. An example would be the opportunity to view the Alaska Range. Vistas, defined by some as confined views, often focus on a specific feature within the landscape. Travel routes frequently become an important factor in aesthetic resources because of observer position, duration of view, and number of viewers associated with the viewsheds of a project area. The vista point, or observer position, is the location of specific places or settings where an individual can "view" the landscape. Under the proposed project, views would primarily occur along various portions of the access roads. Other vista points would be located at recreation sites; existing use areas; the proposed Watana and Devil Canyon dams and visitor centers; town and campsites; and along the reservoir areas.

Within the upper and middle basin area, the higher mountain peaks (including Deadman, Devil, and Watana mountains) provide vista points that overlook the proposed dam sites and adjacent areas. Views can also be obtained from the more accessible overlooks of Tsusena and Chulitna buttes and along the ridges above Vee Canyon and at Big Lake and Swimming Bear Lake. Many of these sites allow extensive views of the central Talkeetna Mountains and the Alaska Range, often focusing on Mounts McKinley, Deborah, and Hess and on the Eldridge, West Fork, and Susitna glaciers (Terrestrial Environmental Specialists, 1982). Views also have been previously discussed in relation to the various landscape character types described in Table M-2. The most significant travel route within the upper and middle Susitna River Basin is the Denali Highway to the north of the proposed dam facility areas (see Fig. M-1).

M.2.1.2 Power Transmission Line Corridor

The proposed 330-mi (530-km) transmission line corridor between Fairbanks and Anchorage generally follows portions of the George Parks Highway (Route 3) and the Alaska Railroad, which are located in part within the Tanana, Nenana, Chulitna and Susitna river valleys. This area is commonly referred to as the Alaska Railbelt. Areas of human development within the Railbelt region occur primarily along the 323-mi (520-km) George Parks Highway and Alaska Railroad. Principal areas of human development include Fairbanks, Ester, College, Nenana, Anderson, Healy, Mt. Denali National Park, Cantwell, Chulitna, Denali State Park, Talkeetna, Willow, and Anchorage. Although there is more human development along the transmission line corridor than within the upper and middle Susitna River Basin area (see Appendix F), there are still diverse landscapes with varying landforms, waterforms, topographical features, and views.

The major landscape character types, prominent natural features, and significant viewsheds, vista points, and travel routes found along the proposed Fairbanks-to-Anchorage transmission line corridor are described below. The visual resources along the proposed Watana-to-Gold Creek transmission line corridor were discussed in Section M.2.1.1.

M.2.1.2.1 Landscape Character Types

The landforms along the transmission line corridor are mainly defined by the Tanana, Nenana, Chulitna and Susitna river valleys and their tributaries; the Alaska Mountain Range (including

Mt. McKinley); the Talkeetna Mountains; and the Cook Inlet off the Gulf of Alaska. The area also contains a number of human developments (e.g., cities, towns, highways, and railroad). As previously discussed in Section M.2.1.1.1, the vegetation in the area is diverse and varies with elevation, slope, drainage, and season.

Descriptions of the various landforms, waterforms, vegetation, and views for the various landform types along the transmission line corridor are provided in Table M-3. Principal project features (e.g., transmission lines, substations, access roads, etc.) and mile posts for the transmission line route are listed under the appropriate landscape character type. These descriptions correspond to the landscape character types shown in Figures M-4 through M-7. Photos for each landscape character type are presented in Figure M-8. Prominent natural features located within each specific landscape type are discussed in detail below.

M.2.1.2.2 Prominent Natural Features

A number of prominent natural features occur within and adjacent to the transmission line corridor. Many of the mountainous natural features occur within the Alaska Range. The most significant natural feature within the region is Mt. McKinley, which dominates the landscape from various locations along the corridor. Other significant features include Rex Dome [4,155 ft (1,266 m) MSL], Walker Dome [3,942 ft (1,202 m)], Jumbo Dome [4,493 ft (1,369 m)], Sugarloaf Mountain [4,450 ft (1,356 m)], Usibelli Peak [6,129 ft (1,868 m)], and Dora Peak [5,572 ft (1,698 m)]. A colorful "badlands" type area (soft rock strata rapidly eroding) occurs in the Nenana Uplands. The narrow, steep-walled Nenana Gorge is located to the west of the corridor. Natural features surrounding the scenic Broad Pass area include Mt. McKinley [20,320 ft (6,194 m) MSL], Mt. Deborah [12,339 ft (3,761 m)], Mt. Pendleton [7,800 ft (2,377 m)], Panorama Mountain [5,778 ft (1,761 m)], and the Reindeer Hills [4,534 ft (1,382 m)]. Notable natural features located within the Chulitna River Valley landscape area include Hurricane Gulch and the Honolulu Creek area. The prominent Curry Ridge extends through the Denali State Park, and the Talkeetna Mountains are located to the east. The Susitna River lowlands landscape area includes the scenic Nancy Lake Recreation Area.

The most prominent natural features located along the transmission line corridor are described below. The locations of these natural features are shown in Figures M-4 through M-7 and are cross-referenced by alphabetical designation in the appropriate landscape character type description in Table M-3. Photos of selected prominent natural features are included in Figure M-9. The following descriptions are based upon information presented in Exhibit E (Vol. 8, Chap. 8), and in a land use analysis prepared by Terrestrial Environmental Specialists, Inc. (1982), as well as on field verification by aerial and ground reconnaissance.

V.* Nenana Gorge: Nenana River flows through a very narrow, steep-walled gorge for approximately 10 mi (26 km) from McKinley Park Station to Healy. The gorge consists of an outer U-shaped canyon (1/2 to 3/4 mi wide) that extends to a height of 2,500 ft (760 m) above the canyon floor. In a portion of the canyon the river flows in an inner gorge about 500 ft (150 m) wide with nearly vertical rock walls 200 to 300 ft (60-90 m) high (Alaska Dept. of Natural Resources, 1981).

W. Mt. McKinley and Surrounding Mountainous Region: Numerous exceptional natural features are located throughout the Alaska Range, including Mt. McKinley [20,320 ft (6,194 m)] which dominates the landscape from various points along the proposed corridor area. Other prominent features include Rex Dome, Walker Dome, Jumbo Dome, Walker Mountain, Usibelli Peak, Nora Peak, and Mt. Fellows.

X. Honolulu Creek: Honolulu Creek is a tributary to the Chulitna River; it has rapidly flowing water and a steeply incised valley.

Y. Hurricane Gulch: Hurricane Gulch is a tributary creek to the Chulitna River. It has a steeply incised valley that provides a spectacular view from the Alaska Railroad bridge and George Parks Highway bridge.

Z. Nancy Lake State Recreation Area: The Nancy Lake State Recreation Area is characterized by a flat to gently rolling landscape with numerous lakes, streams, and swamps. The area is quite different from the surrounding mountainous and tundra areas and is one of the few pastoral lake-forest landscapes preserved in its natural state for recreation purposes (Alaska Div. of Parks, undated).

M.2.1.2.3 Significant Viewsheds, Vista Points, and Travel Routes

The definitions of significant viewsheds, vista points, and travel routes are discussed in Section M.2.1.1.3. Significant viewsheds and vista points occur in numerous locations along the

*Continuation of lettering sequence started in Section M.2.1.1.2.

Table M-3. Descriptions of Landscape Character Types (LCT) along the Proposed Power Transmission Line Corridor

Landforms†[1]	Waterforms	Vegetation
1. TANANA RIDGE LCT		
• Distinct rounded hills interrupted by small valleys. • Slopes moderately steep to steep. • Slopes rise several thousand feet above lowlands.	• Bounded to south and west by heavily braided Tanana River. • Numerous creeks located throughout area. • A few small scattered lakes. • Goldstream Creek is very distinctive meandering watercourse dividing Tanana Ridge from higher hills to the north.	• Distinct stands of deciduous trees and stands of spruce and mixed forests. • Generally dense forest cover. • Foliage color patterns have high aesthetic value in spring and fall. • White trunks of birch provide interesting winter textures.
2. NENANA RIVER LOWLANDS LCT		
• Extremely flat terrain. • Numerous small drainages and the Nenana and Teklanika rivers. • Sand, gravel, and cobbles.	• Braided channels and heavily meandering Nenana and Teklanika rivers create a distinct pattern. • Numerous smaller, meandering tributaries. • Many scattered small lakes and expansive wetland areas. • Numerous islands.	• Expansive cover of thin to moderately dense spruce forests west of Nenana River. • Linear bands of spruce along drainages east of Nenana River. • Tundra and wetland-bog species cover most of the area.
3. NENANA UPLANDS LCT		
• Relatively flat, meandering river valley terraces several miles wide with steep slopes rising up to the Alaska Range foothills. • Exposed rock and soil cliffs and highly eroded banks common along Nenana River. • Rock outcrops, generally light to tan to dark brown, common along rising terrace edges.	• Large and moderately braided Nenana River, with silty glacial water, is the most significant waterform. • Several relatively small tributaries. • Scattered small lakes. • Bog areas and wetlands. • Numerous islands and a broad floodplain.	• Variable patterns of sparse to dense spruce and mixed forest over most of the area. • Scattered open spaces of tundra and bare ground with light-colored soils.
4. ALASKA RANGE (SUGAR LOAF MOUNTAIN/WINDY PASS AREAS) LCT		
• Rugged and steeply sloped 600-mi-long, 50- to 80-mi-wide mountain range extending from west of Cook Inlet to Canadian border. • Divides Southcentral and Interior Regions of Alaska. • Includes Mt. McKinley, highest mountain in North America. • Elevations range from 2,000 ft to over 20,000 ft • Includes hundreds of glaciers, icefields, and other glacial features. • Prominent landforms include Pyramid Mtn., Panorama Mtn., Reindeer Hills, Mt. Healy, Mt. Fellows, and Sugar Loaf Mtn.	• Cirque lakes. • Numerous small glacial lakes. • Many rivers and creeks. • Prominent water features include Nenana River, Yanert Fork, Jack River, Moody Creek, Montana Creek, and Carlo Creek.	• Primarily tundra and shrub occur throughout mountains below steeper rocky slopes and peaks. • Spruce-deciduous forests cover many river valleys. • Wet tundra on lower elevations.

Views	Prominent Natural Features†[2]	Proposed Project Features
• Views are moderate in scenic quality except high during fall color. • Views are limited by dense forest cover. • Clear-cut transmission line and road rights-of-way clearly visible in many areas.	• None identified.	• Ester substation • Transmission line mile posts 0 to 40.
• Views of the immediate area are monotonous because of the lack of relief and lack of distinctive features. • Views are across the river and directed to the high, forested Tanana hills to the north and Alaska Range to the south. • Existing transmission lines are highly visible.	• None identified.	• Transmission line mile posts 40 to 70.
• Views oriented to Alaska Range in the south and the high foothills in the east. • Views of the river are not particularly scenic in comparison to mountain views. • Rock cliffs and outcrops are of visual interest. • Existing transmission lines are highly visible.	• Nenana Gorge (V)	• Transmission line mile posts 70 to 100. • Healy substation.
• Many scenic and limitless views. • Views are panoramic to semi-enclosed, depending on viewer position. • Impressive and prominent natural features. • Mountain rock colors of light to dark gray (primarily talus slopes) and medium to dark brown (higher mountain tops) provide variety of textures and patterns with the seasonal color changes of the tundra. • Man-made features include Alaska Railroad, George Parks Hwy., communities of Cantwell and McKinley Village, and some private residences.	• Numerous exceptional natural features are located throughout the Alaska Range. Area features include Mt. McKinley, Rex Dome, Walker Dome, Jambo Dome, Walker Mountain, Usibelli Peak, Nora Peak, and Mt. Fellows (W).	• Transmission line mile posts 100 to 113 and 123 to 134.

Table M-3. Continued

Landforms†[1]	Waterforms	Vegetation
5. YANERT RIVER VALLEY LCT		
• River valley width ranges from 2 mi at Yanert Glacier to over 5 mi at confluence with Nenana River. • Alaska Range rises steeply from the valley near the glacier. • Gently sloping terraces up to the mountains becomes progressively longer as valley opens into adjoining Nenana River valley.	• Heavily braided river for most of its length. • Broad, fixed channel last 5 mi.	• Tundra dominates. • Scattered spruce stands adjacent to river bottom.
6. BROAD PASS LCT		
• Wide drainage trough separating the Alaska Range and the northwest Chulitna Mountains. • Broad, flat to gently rolling glacial-carved valley floor. • Moraines and drainlines parallel long axis of drainage trough.	• Long and linear lakes paralleling valley, including Summit and Mirror lakes. • Jack and East Fork Chulitna rivers.	• Variety of treeless tundra-type vegetation. • White and black spruce with deep-green color.
7. CHULITNA RIVER VALLEY LCT		
• River divides Alaska Range from Chulitna Mountains. • Topography varies from level valleys to steep ridges. • Steeply incised valleys such as Hurricane Gulch. • Alaska Range rises gently from valley. • Steep rise from valley to Chulitna Mountains.	• Chulitna River system divided into east, west, and middle forks. • Lakes are small and elongated. • Waterfalls present along Hurricane, Honolulu, and Antimony creeks.	• River valley predominantly open-tundra-covered landscape. • Mixed spruce-poplar in bottomlands. • Spruce-hardwood in uplands. • Alpine tundra and barren ground above tree line. • Treeless bogs with low-growing vegetation.
8. CURRY RIDGE LCT		
• Area dominated by Curry Ridge, which rises to elevation of 4,000 to 4,500 ft. • Two narrow to to 8-mi-wide river valleys extend along ridge base. • Valley floors slope gradually upward to 1,400 ft in elevation at north end of ridge.	• Chulitna River varies in width from 300 ft to over 1 mi. • Eastern portion of landscape dominated by the Susitna River and its tributary, the Indian River. • Byers, Lacy, and Spinks lakes are the most visible.	• Cover includes upland spruce/deciduous forest and upland tundra with isolated areas of lowland spruce, deciduous forests, and low brush. • Muskeg bogs are present. • Moist slopes are brush covered. • Alpine tundra and shrubby low-growing plant mats occur above timberline.

Views	Prominent Natural Features†[2]	Proposed Project Features
• Views are foreground and middle-ground. • Area moderate to high in aesthetic value. • Nenana Valley, Yanert Fork, and upper Nenana Valley near Denali National Park entrance provide dramatic features.	• None identified.	• Transmission line mile posts 113 to 123.
• Views of Mt. McKinley, Mt. Deborah, Mt. Pendleton, Panorama Mountain, and Reindeer Hills. • Parks Highway between the communities of Broad Pass and Windy Pass under consideration for state scenic highway classification. • Visible commercial and residential structures concentrated around Cantwell-Denali Highway junction and Summit Lake. • Alaska Railroad stops at Colorado, Summit, and Broad Pass.	• Surrounding mountainous area.	• Transmission line mile posts 134 to 158.
• Parks Highway crosses entire length of landscape type from north to south. • Prominent views of the Alaska Range to the west. • Spectacular mountain, glacier, and valley views from open areas and vantage points along the Parks Highway. • Several small road, railroad, and recreational-related communities and facilities within the valley. • Portions of Parks Highway recommended for state scenic highway classification.	• Honolulu Creek area (X). • Hurricane Gulch (Y).	• Transmission line mile posts 158 to 188.
• Mt. Denali can be seen above the flat Chulitna River valley and Ruth Glacier from the southern portion of Curry Ridge. • Views of Curry Ridge can be seen from Parks Highway and Byers Lake area.	• None identified.	• Transmission line mile posts 188 to 193.

Table M-3. Continued

Landforms†[1]	Waterforms	Vegetation
9. CHULITNA MOIST TUNDRA UPLANDS LCT		
See Table M-2 for description		
10. MID-SUSITNA RIVER VALLEY LCT		
See Table M-2 for description		
11. TALKEETNA MOUNTAIN LOWLANDS AND UPLANDS LCT		
· Terraced and hilly landscape. · After rising steeply several thousand feet from the Susitna River Valley, landscape becomes a rolling terraced plateau. · Average elevation of 3,000 ft, with a few knobs rising above 4,000 ft	· Braided Talkeetna River and tributaries. · Number of lakes used for recreation. · Larson Lake is largest within the area. · Gold, Cheechako, Chulitna, and Disappointment creeks are the more scenic drainages.	· Dense spruce-deciduous forest. · Muskeg bogs common. · Wet tundra vegetation predominates in lowlands. · Hundreds of small lakes and muskeg bogs. · Scattered spruce trees throughout area, but usually in drainages at lower elevations.
12. SUSITNA RIVER LOWLANDS LCT		
· Very flat to gently rolling lowlands. · Larger lake areas enclosed by small hills. · Mount Susitna, a flat-topped remnant volcano, rises over 3,000 ft above the lowlands; adjacent Little Mount Susitna and nearby Beluga Mountain also rise steeply above the landscape.	· Wet bog and wetlands cover a large percentage of the land. · Hundreds of small lakes in dense patterns. · Numerous topographically enclosed lakes several hundred acres in size. · Heavily braided Susitna River varies from ½ to several miles wide with many islands. · Numerous meandering tributaries to Susitna.	· Thin stands of black spruce and many bog areas. · Marsh grasses. · Moderately dense to dense cover of spruce-deciduous trees around higher reliefed and larger lake areas. Good fall color along the Susitna and its tributaries. · Dark green color of spruce is dominant.
13. ANCHORAGE LCT		
· Rolling and flat terraced lowlands of Knik and Turnagain arms (upper Cook Inlet). · Rolling and moderately steep slopes of Chugach foothills. · Large sunken areas caused by the 1964 earthquake. · Urbanized town landscape.	· Several small creeks traverse the area and flow into Cook Inlet. · Several large man-made lakes. · Scattered natural lakes. · Area dominated by the adjacent Cook Inlet and connecting arms.	· Denser urban areas have sparse ornamental tree cover with some natural spruce and deciduous trees. · Undeveloped areas, lakes, and foothills generally covered with moderately dense to dense forests of spruce-deciduous trees and willow. · Natural drainages usually forested and/or have dense shrub cover.

†[1] Numeric designations are keyed to landscape character photos provided in Figure M-8.

†[2] Letter designation following each prominent natural feature is keyed to the written description in Section M.2.1.2.2 and photos provided in Figure M-9.

Conversions: To convert feet to meters, multiply by 0.305;
To convert miles to kilometers, multiply by 1.61;
To convert square miles (mi^2) to square kilometers (km^2), multiply by 2.59;
To convert acres to hectares, multiply by 0.405.

Source: Exhibit E, Vol. 8, Chap. 8, and field verification through aerial and ground reconnaissance.

Views	Prominent Natural Features	Proposed Project Features
		• Transmission line mile posts 193 to 197
		• Transmission line mile posts 197 to 203. • Watana to Gold Creek transmission line. • Gold Creek switching station.
• Some scenic and panoramic views of the Alaska Range, Talkeetna and Susitna rivers, and the Chulitna and Talkeetna mountains. • Dense upland forest cover restricts vision, with scenic views possible from occasional elevated positions and widened river channel. • Viewer access limited to foot, floatplane, boat, and a small number of jeep, all-terrain vehicle, and horse trails. • Views of surrounding river valleys from high points and terraced edges.	• None identified.	• Transmission line mile posts 203 to 230.
• Views of immediate area generally monotonous because of expansive commonality and flat topography of landscape. • Views of the Alaska Range and Chugach and Talkeetna mountains, as well as of the Mount Susitna landmark, are possible from open areas. • Weather permitting, Mount McKinley dominates the scene. • River paralled by Parks Highway and Alaska Railroad. • Small communities and recreation sites occur along or near the Parks Highway.	• Nancy Lake Recreation Area (Z).	• Transmission line mile posts 230 to 314. • Willow substation.
• Due to flat to undulating terrain views are open. • Adjacent Chugach Mountains create a high-quality aesthetic setting, covered with snow in winter, green vegetation in summer, and colorful foliage in fall. • The Alaska Range, nearby Mount Susitna, Kenai Mountains, and the Cook Inlet, with its unique mud flats, can be viewed.	• None identified.	• Transmission line mile posts 314 to 330. • Anchorage substation.

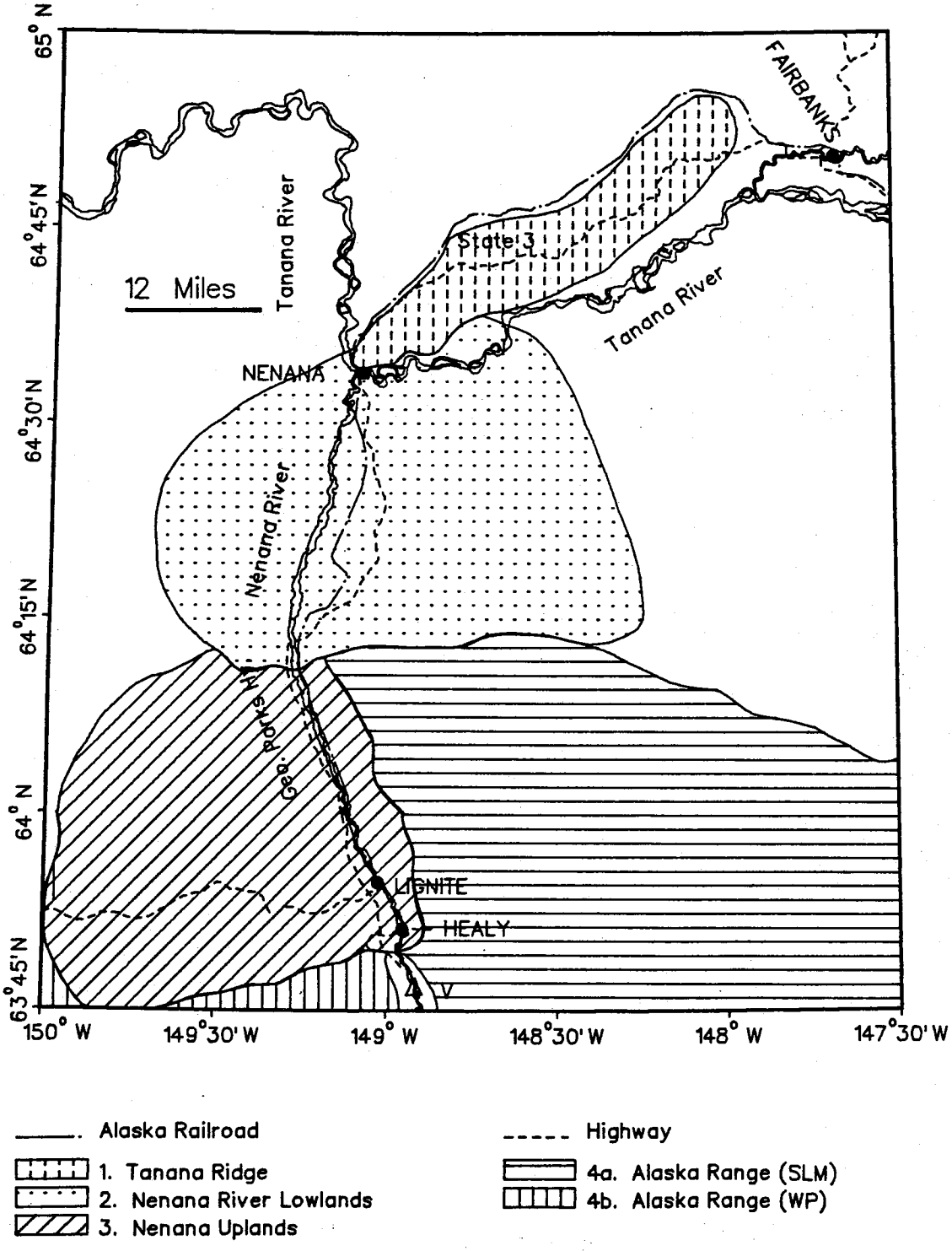


Figure M-4. Landscape Character Types and Prominent Natural Features Along the Fairbanks-to-Healy Segment of the Proposed Transmission Line Corridor. [Numbers are keyed to the landscape character types listed in Table M-2 (designated by an asterisk) or Table M-3. Letters are keyed to the prominent natural features listed in those tables and described in the text.] [Source: Exhibit E, Vol. 8, Chap. 8, Fig. E-8-6]

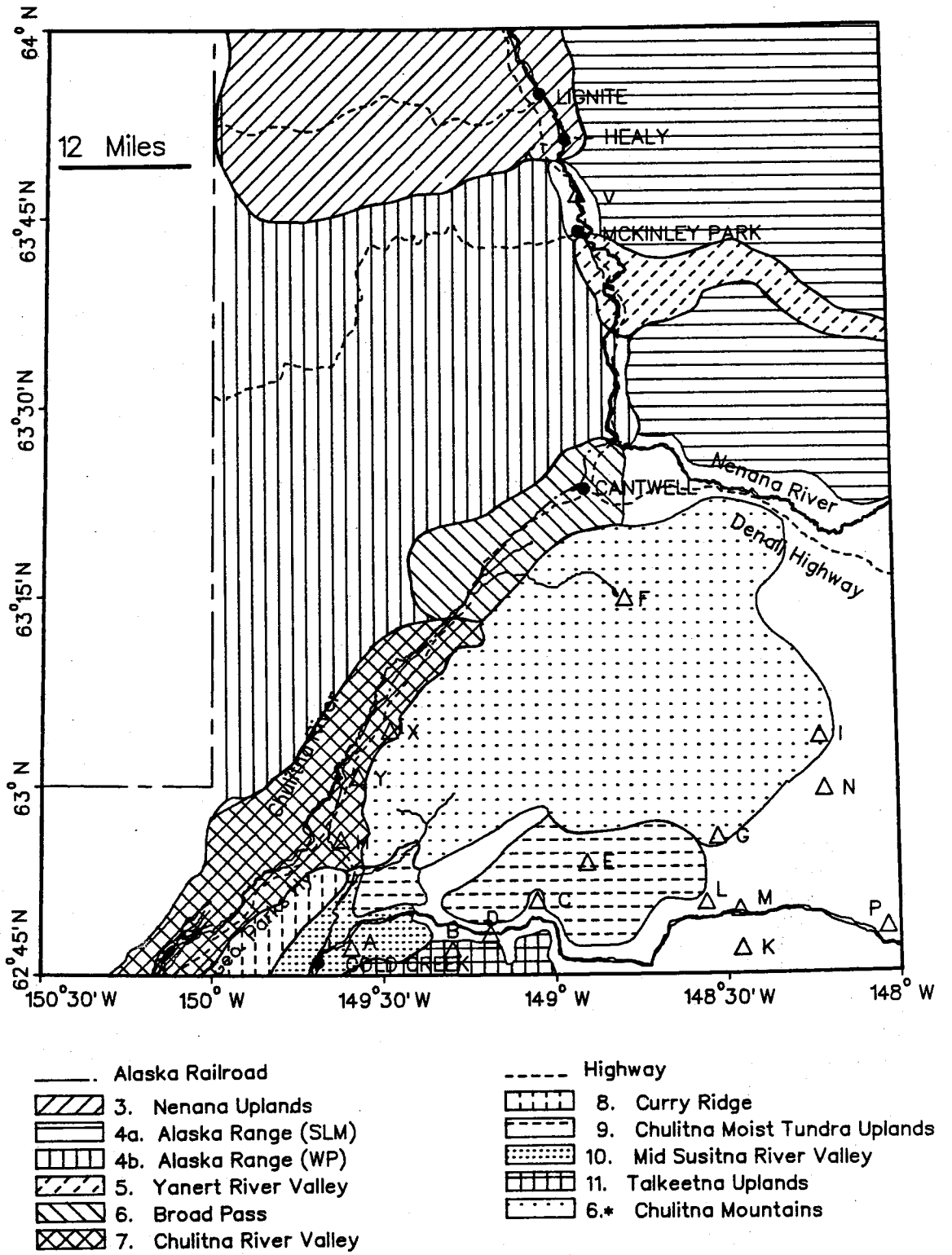


Figure M-5. Landscape Character Types and Prominent Natural Features Along the Healy-to-Gold Creek Segment of the Proposed Transmission Line Corridor. [Numbers are keyed to the landscape character types listed in Table M-2 (designated by an asterisk) or Table M-3. Letters are keyed to the prominent natural features listed in those tables and described in the text.] [Source: Exhibit E, Supplemental Information, Chapter 8, Comment 7]

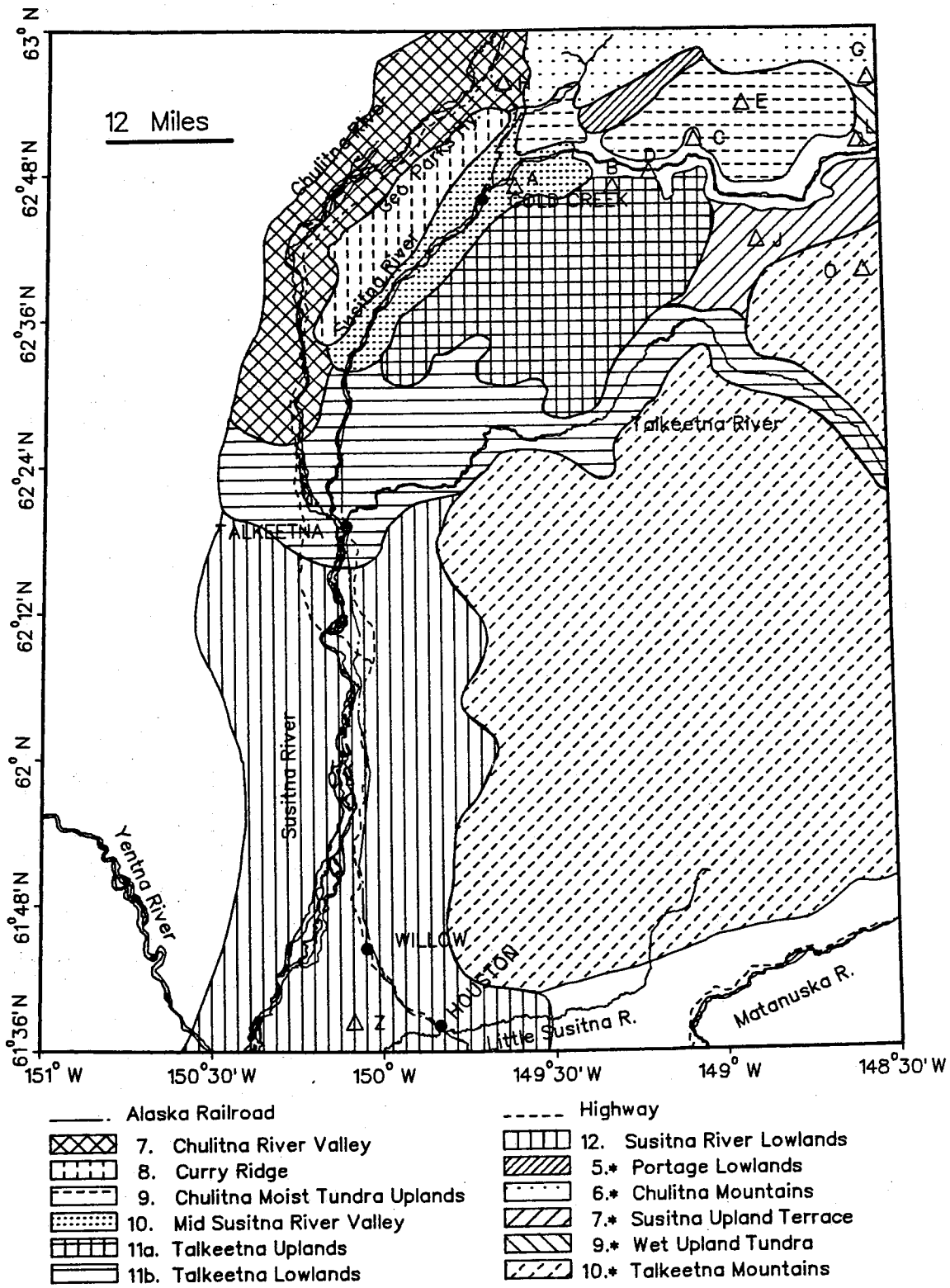


Figure M-6. Landscape Character Types and Prominent Natural Features Along the Gold Creek-to-Willow Segment of the Proposed Transmission Line Corridor. [Numbers are keyed to the landscape character types listed in Table M-2 (designated by an asterisk) or Table M-3. Letters are keyed to the prominent natural features listed in those tables and described in the text.] [Source: Exhibit E, Supplemental Information Chapter 8, Comment 7]

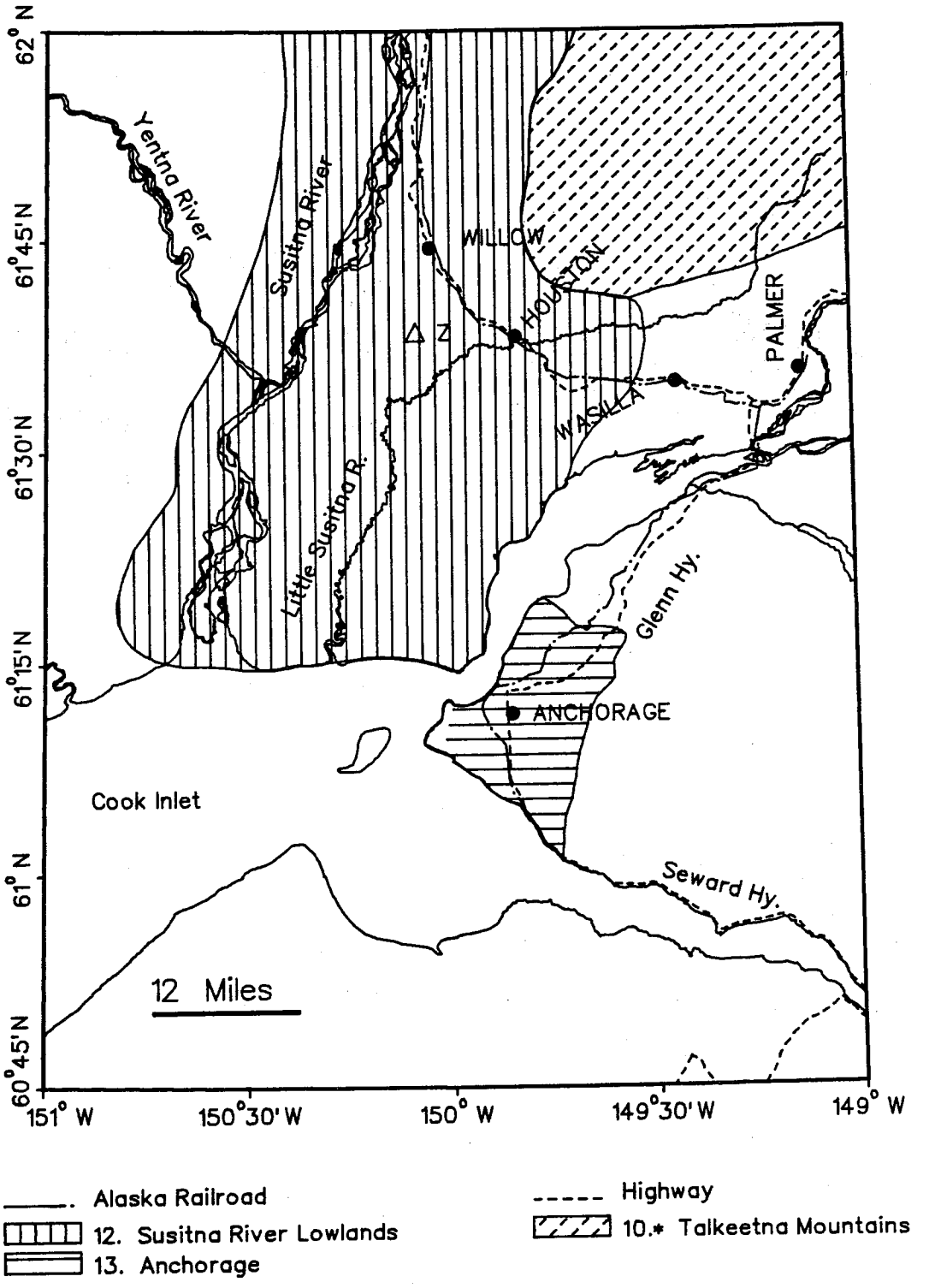
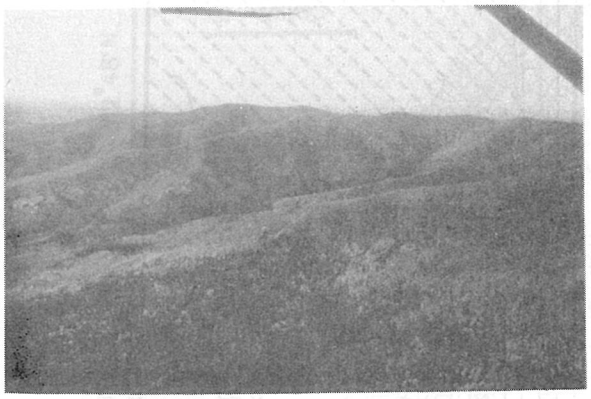
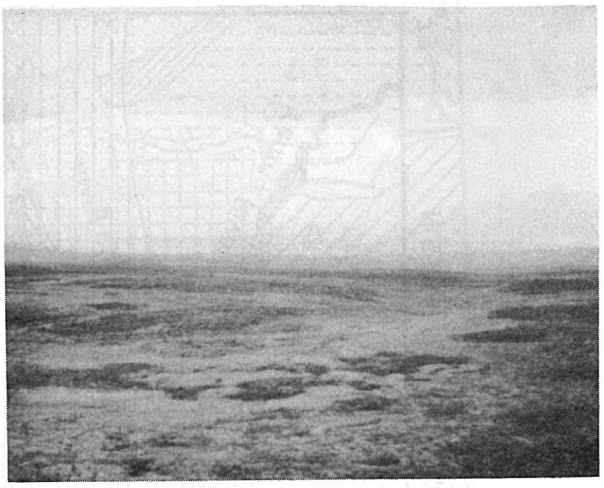


Figure M-7. Landscape Character Types and Prominent Natural Features Along the Willow-to-Anchorage Segment of the Proposed Transmission Line Corridor. [Numbers are keyed to the landscape character types listed in Table M-2 (designated by an asterisk) or Table M-3. Letters are keyed to the prominent natural features listed in those tables and described in the text.] [Source: Exhibit E, Vol. 8, Chap. 8, Fig. E.8.7]

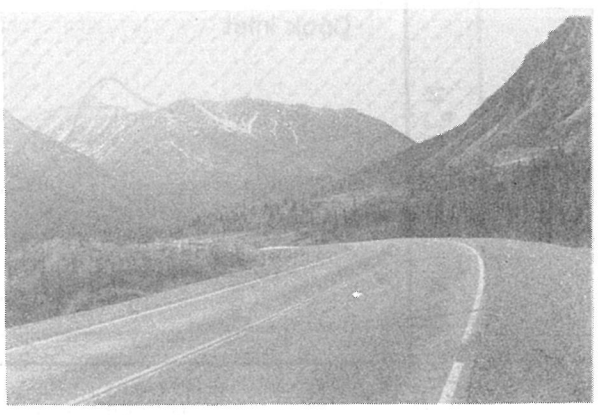


1. Tanana Ridge LCT



2. Nenana River Lowlands LCT

3. Nenana Uplands LCT



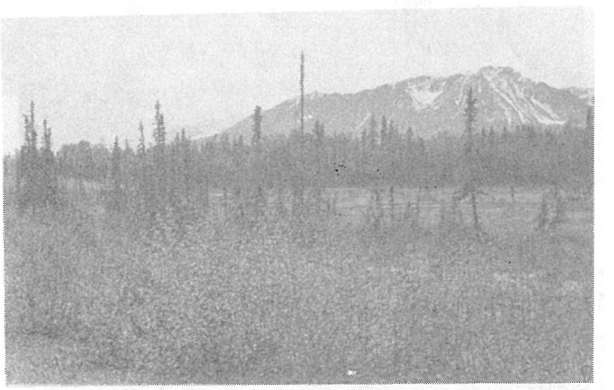
4. Alaska Range (Windy Pass Area) LCT

Figure M-8. Photos of the Landscape Character Types Along the Proposed Transmission Line Corridor. (Numbers are keyed to Table M-3)

5. Yanert River Valley LCT

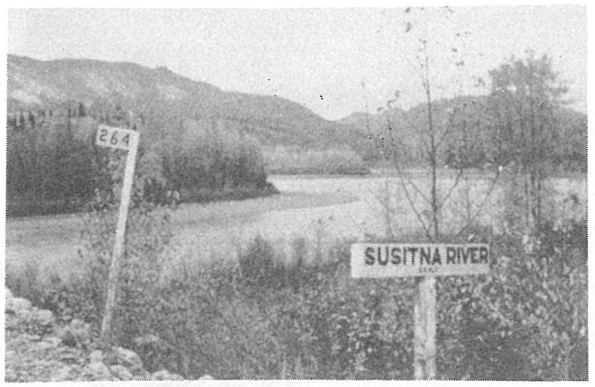
6. Broad Pass LCT

7. Chulitna River Valley LCT

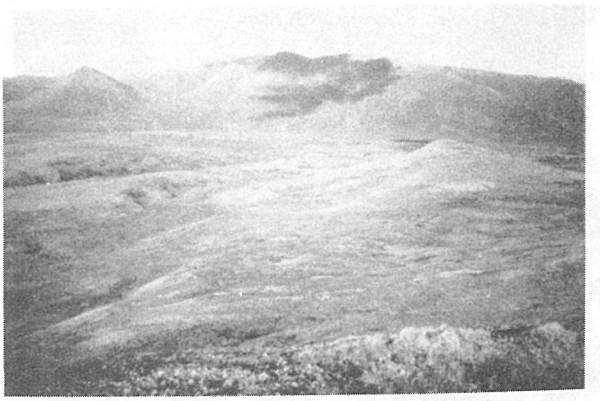


8. Curry Ridge LCT

Figure M-8. Continued



9. Mid-Susitna River Valley LCT

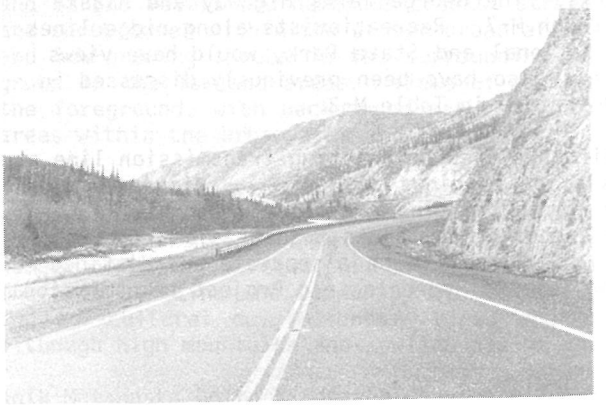


10. Talkeetna Lowlands and Uplands LCT

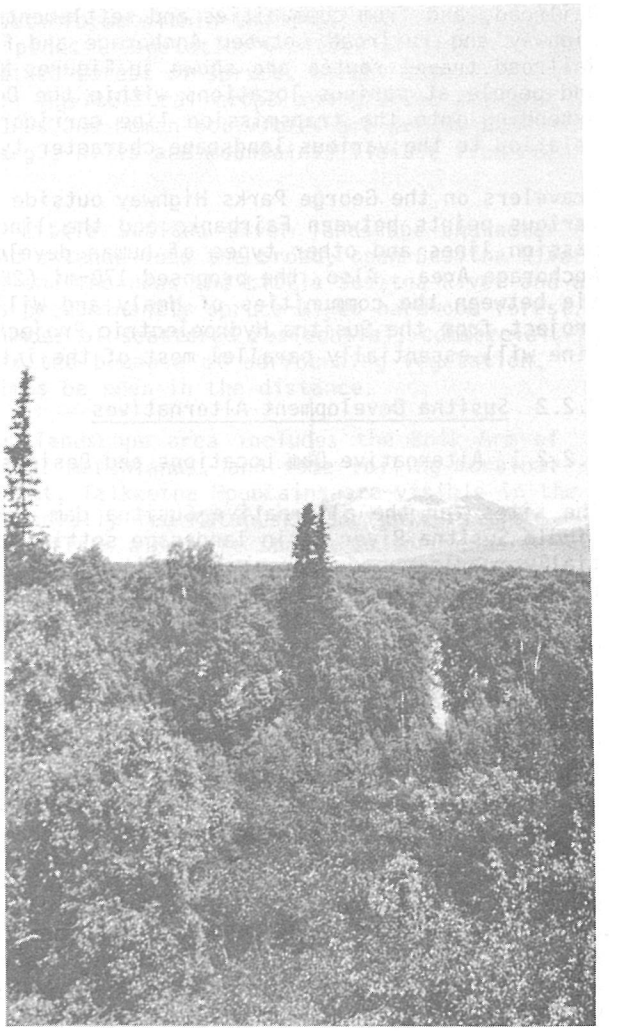
11. Susitna River Lowlands LCT

12. Anchorage LCT

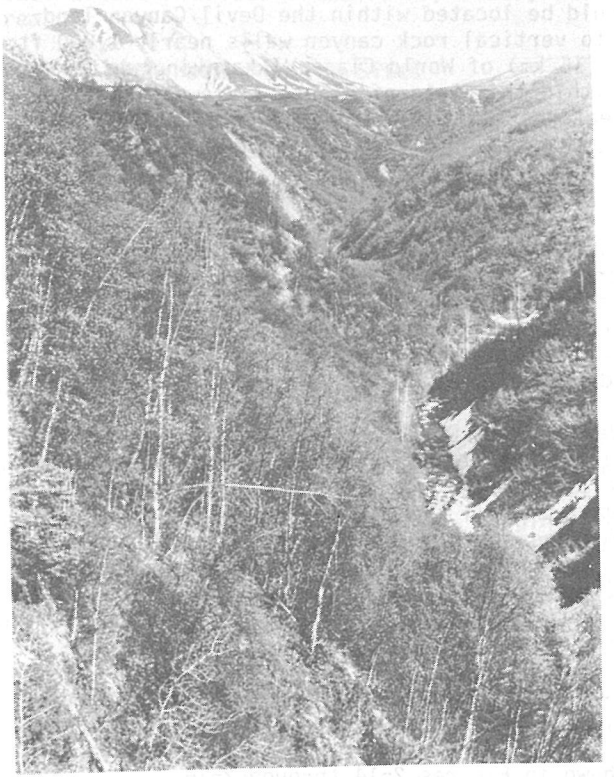
Figure M-8. Continued



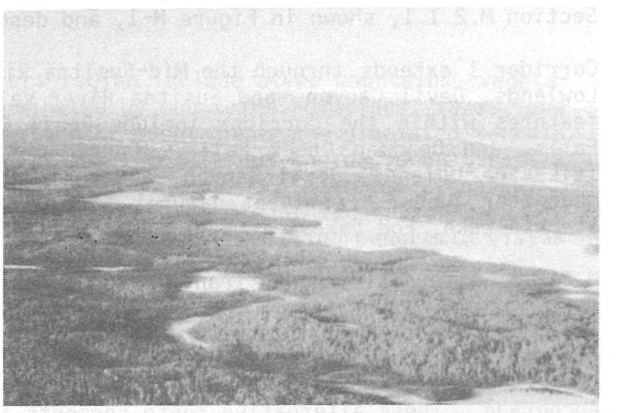
1. Nenana Gorge (V)



2. Looking toward Mt. McKinley and Surrounding Mountainous Region (W)



3. Hurricane Gulch (Y)



4. Nancy Lake State Recreation Area (Z)

Figure M-9. Photos of Selected Prominent Natural Features Located within the Proposed Transmission Line Corridor Area. (Letter designations after titles are keyed to text descriptions, Table M-3, and Figs. M-4 through M-7.)

Tanana, Nenana, Chulitna, and Susitna river valleys and ridge areas. Views within the transmission line corridor area would occur at various points along the George Parks Highway, Alaska Railroad, and from communities and settlements (e.g., McKinley Village) located adjacent to the highway and railroad between Anchorage and Fairbanks. The George Parks Highway and Alaska Railroad travel routes are shown in Figures M-4 through M-7. Recreationists along ridge lines and people at various locations within the Denali National and State Park, would have views extending into the transmission line corridor. Views also have been previously discussed in relation to the various landscape character types described in Table M-3.

Travelers on the George Parks Highway outside of Fairbanks view an existing transmission line at various points between Fairbanks and the line's existing terminus at Healy. Various transmission lines and other types of human development and activities are clearly visible in the Anchorage Area. Also, the proposed 170-mi (280-km) Anchorage-Fairbanks transmission line intertie between the communities of Healy and Willow is considered to be a separate and distinct project from the Susitna Hydroelectric Project. The Susitna Hydroelectric Project transmission line will essentially parallel most of the intertie route.

M.2.2 Susitna Development Alternatives

M.2.2.1 Alternative Dam Locations and Designs

The sites for the alternative Susitna dam locations and designs are within the same upper and middle Susitna River Basin landscape setting as described above in Section M.2.1.1. This essentially roadless and sparsely inhabited area is diverse in landscape character, with mountains, tundra, wooded areas, lakes, and river valleys. Prominent natural features include V-shaped valleys, turbulent rapids, waterfalls, rock outcroppings, shear cliffs, and enclosed canyon walls.

The alternative Watana I and Reregulating dams would be located within the Susitna River Valley landscape character type. This broad river valley consists of an initially braided river with moderately dense to dense spruce-deciduous forest cover along the river and tributary valleys. The broad valley affords expanded views, although most views are river and valley oriented, with some views of distant mountain tops. The two most prominent natural features in the area are Tsusena Creek Falls and Deadman Creek Falls.

The alternative Modified High Devil Canyon dam would be located within the Devil Canyon landscape character type. The area consists of steep to vertical rock canyon walls nearly 1,000 ft (300 m) high. The canyon contains more than 10 mi (16 km) of World Class VI kayaking whitewater and is considered a significant natural feature within the State of Alaska. Views within the canyon area are dramatic, and prominent natural features include the canyon, rapids, and Devil Creek Falls.

M.2.2.2 Alternative Access Routes

Two alternative access corridors were considered in the development of the Watana and Devil Canyon dam site plans. These corridors were: Corridor 1 - Parks Highway to Watana dam site, north side of Susitna River and Corridor 2 - Parks Highway to Watana dam site, south side of Susitna River. Both corridors are located within the upper and middle Susitna River Basin. The landscape character types, natural features, and views within these corridors are discussed in Section M.2.1.1, shown in Figure M-1, and described in Table M-2.

Corridor 1 extends through the Mid-Susitna River Valley, Chulitna Moist Tundra Uplands, Portage Lowlands, Devil Canyon, and Susitna River Valley landscape character types. Prominent natural features within the corridor include Devil Canyon Rapids, Devil Creek Falls, Tsusena Creek Falls, and Deadman Creek Falls. Corridor 2 extends through the Mid Susitna River Valley, Talkeetna Uplands, Devil Canyon, Susitna Upland Terrace, and Susitna River Valley landscape character types. Prominent natural features include Devil Canyon Rapids, Devil Creek Falls, Stephan Lake, Fog Lakes, Tsusena Creek Falls, and Deadman Creek Falls.

M.2.2.3 Alternative Power Transmission Line Routes

The alternative power transmission line routes are located within three corridor study areas: (1) northern study area between Fairbanks and Healy, (2) central study area, which is within the upper and middle Susitna River Basin area, and (3) southern study area between Willow and Anchorage. These alternative route segments are shown in Figures 2-14 through 2-16.

In general, the landscape character types, prominent natural features, and viewing areas that would be affected by these routes are the same as those described in Section M.2.1. However, the alternative route segments also extend through four landscape character types not previously mentioned: (1) the Fairbanks landscape in the northern corridor area and the (2) Little Susitna River, (3) Knik-Matanuska Delta, and (4) Chugach Foothills landscapes in the southern corridor area. Descriptions of these landscape character types, adapted from a report prepared by the Alaska Department of Natural Resources (1981), are as follows:

Fairbanks Landscape Character Type: The Fairbanks area is characterized by an urban town landscape situated within nearly level floodplains and lowlands with alluvial fans. Chena Ridge [over 1,000 ft (300 m) MSL] is west of the city. Waterforms within the area include the Chena and Tanana rivers and numerous creeks, streams, and ponds. Vegetation includes ornamental tree and shrub cover within the denser urban area and a mixed forest of spruce, birch, aspen, poplar, and low-growing shrubs in the surrounding lowlands. Agricultural crops and grasses are also grown in the lowland areas. Views of manmade features and human activities are predominant in the foreground, with background natural features (e.g., hills and mountains) visible from open areas within the urban area and fringe.

Little Susitna River Landscape Character Type: The Little Susitna River landscape character type is bordered by high mountains on three sides and extends into the broad, open Susitna River lowlands to the west. The area is a rolling moraine and includes the Little Susitna River and a number of lakes, streams, and creeks. Vegetation is predominantly spruce-mixed hardwood forest. The area contains the community of Wasilla and a number of scattered residential, commercial, and agricultural developments. Views are often limited because of surrounding vegetation, although high mountains and lowland plains can at times be seen in the distance.

Knik-Matanuska Delta Landscape Character Type: This landscape area includes the Knik Arm of Cook Inlet and surrounding tideflats (mudflats), tidal marshlands, and some rolling morainal terrain. The Chugach Mountains and, to a lesser extent, Talkeetna Mountains are visible in the background. The major waterforms include large, glacially fed Matanuska and Knik rivers. Vegetation is extremely variable, ranging from bare mudflats along the shores to spruce-hardwood forests (birch dominated) in the uplands. Prominent landscape features include Pioneer Peak, Twin Peaks, Bolderburg Butte, and Mt. Susitna in the distance. Views are significant because of the high contrast created by the broad, treeless delta surrounded on three sides by steep mountains more than 6,000 ft (1,800 m) high.

Chugach Foothills Landscape Character Type: This narrow, glaciated lowland area located between Anchorage and the Knik River delta is bordered by the steep Chugach Mountains to the east and the Knik Arm to the west. The Talkeetna Mountains and the more distant Alaska Range can be seen to the north. Vegetation consists predominantly of a spruce-birch forest with occasional bogs and marshlands. Waterforms include the Eagle River and numerous small creeks and streams with rapids and waterfalls. The Knik Arm is shallow and turbid, with extensive mudflats along the tidal areas. Various communities, roads, and other human developments can be viewed in the area.

M.2.2.4 Alternative Borrow Sites

All of the alternative borrow sites are within the upper and middle Susitna River Basin area and occur in the Susitna River Valley, Susitna Upland Terrace, Wet Upland Terraces, Chulitna Moist Tundra Uplands, and Chulitna Mountains landscape character types. These landscape character types and associated prominent natural features and views are shown in Figure M-1 and described in Table M-2.

M.2.3 Non-Susitna Generation Alternatives*

M.2.3.1 Natural-Gas-Fired Generation Scenario

M.2.3.1.1 Beluga and Chuitna Rivers

Visual characteristics of the Beluga and Chuitna rivers region include steep mountains, vegetated uplands, and coastal wetlands. The region is dominated by mountains, glaciers, lakes, and streams in the Alaska Range. Panoramic views of spectacular mountainous and glaciated terrain are common. Vegetation is variable, ranging from a mixture of coniferous and deciduous trees at lower elevations to shrubs, thickets, and alpine vegetation at higher elevations. Coastal wetlands extend about 5 mi (8 km) inland from the coast. The predominant vegetation in the coastal region consists of relatively low grasses and sedges, thus permitting panoramic vistas of the surrounding mountains, Cook Inlet, and the Kenai Peninsula across Cook Inlet.

M.2.3.1.2 Kenai Peninsula

Visual resources in the Kenai area range from high mountains and glaciers to uplands, dense forests, lakes, rivers, and wetlands (Alaska Geographic Society, 1981). The major waterform within the area is Cook Inlet. Vegetation consists mainly of lowland spruce-hardwood forest. A number of small communities and homesteads are scattered along the Sterling Highway. Views of the Cook Inlet and lowlands, uplands, and mountainous regions are often highly scenic.

*The locations of the non-Susitna generation alternatives are shown in Figure 2-18.

M.2.3.1.3 Anchorage

The Anchorage area consists of an urbanized town landscape situated within rolling and flat terraced lowlands. Rolling and moderately steep slopes occur in the Chugach Foothills. The area is dominated by the Knik and Turnagain arms of the Cook Inlet. Several small creeks traverse the area and flow into Cook Inlet; scattered natural and manmade lakes are also found within the region. Vegetation within the urban area includes sparse ornamental tree cover with some natural spruce and deciduous trees. Undeveloped areas, lakes, and foothills are generally covered with moderately dense to dense forests of spruce and deciduous trees. Because of the flat to undulating terrain, views are generally open. The adjacent Chugach Mountains create a high-quality aesthetic setting with snow in the winter, green vegetation in summer, and colorful foliage in autumn. The Alaska Range, nearby Mount Susitna, the Kenai Mountains, and the Cook Inlet, with its notable mudflats, can be viewed within the Anchorage urban area.

M.2.3.2 Coal-Fired Generation Scenario

M.2.3.2.1 Nenana

The landscape character types located in the Nenana/Healy region include the Nenana River Lowlands and the Nenana Uplands. The lowland areas consist of extremely flat terrain with numerous small drainages. Rivers are braided and meander extensively. Vegetation is thin to moderately dense spruce forests and tundra and wetland bog areas. Views can become monotonous because of the lack of topographical relief and lack of distinctive and varying foreground features. Existing transmission lines are visible. The Nenana Uplands area consists of a relatively meandering river valley that is terraced and has steep slopes rising to the Alaska Range foothills. The large and moderately braided Nenana River is the most significant waterform in the region, which also includes lake, bog, and wetland areas. Vegetation is variable patterns of spruce and mixed forest scattered with open areas of tundra. Views are oriented to the Alaska Range in the south and the high foothills in the east. Existing transmission lines are also visible in the region.

M.2.3.2.2 Willow

The Willow region consists essentially of the Susitna River Lowlands landscape character type. The lowlands are flat to gently rolling with the larger lakes enclosed by small hills. Mount Susitna [over 3,000 ft (900 m) MSL], Little Mount Susitna, and Beluga Mountain rise above the lowlands. The heavily braided Susitna River varies from one-half mile to several miles wide and has numerous meandering tributaries. The area is covered by large tracts of wetlands and hundreds of small lakes. Vegetation includes marsh grasses, thin stands of black spruce near bog areas, and moderately dense to dense stands of spruce and deciduous trees around areas of higher relief and large lakes. Views within the immediate area are generally monotonous because of the commonly flat topography; however, views of the Alaska Range (dominated by Mt. McKinley) and Chugach and Talkeetna mountains are possible from open areas. Small communities and recreation sites occur along the Parks Highway and Alaska Railroad, which extend through the Susitna River lowlands area.

M.2.3.2.3 Cook Inlet

Visual characteristics of the Cook Inlet region are extremely varied and include steep mountains, vegetated uplands, and coastal wetlands, as generally described in Section M.2.3.1. Vegetation is variable, from a mixture of coniferous and deciduous trees at the lower elevations to shrubs, thickets, and alpine vegetation at higher altitudes. Wetlands extend about 5 mi (8 km) inland from the coast. The predominant vegetation of grasses and sedges in the coastal region allows for panoramic vistas of the surrounding Cook Inlet coastline and hills, mountains, and glaciated terrain in the background. This region also includes the Anchorage area, previously described in Section M.2.3.1.3.

M.2.3.3 Combined Hydro-Thermal Generation Scenario

M.2.3.3.1 Chakachamna Lake

The visual characteristics of the Chakachamna Lake area include steep mountainous terrain, vegetated uplands, and coastal wetlands. Chakachamna Lake, Chakachatna River Canyon, and the headwaters of the McArthur River are located in narrow glaciated valleys that are surrounded by steep and rugged mountainous terrain (Bechtel, 1983). Extended views from along the lake offer scenic vistas of glaciers descending into the lake. The Chakachatna River descends from the lake and goes through a twisting canyon surrounded by steep mountainous terrain. Whitewater rapids frequently occur through this portion of the river, which has both a single channel and braided systems. Vegetation of the lower slopes along the lake consists of a mixture of conifers and deciduous trees. Vegetation on the higher slopes consists of a band of shrub thickets and higher alpine vegetation. Dense vegetation (e.g., cottonwood, white spruce, willow) limits views as one descends along the Chakachatna and McArthur rivers. An unusual area of dry sand

flats and a border of lichen-covered flats occur along the middle reach of the McArthur River; this provides visual diversity (texture and color) and permits extended views of the surrounding mountains (Bechtel, 1983). Wetlands extend about 5 mi (8 km) inland from the coast. The predominant vegetation of grasses and sedges allow for panoramic vistas of the surrounding mountains, Cook Inlet, and the Kenai Peninsula located across Cook Inlet.

M.2.3.3.2 Browne

The landscape character of the Browne area is mainly defined by the Nenana River Valley and its tributaries and the Alaska Mountain Range, which includes Mt. McKinley. Landforms in the area include a relatively flat, meandering river valley bordered by terraced uplands that give way to steep slopes rising up to the Alaska Range foothills. Exposed rock and soil cliffs (light tan to dark brown) with highly eroded banks are common along the Nenana River. The large and moderately braided river is the most significant waterform, with its silty, glacial water. The area includes several small tributaries, scattered small lakes, bog areas, wetlands, and numerous islands within the broad floodplain. Vegetation consists of variable patterns of sparse to dense spruce and mixed forest. The area also contains scattered open spaces of tundra and bare ground with light-colored soils. A number of small human development areas (e.g., Healy, Suntrana) occur in the Railbelt corridor. Views are essentially oriented to the mountains of the Alaska Range and high foothill areas.

M.2.3.3.3 Keetna

The Keetna area is located in the lower half of the Talkeetna River Basin. The major landform is the Talkeetna Mountains, located to the northeast. The vegetation near the alternative project site is predominantly upland spruce-hardwood forest. Vegetation above the river at higher elevations is a mixture of low shrub communities, sedge-grass tundra, and mat and cushion tundra. Two scenic areas located in the vicinity include Sentinel Rock and Granite Gorge (Exhibit E, Vol. 9, Chap. 10, p. E-10-13).

M.2.3.3.4 Snow

The Snow River is one of the Kenai Peninsula's major river drainage systems. The region is characterized by glacially carved valleys, rugged, snow-capped mountain ridges, and a variety of vegetation types. The visual setting of the region is dominated by the steep, snow-capped peaks of the Kenai Range, with sharply defined ridges, steep-sided crests, and boulder outcrops. Three prominent peaks above 4,000 ft MSL (1,200 m) surround the Snow site location. Large glacial icefields are located in the Kenai Mountains northeast of the Snow site. Mixed conifer and deciduous species constitute most of the densely forested valley areas. Alpine vegetation and subalpine herbaceous meadows dominate the slopes above the tree line. Slopes above 4,000 ft (1,200 m) MSL are typically barren rock and talus surfaces.

M.2.3.3.5 Johnson

The Johnson area is located in the lowland areas near the confluence of the Tanana River and its tributary, the Johnson River. The dominant landform in the area is the Alaska Range. Johnson River is located in a glaciated "U"-shaped valley. The braided Johnson River flows toward the broad valley of the Tanana River, which is bordered by the Alaska Range to the south and rounded, gentle ridges and slopes of the Yukon-Tanana Upland area to the north. The vegetation near the alternative dam site is predominantly bottomland spruce-poplar forest. Vegetation at higher elevations above the floodplain is mostly upland spruce-hardwood forest.

M.2.3.3.6 Nenana, Chuitna River and Anchorage

The landscape for the Nenana area is described in Section M.2.3.2. The Chuitna River and Anchorage landscapes are described in Section M.2.3.1.

M.3 ENVIRONMENTAL IMPACTS

M.3.1 Proposed Project

The visual resources within the proposed project area were described in Section M.2.1 in relation to the landscape character types; prominent natural features; and significant viewsheds, vista points, and travel routes. In this section, the potential impacts of the proposed project on these visual resources are evaluated. This evaluation is based on field reconnaissance and on information, engineering data, and engineering designs and drawings supplied in the Susitna project application (Exhibit E, Vol. 8; Exhibit F; and Exhibit G).

M.3.1.1 Watana Development

M.3.1.1.1 Construction

The construction of the Watana dam and associated facilities, the impoundment area, the construction camp and village, and permanent town would significantly change the image and character of the upper and middle Susitna River Basin area, especially in the Susitna River Valley landscape character type and the southern portion of the Wet Upland Tundra landscape character type. The currently remote and largely undisturbed Susitna River Valley would become an area of increased human activity and development, and visual resources would be altered accordingly.

Temporary visual impacts during construction of the proposed Watana dam would include the presence of construction personnel, heavy equipment, and materials in a remote, natural setting. Construction activities of more long-term impact at the dam site would include the removal of vegetation and the disturbance of soil, scaring of the land in this natural river valley. Landforms, waterforms, and vegetation would also be disturbed at borrow sites and other project-associated facilities, such as the powerhouse, tailrace tunnel, construction camp site, air strip, and access roads. As construction of the dam progressed, the dam structure and associated reservoir would become increasingly prominent features of the area.

The construction camp and village would be built on about 300 acres (120 ha) of wetlands northeast of the proposed dam site (Fig. 2-3), resulting in views of such structures such as dormitories, a hospital, recreation facilities, administrative buildings, single and multifamily dwellings, a school, stores, a sewage treatment plant, and a landfill.

These various visual disturbances would be viewed by the construction personnel and their families, occasional recreationists in the area, and individuals flying over or near the project area. Alterations to the landscape during the construction period that are not subsequently inundated by the reservoir would remain visible during the entire operational lifetime of the project, as discussed below.

M.3.1.1.2 Operation

The proposed 885-ft (270-m) high, 4,100-ft (1,750-m) crest-length, earth-fill dam would become the most prominent visual feature in the previously natural setting of the Susitna River Valley landscape area. The geometric lines and forms of the dam and associated structures would be in dramatic visual contrast to the natural form, color, and texture of the river valley (see Fig. M-10). These structures would be viewed by project personnel, support staff, recreationists in the area, and individuals flying over or near the project area.

The main spillway of the dam would consist of a long, straight, sloping concrete chute, 2,000 ft (600 m) long, up to 100 ft (30 m) wide, and more than 100 ft (30 m) deep. The emergency spillway would consist of a concrete chute over 5,000 ft (1,515 m) long, 200 ft (60 m) wide, and 30 to 50 ft (9 to 15 m) deep. These spillways would be positioned in deep rock cuts on the river valley slopes and would be visible to operation personnel and visitors as they crossed the access road bridge (Fig. 2-3). The rock cuts and grading would be inconsistent with the natural landforms and vegetation in the area. The visual scars created by construction of the road access to the powerhouse and trailrace tunnel areas would also remain highly visible from the dam area.

When filled, the Watana impoundment would be about 54 mi (90 km) long, more than 5 mi (8 km) wide, and have a water surface area of 36,000 acres (14,600 ha). The landforms, waterforms, and vegetation within the valley of the Susitna River would be inundated (Fig. M-11). The impoundment also would inundate portions of major tributaries, including Deadman, Watana, Kosina, and Jay creeks. The Deadman and Watana creek waterfalls would be inundated. Deadman Creek Falls is one of the largest and most scenic waterfalls in the project area. Much of the Vee Canyon area also would be inundated. This highly scenic canyon includes a double hairpin bend, a deeply cut channel, and a stretch of whitewater rapids. Various rock formations, steep ridges, and varied coloration (rock interlaid with marble and green schist) make the area an important visual resource. The partial inundation of the canyon area will detract from its significance as a natural scenic feature.

It is anticipated that during operation, the maximum reservoir drawdown of 120 ft (35 m) would be in the spring (April and May) and would result in exposure of substantial areas of mudflats. It is expected that these mudflats would be more than 1 mi (1.6 km) wide and would be visually obtrusive to any recreationists near the reservoir area (although snow cover might obscure the view of the mudflats in early spring). These mudflat areas would continue to be visually obtrusive to recreationists on or near the reservoir throughout the summer months until the reservoir was filled (completely covering exposed mudflat areas) by September. Extensive slumping, scaling, and landsliding would be expected to occur along steep slopes of the newly created reservoir. Such slumping could extend hundreds of feet up the sides of the slope and would result in unsightly scars visible to recreationists using the reservoir and adjacent areas.

Figure M-10. Artist's Photo Rendition of the Proposed Watana Dam. (Does not include permanent town, access roads, transmission lines, substation, or aircraft landing strip.) [Source: Exhibit E, Vol. 8, Appendix E8b]

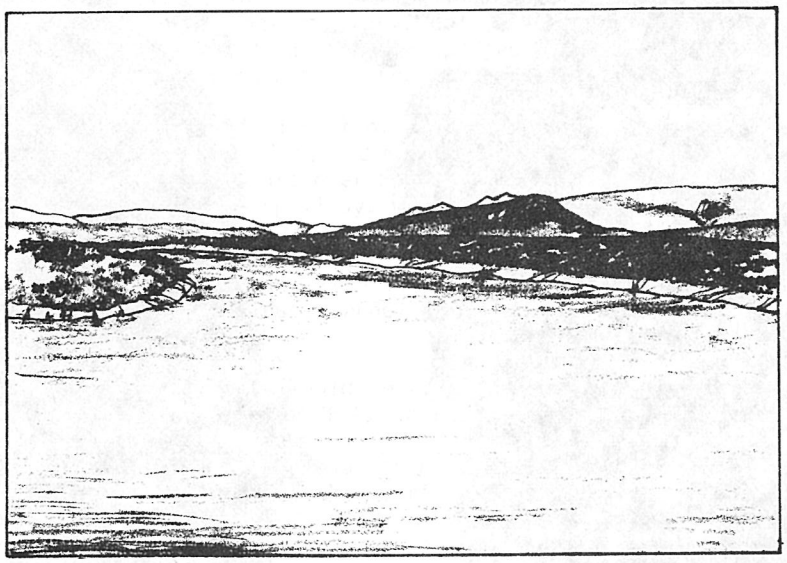


Figure M-11. Photo of Existing Susitna River Valley (top) and Artist's Rendition of the Proposed Watana Reservoir at Mid-Drawdown (bottom). [Source: Exhibit E, Vol. 8, Appendix E8B]

This slumping and landsliding would continue to occur until the angle of repose was reached and the slopes became stabilized (Fig. M-12).

The Watana switchyard (origin point of the two 345-kV transmission lines) would occupy about 11 acres (4.5 ha) of land in an area above the dam on the north terrace (Fig. 2-3). The yard, which would be fenced and paved with gravel, would contain electrical equipment and structures that would be predominantly aluminum-tone in color. The form, line, and color of this equipment would be visually predominant in an area where there is little vegetation screening. The electrical equipment and structures would be silhouetted against the skyline from various vantage points, such as along the access road.

A number of proposed borrow sites would be located both up- and downstream from the proposed Watana dam. The presence of borrow sites not inundated by the reservoir would create long-term visual impacts. Such areas would include islands in the Susitna River below the dam, the low north river terrace below the dam (near the mouth of Tsusena Creek), and the 640-acre (256-ha) borrow site located on the high north terrace adjacent to Deadman Creek. The borrow sites along the river below the dam would be in full view from the dam area. Borrow sites upstream of the dam might create rigid angular forms along the shoreline of the reservoir that would be visible to visitors in the area.

The 300-acre (120-ha) temporary construction camp and village would create visual impacts that would extend into the operation phase of the Watana project. Visual impacts would result from the scarification of the land and presence of areas devoid of vegetation where the camp structures were removed. In these areas denuded of vegetation, mud and water ponding resulting from soil compaction would be visible to visitors and to the permanent town residents who traveled through the area and who lived adjacent to the construction village site. The 90-acre (36-ha) permanent village would be visually inconsistent with the natural landscape character of the area. The village would consist of a town center with approximately 20 buildings, a hospital, 125 dwelling units, and a water and sewage treatment plant. Extensive human activities in and surrounding the permanent village would degrade the visual character of the existing wetland setting (Fig. M-13). Views in relation to the Watana dam facilities and permanent townsite are described in Table M-4 and shown in Figure M-14.

M.3.1.2 Devil Canyon Development

M.3.1.2.1 Construction

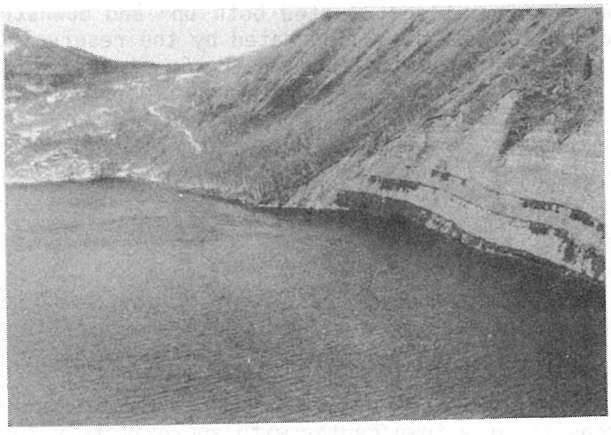
Temporary visual impacts during construction of the Devil Canyon dam project would include the presence of workers, equipment, and materials in the remote and natural setting of the Devil Canyon area. As was described for the Watana project, the construction of the Devil Canyon dam and associated facilities, the impoundment area, and the construction camp and village would significantly change the image and character of the upper and middle Susitna River Basin area, especially in portions of the Devil Canyon, Mid Susitna River Valley, Talkeetna Uplands, Chulitna Moist Tundra Uplands, and Portage Lowlands landscape character types. The visual character of the area would change from that of a remote and largely undisturbed canyon area to one of greater human activity, development, and disturbance.

M.3.1.2.2 Operation

The proposed project area would be viewed by project personnel, recreationists, and people flying over or near the area. The line, form, and color of the 645-ft (195-m) high, 1,300-ft (394 m) span concrete arch dam would visually contrast with the natural form, color, and texture of the Devil Canyon area (Fig. M-15).

When filled, the Devil Canyon reservoir would be about 32 mi (53 km) long and a maximum of 1800 ft (549 m) wide near the dam. The surface area of the reservoir would be about 7,800 acres (3,120 ha), with the water impoundment reaching upstream almost as far as the Watana dam. The reservoir would inundate Devil Canyon and the rapids that extend through it. The canyon is a steep-sided, nearly enclosed, gorge that constricts the Susitna River channel and results in over 10 mi (16 km) of turbulent (Class VI) whitewater rapids. The unusual geologic, hydrologic, and aesthetic characteristics of the canyon make it a notable Alaskan natural feature. The impoundment would also inundate minor portions of Devil and Fog creeks.

The main spillway of the dam would consist of a sloping concrete channel more than 1,000 ft (300 m) long, a tapered width from about 150 ft to 75 ft (45-25 m), (23 m), and a depth of approximately 25 ft (7.5 m). The emergency spillway would consist of a sloping rock cut channel over 1,400 ft (420 m) long and 250 ft (75 m) wide, with an extending concrete pilot channel approximately 800 ft (240 m) long and 50 ft (15 m) wide. These spillways would require rock cuts on the northern slope of the river valley and on the high terraced area on the southern side of the Susitna River. The main spillway and rock cut would dominate the landscape on the northern river valley slope and would be in full view of the proposed visitor center, which would be located on the southern side of the canyon. The rock chute of the emergency spillway would dominate the landscape on the southern side of the dam (Fig. 2-5).



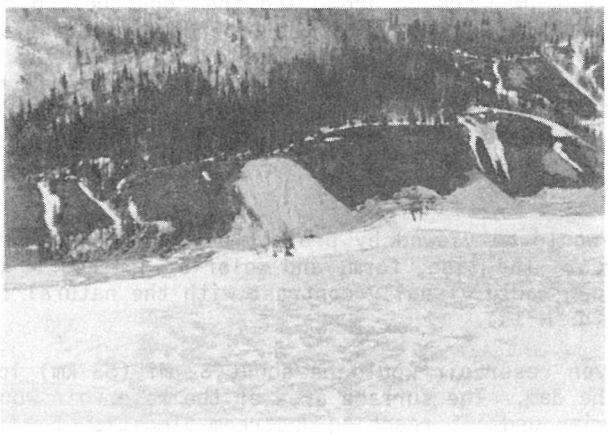


Figure M-12. Examples of Slope/Slide Problems Around a Reservoir (Williston Reservoir, British Columbia). [Source: Exhibit E, Vol. 8, Appendix E8E, Photos 8.E.1 and 8.E.2]

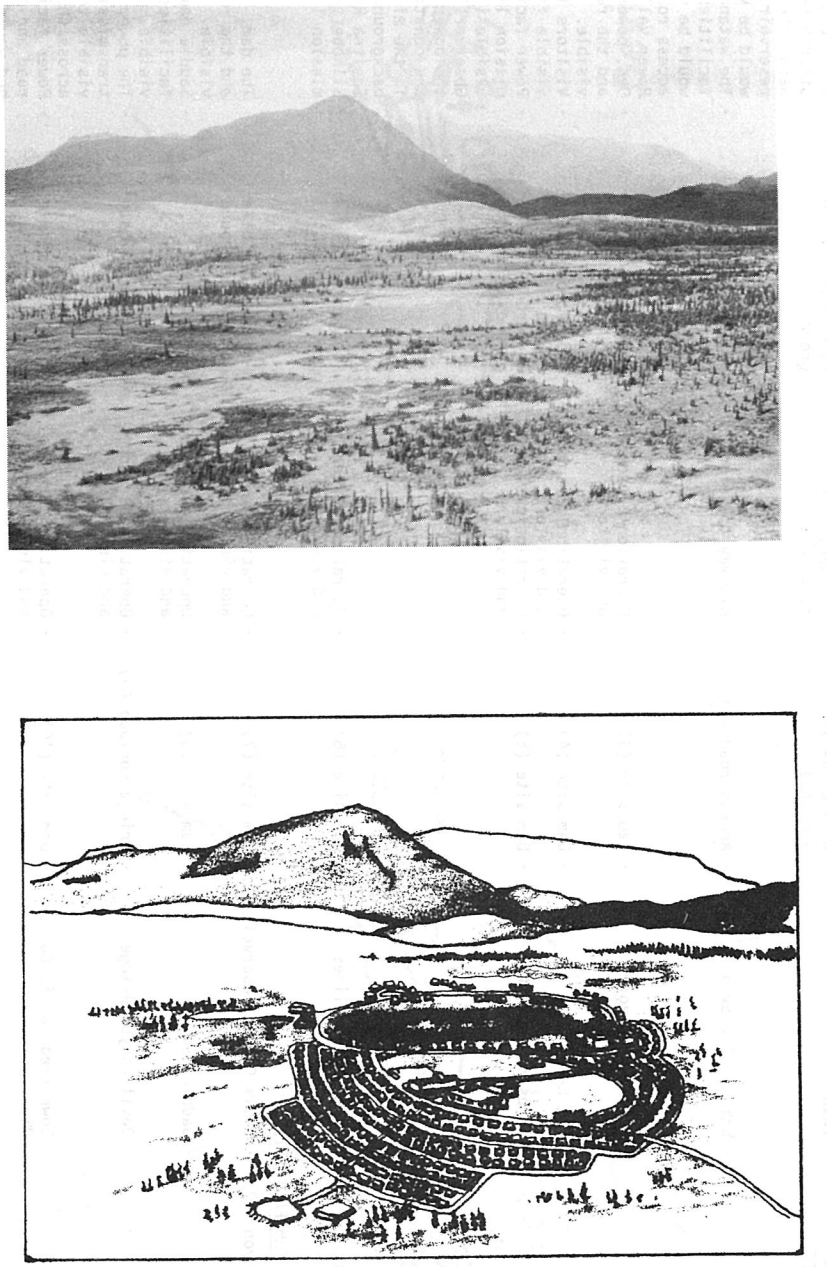


Figure M-13. Photo of Proposed Site of the Construction Camp/Permanent Village Area (top) and Artist's Rendition of Permanent Watana Settlement (bottom). [Source: Exhibit E, Vol. 8, Appendix E8B, Photo 8.B.2]

Table M-4. Significant Views and Visual Resource Impacts within the Watana and Devil Canyon Dam Facilities and Village Area

Landscape Character Type	Project Feature or Area Viewed	Viewpoints†[1]	Viewers Affected	Viewing Distance†[2]	Visual Resource Impact
WATANA DAM FACILITIES					
1. Susitna River Valley LCT	· Town	· Watana Townsite area (1)	· Residents and travelers	· Foreground/Middleground	· Commercial and residential structures, the Watana Dam, associated facilities, the reservoir, and Tusuena Butte would be visible.
	· Watana Site area	· Access road (2)	· Highway travelers	· Middleground/background	· The Watana dam, associated facilities, and reservoir would be visible from the access road above the Susitna River valley.
	· Watana Reservoir	· Dam site (3)	· Operation personnel and visitors	· Foreground/middleground/background	· Dam, power plant facilities, and the reservoir would be visible.
	· Fog Lakes Area	· Dam site (4)	· Operation personnel and visitors	· Middleground/background	· Visitors facilities would be visible from the dam area.
	· Downstream Susitna	· Dam site (5)	· Operation personnel and visitors	· Foreground/middleground/background	· Power facilities and transmission lines would be highly visible in the foreground. Observers would clearly view the powerhouse access road and construction borrow areas in the middleground and have background views of the Susitna River valley.
	· Transmission lines	· Dam site (6)	· Operation personnel and visitors	· Foreground/middleground	· Silhouetted views of the transmission lines and switchyard.
DEVIL CANYON DAM FACILITIES					
2. Devil Canyon LCT	· Devil Canyon Reservoir	· Dam site (7)	· Operation personnel and visitors	· Foreground/middleground/background	· The dam, associated facilities, and the reservoir would be visible.
	· Saddle dam	· Dam site (8)	· Operation personnel and visitors	· Middleground	· Saddle dam and associated facilities would be clearly visible.
	· Devil Canyon Bridge	· Bridge surface (9)	· Operation personnel and visitors	· Foreground/middleground	· The power plant out fall and transmission lines would be visible to people driving across the suspension bridge.
	· Downstream Devil Canyon views	· Dam site (10)	· Operation personnel and visitors	· Foreground/middleground	· Power facilities, power access road and the dry Susitna River bed would be highly visible.

†[1] Numbers of viewpoints are keyed into Figure M-14.

†[2] Viewing distances are (1) foreground = 0-1/4-1/2 mi, (2) middleground = 1/4-1/2-3-5 mi, (3) background = 3-5 mi - infinity (U.S. Forest Service, 1973) viewing distance characteristics are discussed in Section J.2, Table J.1.

Source: Adapted from Exhibit E, Supplemental Information, Chap. 8, Comment 2.

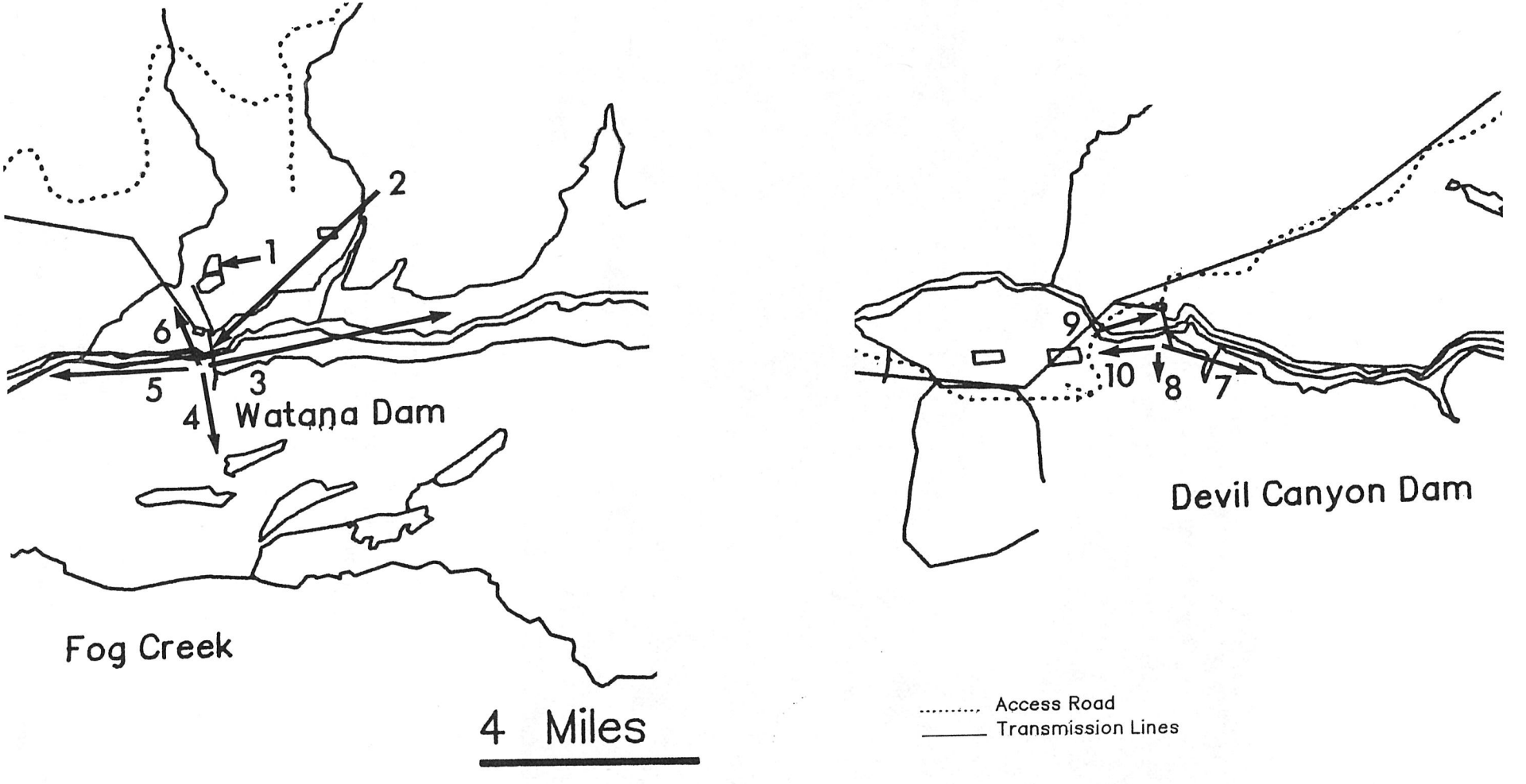


Figure M-14. Significant Views and Visual Resource Impacts within the (left) Watana and (right) Devil Canyon Dam Facilities and Village Area. (Numbers are keyed to the viewpoints listed in Table M-4. Arrows indicate general direction of view.)

Figure M-15. Artist's Photo Rendition of the Proposed Devil Canyon Dam and Reservoir. (Does not include construction camp and village, access roads, transmission lines, or substation.) [Source: Exhibit E, Vol. 8, Appendix E8B]

The 1,000-ft (300-m) long Devil Canyon saddle dam that would be adjacent to the main arch dam would dominate the small-scale plateau-type landscape. The texture and color of the saddle would be in sharp contrast to the surrounding vegetation and small pond area. Extensive clearing of vegetation, as well as rock cutting for 2.5 mi (4 km) of road access during the construction of the powerhouse tunnel would leave large visual scars on the steep northern slopes that would be visible to persons using the access road and to persons at the visitor center.

The Devil Canyon switchyard would occupy about 18 acres (7.3 ha) of land on the northern terrace above the dam site (Fig. 2-5). Similar to the Watana dam switchyard, the area would be fenced and surfaced with gravel. The switchyard would contain various pieces of electrical equipment and structures whose form, line, and aluminum-tone color would be visually dominant in an area where there is little vegetation screening. The electrical equipment and structures also would be silhouetted against the skyline from various vantage points, such as along the access road.

The development of the 200-acre (80-ha) temporary construction village and camp sites would cause long-term visual impacts that would extend into the operation phase of the Devil Canyon project. Both sites would be located on a flat, wetland terrace surrounded by mixed forests. Visual impacts would result from the scarification of the land in areas devoid of vegetation where the camp structures were removed. This lack of vegetation and the presence of mud and water ponding created by soil compaction would be visible to persons who traveled through the area. Visual resource impacts in relation to the Devil Canyon dam facilities are described in Table M-4 and shown in Figure M-14.

M.3.1.3 Access Routes

Temporary visual impacts during construction of the proposed (1) Denali Highway-to-Watana dam site access route, (2) Watana dam-to-Devil Canyon dam access route, and (3) Devil Canyon rail spur would consist of the presence of workers, equipment, and materials along the routes. The nature of these impacts would be similar to those discussed for other project features--a remote and largely undisturbed area would be converted to one of greater human activity and development. These visual disturbances would be viewed by construction personnel, occasional recreationists in the areas, and individuals flying over the access routes. Visual impacts that would extend into the long-term operation phase of the project are discussed below.

M.3.1.3.1 Denali Highway-to-Watana Route

The presence of the 40-mi (67-km) long, 24-ft (7.3-m) wide, high-speed design (40-55 mph, 65-90 Km/h), gravel access road to Watana dam would result in significant visual resource impacts to the landscape. The road would extend south from Denali Highway, cross Brushkana and Deadman Creeks, extend to the west of Deadman Mountain, cross a Deadman Creek tributary, and parallel Deadman Creek to the Watana dam site (Fig. M-16). Visual impacts along this route would consist of views of large cut and fill areas, areas where vegetation had been removed, and areas subject to erosion. All these features would detract from the aesthetic character of the area. In addition, large borrow pits excavated adjacent to the road would result in long-term visual impacts from scarification caused by removal of vegetation, erosion, and the presence of partially water-filled depressions.

On the positive side, the proposed road would provide new access to scenic views for visitors, recreationists, and persons from the permanent Watana village. Such views would include panoramic views toward the Alaska Range, Clearwater Mountains, and the Talkeetna Range. However, recreationists in the area around the proposed route might consider the road a visual intrusion detracting from their enjoyment of the natural landscape of the area. Views from the road as well as off-road views are described in Table M-5 and shown in Figure M-16.

M.3.1.3.2 Watana-to-Devil Canyon Route

Development of the 34-mi (56 km) long, 24-ft (7.3 m) wide, gravel road between the Watana and Devil Canyon dam sites would result in cut-and-fill work and borrow pits that would be visible to motorists and recreationists in the area during the operational phase of the project. Creation of borrow sites near the road would result in scarred, unvegetated, and partially water-filled depressions that would remain long after construction was completed. As with the Denali Highway-to-Watana dam access road, the visual character of the Watana-to-Devil Canyon access road would be in contrast to the existing natural environment, but at the same time, the route would provide views of the surrounding area previously seen only by persons on foot.

One of the more visually prominent features of the access road would be a 2,600-ft (785-m) steel suspension bridge 600 ft (180 m) above the Susitna River to the west of the Devil Canyon dam. Construction of this high-level bridge would require extensive grading and disruption of land forms and vegetation for the bridge approaches and would infringe upon the natural setting of the Devil Canyon area. These alterations would be visible after construction ceases. The bridge would not offer recreationists a good view of the dam, and the proposed structural style and form of the bridge would do little to complement the form and line of the surrounding Devil

Table M-5. Significant Views and Visual Resource Impacts Along the Proposed Road and Rail Access Routes

Landscape Character Type	Approximate Duration of View†[1]	Viewpoints†[2]	Viewers Affected	Viewing Distance†[3]	Significant Views and Visual Resource Impact†[4]
DENALI - WATANA ACCESS					
1. Wet Upland Tundra LCT (Denali Highway Area)	· 4 minutes (~3 mi)	· Access road (1)	· Motorists	· Foreground/Middleground/background	· Upland tundra visible in the foreground and the Nenana River Valley and Alaska Mountain Range visible in the middleground and background.
	· 8 minutes (~5 mi)	· Access road (2)	· Motorists	· Foreground/middleground	· Extended view of access road and Butte land mark.
	· 4 minutes (~3 mi) and extended views at pull-off points	· Access road and (3) trailhead pulloffs	· Motorists and hikers	· Foreground/middleground/background	· Motorists would have foreground and middleground views of trailheads and trails in drainage way and background views of Chulitna Mountains from access road and pulloff areas at trailhead locations; hikers would experience foreground and middleground views of the access road.
	· 5½ minutes (~4 mi)	· Access road (4)	· Motorists	· Foreground/middleground/background	· Panoramic view of Clear Water Mountains.
2. Chulitna Mountains LCT	· 5½ minutes (~4 mi)	· Access road (5)	· Motorists	· Foreground/middleground/background	· Foreground views of Big/Deadman Lakes area, middleground views of Watana Reservoir and and panoramic views of the Talkeetna mountains in the background.
	· 13½ minutes (~10 mi)	· Access road (6)	· Motorists	· Middleground	· Extended views of Tsusena Butte.
	· Walking pace for various trail lengths	· Off-road trail (7-12)	· Hikers and recreationists	· Foreground/middleground/background	· Numerous views of Soul, Deadman, and Tsusena Creeks, Caribou Pass; the Chulitna River Valley; Alaska Range and other natural features along proposed hiking trails. Views would be closed to panoramic with occasional views of project features such as the access road.

Table M-5. Continued

Landscape Character Type	Approximate Duration of View†[1]	Viewpoints†[2]	Viewers Affected	Viewing Distance†[3]	Significant Views and Visual Resource Impact†[4]
3. Wet Upland Tundra LCT (Deadman Creek area)	• 8 minutes (~6 mi) and extended at pulloffs	• Access road and pulloff area (13)	• Motorists	• Foreground	• Clear view of the Deadman Creek drainage.
	• 4 minutes (~3 mi)	• Access road (14)	• Motorists	• Middleground/background	• View the Tsusena Creek drainage.
WATANA-DEVIL CANYON ACCESS					
4. Chulitna Moist Tundra-Upland LCT	• Less than ½ minute (~200 feet)	• Access road (15)	• Motorists	• Foreground/middleground	• Views of the transmission line towers and corridor would be more prominent because of the oblique crossing of the transmission line and road; however, the duration of view would be short.
	• Less than ½ minute (~200 feet)	• Access road (16)	• Motorists	• Foreground	• Brief view of the transmission towers and corridor as motorists drive beneath the line where it crosses the road at a sharp angle.
	• 7 minutes (~5 mi)	• Access road (17)	• Motorists	• Foreground/middleground	• Panoramic views of the Susitna River Valley and Talkeetna Mountains; no project facilities would be visible.
	• 1½ minutes (~1 mi)	• Access road (18)	• Motorists	• Middleground/background	• Views of the transmission line extending up the Devil Creek drainage.
	• 3 minutes (~2 mi) and extended views at pull-off points	• Access road and pulloff area (19)	• Motorists and High Lake visitors	• Middleground/background	• Views of the High Lake area.
RAIL ACCESS TO DEVIL CANYON					
5. Mid Susitna River Valley LCT	• Floating time†[5] for ~6 mi	• River surface or shoreline (20)	• River recreationists	• Foreground/middleground	• Views of railroad facilities by boaters along the Susitna River

†[1] Duration of view based on travel speed of 45 miles per hour.

†[2] Numbers of viewpoints are keyed to Figure M-16.

†[3] Viewing distances are (1) foreground = 0-¼-½ mi, (2) middleground = ¼-½-3-5 mi, (3) background = 3-5 mi - infinity (U.S. Forest Service, 1973) viewing distance characteristics are discussed in Section M.2, Table M-1.

†[4] Motorists would view large cut and fill areas, borrow sites, water-filled depressions and devegetated and eroded soils at various locations along the entire proposed access route.

†[5] Travel time would be dependent upon type of river craft, stream flows, and upstream or downstream direction of travel.

Source: Adapted from Exhibit E, Supplemental Information, Chap. 8, Comment 2.

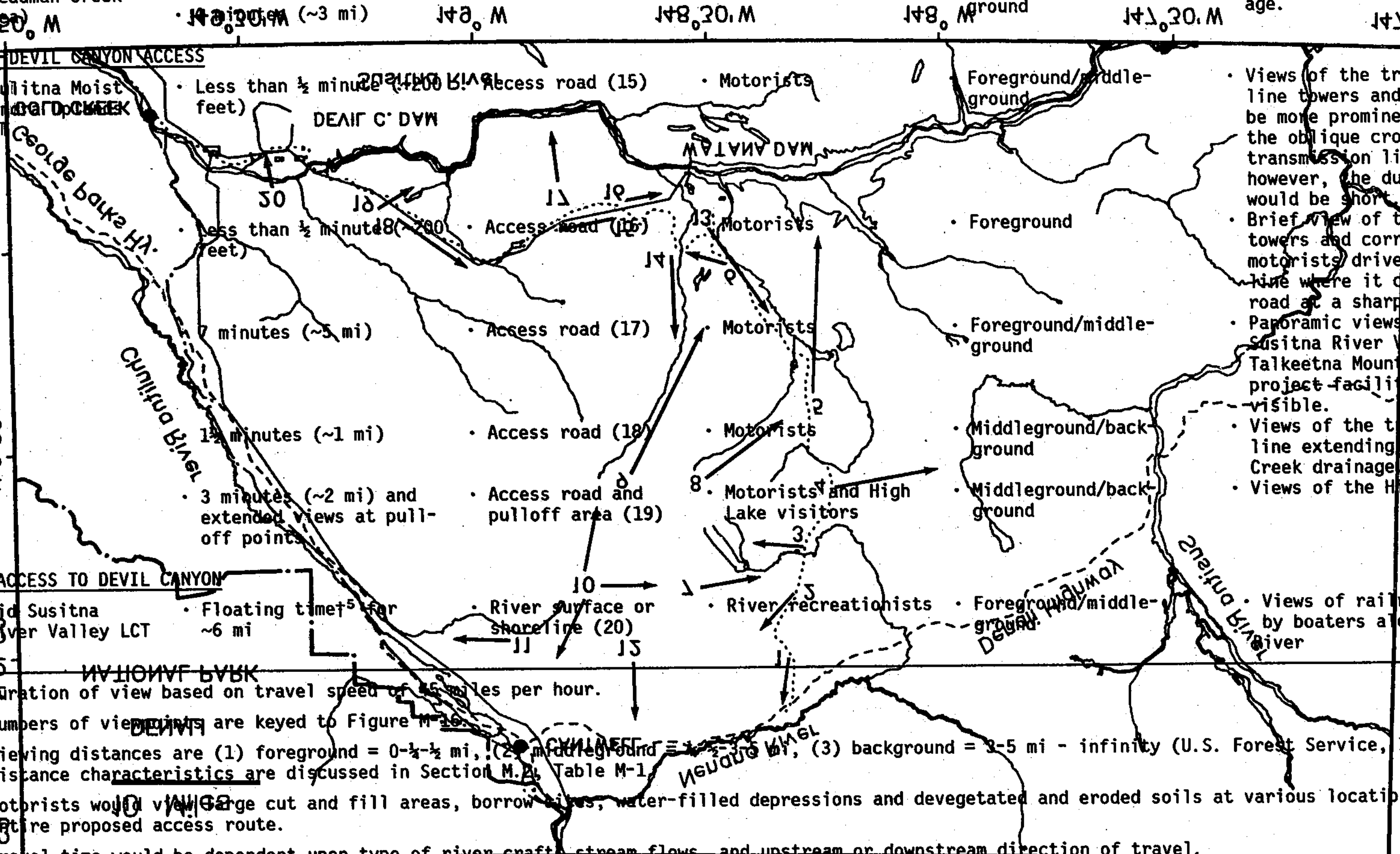


Figure M-16. Significant Views and Visual Resource Impacts Along the Proposed Road and Rail Access Routes. (Numbers are keyed to the viewpoints listed in Table M-5. Arrows indicate general direction of view.)

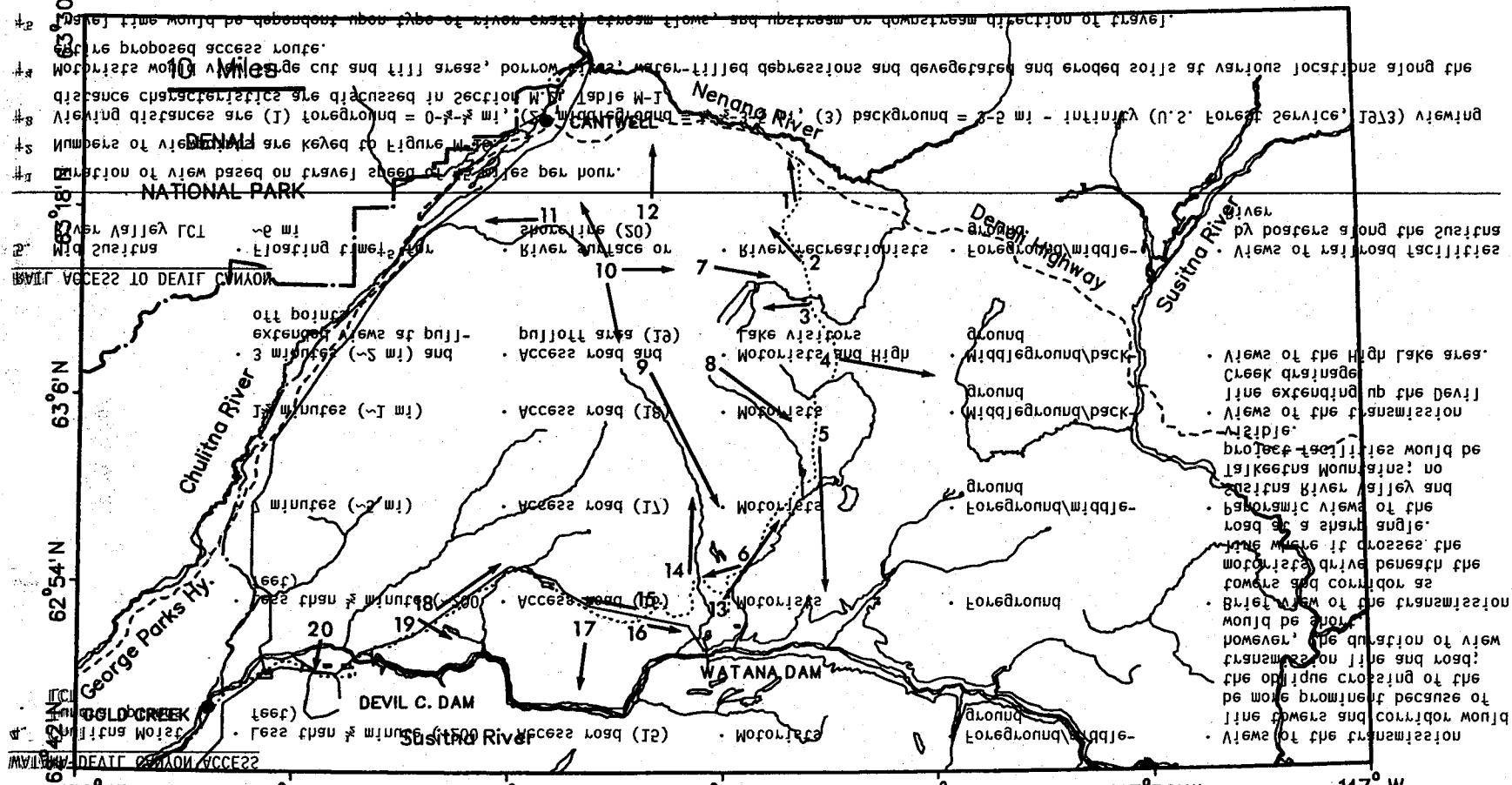


Figure M-16. Significant Views and Visual Resource Impacts Along the Proposed Road and Rail Access Routes. (Numbers are keyed to the viewpoints listed in Table M-5. Arrows indicate general direction of view.)

Canyon landscape (see Fig. M-17). Views from the Watana to Devil Canyon access road and the high-level suspension bridge are described in Table M-5 and shown in Figure M-16.

M.3.1.3.3 Rail Access to Devil Canyon

The presence of the proposed 14-mi (23-km) long, 31-ft (9.3-m) wide rail spur between Gold Creek and the Devil Canyon dam site would result in visual impacts along the Susitna River. The rail alignment would result in cut and fill operations that would contrast with the color and texture of the naturally forested and vegetated areas along the river valley. Recreationists using the Susitna River would be able to view the scarification on the slopes adjacent to the rail spur. At present, there is no intention of using the rail spur for public transportation; thus the line would not provide members of the public with new opportunities to view remote areas in the Susitna River valley. Views from the rail spur are described in Table M-5 and shown in Figure M-16.

M.3.1.4 Power Transmission Facilities

The temporary visual impacts that would occur during construction of the Susitna transmission line facilities would be similar in nature for all segments of the proposed corridor. These impacts would consist of the presence of workers, equipment, and materials during construction of associated access roads, transmission line towers, and substations, and during the stringing of the conductors. These visual disturbances would be viewed by construction personnel, individuals flying over the transmission line route, recreationists, persons at various vantage points along project access roads and highways and railroads in the vicinities of the transmission line segments, and residents of communities along the various corridor segments. In addition to these temporary impacts, the development of the transmission facilities would create long-term visual impacts that would continue for the entire operating life of the facilities. These long-term impacts along each of the transmission line segments are presented in Table M-6 and Figures M-18 through M-21 and are discussed in more detail in the following sections.

M.3.1.4.1 Dams-to-Gold Creek Segment

The transmission towers along the 45-mi (72-km) long Watana and Devil Canyon dams-to-Gold Creek 345-kV transmission line segment would consist principally of 100-ft (30-m) high, guyed, steel-pole, X-frame structures; some single steel-pole structures would be used for angles and areas with steep slopes (Fig. M-). The cleared right-of-way would be 300 ft (90 m) wide between the Watana and Devil Canyon dams, and 510 ft (155 m) wide between the Devil Canyon dam and the Gold Creek substation. The transmission line towers and conductors would be silhouetted against the skyline from various viewpoints along the Watana-to-Devil Canyon dam access road and rail spur and at the dam sites. Through wooded areas, the cleared right-of-way corridor would be highly visible from the air. Potential views of the transmission lines and towers are described in Table M-6 and shown in Figure M-.

M.3.1.4.2 Gold Creek-to-Fairbanks Segment

The transmission line segment extending 185 mi (298 km) from the Gold Creek substation to its termination point at Fairbanks would consist mainly of 100-ft (30-m) tall, guyed steel-pole, X-frame towers. The cleared right-of-way would be 300 ft (90 m) wide. The distance between tower structures along the proposed line typically would be 1,300 ft (390 m). Adjacent tower structures along parallel lines would be about 115 ft (35 m) apart. Between Gold Creek and the Healy substation, the proposed transmission line would essentially parallel the Anchorage-Fairbanks Intertie; therefore, visual impacts caused by the Susitna project tower and line placement along this stretch of the corridor would be only incremental in nature. From the Healy substation to the [illegible] new right-of-way would be required.

Visual resources would be particularly impacted within the Broad Pass Landscape Character Type, where the transmission line would extend across Denali Highway and be in full view of motorists. This area has been recommended by the state for designation as a scenic highway area. Also, the transmission line would be from about 200 ft (60 m) to about 2 mi (3 km) away from the George Parks Highway in this highly scenic region. The transmission line also would be visible at two Alaska Railroad crossings and from portions of the planned remote parcel land disposal areas between Gold Creek and Hurricane. Between Cantwell and the Yanert Fork, the transmission line would again extend close to the George Parks Highway. The transmission line would be highly visible along the Indian River in the Alaska Range landscape, and from various vantage points along the eastern boundary of Denali National Park and the George Parks Highway. The Healy substation near the Alaska Railroad would be highly visible. From Healy to Fairbanks, the transmission line would extend through the forested Tanana Ridge and the Nenana Uplands landscape character types, while paralleling the road near Healy. Views of the transmission line and specific visual impacts in relation to those views are shown in Figures M-18 and M-19 and described in Table M-6.

Table M-6. Significant Views and Visual Resource Impacts Along the Proposed Transmission Line Corridor

Landscape Character Type (LCT)[1]	Transmission Line Segment	Viewpoints
GOLD CREEK-TO-FAIRBANKS SEGMENT		
1. Tanana Ridge LCT	• Segment extending from Ester Substation across Parks Highway	• Ester Substation area
	• Paralleling and extending across portions of Parks Highway toward Ohio Creek and on toward Little Gold Stream Creek	• Tanana Ridge area
	• Paralleling Parks Highway and Little Goldstream Creek area	• Nenana Ridge area
	• Extending southwest to the Tanana River	• Tanana Ridge area
2. Nenana River Low-lands LCT	• Segment extending across the Tanana River Valley	• Tanana River
	• Extending through the Nenana public use area	• Nenana Public Use Area
	• Extending through Nenana lowlands and the Clear M.E.W.S. Military Reservation	• Nenana Lowlands
3. Nenana Uplands LCT	• Segment extending along the Nenana River adjacent to the Alaska Railroad	• Nenana Uplands area
	• Extending across the Alaska Railroad and Nenana River toward Rock Creek	• Alaska Railroad and Nenana River and railroad crossings
	• Extending from the Rock Creek area near the community of Ferry between the Parks Highway and Alaska Railroad toward the community of Lignite	• Nenana Uplands area
	• Extending across the Alaska Railroad and Nenana River toward the community of Healy	• Alaska Railroad and Nenana River crossings
	• Extending from Healy Substation across Healy Creek basin, to Nenana Uplands area and then beginning to extend along Moody Creek drainage. The line would begin to parallel proposed Intertie route[3]	• Healy area
4. Alaska Range LCT (Sugar Loaf Mountain Area)	• Segment extending through Moody Creek drainage, Montana Creek drainage, and Alaska Range	• No site-specific viewpoints identified
5. Yanert River Valley LCT	• Segment extending along east shore of Nenana River and extending across confluence of Nenana and Yanert rivers	• Yanert and Nenana rivers
	• Traversing river valley and extending up to Windy Pass area	• McKinley Village
6. Alaska Range LCT (Windy Pass Area)	• Segment extending across Carlo Creek near Parks Highway and Alaska Railroad	• Carlo Creek
	• Adjacent to portions of Parks Highway (½ mi) and Alaska Railroad (½ mi)	• Windy Pass Corridor
	• Extending to Nenana River	• Windy Pass/Nenana River crossing

Viewers Affected	Viewing Distance[2]	Visual Resource Impact
• Highway travelers	• Foreground/middleground	• Ester Substation and line extending across highway would be in full view of travelers.
• Highway travelers	• Foreground/middleground	• Line would be viewed extensively by travelers where it paralleled the highway and crossed it in 2 locations. There would be 6 scenic overlooks along this section of highway where views of the line would be very noticeable.
• Highway travelers	• Middleground	• Line would be viewed by travelers along most of the segments and would be viewed from 2 scenic overlooks.
• Highway travelers	• Middleground/background	• Line would begin to extend away from the highway, with limited viewing potential.
• River recreationists	• Foregound/middleground	• Line would be viewed by recreationists using the river and from a nearby recreation site.
• Recreationists	• Middleground/background	• Line would be viewed mainly by persons using the area for dog sledding activities.
• Highway travelers	• Middleground/background	• Line would be viewed intermittently by highway travelers.
• Highway and railroad travelers	• Middleground/background	• Highway and rail travelers would intermittently view the line in the distance.
• River recreationists, railroad and highway travelers	• Foreground/middleground	• Railroad and highway travelers and river recreationists would be able to view the line extending along and across the Nenana River valley. The line might be seen from various scenic highway turnouts and adjacent to about 8 mi of the Alaska Railroad.
• Highway and railroad travelers and recreationists	• Foreground/middleground	• The line would parallel about 8 to 10 mi of the Parks Highway and Alaska Railroad in a generally open area easily viewed by travelers. The line could also be viewed from 2 scenic turnouts and 2 recreation sites within 1 to 3 mi of the transmission route.
• Rail travelers and river recreationists	• Foreground	• Direct view of line extending over Alaska Railroad and Nenana River.
• Residents and highway and railroad travelers	• Foreground/middleground	• Healy Substation and associated transmission lines and towers would be highly visible to local residents and highway and rail travelers. Local residents would also be able to view line extending into the Sugar Loaf Mountain area.
• Occasional back-country recreationists and hunters	• Foreground/middleground/background	• No significant site-specific impacts anticipated for ground-level viewers. However, tour and hunting guide services feel line would disrupt aerial views for hunters and tourists. Occasional back-country recreationists and hunters would be able to view the line from various vantage points within the Sugar Loaf Mountain area.
• River recreationists and boaters	• Foreground/middleground	• Rafters would view line extending across the Yanert River valley area.
• Residents and tourists	• Middleground	• Line segment within the river valley would be visible from McKinley Village.
• Residents and highway and railroad travelers	• Foreground/middleground	• Travelers and residents would view line in Carlo Creek area.
• Highway and railroad travelers	• Foreground/middleground	• Highly visible at times to highway travelers as the line paralleled the highway and Panorama Mountain throughout Windy Pass. Little vegetation screening present.
• Windy Pass residents, highway and railroad travelers, river boaters	• Foreground/middleground	• Line would be visible to highway and rail travelers and Nenana River boaters.

Table M-6. Continued.

Landscape Character Type (LCT)†[1]	Transmission Line Segment	Viewpoints
7. Broad Pass LCT	• Segment extending over Nenana River and across Reindeer Hills, Denali Highway, and Jack River	• Cantwell area
	• Paralleling Summit Lake area within 1 mi	• Summit Lake area
	• Extending along and then crossing the Middle Fork of the Chulitna River	• Broad Pass valley
	• Extending within 1 mi of the Broad Pass community and paralleling Parks Highway and the Alaska Railroad	• Community of Broad Pass
8. Chulitna River Valley LCT	• Segment extending across the East Fork of the Chulitna River and then paralleling the bank of the river	• East Fork Chulitna River
	• Paralleling the Parks Highway (within ½ to 1 mi)	• Forks campground/rest area
	• Extending along the Parks Highway and crossing Honolulu Creek	• Honolulu Creek area
	• Paralleling the Parks Highway (within 1 mi) and crossing Hurricane Gulch, then extending south between Chulitna Butte and the Chulitna Mountains	• Hurricane Gulch area
9. Chulitna Moist Tundra Uplands LCT	• Segment extending through Chulitna Pass area within ½ mi of the Alaska Railroad and crossing the Indian River near the community of Chulitna	• Chulitna Pass area
10. Mid-Suitna River Valley LCT (northern section)	• Extending south, crossing the Susitna River and extending in a southwesterly direction near the Susitna River toward Gold Creek	• Susitna River area
	• Extending to the Gold Creek Substation	• Gold Creek area
DAMS-TO-GOLD CREEK SEGMENT		
11. Mid Susitna River Valley LCT (central section)	• Extending from Gold Creek Substation toward Devil Canyon Dam within the Susitna River Valley	• Susitna River area
12. Devil Canyon LCT	• Extending across the Susitna River to the east of Portage Creek in the Devil Canyon area	• Devil Canyon dam area
13. Chulitna Moist Tundra Uplands LCT	• Extending in a northeasterly direction on the tundra uplands past the High Lake area to Devil Creek, extending across the upper portion of Devil Creek and then east toward the Watana dam area	• Upland Tundra area
14. Susitna River LCT	• Extending across Tsusena Creek and terminating at the Watana dam substation	• Watana dam area
GOLD CREEK-TO-ANCHORAGE SEGMENT		
15. Mid-Susitna River Valley LCT (southern section)	• Segment extending from the Gold Creek Substation in a westerly direction parallel to the Susitna River and crossing Gold Creek toward the Talkeetna Uplands area	• Susitna River area

Viewers Affected	Viewing Distance†[2]	Visual Resource Impact
• Residents, highway and railroad travelers	• Foreground/middleground	• Line would be in full view of Denali Highway travelers, residents of Cantwell, and from along Old Airport Road. Views of towers and cleared right-of-way as line extended over Reindeer Hills.
• Highway and railroad travelers	• Middleground	• Views from train would be directed toward lines.
• Highway and railroad travelers	• Background	• Line would be viewed from highway and railroad where it extended across the Chultna River valley.
• Residents, highway and railroad travelers	• Foreground	• Line would be viewed from the Broad Pass community area.
• River recreationists	• Foreground	• Line would be viewed by recreationists using the E. Fork of the Chulitna River.
• Highway travelers, campers, recreationists	• Foreground	• Line would be viewed from rest area because of limited screening.
• Highway and railroad travelers	• Foreground/middleground	• Because of proximity of line and scattered vegetational screening, the line would be viewed from portions of Parks Highway (proposed scenic designation) and the Alaska Railroad.
• Highway and railroad travelers	• Middleground	• Hurricane Gulch is an outstanding natural feature viewed by travelers along the Parks Highway pulloff. Cleared right-of-way would be viewed from pulloff area.
• Residents and railroad travelers	• Foreground	• Line would be in view of Chulitna residents and Alaska Railroad travelers because of sparse vegetational screening at high elevations.
• Boaters and recreationists	• Foreground/middleground	• Line would be viewed by numerous river boaters and recreationists traveling along the Susitna River, causing a disruption in the natural river boating experience.
• Residents and railroad travelers	• Middleground	• Occasional views of the line by Gold Creek residents and rail travelers would occur where vegetational screening is inadequate.
• Watana and Devil Canyon dam project personnel	• Foreground/middleground	• Line would be viewed by Watana and Devil Canyon personnel along the entire rail access route.
• Devil Canyon dam project personnel and recreationists	• Foreground/middleground	• Line would be viewed by Devil Canyon dam personnel and by recreationists visiting the dam site and traveling to the High Lake Lodge area.
• Watana and Devil Canyon dam project personnel and recreationists	• Foreground/middleground	• Line would be viewed by Devil Canyon and Watana dam personnel and by recreationists traveling along the access road.
• Watana and Devil Canyon dam project personnel, residents, and recreationists	• Foreground/middleground	• Line would be viewed by Watana dam personnel, Watana settlement residents, and recreationists and others visiting the Watana dam site.
• Back-country recreationists	• Background	• Line would be viewed by recreationists in the back-country area of Gold Creek.

Table M-6. Continued.

Landscape Character Type (LCT)†[1]	Transmission Line Segment	Viewpoints
16. Talkeetna Mountains (Lowlands and Uplands) LCT	• Below Gold Creek extending in a southwesterly direction toward Deadhorse and Lake creeks and then extending in a southerly direction toward Chunilna Creek	• Curry Ridge
	• Extending across Chunilna Creek in a southerly direction toward the Talkeetna River and extending to the west of Mama Bear and Papa Bear Lakes	• Chunilna Creek area
17. Susitna River Lowlands LCT	• Segment extending across the Talkeetna River	• Talkeetna River area
	• Passing within ⅛ mi of the southwestern corner of Larson Lake and extending across Answer, Montana, and Goose creeks	• Larson Lake area
	• Extending between the community of Caswell and Caswell Lake and crossing Caswell Creek	• Caswell Residential area
	• Extending across the Kashwitna River and paralleling the Parks Highway and Alaska Railroad (within 1 to 2 mi)	• Kashwitna River area
	• Extending to Healy Substation†[3]	• Willow Substation and Fish Hook-Willow Road
	• Extending across the Alaska Railroad and Parks Highway toward proposed Willow Creek recreation area	• Willow Creek Bridge
	• Extending in a southerly direction from Parks Highway and bisecting proposed Willow Creek Recreation Area	• Existing and proposed Willow Creek Recreation Area
	• Extending through the lowlands to the west of the Nancy Lake State Recreation Area	• Iditarod Trail crossings (and other trail crossings)
	• Extending through the Susitna Flats State Game Refuge and toward Pt. McKenzie and the Knik Arm of Cook Inlet	• Little Susitna State Recreation River crossing
18. Anchorage LCT	• Segment extending from Knik Substation to Alaska Railroad crossing	• Knik Bottomland area
	• Extending from north of Anchorage, around the Fort Richardson area, along the Glenn Highway, Muldoon and Tudor streets, terminating at the Anchorage Substation	• Anchorage area

†[1] Landscape character types are described in Tables M-2 and M-3.

†[2] Viewing distances are: (1) Foreground = 0-¼-½ mi, (2) Middleground = ¼-½--3-5 mi., (3) Background = 3-5 mi.--infinity (U.S. Forest Service, 1973). Viewing distance characteristics are discussed in Section M.2, Table M-1.

†[3] Transmission line would essentially parallel the proposed Anchorage-Fairbanks transmision line from Healy (located within the Nenana Uplands LCT) to Willow (located within the Susitna River Lowlands LCT).

Conversion: To convert miles to kilometers, multiply by 1.61.

Source: Adapted from Exhibit E, Supplemental Information, Chap. 8, Comment 7.

Table M-6. Continued

Viewers Affected	Viewing Distance†[2]	Visual Resource Impact
• Back-country recreationists	• Background	• Line would be in full view from Curry Ridge in Denali State Park, adversely impacting the views of back-country recreationists.
• Recreationists	• Foreground/middleground	• Heavy vegetation cover might limit views of line extending across the creek. However, views would occur where the line extended across trails and waterways leading to local residences. Also, visual impacts could occur where the line extended across southeastern corner of the Chase II, Unit IV subdivision and for land parcels near where the line would bisect the West Talkeetna Bluffs addition.
• Boaters and river recreationists	• Foreground/middleground	• The line would be highly visible to boaters and river recreationists as it extended across the Talkeetna River, considered an important recreational resource.
• Lake recreationists	• Foreground/middleground	• Line would be within ¼ mi of the southern portion of Larson Lake and would be viewed from the water and the proposed Larson Lake development area; line would also be viewed as it extended upward along a ridge, silhouetted against the Alaska Range.
• Residents	• Middleground	• Line would be within 1 mi of Caswell.
• Water recreationists	• Foreground	• Line would be visible along a short segment of the river. In general, dense vegetation covering the area would minimize visual impacts.
• Residents and highway travelers	• Foreground/middleground	• Substation and transmission line would be visible in the Willow area, especially at residences along Fish Hook-Willow Road due to lack of vegetational screening.
• Highway and railroad travelers	• Middleground	• In general, vegetation would screen the line from highway and rail travelers except from certain angles over open bog areas and where the line extends across Willow Creek.
• Recreationists	• Foreground/middleground	• Line would be located to the north of the existing Willow Creek Recreation Area and would extend through a major portion of the proposed recreation area.
• Recreationists	• Foreground/middleground	• Line would be in full view of persons using the Iditarod Trail, as well as 6 other recreation trails within the area.
• Recreationists	• Foreground/middleground	• Line would be viewed by recreationists using the Little Susitna River.
• Railroad travelers	• Foreground	• Line would be adjacent to the Alaska Railroad for about 3 mi and would cross it.
• Urban residents, highway travelers, recreationists	• Foreground	• Line would be viewed from roads, residential areas, and recreation areas along about 5 mi of Glenn Highway, the access road to the Arctic Bowl recreation area, the borders of Ft. Richardson and Elmendorf Air Force Base, and Muldoon and Tudor streets.

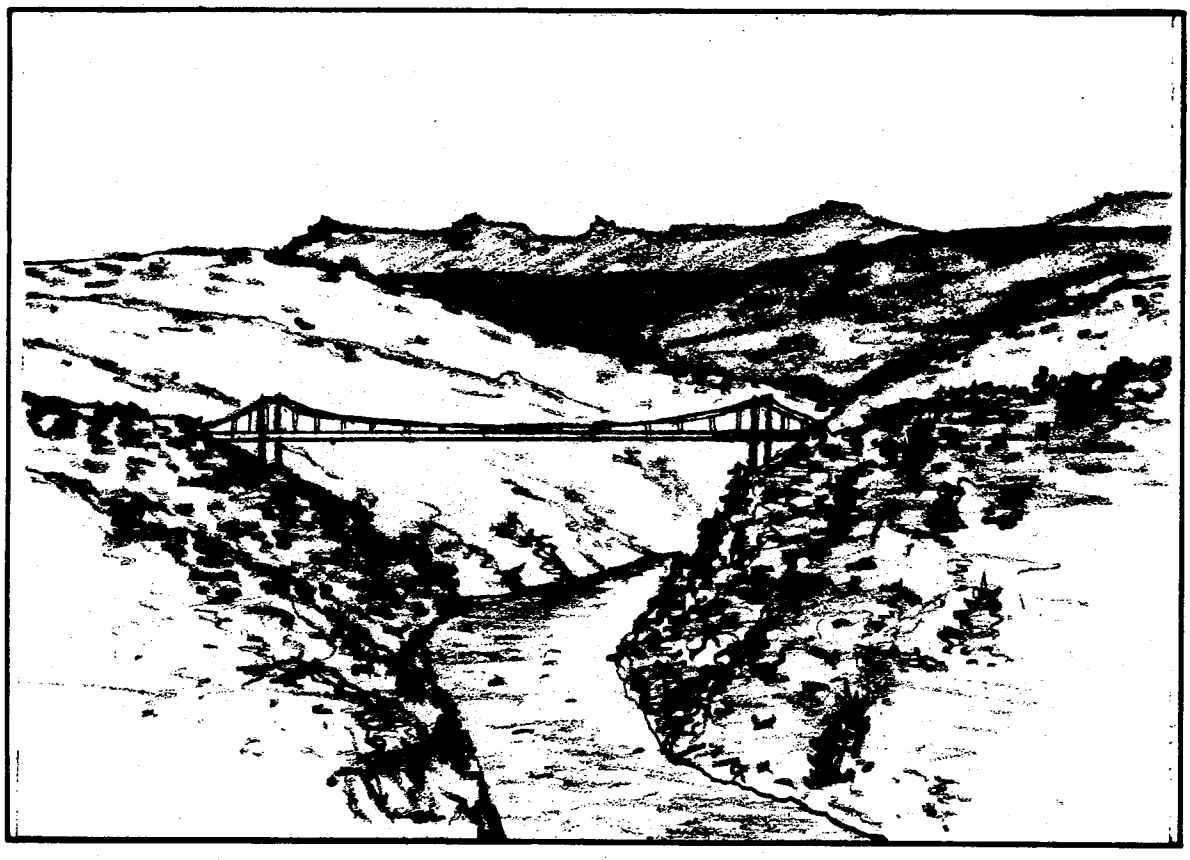


Figure M-17. Artist's Rendition of the Proposed Devil Canyon High-Level Suspension Bridge. [Source: Exhibit E, Vol. 8, Appendix E8B]

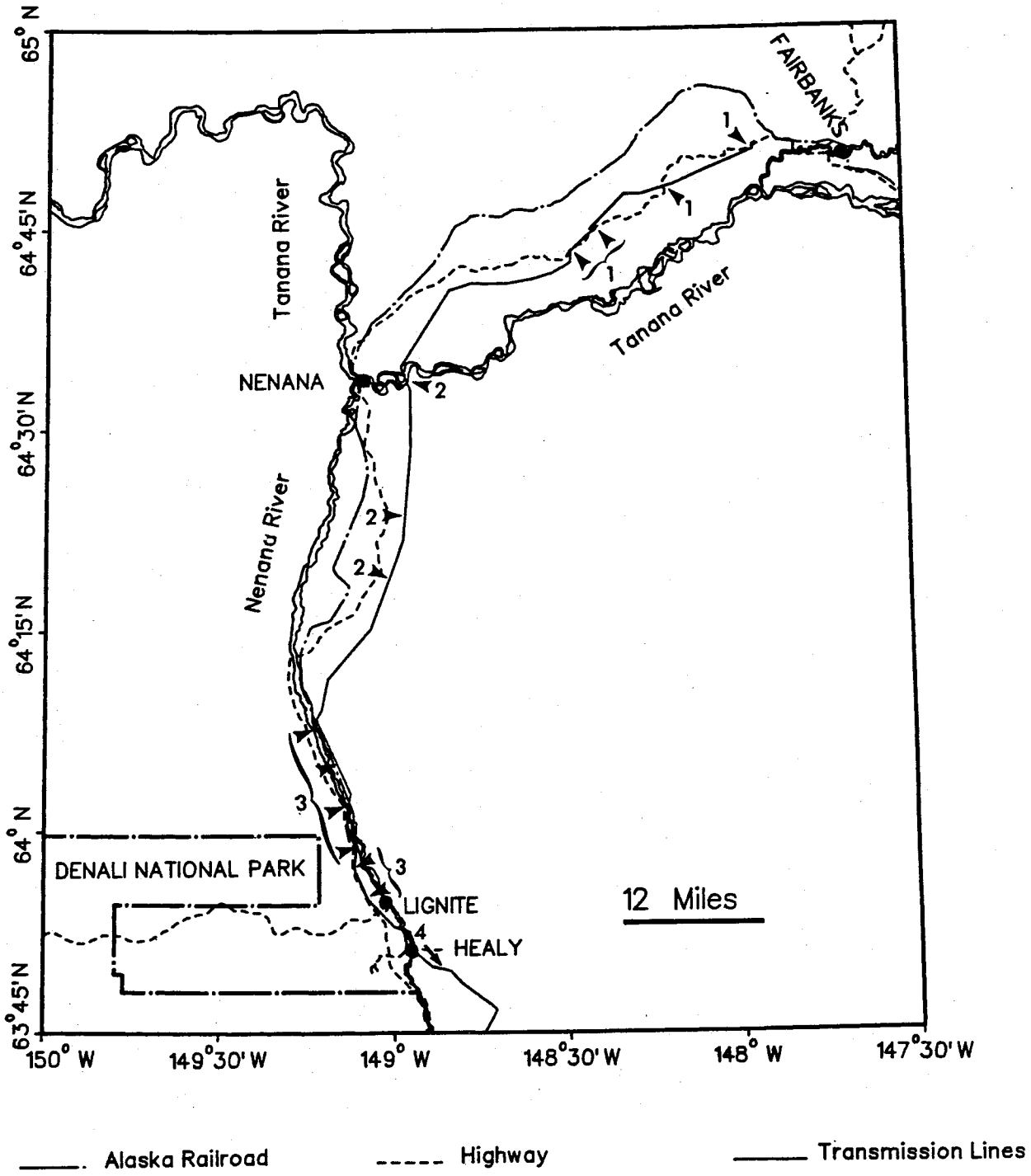


Figure M-18. Significant Views and Visual Resource Impacts Along the Proposed Fairbanks-to-Healy Transmission Line Segment. (Numbers are keyed to landscape character types listed in Table M-6. Arrows indicate general direction of view.)

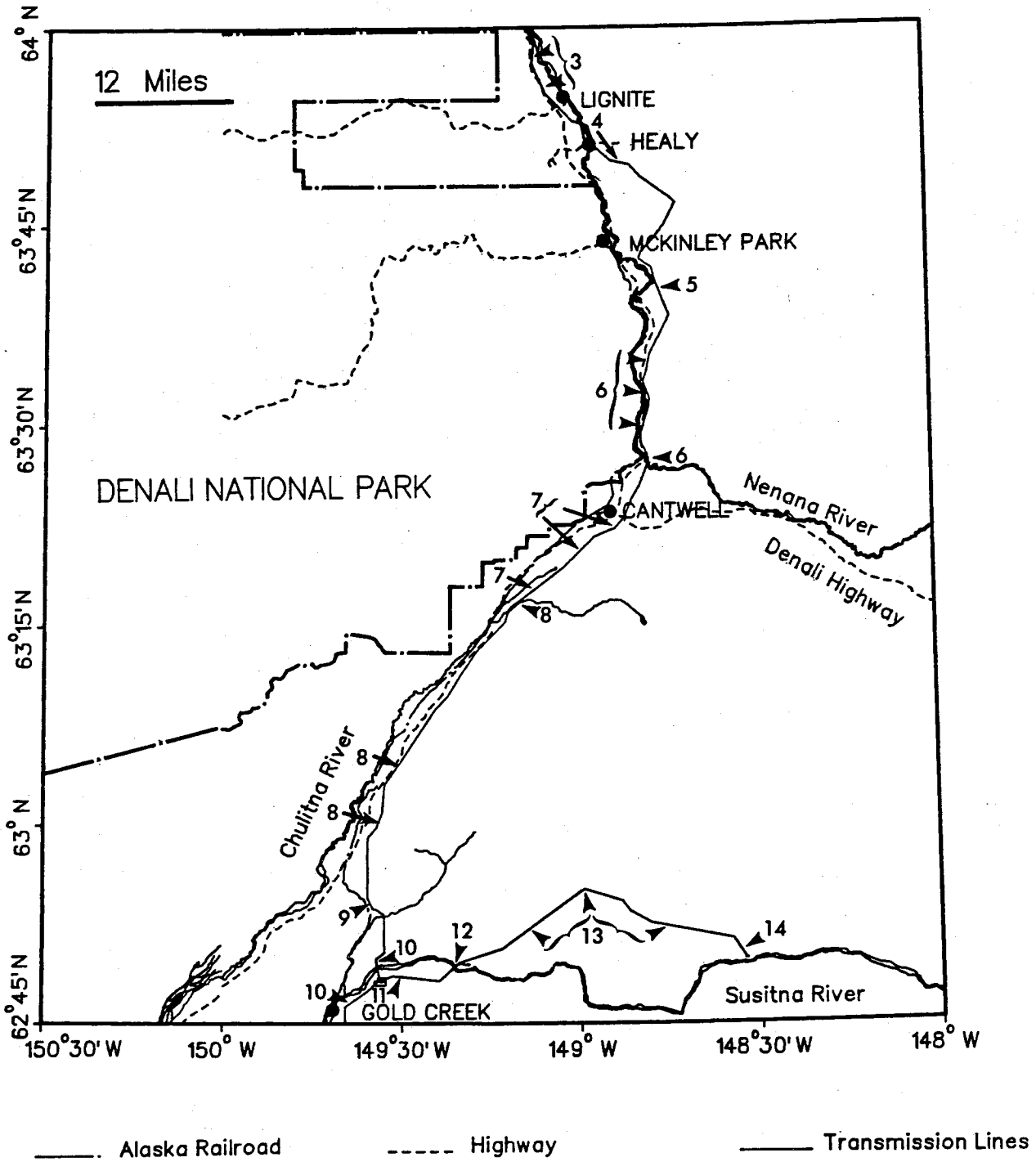


Figure M-19. Significant Views and Visual Resource Impacts Along the Proposed Healy-to-Gold Creek and Dams-to-Gold Creek Transmission Line Segments. (Numbers are keyed to landscape character types listed in Table M-6. Arrows indicate general direction of view.)

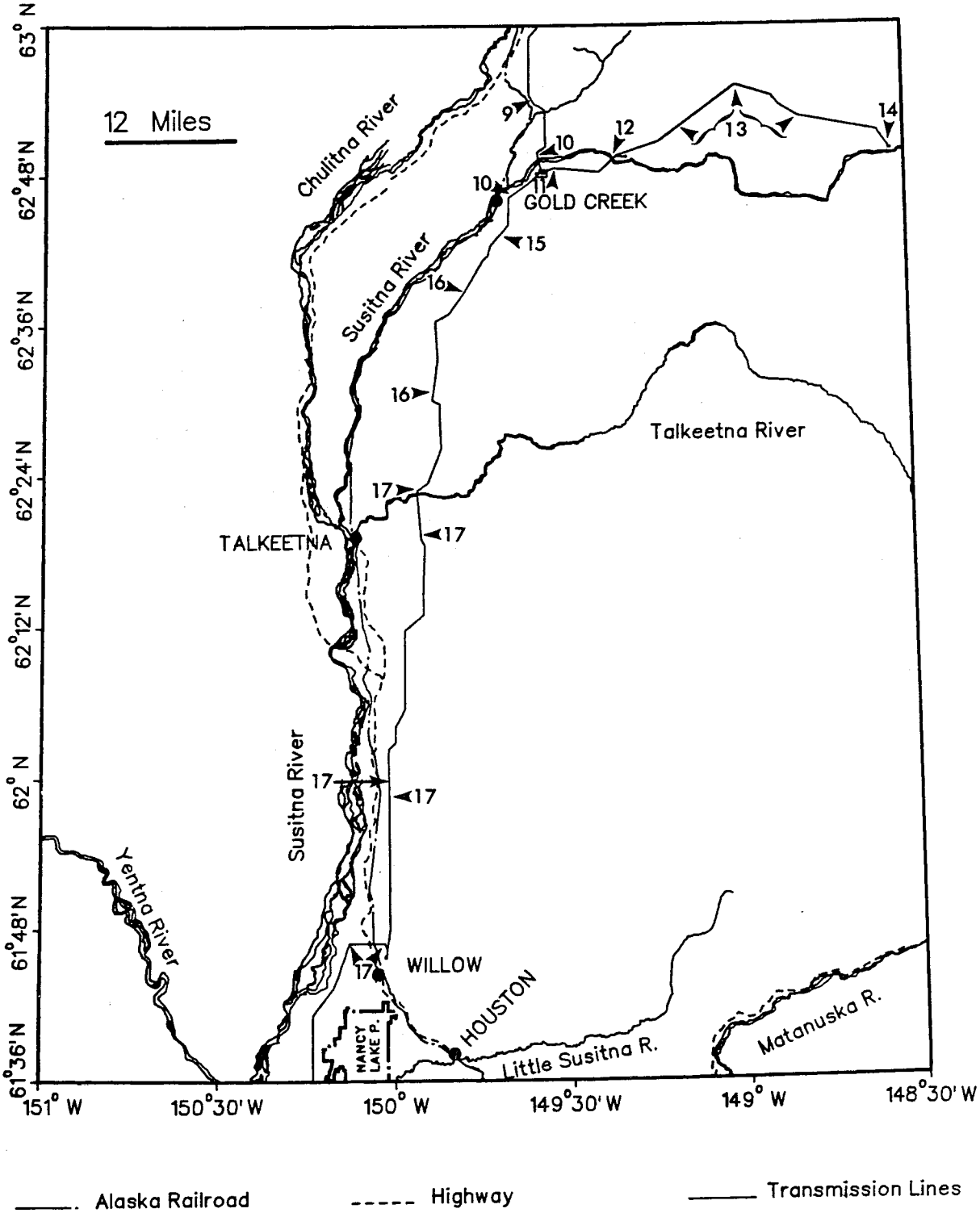


Figure M-20. Significant Views and Visual Resource Impacts Along the Proposed Gold Creek-to-Willow Transmission Line Segment. (Numbers are keyed to landscape character types listed in Table M-6. Arrows indicate general direction of view.)

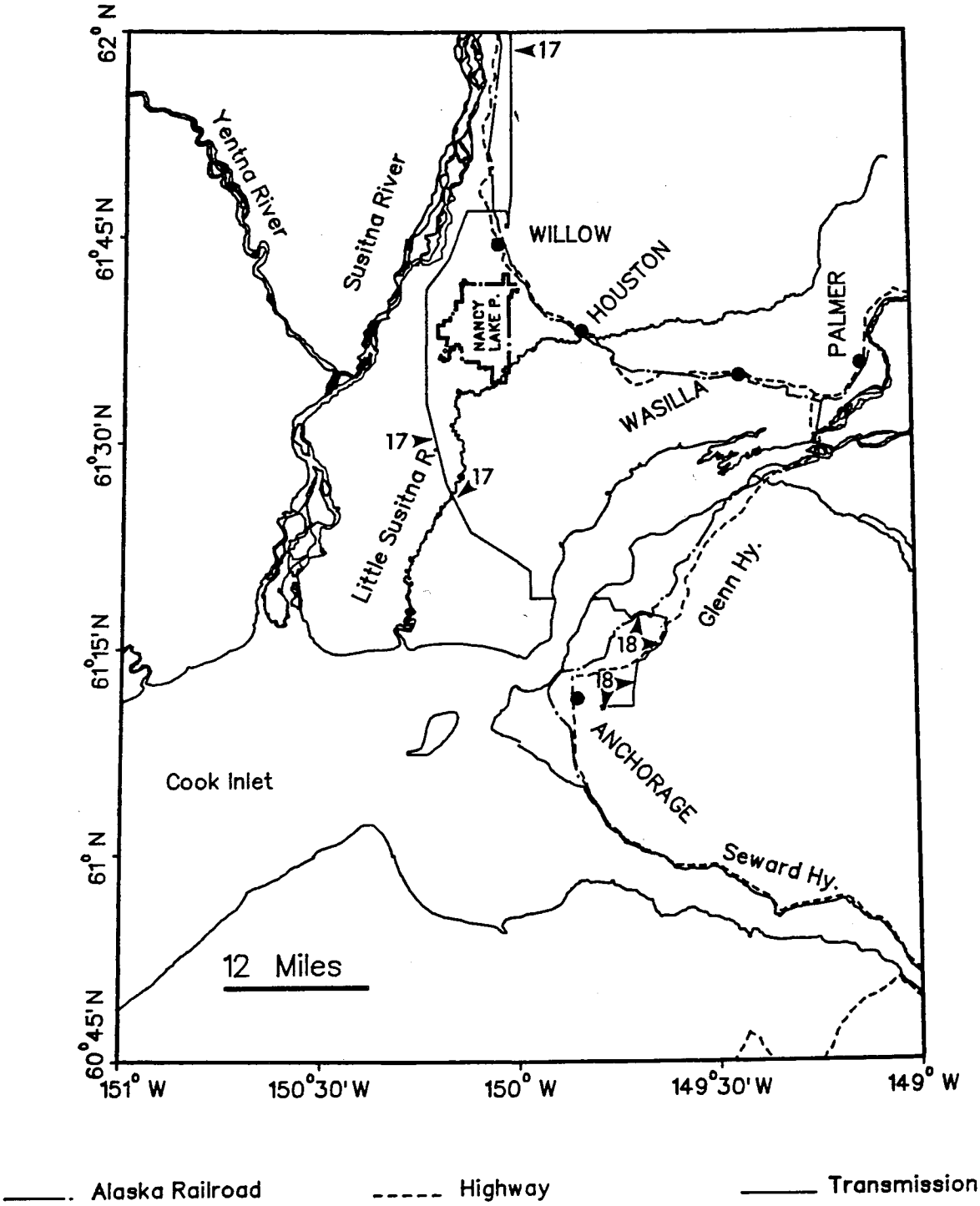


Figure M-21. Significant Views and Visual Resource Impacts Along the Proposed Willow-to-Anchorage Transmission Line Segment. (Numbers are keyed to landscape character types listed in Table M-6. Arrows indicate general direction of view.)

Figure M-22. Aerial View of Existing Transmission Line Similar in Size and Tower Design to that of the Proposed Susitna Transmission Line System. [Source: Exhibit E, Vol. 8, Appendix E8D, Photos 8.D.11 and 8.D.12]

M.3.1.4.3 Gold Creek-to-Anchorage Segment

The transmission line segment extending 145 mi (233 km) from the Gold Creek substation to the terminus point in Anchorage would consist of the same type of tower structures as discussed in Section M.3.1.4.2. The right-of-way clearing would be 400 ft (120 m) wide. Between Gold Creek and the Willow substation, the proposed transmission line would parallel the Anchorage-Fairbanks Transmission Intertie, and thus visual impacts caused by the Susitna project tower and line placement would be only incremental in nature. A completely new right-of-way would be required from the Willow substation to the terminus point in Anchorage.

Major visual resource impacts between Gold Creek and Anchorage would include those in the Talkeetna Mountains landscape area, where the transmission line would be in full view from Curry Ridge in Denali State Park and would be highly visible as it extended across the Talkeetna River, considered to be an important recreation resource within the state. In the Chulitna River landscape area the transmission line would be visible from the George Parks Highway. Between Willow and Anchorage, the transmission line corridor would be visible mainly from the air. Within the greater Anchorage area, from the Knik Arm to the terminus point, the transmission line would essentially parallel an existing transmission line and would not significantly affect the visual resources of the area. Views of the transmission line and specific visual impacts in relation to those views are shown in Figures M-20 and M-21 and described in Table M-6.

M.3.2 Susitna Development Alternatives

M.3.2.1 Alternative Dam Locations and Designs

The construction and operation of alternatives involving Watana I, the Reregulating dam and Modified High Devil Canyon would result in essentially the same type of visual resource impacts discussed in Sections M.3.1.1 and M.3.1.2. These facilities would produce a significant change in the image and character of the upper and middle Susitna River Basin area, especially in the Susitna River Valley and Devil Canyon landscape character types. The dam structures, associated facilities, and reservoirs would modify the visual character of the area from that of a remote and largely undisturbed river valley and canyon area to one of greater human activity, development, and disturbance. In addition, the High Devil Canyon alternative would inundate Tsusena Falls (Exhibit E, Vol. 9, Chap. 10, Table E.10.19).

M.3.2.2 Alternative Access Routes

Construction activities along the northern and southern alternative access routes would result in temporary visual disturbances similar to those discussed in Section M.3.1.3. In addition, a temporary low-level bridge across the Susitna River would be required during the construction phase of the southern alternative route. Construction activities and the disturbance of the natural landscape would be viewed by construction personnel, occasional recreationists in the area, and individuals flying over the access routes. In a similar fashion to the proposed access route, the alternative routes would require cut and fill operations, vegetation removal, and borrow areas that would result in long-term visual impacts due to land scarification.

In particular, the 48-mi (77-km) northern access route alternative (Corridor 1) would impact the natural landscape from Hurricane (along the George Parks Highway), across the Indian River, parallel to the scenic Portage Creek area at a high elevation, and across the tundra uplands toward the Watana Dam site area crossing Devil and Tsusena Creeks. The 7-mi (11-km) Devil Canyon road spur (to serve the proposed Devil Canyon Project) would extend across mountainous terrain and result in extensive sidehill cutting in the Portage Creek area.

The southern access route alternative (Corridor 2) would consist of a 12-mi (19-km) railspur generally paralleling the south side of the Susitna River between Gold Creek and Devil Canyon, a 35-mi (56-km) access road from the Devil Canyon damsite area to the Watana damsite and a 20-mi (32-km) road from the Devil Canyon damsite to the George Parks Highway near Hurricane. The road portion of the alternative route would make a southerly loop away from the Susitna River Valley and then extend across the Susitna River at a point approximately 12-mi (19-km) downstream of the Watana damsite. This access route would result in visual resource impacts from extensive sidehill cutting in the rugged area between the two damsites and the need for a low-level bridge across the Susitna River. In a similar fashion as discussed for the northern alternative route, visual impacts would also occur from the construction and operation of an access road and high level suspension bridge from the Devil Canyon damsite to the George Parks Highway near Hurricane. The suspension bridge would require extensive grading and disruption of natural landforms.

As discussed previously in Section M.3.1.3, new access routes in the upper and middle Susitna River Basin would provide for panoramic views from the highway at the expense of detracting from the natural scene for recreationists in the area.

M.3.2.3 Alternative Power Transmission Line Routes

Temporary visual impacts during the construction of any of the alternative transmission line route segments [including those identified by Wakefield (1983)] would be similar to those described in Section M.3.1.4. Sensitive viewing areas that might be impacted by the long-term, permanent placement of transmission line right-of-way support towers, conductors, access roads, and substation facilities along the various alternative transmission route segments are described in Table M-7. The transmission line route segments are shown in Figures 2-14 through 2-16.

M.3.2.4 Alternative Borrow Sites

Seven borrow sites and three quarry sites are being considered for dam construction materials (Figs. 2-2 and 2-6). In general, the visual resource impacts caused by the establishment of a borrow area are described in Sections M.3.1.1 and M.3.1.2. In particular, six of the borrow areas (A, C, D, E, F, and H) would be visually degraded in appearance because of the scarification of natural features caused by the removal of vegetation, gravel, rock, and overburden. Also, two borrow areas located along Tsusena Creek (Site C) and adjacent to Fog Creek (Site H) would require the construction of haul roads, further degrading views of the surrounding natural features. Four borrow areas (B, I, J, and L) would be eventually inundated by the Watana and Devil Canyon Reservoirs, resulting in no long-term visual impacts.

M.3.3 Non-Susitna Generation Alternatives

M.3.3.1 Natural-Gas-Fired Generation Scenario

Each of the 200-MW combined-cycle units and the 70-MW combustion-turbine units in the natural-gas-fired generation scenario would consist of a main power plant building and associated support structures on about a 5-acre (2-ha) site. Specific visual resource impacts would depend on the actual siting location of the plant facilities within the proposed Beluga, Kenai, and Anchorage areas. Potential viewers impacted might include highway motorists, recreationists, or local residents. Impacts might occur from views of the plant structure, smokestack [about 75 ft (23 m) high], any hazard warning lights (e.g., strobes) located on the stack, and depending on cooling tower design and atmospheric conditions, water vapor plumes emanating from the cooling towers. If wet-dry cooling towers are used, no significant vapor plumes are anticipated. In addition, visual impacts might occur along the gas line and power transmission line right-of-ways that would be necessary to connect the power plant with existing utility facilities. However, it is anticipated that the proposed power plants would be located within 10 mi (16 km) of existing utility systems thereby minimizing the potential for significant visual impacts.

Table M-7. Significant Views and Visual Resource Impact Areas Along the Alternative Power Transmission Route Segments

Route Segment	Length (Miles)†[1]	Visual Resource Impact Area
Northern Study Area (Fairbanks-to-Healy)		
1. ABC (Proposed Route)	90	3 crossings of Parks Hwy.; Nenana River - scenic area
2. ABDC	86	3 crossings of Parks Hwy.; high visibility in open flats
3. AEDC	115	1 crossing of Parks Hwy.; high visibility in open flats
4. AEF	105	High visibility in open flats
Central Study Area (Upper and Middle Susitna River Basin)		
1. ABCD	40	Fog Lakes; Stephan Lake; proposed access road
2. ABECD	45	Fog Lakes; Stephan Lake; proposed access road; high country (Prairie & Chulitna Creek drainages) and viewshed of Alaska Range
3. AJCF	41	Viewshed of Alaska Range and High Lake; proposed access road
4. ABCJHI	77	Fog Lakes; Stephan Lake; proposed access road; viewshed of Alaska Range
5. ABECJHI	82	Fog Lakes; Stephan Lake; High Lake; proposed access road; viewshed at Alaska Range
6. CBAHI	68	Fog Lakes and Stephen Lake; proposed access road; Tsusena Butte; viewshed of Alaska Range
7. CEBAHI	73	Fog Lakes and Stephen Lake; proposed access road; high country (Prairie-Chunilna Creeks); Tsusena Butte; viewshed of Alaska Range
8. CBAG	90	Fog Lakes; Stephen Lake; access road; scenic area of Deadman Creek; viewshed of Alaska Range
9. CEBAG	95	Fog Lakes; Stephen Lake; proposed access road; high country (Prairie and Chunilna Creeks); Deadman Creek; viewshed of Alaska Range
10. CJAG	86	High Lakes area; proposed access road; Deadman Creek drainage; viewshed of Alaska Range
11. CJAHI	69	High Lakes area; proposed access road; viewshed of Alaska Range
12. JA-CJHI	70	High Lakes area; proposed access road; Tsusena Butte; viewshed of Alaska Range
13. ABCF	41	Fog Lakes; Stephan Lake; proposed access road
14. AJCD (Proposed Route)	41	Viewshed of Alaska Range and High Lake; proposed access road
15. ABECF	45	Fog Lakes; Stephan Lake; proposed access road; high country (Prairie and Chunilna Creeks drainages); viewshed of Alaska Range
Southern Study Area (Willow-to-Anchorage)		
1. ABC'	73	Iditarod Trail; trail paralleling Deception Ck.: Gooding L. Birdwatching area; 5 crossings of Glenn Hwy., 1 crossing of Parks Hwy.
2. ADFC (Proposed Route)	38	Susitna Flats Game Refuge; Iditarod Trail; 1 crossing of Parks Hwy.
3. AEFC	39	Lake area south of Willow; Iditarod Trail; 1 crossing of Parks Hwy.

†[1] Conversion: To convert miles to kilometers, multiply by 1.61.

Source: Adapted from Exhibit E, Vol. 9, Chap. 10, Tables E.10.21, E.10.22 and E.10.23.

M.3.3.2 Coal-Fired Generation Scenario

The three 200-MW coal-fired units in the Nenana area and two 200-MW units in the Willow area would probably be visually obtrusive in relation to their surrounding environment and proximity to scenic highways, waterways, and recreation areas. Because of the proximity of the Denali National Park and Preserve and other scenic resources, the Nenana area would be significantly impacted by the construction and operation of three 200-MW coal-fired units. Also, the residential and recreational areas surrounding Willow would be adversely impacted by views of the two 200-MW coal-fired units there.

Coal-fired generation plants would produce many of the same visual resource impacts as discussed in Section M.3.3.1. In addition, the coal power plant would require additional plant structures, coal unloading facilities, reserve coal piles, and waste disposal areas. Stack height would be between 400 and 500 ft (120-150 m) high and very visible to nearby viewers. Depending on atmospheric conditions, the steam plume emanating from the stack would vary from being non-existent to several hundred feet in length during the summer and up to 1 mi (1.6 km) during the winter months. Also, visibility downwind from the plant would be adversely impacted by haze layers created from stack emissions. Besides the visual impacts within the proximity of the plant sites, additional visual impacts might occur as the result of disturbing lands for strip mining coal and solid waste disposal. However, it is anticipated that lands disturbed for coal extraction or waste disposal would eventually be revegetated, minimizing the long-term visual impact to the surrounding landscape.

M.3.3.3 Combined Hydro-Thermal Generation Scenario

Visual resource impacts of dam facilities, access routes, borrow areas, and power transmission facilities at the various out-of-basin alternative hydro sites would be similar to those discussed in Section M.3.1. In particular, the Browne site would detract from the visual resources of the Nenana River Valley. At the Keetna site two scenic areas, Sentinel Rock and Granite Gorge, would be inundated. Although the Snow and Johnson sites would not impact any designated scenic areas, they would result in the presence of man-made facilities in an area of high aesthetic quality and essentially natural, undisturbed areas. Long-term visual impacts at the Chakachamna site are expected to be minimal since no dam structure would be constructed. Visual resource impacts from the thermal facilities of this scenario have been discussed in Sections M.3.3.1 and M.3.3.2.

M.3.4 Comparison of Alternatives

M.3.4.1 Susitna Development Alternatives

The construction and operation of alternatives involving the Watana I, Reregulating dam, and Modified High Devil Canyon dam would essentially result in the same type of visual resource impacts as the proposed Watana and Devil Canyon dams. Each of the alternative dam facilities would produce a significant change in the image and character of the upper and middle Susitna River Basin area, especially in the Susitna River Valley and Devil Canyon landscape character types. The dam structures, associated facilities, and reservoirs would modify the visual character of the area from that of a remote and largely undisturbed river valley and canyon area to one of greater human activity, development, and disturbance.

Construction activities along the northern and southern alternative access routes would result in temporary visual disturbances similar to those from the proposed access route. All access routes would require cut and fill operations, vegetation removal, borrow areas, and high-level suspension bridges that would degrade the natural character of the region and be visible during the long-term operation phase of the project. On the positive side, all the alternative routes would provide new access to scenic views for motorists. However, recreationists in the surrounding area viewing the alternative routes might consider the roads and rail spur a visual intrusion detracting from their enjoyment of viewing a natural landscape. Neither of the alternative access routes or the proposed route are clearly preferable.

The visual resource impacts for each of the alternative power transmission route segments for the northern, central, and southern corridor areas are described in Section M.3.2.3. In the northern study area, alternative routes AEF and AEDC have more potential for disrupting back country views because of their length, extending through the Healy Creek and Wood River valleys, and extending across the extensive open flat area south of Fairbanks. In general, the transmission line corridor segments within the central study area extending along Deadman Creek and the Denali Highway, Tsusena Creek and Jack River, and Devil Creek and Jack River would produce greater significant impacts within the Chulitna Mountains and tundra uplands than the proposed and alternative corridor segments extending west from the dam sites to the Gold Creek area. These segments would detract from the natural setting in areas planned to be developed for recreation purposes. Also, several of the alternative segments between the dam sites and the Gold Creek area would have greater visual impacts to the existing recreation areas around the Fog Lakes and Stephan Lake area than the proposed transmission route. Within the southern

corridor area, alternative route segments ABC' and AEFC would produce significantly greater visual impacts than alternative segment ADFC or the proposed route. Segment ABC' would be viewed by persons within the Little Susitna River Basin, around the Palmer area, and from the Glenn Highway (Route 1) along the Knik Arm.

Of the ten alternative borrow site areas, four (B, I, J, and L) would be completely inundated and would not cause any long-term visual impacts. The six remaining alternative borrow site areas would be viewed in the long-term. Borrow sites C and H would require extensive haul roads further degrading the views of the surrounding natural features, resulting in greater visual resource impacts to the Susitna River Valley area than the other eight sites.

M.3.4.2 Power Generation Scenarios

Visual resource impacts are highly dependent on the actual siting of the project alternatives with respect to the visual quality of the area, established viewpoints and viewshed areas, and the number of persons residing or traveling through such areas. In general, natural gas-fired generation plants would be less obtrusive and result in fewer visual resource impacts than the larger coal-fired plants or dam alternatives for the reasons discussed in the previous sections.

In particular, the urban Anchorage area would be most suited for additional natural-gas power plant development in relation to minimizing visual resource impacts. Because of the proximity of Denali National Park and other scenic resources, the Nenana area would be significantly impacted by the construction and operation of three 200-MW coal-fired power plant units. The residential and recreational areas surrounding the Willow area would also be adversely affected by views of plant facilities and associated haze layer created by the operation of two 200-MW coal-fired units. Concerning the combined hydro-thermal alternative, Lake Chakachamna would not produce significant long-term visual impacts; however, the remaining hydro units and coal-fired plant in Nenana would produce significant visual resource impacts.

M.4 MITIGATION

M.4.1 Mitigative Measures Proposed by the Applicant

The Applicant's visual resource/aesthetic mitigation plan is designed to reduce or eliminate adverse impacts due to project development. The Applicant states that the emphasis of the mitigation measures is to: (1) avoid critical environments including ongoing site refinements throughout the design phase, (2) use best development practices and site sensitive engineering, and (3) rehabilitation. The applicant has identified four major categories of mitigation which include (1) additional studies, (2) best development practices, (3) creative engineering design, and (4) the use of form, line, color, and texture. These four types of mitigative strategies proposed by the Applicant are described below and in Exhibit E (Vol. 8, Chap. 8, pp. E-8-47 through E-8-59).

M.4.1.1 Additional Study

During the Phase II detailed design process, an interdisciplinary design team would be assembled to resolve the aesthetic impacts. These aesthetic impacts would be further ameliorated through site specific design analysis and development. Aesthetic impacts should be mitigated through siting studies and alternative solutions. These studies would include:

(a) Siting Studies

Siting of facilities would be used to reduce visual intrusion into the existing landscape and minimize requirements for grading and other disruptions. By utilizing local conditions such as topographic changes and vegetation, the inherent absorption capabilities of landscapes could be maximized.

The need for mitigation measures in the facility designs also would be reduced by avoiding particularly sensitive locations such as wetlands, discontinuous permafrost zones and other areas which would require extensive modification.

Siting would be used to maximize the potential for enhancing the aesthetic experience. Examples of this include: facility locations to take advantage of spectacular view opportunities and siting facilities such that they enhance or compliment their setting.

Other specific examples of mitigation through siting might include:

- Facility siting would be used to minimize requirements for clearing or removal of vegetation. Structures should be consolidated as much as possible to disturb the minimum necessary area of ground surface;

- Facility would be sited to avoid thaw-susceptible areas (discontinuous permafrost zones) capable of slumping or thermal erosion;

- Solid waste disposal sites would be located in stable, well-drained locations. Siting would utilize existing excavations such as depleted upland borrow pits. Intermittent drainages, ice-rich soils, or other erosion-susceptible features would be avoided;

- Transmission line additions should be located adjacent to established transmission corridors. Where transmission lines have a common destination, they should follow a common route; and

- Transmission corridors should follow the forest edge as much as possible (i.e., the transition zone between forest and shrub or forest and tundra) versus cutting through dense woodlands. Lines should avoid crossing wetlands.

(b) Alternative Solutions

In some instances the facility chosen to serve a specific project function might not be the design solution which would lease impact the aesthetic resource. This would be considered only in cases where present solutions would be difficult to mitigate even with modifications.

M.4.1.2 Best Development Practices

Construction and rehabilitation, as well as operation policies, are often as important in mitigating facility impacts as is the facilities actual design. Throughout the Susitna project, general development policies which mitigate or prevent impacts would include:

(a) Construction Techniques

- Construction equipment and vehicles would be confined to gravel roads and pads or designated construction zones.

- All off-road or all-terrain vehicles use would be prohibited on the site by individuals.

- Temporary facilities such as roads, construction zones and storage yards would be located to minimize the impacts and therefore the rehabilitation needed.

- Borrow sites would be excavated according to a site priority program developed by the design phase contractor. Those sites which would cause least impacts would be exploited first with the identified sensitive areas utilized last and only if all other sources are exhausted. Material sites would be planned and mined in such a way as to facilitate restoration.

- Abandoned access roads, camp pads, and airstrips would be used wherever feasible as material sources for operations, in lieu of expanding existing sites or initiating new ones.

- Where riprap is required, material produced during excavation of the powerhouse, galleries, and tunnels would be used if feasible.

- Where they are not adjacent to an existing road, transmission corridors should be constructed to avoid unnecessary clearing of vegetation. In tundra location where clearing is not required for access, minimum ground disturbance vehicles such as Roligon or flat-tread Nodwell-type vehicles should be used. Transmission corridor development should avoid creating an alternative access route for all-terrain vehicles. All debris generated by construction activities would be removed after completion.

- Excavation spoil would be disposed of in the future impoundment area of the dam under construction. Where haul distances prohibit this, spoil disposal sites would be placed in stable, well-drained upland locations.

- Limits of construction activity and storage would be defined during the design phase so that vegetation clearing and soil disruption would be minimized. Where removal of vegetation is required, organic overburden should be segregated and stockpiled for use in subsequent rehabilitation.

(b) Rehabilitation Techniques

- Disturbed rock cuts would be roughly blasted to forms similar to existing natural conditions. Construction areas not required for project operation would be phased out as soon as they are no longer required (during the same season, if possible). Restoration should include

scarification and fertilization. Non-operational roads would be structurally altered to restore normal drainage patterns.

- Organic overburden, slash, and debris stockpiled during clearing would be distributed over the excavated areas prior to fertilization. This includes borrow sites which have ponded. Once operational material sites are depleted or no longer required, they should be rehabilitated by the end of the next growing season following last use.

- Equipment, structures, and materials should be removed from a site prior to rehabilitation. The site should be graded to contours which are consistent with surrounding terrain and allow complete drainage with minimal erosion potential.

- Where it can be demonstrated that erosion is not likely to be a problem, restoration should emphasize fertilization and scarification, and minimize seeding, to encourage the invasion of native plans from the surrounding parent population. Where seeding is employed, nature grasses appropriate to the climate and geography of the project area should be used.

(c) Operation Policies

- On project lands, off-road and all-terrain vehicles would be restricted to designated maintenance trails.

- Concurrent with other educational programs for Susitna workers and residents, an organized effort would be made to increase the awareness to the aesthetic environment, i.e., refuse disposal, vandalism and indiscriminate use of fragile environments.

M.4.1.3 Creative Engineering Design

For project facilities that are not compatible with the landscape character type, examples of potential design measures that might be taken include:

- Road profile elevations would be minimized and side slopes made sufficiently gentle to blend into existing contours; and

- To minimize excavation disruption, facility design would minimize gravel requirements by avoidance of wet areas or permafrost zones, structure consolidation, and balanced cut and fill.

M.4.1.4 Use of Form, Line, Color, or Textures

Some aesthetic impacts caused by project facilities could be greatly reduced by modifying their appearance to blend into the surrounding landscape. This should be accomplished by repeating predominant existing conditions such as:

- The colors of soil vegetation or sky;

- Forms of topography such as massive low hills or angular rock cliffs;

- Line: including elements such as the vertical orientation of spruce forests or the horizontal character of a lake; and

- Texture: Existing rough and dull surfaces should be approximated and shiny materials prone to glare avoided.

M.4.2 Additional Mitigative Measures Recommended by the Staff

It is recommended that the applicant adhere to all the measures stated in Section M.4.1. In addition, the Staff recommends that where road and stream crossings occur along the proposed transmission line route, shrubs and trees should be planted and retained as much as possible to prevent a view into the corridor from along such crossing points. To minimize the duration of view and length of the line seen from roadways, crossings should be made at right angles to the roadways wherever possible. H-frame and/or single-pole towers should be used to reduce tower dominance in sensitive viewing areas. Low-profile tower structures should be used (if feasible) in highly visible areas where towers of standard height could be viewed above the treetops. Tower structures should be set as far back from roadways and stream banks as feasible. All transmission line structures should be colored to blend in with the natural background vegetation.

Visual impacts in forested areas can be minimized by selective clearing, leaving as much low growth in the right-of-way as possible, and through additional planting. Tapered clearing of the right-of-way (through tree topping, etc) will soften the edges of the right-of-way, reducing the visual impact. A right-of-way clearing pattern should be developed where feasible to reduce

the straight-line corridor effect. The lines should be routed so that they follow and conform to natural topographic lines as much as possible. In addition, lines should be sited to one edge of a valley or draw and parallel a landform change. Skylining of the lines and towers should be minimized. If a hill must be crossed, it should be crossed at an angle (e.g., side or shoulder of the hill rather than the top). If the proposed lines traverse a prominent viewing area, the lines should be located between the viewing area and a vegetative or topographical screen if feasible.

At the proposed substation locations, any existing trees and vegetation should be left standing to the extent possible to screen the terminal facilities. The terminal facilities should be painted a color that will best blend in with the background vegetation. The height of the transmission line terminating structures should be kept to the minimum safe and practical height.

REFERENCES FOR APPENDIX M

Alaska Department of Natural Resources. 1981. Susitna Basin Planning Background Report. Scenic Resources Along the Parks Highway, Inventory and Management Recommendations. Division of Research and Development. Anchorage.

Alaska Division of Parks. Undated. Nancy Lake State Recreation Area. Alaska State Parks. Anchorage.

Alaska Geographic Society. 1981. Alaska National Interest Lands - The D-2 Lands. Alaska Geographic. Vol. 8, No. 4. Anchorage.

Bechtel Civil and Minerals Inc. 1983. Chakachamna Hydroelectric Project Interim Feasibility Assessment Report. Vol. 1, Sec. 1-10, Appendices to Sec. 4.0 and 8.0, and Vol. II, Appendix to Sec. 6.0. Prepared for the Alaska Power Authority. Anchorage.

Terrestrial Environmental Specialists, Inc. 1982. Susitna Hydroelectric Project, Environmental Studies, Subtask 7.07: Land Use Analysis. Phase 1 Report. Prepared for Acres American, Inc. Buffalo, NY.

U.S. Forest Service. 1973. National Forest Landscape Management. Volume 1. Agricultural Handbook No. 434. Washington, DC.

U.S. Forest Service. 1974. National Forest Landscape Management. Volume 2, Chapter 1. The Visual Management System. Agricultural Handbook No. 462. Washington, DC.

U.S. Forest Service. 1975. National Forest Landscape Management. Volume 2, Chapter 2. Utilities. Agricultural Handbook No. 478. Washington, DC.

Wakefield, W.C., II. 1983. Memorandum from William C. Wakefield II, Susitna Project Manager, Federal Energy Regulatory Commission, to Susitna Advisory Committee. Potential Refinements for the Susitna Hydroelectric Projects. (October 18).