3.0 AFFECTED ENVIRONMENT

3.1 Social and Economic Environment

3.1.1 Land Use

The Alaska Department of Transportation and Public Facilities (DOT&PF) prepared a *Land Use and Coastal Zone Technical Report* in 1995 (revised in 1997) in support of the 1997 Draft EIS. The report has been updated to include changes in land management and land use since 1997 (*Land Use and Coastal Management Technical Report*, Appendix F). Documents reviewed for this update included district coastal management programs and enforceable policies of the district programs and the Alaska Coastal Management Program (ACMP); the current *Tongass National Forest Land and Resource Management Plan* (TLMP) (USFS, 1997b); the most recent community (Juneau, Haines, and Skagway) comprehensive plans and other local government planning documents; State of Alaska land, park, preserve and forest management plans; and current state and federal legislation. Privately produced planning documents for entities such as Goldbelt Incorporated, a Native corporation owning land north of Echo Cove, and Coeur Alaska, a mining company owning land and holding mineral claims on the northwest side of Berners Bay, were also reviewed, as were state fish and wildlife management plans and reports. Additional contacts were made with federal, state, and local officials and private parties to update planning, land management, and land use information. Finally, information from 2003 traffic projections and socioeconomic analyses and a 2003 public survey was incorporated into the description of the affected environment and analysis of potential impacts.

The project area includes federal, state, local, and private lands. Most of the lands are within the Tongass National Forest and are managed by the United States Department of Agriculture Forest Service (USFS). The Klondike Gold Rush National Historic Park (NHP) in Skagway is administered by the United States Department of the Interior National Park Service (NPS).

A majority of the state lands in the project area are within the Haines State Forest along West Lynn Canal and are managed by the Alaska Department of Natural Resources (ADNR) Division of Forestry. Local government lands are managed by the City and Borough of Juneau (CBJ), Haines Borough, and City of Skagway, respectively. Private lands include Native corporation holdings, Native allotments, private commercial, and private residential properties. The principal change in land use in the project study area since preparation of the 1997 Draft EIS is that the City of Haines and the Borough of Haines have consolidated.

Figures 3-1 and 3-2 depict land ownership and coastal management district locations on the northern and southern ends of Lynn Canal, respectively. Primary landowners and managers in the study area are described further below.

3.1.1.1 United States Forest Service

Information in the 1997 Draft EIS was taken from the TLMP of 1979, as amended in 1986 and amended again in 1991 by the Tongass Timber Reform Act of 1990. Information for the Supplemental Draft EIS has been taken from the 1997 revision of the plan.

Most of the lands in the study area are in the Tongass National Forest and are therefore managed by the U.S. Forest Service (USFS). Management direction for these lands is set forth in the most current version of the TLMP (USFS, 1997b). The TLMP guides natural resource decision making in the Tongass National Forest by establishing management standards and guidelines for a variety of activities, based on land use designations (LUDs). Figure 3-3 identifies LUDs within the study area.

Two main LUD categories were established in the TLMP: Non-Development (which maintains old-growth forest habitat) and Development. Each LUD category describes the purpose and objectives of management for each area of the Tongass National Forest and establishes specific constraints for the various uses. Within the Non-Development LUD category are two groups: Wilderness and National Monument, and Mostly Natural. The Development LUD category also consists of two groups: Moderate Development and Intensive Development. Each of these four groups consists of subcategories of LUD designations, which are described below. (Note that not all of these LUDs occur in the Lynn Canal corridor.)

- Wilderness and National Monument
  - **Wilderness** – Preserve essentially unmodified areas to provide opportunities for solitude and primitive recreation. Limit motorized access.
  - **Wilderness National Monument** – Manage monuments to provide opportunities for solitude and primitive recreation. Limit motorized access.
  - **Non-Wilderness National Monument** – Facilitate the development of mineral resources in a manner compatible with the National Monument purposes.
- Mostly Natural
  - **LUD II** – Maintain the wildland characteristics of these Congressionally designated roadless areas; permit fish and wildlife improvements and primitive recreation facilities; and permit roads for access for transportation needs identified by the state as vital linkages.
  - **Old-Growth Habitat** – Maintain old-growth forests in a natural or near-natural condition for wildlife and fish habitat.
  - **Research Natural Areas** – Manage areas for research and education and/or to maintain natural diversity of National Forest System lands.
  - **Remote Recreation** – Provide for recreation in remote natural settings outside Wilderness, where opportunities for solitude and self-reliance are high.
  - **Semi-Remote Recreation** – Provide for recreation and tourism in natural-appearing settings, where opportunities for solitude and self-reliance are moderate to high.
  - **Municipal Watersheds** – Manage municipal watersheds to meet state water quality standards for domestic water supply.
  - **Special Interest Areas** – Preserve areas with unique archeological, historical, scenic, geological, botanical, or zoological values.
  - **Wild, Scenic, and Recreational Rivers** – Maintain and enhance the outstandingly remarkable values of river segments, which qualify a river to be classified as a Wild, Scenic, or Recreational River.
- Moderate Development
  - **Modified Landscapes** – Provide for natural-appearing landscapes while allowing timber harvest and a mix of resource activities, including mineral development.
  - **Scenic Viewsheds** – Maintain scenic quality in areas viewed from popular land and marine travel routes and recreation areas, while permitting timber harvest.
  - **Experimental Forest** – Provide opportunities for forest practices research and demonstration.

- Intensive Development
  - **Timber Production** – Manage the area for industrial wood production. Promote conditions favorable for timber resources and for maximum long-term timber production.
  - **Minerals** – Encourage mineral exploration and development of areas with high mineral potential.
  - **Transportation and Utility Systems** – Emphasize existing and potential major public transportation and utility systems. Until constructed, manage according to the other land use designation indicated.

Note: In awareness and anticipation of the Juneau Access Improvements Project, the TLMP designated the two possible road corridors as Intensive Development – Transportation and Utility Systems.

LUDs on East Side of Lynn Canal – Much of the area around the east side of Berners Bay is designated LUD II and Semi-Remote Recreation. The northwest side of Berners Bay has two areas designated Old-Growth Habitat, located both east and west of Slate Cove; an additional area of Old-Growth Habitat occurs about midway between Comet and Met Point. The Katzehin River is proposed as a Wild River; however, the lower two miles of the river adjacent to Lynn Canal are not proposed Wild in recognition of the potential for a future transportation corridor in this area.

Portions of land along East Lynn Canal extending north from Echo Cove to approximately 4 miles north of Met Point are Tongass National Forest lands designated as Scenic Viewshed (Echo Cove area only) and Modified Landscape; the Modified Landscape lands include some areas of mineral development activity. From approximately 4 miles north of Met Point to north of the City of Skagway, USFS lands are designated Semi-Remote Recreation. The Modified Landscape and Old-Growth Habitat designations west of Berners Bay are overlaid with a Mineral designation.

The congressionally designated LUD II permits roads only for access for authorized uses, for transportation needs identified by the state, or for vital linkages. In 1994, the state sent a letter to the USFS identifying a highway along the east side of Lynn Canal between Juneau and Skagway as a state transportation need (Hickel, 1994). The USFS included the highway alignment as a transportation corridor in the 1997 TLMP.

LUDs on West Side of Lynn Canal – From William Henry Bay north to nearly the Sullivan River, most of the USFS lands are designated Semi-Remote Recreation. The Endicott River Wilderness Area, which lies inland west and northwest of William Henry Bay, is not affected by the project. The lower 2.5 miles of the Endicott River, where the Alternative 3 highway would be located, is outside of the designated Wilderness category area. The land on either side of Alternative 3 in this area is a Scenic Viewshed LUD.

LUDs in the Development category in the West Lynn Canal study area include Scenic Viewshed along the western shore surrounding William Henry Bay and adjoining the lower 3 miles of the Endicott River. USFS lands are designated as Modified Landscape from approximately the Sullivan River to the area of Sullivan Mountain at the boundary with the Haines State Forest. The Modified Landscape designation west of Sullivan Island is partially overlaid with a Mineral designation.

The USFS identified a transportation corridor on the west side of Lynn Canal during preparation of the 1997 TLMP. That corridor was included in the adopted 1997 TLMP.

3.1.1.2 State of Alaska

The State of Alaska owns and manages several state parks, marine parks, and a state forest in the project vicinity. The state also owns and manages most of the tidelands, submerged lands, and navigable waters along Lynn Canal. Specific management guidelines for these lands are set forth in various land management plans. University of Alaska lands and Mental Health Trust lands also lie within the study area.

The state owns the following parcels within the study area (Figures 3-1 and 3-2):

- Point Bridget State Park
- State-owned parcel southeast of Skagway in the area of Devil's Punchbowl
- State-owned parcel north of Skagway in the Twin Dewey Peaks area
- Sullivan Island State Marine Park
- Haines State Forest
- Pyramid Island
- Some parcels of shoreline along Mud Bay Road
- Chilkat State Park

In addition, ADNR owns and manages submerged lands and tidelands throughout the study area, unless conveyed to another entity. Parcels of land owned by other state entities exist within the study area and within alternative corridors. These lands, owned by the Alaska Mental Health Trust and the University of Alaska, are managed to produce revenue for their agencies.

3.1.1.3 Local Government

City and Borough of Juneau – Approximately 3,281 square miles of land are located within the City and Borough of Juneau (CBJ) boundaries, including tidelands and submerged lands. The stated policy of the *Comprehensive Plan 1995 Update* (CBJ, 1996) is to participate as actively as possible in the preparation, review, and approval of any transportation or utility corridor plans or routes undertaken by the state or federal government. The CBJ depends on air and marine transportation because no roads connect the area with other regions of the state and Canada. Strong local support exists for increasing ferry service in Southeast Alaska; improving and expanding air, marine, and highway transportation systems; and participating in studies of road transportation links between Juneau, Southeast Alaska, and Canada. These would expand Juneau's role as a regional center.

Haines Borough – The City of Haines and the third-class Haines Borough consolidated in 2002 to become the Haines Borough, a Home Rule Borough with the same boundaries as the former Haines Borough. The Haines Borough is located on the east and west shores of the Lynn Canal. The borough extends to the Canadian border. The area encompasses 2,344 square miles of land and 382 square miles of water (Alaska Department of Community and Economic Development, 2004).

The Haines Borough adopted an April 2004 Comprehensive Plan to reflect the consolidation. This plan expresses a concern about a Lynn Canal road link to Juneau. The *City of Haines Coastal Management Plan* (HCMP) (City of Haines, 2000) was revised on November 20, 2002, to include newly annexed areas. The HCMP applies to all lands and waters within the original and annexed city limits. The annexed areas are immediately west of the central urban area in Haines and south of the original city limits. The annexed areas encompass a portion of Deshu

Isthmus, including the Chilkat landfall of the West Lynn Canal Highway Alternative 3 route. Areas outside of the former City of Haines limits are governed by the state coastal boundary and the statewide ACMP standards.

City of Skagway – The City of Skagway is a first-class city encompassing a land area of 443 square miles. The southern and western boundaries of Skagway are adjacent to the northern and eastern borders of the Haines Borough. The city's northern and eastern boundaries abut the U.S./Canada border.

Land use within the City of Skagway is guided by *City of Skagway Comprehensive Plan* policies (City of Skagway, 1999), *Skagway Coastal Management Plan* (SCMP) (City of Skagway, 1991) policies, and zoning ordinance regulations. The SCMP focuses primarily on the downtown area, including the current Alaska Marine Highway System (AMHS) terminal area, and notes that continued development in ferry service and scheduling is desirable, including development of fast shuttle ferries (City of Skagway, 1991). The waterfront/port area is designated in the SCMP as an Area Meriting Special Attention (AMSA) [8], which means that the city will manage land uses in this area to prioritize transportation and waterfront industrial and commercial development. The extreme southeast corner of the Skagway River AMSA (shown in Figure 3-4) could also be affected by the Juneau Access Improvements Project.

City-owned land in the study area includes a parcel surrounding Lower Dewey Lake that was conveyed from the state in 1995.

3.1.1.4 Private Lands

The area of Berners Bay was traditionally used by the Auk Tlingit. The land north of Point St. Mary on the east side of Lynn Canal was traditionally used by the Chilkat Tlingit as was much of the west side of Lynn Canal. As explained above, most of this land is now managed by the USFS and the State of Alaska. Sealaska, the regional Native corporation for southeast Alaska, owns a parcel of land north of Sawmill Cove. Goldbelt, a Native corporation based in Juneau, owns 1,382 acres in the study area surrounding Echo Cove. In 1996, Goldbelt prepared the Echo Cove Master Plan and the USFS circulated an EIS for a proposed access highway from Echo Cove to Cascade Point in Berners Bay. The USFS completed a Record of Decision in 1998. Goldbelt has received USFS special-use permits and a U.S. Army Corps of Engineers (USACE) 404 permit for construction of the proposed highway.

One Native allotment application lies along the proposed alignment of Alternatives 2, 2B, and 2C; seven certified allotments and allotment applications lie near the proposed alignment of the West Lynn Canal Highway. The Central Council Tlingit and Haida Tribes of Alaska administers Native land allotments for the Bureau of Indian Affairs.

Other private lands are clustered at several locations throughout the study area (Figures 3-1 and 3-2) and include mines and patented mining claims (Kensington Gold Project) and private homesteads.

3.1.1.5 Land and Resource Uses

Current land and resource uses in the study area include commercial/industrial, recreational, residential, and public. Commercial/industrial uses include timber harvest, mineral exploration, commercial fishing, commercial guiding and outfitting, and commercial charter fishing.

[8] AMSAs are specific areas designated under the ACMP that are sensitive to change or alteration and possess unique physical, cultural, or biological characteristics.

Recreational uses include sport and personal use fishing, hunting, boating, camping, wildlife viewing, and other recreational activities.

Timber Harvest – Some USFS lands and Haines State Forest lands are potentially available for timber harvest. Because no changes in timber harvesting have taken place since 1997 and no timber harvests are proposed in any of the five- or 10-year plans for lands within the study area, the following description of timber harvest from the 1997 Draft EIS is still relevant:

> Throughout Lynn Canal, timbered areas are limited to the shorelines and the major river valleys. Historically, commercial timber harvest has been an important industry in Southeast Alaska but it has been in decline for several years.

Haines currently supports a small sawmill, which is mainly used to cut cedar for locally produced hot tubs.

Mineral Development – The study area lies within a large mineral region known as the Juneau Mining District. The district has been a highly productive mineral area since 1869, producing large quantities of gold, silver, and lead. The proposed routes for Alternatives 2 through 2C and Alternative 3 run through this area of mineral occurrences, prospects, claims, and historic and current mines. The Juneau Mining District consists of five geographical subareas: Haines-Klukwan-Porcupine, Glacier Bay, West Lynn Canal, Juneau Gold Belt, and Coast Range. Portions of each subarea except Glacier Bay are within the Juneau Access Improvements study area.

The Kensington Gold Project is located just north of Berners Bay within CBJ boundaries and the Tongass National Forest. Coeur Alaska, Inc., the managing company for the Kensington Gold Project, acquired the Jualin gold prospect in 2001. Coeur Alaska recently completed its Supplemental EIS, developed agreements with state and federal agencies, and expects to receive all necessary permits for mine operation in 2005. Construction could begin in 2005, and mine operation could begin in 2006. The Kensington Gold Project has an expected life of 10 years, although additional ore discovery could extend the operating life of the mine. The monitoring and reclamation phase following mine closure is expected to last five years (Coeur Alaska, Inc., 2004).

Commercial Fishing – Commercial fishing has historically been an important element of the economy of Southeast Alaska. Although market and other considerations have reduced profits in the salmon industry, commercial fishing continues to be a valuable contributor to the Juneau economic and employment base and an important sector of the Haines economy. Commercial fishing has not been substantial in the Skagway economy. Only three Skagway residents hold commercial fishing licenses. Salmon, halibut and other groundfish, and shellfish (crab and shrimp) are the targeted species for Lynn Canal commercial fishing.

Lynn Canal supports commercial salmon drift gill net and troll fisheries. Berners Bay and the Chilkat River and lakes system are productive fish-rearing areas that contribute to these fisheries. To a lesser degree, the study area also supports halibut and groundfish longline fisheries and crab and shrimp pot fisheries.

Recreation, Sport Fishing, and Hunting – The Lynn Canal area has high recreational value and annually attracts thousands of Alaskans and visitors from all over the world. Because most of the study area lies within the Tongass National Forest, recreation in the region is affected by USFS management decisions. The 1997 Draft EIS included the following description of recreation, which is still pertinent:

Recreation in Lynn Canal is primarily water-based because of limited access. Boating is both a recreational activity and a means of transportation for other recreational pursuits, such as camping, hunting, hiking and kayaking. Berners Bay is a popular recreation area, which is accessible from a public boat launch at Echo Cove. Tent and recreational vehicle camping occur in urban outskirt areas and in developed campgrounds. A public recreation cabin, managed by the [USFS], is located [8 miles] north of Echo Cove.

Hiking occurs primarily on trails built and maintained by federal, state, and local government agencies and a few private, nonprofit groups. These trail systems are generally in road accessible areas within and around the communities of Juneau, Haines, and Skagway.

Wildlife viewing is an important recreation activity for residents and visitors, especially viewing marine mammals, such as seals, sea lions, porpoises, and whales. Gran Point, located south of the Katzehin River, is the site of a Steller sea lion haulout, a popular viewing location. Seabirds and ducks are abundant in the area. Terrestrial mammals such as brown bears, black bears, and mountain goats can also be seen.

Sport fishing is extremely popular. Surveys have found that boating and sport fishing have higher participation rates in Southeast than in any other region of Alaska.

Hunting is a relatively minor activity in Lynn Canal. The most productive valleys for wildlife are around Haines and Skagway, Berners Bay, William Henry Bay, Katzehin River and the Endicott Wilderness Area. Species harvested include brown bear, black bear, wolf, moose, Sitka black-tailed deer, mountain goat, waterfowl, ptarmigan, and grouse.

Other recreational activities in the study area include flight seeing, eagle viewing at the Alaska Chilkat Bald Eagle Preserve, wildlife viewing, camping, hiking, kayaking, canoeing, and jet and air boating. Marine and freshwater sport fishing is extremely popular in Lynn Canal. Shellfish, including red and blue king, Tanner, and Dungeness crab, and shrimp are also harvested for sport.

3.1.1.6 Parks and Recreation Facilities

Many municipal, state, and federal parks and public recreation areas are located within the study area. The City of Skagway has two public parks: Pullen Creek Shoreline Park and Molly Walsh Park (Figure 3-5). State parks include Point Bridget State Park, Sullivan Island State Marine Park, Chilkat State Park, Chilkoot Lake State Recreation Site, Portage Cove State Recreation Site, and Chilkat Island State Marine Park (Figures 3-1 and 3-2). The United States Park Service manages the Klondike Gold Rush National Historical Park in the Skagway area (Figure 3-5). The USFS has a public use recreation cabin in Berners Bay (Figure 3-2) and a day use area at Sturgill's Landing south of Skagway (Figure 3-4).

The Lower Dewey Lake area is a popular hiking/picnicking destination and trail hub and is owned by the City of Skagway (Figure 3-5). The area has many trails connecting to Sturgill's Landing, Icy Lake, Upper Reid Falls, Upper Dewey Lake, and Devil's Punchbowl.

3.1.1.7 Residential, Commercial, Industrial, and Public Facilities

City and Borough of Juneau – From the Auke Bay Ferry Terminal north to the end of the highway at Echo Cove, Glacier Highway is an arterial highway designed to accommodate traffic at steady speeds. The land use designations in the CBJ Comprehensive Plan vary from Rural Dispersed Residential, General Commercial, Resource Development, and Waterfront Commercial to Recreation Resource Area around Berners Bay (CBJ, 1996). Land use surrounding Echo Cove, including the mouth of Sawmill Creek, is designated for Resource

Development. The CBJ has designated the Goldbelt land near Echo Cove as New Growth (CBJ, 1996). Goldbelt has completed a master plan for Goldbelt lands in the area.

Haines Borough – Active management within the Haines Borough boundaries takes place only within the former City of Haines boundaries (now called the Townsite Planning Zone) and in former City of Haines Coastal Management AMSAs. All other areas of the Borough fall under the general use zoning district, until zoned otherwise. Traffic from a West Lynn Canal Highway that would be directed onto Mud Bay Road would be within the Development Zoning District of Mud Bay/Tlingit & Haida and includes single-family residential, multifamily residential, recreation, and public institution land uses (City of Haines, 2000).

City of Skagway – The City of Skagway is in the design stage of a $4 million project to move the existing seawall 50 feet into the harbor and add new uplands for pedestrian access, additional boat harbor parking, and a city park. The focus of the project is to better manage existing pedestrian, vehicle, and train traffic in the area. The area is within the waterfront zoning district, and it is zoned Waterfront Industrial. Future land use for this area, as established in the "Skagway Future Growth Plan" (City of Skagway, 1999), is also industrial. Current land use is a mixture of water-related commercial and industrial activities, pedestrian paths and amenities, shops and restaurants, small boat harbor uses, a staging area for the city transfer bridge, and the Pullen Creek picnic area. The Lower Dewey Lake area is zoned Residential-Conservation and allows for low-density residential development, natural resource development, conservation-dispersed recreation, seasonal recreational lodges and cabins, and other facilities.

3.1.1.8 Coastal Zone Management

Provisions of 15 CFR 930 require the preparation of a consistency statement to ensure that proposed federal actions and projects requiring federal permits that could potentially affect the coastal zone are consistent with the federal Coastal Zone Management Act of 1972 and approved local coastal zone management programs. The agency with federal consistency review authority for projects with the potential to affect coastal resources or coastal uses in Alaska is the Alaska Department of Natural Resources (ADNR).

Development activities, such as the construction of a highway or ferry terminal that affects any coastal use or resource that requires federal or state authorization, must be consistent with the Alaska Coastal Management Plan (ACMP), including statewide standards and the enforceable policies of local coastal district plans. Lands owned or managed by the federal government are excluded from the coastal zone. However, all uses and activities on excluded federal lands that affect the coastal area must be consistent with ACMP policies and provisions of Section 307 of the Coastal Zone Management Act of 1972, as amended.

The ACMP identifies uses of state concern, including "facilities serving statewide or interregional transportation and communication needs" (AS 46.40.210[8]). The Juneau, Skagway, and Haines coastal management programs all adopt this or a similar definition of uses of state concern. All proposed project alternatives are considered a "use of state concern" and, as such, may not be arbitrarily or unreasonably restricted by local coastal management districts. The Federal Coastal Zone Management Act regulations (15 CFR 923) direct state coastal programs to assure that district policies do not unreasonably restrict or exclude uses of regional benefit.

Three coastal districts are within the area traversed by the proposed project alternatives: CBJ, City of Skagway, and City of Haines within the Haines Borough (Figures 3-1 and 3-2). Each community has an approved district coastal management plan containing enforceable policies that apply to activities within their coastal area boundaries. These local enforceable policies were incorporated into the ACMP at the time of program approval or amendment. In addition, the City of Skagway coastal management plan includes four approved AMSAs; however, only

the Skagway River AMSA would potentially be affected (Figure 3-4). No AMSAs within the CBJ would be affected by the project. Any of the proposed project alternatives selected for construction must comply with the statewide standards of the ACMP under Title 6, Chapter 80 of the Alaska Administrative Code (AAC) and coastal district coastal management plans.

Key subject areas of the ACMP that are applicable to the type of activities potentially associated with the Juneau Access Improvements Project are briefly summarized below. The full text of the ACMP statewide coastal standards is presented in the *Land Use and Coastal Management Technical Report* (Table A-2, Appendix F).

- Coastal Development
- Geophysical Hazard Areas
- Recreation
- Transportation and Utilities
- Timber Harvest and Processing
- Mining and Mineral Processing
- Subsistence
- Habitats
- Air, Land, and Water Quality
- Historic, Prehistoric, and Archeological Resources

3.1.2 Visual Resources

Landscapes within Lynn Canal are predominantly natural and undisturbed, and contain a wide range of visual resources. The area is characterized by steep mountainous terrain topped with rugged peaks, sheer rock faces, glaciers, and icefields. The upper elevations along the canal range from approximately 5,000 to 7,000 feet. The moderate to steep slopes along Lynn Canal are largely covered by undisturbed, dense coniferous forest. Rivers or braided streams, wetlands, or glaciers (e.g., Davidson Glacier) occasionally break through the forested landscape, creating spectacular and visually diverse landscapes. In some areas, the rocky coastline of the canal is visible, which provides a distinct contrast to the dramatic mountains and icefields in the background. Within Lynn Canal, several low-elevation islands (e.g., Sullivan Island and Chilkat Islands) have been rounded by the extreme erosional forces found in the canal valley.

Weather conditions of Lynn Canal also play an important role in the visual character of the area. During frequent periods of low clouds and rain, most, if not all, of the spectacular scenery surrounding the canal becomes invisible or severely obscured. Conversely, on bright, clear days, the views are unforgettable and unparalleled within the region. The contrasting colors, shapes, and textures of the surrounding environment visible on these days further highlight the extraordinary visual quality of the area.

The 1997 Draft EIS included the following description of visual resources. Because there has been little change in the area, this information is still relevant.

> Important landscape resources on the east side of the Lynn Canal include: Berners Bay and Lions Head Mountain; the Kakuhan Range north of Comet; a Steller sea lion haulout at Gran Point; the Katzehin River delta and valley area; and the eastern shore of Taiya Inlet. On the west side, the major landscape areas are the Chilkat Mountain Range along William Henry

Bay, the Endicott River, Sullivan Island, the narrow drainage valleys west of Sullivan Island, and the Davidson Glacier area. The Forest Service has rated many of these areas as visual variety Class A to denote distinctiveness. This rating is often associated with avalanche chutes, braided streams, steep slopes with rock outcrops, glaciers, and scenic shoreline features.

The majority of the viewers are cruise ship and ferry tourists, local travelers, and recreational users. The view perspectives are from the air and waters of Lynn Canal. The entire coastline of Lynn Canal is considered an area of high visual sensitivity.

The Forest Service has established Visual Quality Objectives (VQOs) for each of the LUDs in the TLMP. These VQOs are categorized as follows (from most protective to least): retention, partial retention, modification, and maximum modification.

The Retention VQO provides for land management activities that are not visually evident. Management activities should only repeat the form, line, color, and texture found in the existing landscape.

The VQO for Partial Retention provides for management activities that remain visually subordinate to the characteristics of the existing landscape. These management activities may change visual qualities of the landscape but do not create man-made features that visually dominate the landscape.

Under the Modification VQO, land management activities can visually dominate the original characteristics of the landscape. However, facilities should borrow from naturally established form, line, color, and texture to blend with the natural landscape. For transportation projects, rock quarries should be designed and located to minimize the apparent visual size and dominance of the activity.

The VQO for Maximum Modification allows management activities of vegetative and landform alteration to dominate the landscape. When viewed in the background, the visual characteristics of these activities should blend with the surrounding landscape.

As mentioned in Section 3.1.1.1, a transportation utility corridor has been designated on both the east and west sides of Lynn Canal. If a highway is constructed on either corridor, the corridor would become a Transportation and Utility Systems LUD. The VQO for this LUD is Modification.

The VQO for much of the study area is Partial Retention, but large areas also have a VQO of retention. Retention areas include the head of Berners Bay, Comet area, Katzehin River valley, William Henry Bay shoreline, several valley mouths on the west side of Lynn Canal, the east shore of Sullivan Island, and the east shore of Taiya Inlet. The Endicott River Wilderness Area has a VQO of Retention.

The USFS Juneau Ranger District staff helped develop the methodology used in the analysis, which incorporated the steps outlined below. This methodology is consistent with the visual impact assessment performed for the 1997 Draft EIS and allows the visual effects of project alternatives to be compared to the visual quality objectives of the TLMP, since most of the land traversed by highway alternatives is within the Tongass National Forest.

Classification of Existing Landscapes – Landscapes within the viewshed (or visual sphere of influence) of project alternatives were inventoried by variety class and existing visual condition. These are qualitative measures of a landscape's inherent scenic value (variety class) and the level of noticeable human-made visual change in the natural landscape setting (existing visual

condition). In addition, the following analyses were conducted to predict the magnitude of impact and to compare the level of impact within the Tongass National Forest with USFS VQOs.

- **Visual Absorption Capability Analysis** – The visual absorption capability analysis characterizes landscapes in terms of their ability to accept human alteration without loss of landscape character or scenic condition. Visual absorption capability levels were integrated with variety class and visibility factors to estimate potential visual impacts of highway alternatives on sensitive viewers and visual quality.
- **Consistency Analysis** – Changes to the visual resource resulting from project alternatives were compared to TLMP VQOs and ACMP districts' visual resource policies.

For additional information on the visual resource assessment methodology, see the *Visual Resources Technical Report* (Appendix G).

Existing travel routes and use areas in Lynn Canal and along the east and west shoreline were inventoried and considered in the visual resources assessment. Landscape units consisting of areas with similar scenic qualities (i.e., variety class) were grouped together to facilitate the discussion of the inventory and assessment results. In clear weather, each area is typically seen from Lynn Canal as a whole unit, combining views of the water, shoreline, mountainsides, and rock features at higher elevations in the overall setting. The major landscape units on the east and west sides of Lynn Canal used for this analysis and the characteristics of those units are listed below.

3.1.2.1 East Lynn Canal

Berners Bay – This bay is almost three miles wide and opens to Lynn Canal on its western side. It has distinctive enclosing mountainsides and a varied coastline, ranging from rocky shore to extensive wetlands at the mouths of the Lace and Antler rivers that flow into the bay. Federal lands have a VQO of Retention, and the USFS manages the eastern shoreline of Berners Bay as a scenic viewshed.

Point St. Mary to Eldred Rock – Lynn Canal ranges from five to eight miles wide in this area. Slopes along the shoreline are moderate on both sides of the canal and have uniform forest cover. Federal lands have a VQO of Retention and Partial Retention.

Eldred Rock to Mount Villard – This area encompasses the Chilkoot Inlet corridor and is about 2 to 3 miles wide. The low hills of the Chilkat Peninsula and islands form the western side, and precipitous mountainsides, interrupted only by the one-mile-wide mouth of the Katzehin River valley, form the eastern side. Federal lands in this area have several VQOs. Most of the area is classified as Partial Retention with a small area north of Eldred Rock classified as Modification. Views that include the mouth of the Katzehin River and the area east of Anyaka Island are classified Retention. The area at about midslope of Sinclair Mountain is classified Maximum Modification.

Mount Villard to Skagway – This area encompasses a linear narrow marine corridor about one mile wide with uniformly steep mountains on both sides. These mountains offer distinctive views of cascading streams, talus slopes, and colorful rock formations. The steep topography flanking the narrow Taiya Inlet tends to funnel views up and down the inlet.

The USFS has established a VQO of Partial Retention for forested lands under its management in this area. This VQO recommends that facilities remain visually subordinate to the natural landscape. From Kasidaya Creek south to Mount Villard, federal lands have a VQO of Retention. In the USFS Retention VQO, facilities should not be visually evident.

3.1.2.2 West Lynn Canal

William Henry Bay to Sullivan Island – This area encompasses William Henry Bay north through the straits west of Sullivan Island. The straits are one to two miles wide with steep mountainsides to the west. This area encompasses the mouth of the Endicott River with the Endicott River Wilderness Area further upstream. The topography north and south of the river delta is relatively rugged and mountainous with closed terrain. Visible glacier fields are rare. Federal lands have a VQO of Retention and Partial Retention primarily at the mouths of the Endicott and Sullivan rivers.

Sullivan Island to Chilkat – This area encompasses the Chilkat Inlet corridor. It is approximately three miles wide and includes views of the forested Chilkat Peninsula and islands to the east and the rugged mountainsides and glaciers of the Chilkat Range to the west. There are no USFS lands in this area; therefore, there are no federal VQOs.

3.1.3 Historical and Archeological Resources

Section 106 of the National Historic Preservation Act, as amended (16 USC 470f), requires federal agencies with jurisdiction over a project (including federal assistance to state projects) to identify and evaluate affected historic properties, assess the project's effect upon them, and afford the Advisory Council on Historic Preservation the opportunity to comment on the project if there would be an adverse effect on an historic property. Historic properties are defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (16 USC 470w[5]).

A literature review completed in 1994 as part of the initial scoping process for the Juneau Access Improvements Project identified a number of known and reported prehistoric and historic sites along both the eastern and western shores of Lynn Canal that could be affected by project alternatives. Archeological inventories were undertaken in 1994 and 2003 to confirm the existence of reported sites, locate previously undiscovered sites, and evaluate the significance of these properties. The archeological research in both years was guided by a research design previously adapted by the Alaska Region of the USFS. An Area of Potential Effect (APE) of approximately 164 feet on both sides of the alternative alignment centerlines including potential terminal locations (a 328-foot-wide corridor) was assessed for cultural resources. Areas with a high potential for past human occupancy (e.g., river and stream mouths, shoreline benches below 100 feet in elevation, and areas of less than 25 percent slope) were surveyed on the ground. Areas with a low potential for past human occupancy received a reconnaissance-level survey using shoreline observations from a boat and a review of aerial photography. The State Historic Preservation Officer (SHPO) was consulted and concurred that the APE and field methodology were applicable for the cultural resource inventories conducted for the proposed project.

Additional archeological fieldwork was performed during the fall of 2003 and spring of 2004, to more accurately locate previously discovered sites and to evaluate new areas potentially affected by revised alternative highway alignments and potential ferry terminal sites. In September 2003, formal tribal consultation letters were sent to 11 area tribes and Native organizations. No potential traditional cultural properties were identified within the Juneau Access Improvements Project APE.

In 1994 and 1995, formal determinations of National Register of Historic Places (NRHP) eligibility were prepared for sites within the APE, and determinations were made of the potential effect of the project on historic properties eligible for the NRHP. Additional properties in the project area were determined eligible by the USFS in 2004. Formal determinations of NRHP

eligibility were also prepared by FHWA for three additional sites within the project study area in 2004.

The APE on the east side of Lynn Canal crosses three historic mining districts eligible for the NRHP: the Berners Bay, Jualin, and Comet/Bear/Kensington historic mining districts (Figure 3-6). The APE passes near a fourth district, the Ivanhoe/Horrible Historic Mining District. The Berners Bay Historic Mining District encompasses the material remains of historic mining activities that took place in the Juneau Mining District from the 1870s to 1944 and contain sufficient integrity to convey that significance. The Berners Bay Historic Mining District includes three smaller districts. Many of the material remains are located in these three smaller historic mining districts.

The contributing elements of the Jualin Historic Mining District are linked with the history of the Jualin Mine operations. The identified elements consist of the Jualin Mine Wharf, Lower Jualin Mine Camp, Upper Jualin Mine Camp, and Jualin Mine Tram. Only one contributing element from this district, the Jualin Mine Tram, is located in the APE for Alternatives 2, 2B, and 2C.

The Comet/Bear/Kensington Historic Mining District includes mining properties that are connected in several ways, including common claim ownership and shared use of mining structures. Identified contributing elements to this district are the Comet/Bear/Kensington Millsite, Comet/Bear/Kensington Railroad, Comet Mine, Comet Mine Tram, Bear Mine, and Kensington Mine. Only one contributing element from this district, the Comet/Bear/Kensington Railroad, is located in the APE for Alternatives 2 through 2C.

The Ivanhoe/Horrible Historic Mining District reflects the connections between two stamp mills, three tramways, and two mines that were developed through changing claim ownership. Contributing elements to this district are the Mellon Millsite, Portland Millsite, and Lynn Canal Company Horrible Mine Tram. The District has two separate areas. The APE passes between these two areas but no part of either area is within the APE of any alternative.

The Dayebas Creek Sawmill site is located in the APE for Alternatives 2, 2A, and 2C. This site consists of a shipway, two areas of mill-related debris, and a penstock running parallel to Dayebas Creek. This sawmill embodies patterns of features, such as its location, a pelton wheel, and other associated objects, that were common to late nineteenth and early twentieth century sawmills along Lynn Canal. Although the site possesses little structural integrity, it does have potential as a historical archeological site to provide information on the character and development of the area's sawmills; therefore, it is eligible for listing in the NRHP (Ballard 1994 and Bittner 1995). This site is in the project's APE.

The Skagway Hydroelectric Complex District located at Lower Dewey Lake is another NRHP-eligible historic district crossed by the APE on the east side of Lynn Canal. Contributing elements of the district include the Lower Dewey Lake Dam, the reservoir, pipelines, power plant, hoist building, and tramway. The pipelines, tramway, and hoist building are in the APE for Alternatives 2, 2A, and 2C.

The Lower Dewey Lake Trail begins at a bridge across Pullen Creek and runs east/southeast toward Lower Dewey Lake. The Lower Dewey Lake Trail (Figure 3-5) is an historic route from the trailhead to the junction where the trail splits into the Upper Dewey Lake Trail, the Sturgill's Landing Trail, and the Lower Dewey Lake Circuit Trail. The eligible portion of the trail ends near the northern end of Lower Dewey Lake at the junction point. The trail is in the APE of Alternatives 2, 2A, and 2C. The trail is visible in a 1903 photograph of Skagway, and older rockwork supports some of the switchbacks.

The Skagway and White Pass District National Historic Landmark (NHL) extends from the Skagway harbor to the Canadian border at White Pass summit. This NHL includes the historic Skagway townsite, which has 152 contributing buildings; a log cabin and wharf built in 1897; the White Pass and Yukon Route railroad built between 1898 and 1900; and cliffside painting east of the White Pass Dock, known as the Ships Registry, dating back to 1918. The only listed NHL-contributing element in the APE for Alternatives 2, 2A, and 2C is the railroad alignment near State Street and 23rd Avenue.

The Klondike Gold Rush NHP was established in 1976 to commemorate the gold rush of 1897 to 1898. The park is listed in the NRHP and includes 14 blocks of downtown Skagway, also designated by the City of Skagway as the Skagway Historic District. No elements of the Klondike Gold Rush NHP are within the APE of any of the project alternatives.

On the west side of Lynn Canal, the only NRHP-eligible site within the APE of the proposed project is the Dalton Trail (Figure 3-1). The 305-mile Dalton Trail was built in 1896 and was the longest of three access routes from Lynn Canal to the Klondike goldfields. The trail began at Pyramid Harbor and stretched to British Columbia and the Yukon Territory. The part of the trail crossing Green Point north of Pyramid Harbor is within the APE for Alternative 3.

On September 28, 2004, FHWA submitted determinations of eligibility for historic properties within the APE and requested concurrence by the SHPO. On October 19, 2004, the SHPO concurred with the FHWA determinations of eligibility but recommended a different width for the Dalton Trail (see correspondence in Chapter 7).

3.1.4 Socioeconomic Resources

3.1.4.1 Juneau

Based on the 2000 Census (U.S. Census Bureau, 2000), approximately 31,000 people reside in the CBJ. The population of Juneau has increased by 128 percent since 1970. This is an average annual rate of growth of 2.9 percent. The 1990s had a much slower pace of growth than previous decades, with population increasing about 16 percent from 1990 to 2000, an average annual growth rate of 1.2 percent.

According to the 2000 Census, approximately 76 percent of Juneau's population is white, and 15 percent is Alaska Native or American Indian. The remaining population consists of six percent Asian, one percent African American, and two percent of a variety of other races (U.S. Census Bureau, 2000).

The 2000 Census counted 11,543 households in Juneau, with an average household size of 2.66 persons. Among these households, 15.5 percent had incomes less than $25,000 in 1999, and six percent of all individuals living in Juneau had incomes below the poverty line. More than 60 percent of the CBJ households had incomes of over $50,000, with almost 38 percent earning $75,000 or more. Median household income was $62,034, and per capita income was $26,719 (U.S. Census Bureau, 2000).

According to the Alaska Department of Labor and Workforce Development (DOL&WD), annual average employment in Juneau reached 17,331 jobs in 2002. Since 1980, employment in the CBJ has grown almost 60 percent, increasing at an average annual rate of 2.2 percent. Juneau's payroll totaled $598 million in 2002. In inflation-adjusted "real" dollars, total annual payroll in Juneau has increased by approximately 33 percent since 1980.

Government is Juneau's most important source of employment, accounting for 43 percent of total employment and 53 percent of the total annual wage and hour earnings. State government alone accounts for 26 percent of employment, and local government makes up another 12 percent. Service-providing industries account for 48 percent of total employment in the CBJ but only 35 percent of the earnings. Goods-producing industries make up the balance of employment (nine percent) and earnings (12 percent) (DOL&WD, 2002).

The leisure and hospitality industry is a new classification under the North American Industry Classification System for recording industry employment. It accounts for 10 percent of the service jobs in the CBJ. This industry has average monthly employment of 1,766 workers in Juneau, which peaked at 2,091 workers in June 2002. Leisure and hospitality positions are mostly seasonal, lower-paying jobs, comprising only four percent of total earnings in the CBJ.

The tourism industry has been Juneau's fastest-growing industry, primarily from cruise ship visits. Juneau cruise passenger volume has more than doubled in the last decade, reaching almost 770,000 visitors in 2003 (Cruise Line Agencies of Alaska, 2003). Continued moderate growth, likely between three and four percent, is forecast for the cruise market over the next decade. Cruise growth is expected to slow to an average of about one to two percent 10 to 20 years into the future.

The Juneau Convention and Visitors Bureau estimates that between 100,000 and 150,000 visitors arrive annually by non-cruise modes of travel. In general, the non-cruise ship, independent visitor market has been flat in Alaska over the last several years; however, some growth in Juneau's visitor industry has occurred. For example, employment in hotels increased by about 125 jobs between 1994 and 2001. Current employment in Juneau's visitor industry is estimated at about 1,650 jobs with total annual payroll of approximately $30 million.

Over the past few years, the Alaska independent visitor market overall has apparently declined. Based on Alaska Visitors Statistics Program data, Alaska independent, pleasure-related visitor traffic (not including cruise ship passengers) declined from 300,000 visitors in 1993 to about 275,000 visitors in 2001. The number of visitors arriving by highway has declined steadily, as has the number of visitors arriving by ferry. Over the long term, the state's commitment to marketing, perceived safety of overseas travel, exchange rates, demographic shifts, and other factors will determine how many independent visitors travel to Alaska.

Juneau's visitor market includes a relatively small number of recreational vehicle (RV) travelers. According to AMHS data, a total of 900 RVs disembarked in Juneau in 2002, including Juneau residents owning RVs. That represents about 14 percent of total RV traffic on the AMHS. Juneau's capacity to serve RVs is limited but adequate to meet current demand. It includes 82 parking sites at private parks, plus up to 63 sites at the Mendenhall Campground.

The Greens Creek Mine is Juneau's largest private sector employer. The mine employs 260 workers and has a projected life of about 10 more years. Greens Creek employees live in Juneau and commute to the mine on a daily basis.

The seafood industry in Juneau includes commercial fishing and seafood processing. According to Commercial Fisheries Entry Commission 2002 data, 286 Juneau-based commercial fishermen fished 510 permits and harvested 18.4 million pounds of fish with an estimated gross income of more than $14 million. Based on 2001 data, the seafood processing sector in Juneau employed 65 workers among four different employers. According to Alaska Department of Fish and Game (ADF&G) data, nine Juneau processors produced 7.3 million pounds of seafood with a wholesale value of $19.5 million.

Retail trade employment in the CBJ for 2002 averaged 1,942 workers who earned a total annual payroll of $44 million. In general, retail employment has been trending downward in Juneau. Over the long term, the retail industry will track with changes in local basic industry employment and population and with growth in the visitor industry.

Bartlett Regional Hospital, the Juneau Public Health Center, and Southeast Alaska Regional Health Consortium Clinic provide medical services in Juneau. Private medical practices are available in the area as well as long-term care facilities; physical therapy services; alcohol treatment programs; and services for victims of domestic violence, AIDS patients, and terminally ill patients. The health services industry in the CBJ provides health care to residents of outlying communities as well as the Juneau resident population. The health care and social assistance industry had average annual employment of 1,497 jobs in 2002, representing about 9 percent of the employment in the area and $40 million in annual payroll.

Juneau's transportation sector generated employment for 730 workers and a total payroll of $23 million in 2002. With limited access options, the transportation industry in Juneau is a critical component of the economy. This sector will continue to grow according to the demands of the local population and growth in the visitor industry.

Most of Juneau's basic goods and materials are shipped into the city by barge. The Port of Juneau had in-bound freight traffic of 222,000 tons in 2001 (U.S. Army, 2001). The majority of this freight (56 percent) was petroleum products, primarily gasoline and other fuels. Manufactured equipment, machinery, and products (almost 20 percent) along with food and farm products (12.6 percent) also made up a significant portion of the waterborne freight into Juneau.

There were 12,369 housing units in the CBJ in 2001, with 321 vacancies (CBJ, 2001). Single-family homes comprise 43 percent of Juneau's housing inventory, and multifamily homes and condominiums/townhouses make up another 30 percent.

Population projections for the year 2035 are for an additional 11,800 residents to live in Juneau. If the average household size is 2.5 people, 4,700 housing units would be required in the area to satisfy this population growth.

The CBJ had revenues of $157 million in 2002 (CBJ, 2002). The majority of revenues collected by the CBJ are derived from taxes and State of Alaska sources. Local taxes include real property, sales, bed, liquor, and tobacco taxes.

The Juneau School District enrolled 5,543 students during the 2002 to 2003 academic year. The school district has typically offered education from kindergarten through twelfth grade, including vocational education programs and a number of alternative learning programs.

Local public safety services consist of 39 volunteers and 32 paid staff for fire and emergency response. The Juneau Police Department has 47 sworn officers and 40 civilian staff. The headquarters for the Alaska State Troopers is located in Juneau, with three uniformed troopers and five fish and wildlife protection officers.

3.1.4.2 Haines

The City of Haines and the Haines Borough consolidated in 2002 and together comprised 2,360 residents (DOL&WD, 2002). The population of Haines has grown at an average annual rate of 1.6 percent since 1980. However, the local population declined over the previous three years, from 2,475 in 1999 to 2,360 in 2002. Average annual population growth from 1992 through 2002 was 0.6 percent.

Klukwan is a Native village located approximately 20 miles northwest of Haines west of the Haines Highway. It is not part of the Haines Borough and is not incorporated as a municipality. It is governed by an Indian Reorganization Act (IRA) Council.

According to the 2000 Census, approximately 83 percent of the Haines population is white and 15 percent is Alaska Native or American Indian. The remaining population consists of one percent Asian and one percent of a variety of other races (U.S. Census Bureau, 2000).

The 2000 Census counted 985 households in Haines, with an averaqe household size of approximately 2.38 persons (U.S. Census Bureau, 2000). Among those households, more than 30 percent had incomes of less than $25,000 in 1999, and 11 percent of all Haines residents had incomes below the poverty line. A total of 41 percent of Haines households had incomes of over $50,000, with almost 21 percent earning $75,000 or more. Median household income was $40,772, and per capita income was $22,090 (U.S. Census Bureau, 2000).

In 2002, the Haines economy produced an annual average of 893 jobs and $23.5 million in wages. Employment grew by 56 percent from 1980 to 2002. This is an annual average growth rate of 2.1 percent.

Total Haines earnings in 2002 dollars decreased by almost 24 percent, from $30.7 million to $23.5 million, between 1990 and 2002. The average annual rate of decline for total earnings was approximately two percent during this 12-year period.

Some of the drop in employment and earnings in 2001 to 2002 may have been due to Royal Caribbean Cruise Lines dropping Haines as a port of call. Cruise traffic dropped from 195,466 visitors in 2000 to less than 20,000 visitors in 2003 (Cruise Line Agencies of Alaska, 2003).

In terms of employment, the largest sector in the Haines economy is local government, with 145 jobs and $4.1 million in annual payroll in 2002. Retail trade accounted for 118 jobs with $750,000 in payroll, and the transportation sector had average annual employment of 115 jobs with $1.6 million in payroll. The construction sector had average employment of 62 jobs with $2.4 million in payroll. Leisure and hospitality jobs peaked at 365 in August of 2002, while offering 189 average annual jobs with annual payroll of $2.8 million.

The visitor industry directly or indirectly accounted for the annual equivalent of approximately 300 jobs in Haines in 2001. These jobs stem from local spending by visitors to the community, including cruise ship passengers, visitors traveling to and through Haines by ferry or highway, and visitors traveling by air or ferry to participate in special activities (e.g., attend the fair, take guided hunts, or view eagles).

The long-term outlook for cruise traffic to Haines is uncertain. Haines is likely to remain a secondary port of call. It lacks the tour and excursion opportunities needed to be popular with passengers and cruise lines. Cruise traffic will probably continue to be erratic as lines add or drop the port, depending on availability of other ports of call.

Haines' non-cruise independent visitor traffic has been declining. In 1992, ferry traffic included 45,300 disembarking passengers and 15,100 vehicles. In 2002, disembarking traffic totaled 36,900 passengers and 13,400 vehicles. This reflects an overall decline in the AMHS visitor market in recent years.

According to Commercial Fisheries Entry Commission preliminary data, 81 Haines-based commercial fishermen fished 120 permits in 2002 and harvested 5.3 million pounds of fish with an estimated gross income of $2 million. Though outside the local area, the Haines economy includes the Excursion Inlet fish processing plant. In 2002, this plant employed a peak

workforce of 200 people. The plant was closed and sold in 2003, and the scale of future operations and employment is uncertain.

The transportation industry in Haines accounted for an average of 115 jobs in 2002, with peak employment of 200 workers (DOL&WD, 2002). Payroll totaled approximately $1.6 million. Most of these jobs are in air (55 jobs) and water (28 jobs) transportation activities.

As mentioned above, employment in Haines's retail trade sector in 2002 averaged 118 jobs with $750,000 in total annual payroll. The retail sector in Haines is particularly dependent on non-resident spending. This is reflected in the seasonal increase in retail employment. In 2002, retail employment peaked at 161 jobs in August, compared to October employment of 89.

To a significant degree, Haines' retailers compete against Juneau stores. Based on data from the 1994 *Juneau Access Household Survey*, Haines households spent an average of $3,500 in Juneau, including $1,000 on groceries. Leakage (the term for when local consumers purchase goods and services from outside of their community) from the Haines economy has likely increased since then because of improved ferry service to Juneau.

Medical services are provided by two facilities, the Haines Medical Clinic and the Klukwan Medical Clinic. Most routine and emergency health care services are provided locally; however, evacuation to Juneau is required for general anesthesia procedures. The peak in summer population spurred by the visitor industry causes a corresponding increase in demand for local health care services.

In 2002, health care generated average employment of 60 jobs and annual payroll of $2 million. The Southeast Alaska Regional Health Consortium (SEARHC) accounts for about half of this employment and is one of Haines's largest employers.

The 2000 Census counted 1,419 housing units in Haines, of which 991 were occupied. Vacant housing units numbered 428 (30 percent), but 301 were classified as seasonal, recreational, or occasional-use units (U.S. Census Bureau, 2000).

The City and Borough of Haines had revenues of $10.5 million in 2002. Local taxes included real property, sales, bed, and tour taxes.

While the Haines population has been relatively stable, school district enrollment has been declining since 1997, with 331 enrolled students in 2003. The school district has typically offered education from kindergarten through twelfth grade.

Local public safety services consist of volunteer fire and emergency response staff. The Haines Police Department has five full-time uniformed officers. There is one Alaska State Trooper stationed in the Borough.

3.1.4.3 Skagway

Approximately 841 people resided in Skagway in 2002 (DOL&WD, 2002). Skagway's population has not changed significantly over the past 20 years, growing only 0.3 percent. However, the community experiences a significant influx of seasonal workers employed in the visitor industry. One estimate placed Skagway's summer population at about 1,700 residents in 1999 (City of Skagway, 2000).

According to the 2000 Census, approximately 92 percent of the population is white. The remaining population consists of five percent Alaska Native or American Indian, two percent Asian, and two percent of a variety of other races (U.S. Census Bureau, 2000).

The 2000 Census counted 398 households in Skagway, with an averaqe household size of approximately 2.11 persons (U.S. Census Bureau, 2000). Among these households, approximately 17 percent had incomes of less than $25,000 in 1999, and 3.7 percent of Skagway residents had incomes below the poverty line. Just under half (49.5 percent) of the households had incomes of over $50,000, and 26 percent of the households earned $75,000 or more. Median household income was $49,375, and per capita income was $27,700 (U.S. Census Bureau, 2000).

The visitor industry is, by far, Skagway's most important industry. In 2003, Skagway had almost 630,000 cruise ship visitors and another 160,000 visitors arriving by other modes of transportation, based on information from the Skagway Convention and Visitors Bureau. Historically, Skagway has also been an important transshipment center, with freight, fuel, and ore concentrates moving over its dock.

Cruise ship traffic to Skagway is expected to increase along with regional growth in the industry. Skagway is a very popular stop among cruise ship passengers and is profitable in terms of tour and excursion sales commissions for the cruise lines. Infrastructure-related limitations (e.g., dock space) may result in Skagway cruise traffic growing at a slower rate than predicted for the region overall. Regional cruise traffic growth of three to four percent annually is predicted for the next 10 years.

Non-cruise independent visitor travel to Skagway includes travelers arriving by ferry, air taxi, and highway. In 2002, approximately 130,000 independent travelers arrived in Skagway by these routes. This represents a decline over recent years. In 1998, approximately 147,000 independent travelers visited Skagway.

The visitor industry-dominated transportation industry employed 193 workers in Skagway in 2002, about 26 percent of the total employment for the area, and these workers accounted for nearly 33 percent of the total earnings for the year. Transportation workers are primarily employed with the White Pass and Yukon Route Railroad. The railroad was originally built to supply goods to interior gold mining camps. Today, the railroad connects Skagway with Fraser, British Columbia, during the summer months. This trip is one of the most popular visitor excursions in Alaska.

The port of Skagway serves several important functions in the City's economy. In addition to serving the cruise ship industry, it is an important freight terminal. Skagway marine freight traffic totaled 84,000 tons in 2001, primarily gasoline and other fuels (almost 75 percent). According to Alaska Marine Lines, 43 percent of Skagway general freight continues on to the Yukon.

The retail trade industry in Skagway employed an average of 146 workers in 2002. As indicated, many of these positions were seasonal.

The 2000 Census counted 502 housing units in Skagway, of which 401 were occupied. Vacant housing units numbered 101 (20 percent), but 47 were classified as seasonal, recreational, or occasional-use units. Skagway is reported to have extreme shortages of housing during the peak summer season.

The City of Skagway had revenues of $6.5 million in 2002. More than 63 percent of the revenues were generated from sales and real property taxes. Skagway also has a bed tax.

The Skagway School District enrolled 117 students during the 2002 to 2003 academic year. Enrollment has varied but has generally declined over the past 10 years. Education has been offered from the pre-elementary through twelfth-grade levels at a single school.

Outpatient medical services are provided by the Skagway Medical Service, which employs two physician's assistants on a year-round basis. General practitioners and specialists visit the community periodically. Emergency medical patients are generally evacuated to Juneau.

Local public safety services consist of four paid staff and 10 to 15 year-round volunteers for fire and emergency response. During the summer cruise ship season, the number of volunteers grows to approximately 40. The Skagway Police Department has a police chief, three sworn officers, and two civilian staff. Two seasonal officers are added during the summer months. The United States Customs and Immigration has an office in Skagway, and the U.S. Park Service also has law enforcement officers on staff. No Alaska State Troopers are located in Skagway.

Additional economic and social information about the Lynn Canal vicinity is provided in the *Socioeconomic Effects Technical Report* and the *Household Survey Report* (Appendices H and I, respectively).

3.1.5 Environmental Justice

Executive Order (EO) 12898 (February 11, 1994) was created to prevent federally assisted projects from adversely affecting the environment and human health of minority and/or low-income communities at a disproportionately high rate.

Data used to assess environmental justice considerations were obtained from the U.S. Census Bureau (U.S. Census, 2000). Ethnicity and income status for Juneau, Haines, Skagway, and Klukwan were examined and compared to state and national data to determine the minority and low-income status of these communities. The overall populations of Juneau and Haines are about 75 and 80 percent white, respectively. The statewide and national average is approximately 70 and 75 percent white, respectively. Approximately 92 percent of the Skagway population is white. The community of Klukwan, located approximately 20 miles northwest of Haines, has a higher percentage (90 percent) minority population than the other three communities in Lynn Canal. This is substantially higher than either the statewide or national average for minority populations. The statewide and national median household incomes are $51,571 and $41,994, respectively. At $62,034, the CBJ has a higher median household income than the statewide and national averages. Skagway's median household income is similar to the statewide average, at $49,375 and Haines' median household income is similar to the nationwide average at $40,772. The community of Klukwan has a lower median household income than the statewide and national averages, at $30,714. Table 3-2 summarizes race and income for Juneau, Haines, Skagway, and Klukwan by Census Tract[9] and Block Group[10] from the 2000 Census (U.S. Census 2000).

3.1.5.1 Poverty Guidelines

The U.S. Department of Health and Human Services (DHHS) poverty guidelines are illustrated in Table 3-1. The guidelines from 2000 are used in this study to match the available Census data on income. The average household size in Juneau, Haines, and Skagway in 2000 was

[9] A **census tract** is a small, relatively permanent statistical subdivision of the MOA delineated by a local committee of census data users for the purpose of presenting data. Census tracts are designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time of establishment, and average about 4,000 inhabitants.

[10] A **census block group** is a subdivision of a census tract (or, prior to 2000, a block numbering area). A block group is the smallest geographic unit for which the Census Bureau tabulates sample data. The block groups consist of all the blocks within a census tract with the same beginning number. For the study area, the block group populations range from about 600 persons to 2,800 persons. For more detailed information or to find out the exact locations of the census block groups, visit the U.S. Census web page at http://factfinder.census.gov/servlet/BasicFactsServlet.

2.66, 2.4, and 2.2, respectively. The poverty guideline for a family of two in Alaska was $14,060 in 2000, while the poverty guideline for a family of three was $17,690. Poverty guidelines for the lower 48 states and Hawaii are presented in Table 3-1 to provide a comparison to Alaska guidelines. The DHHS proverty guidelines are a simplified version of the Census Bureau statistical poverty thresholds used to prepare its statistical estimates of the number of persons and families in poverty. The DHHS poverty guidelines (unlike the Census Bureau poverty thresholds) are designated by the year in which they are issued; the 2000 DHHS poverty guidelines are therefore roughly equal to the Census Bureau poverty thresholds in 1999.

Table 3-1
2000 Health and Human Services Poverty Guidelines

Size of Family Unit	48 Contiguous States and D.C. ($)	Alaska ($)	Hawaii ($)
1	8,350	10,430	9,590
2	11,250	14,060	12,930
3	14,150	17,690	16,270
4	17,050	21,320	19,610
5	19,950	24,950	22,950
6	22,850	28,580	26,290
7	25,750	32,210	29,630
8	28,650	35,840	32,970

Source: Federal Register, Vol. 65, No. 31, February 15, 2000, pp. 7555-7557

3.1.6 Subsistence

The 1997 Draft EIS contained the following description of subsistence:

> The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) requires that subsistence hunting and gathering uses be addressed for all projects on federal lands in Alaska. Subsistence is defined in ANILCA as the "customary and traditional use by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, clothing, tools, or transportation." Subsistence issues are addressed within Section 810 of ANILCA. As a result, subsistence evaluations are commonly called Section 810 evaluations.

Subsistence in Alaska is dually managed by the state and the federal governments. Until late 1989, the state managed statewide subsistence harvests on federal land. Under ANILCA, the federal government began managing subsistence hunting, trapping, and fishing on Alaska's federal public lands in 1990.

Both the state and federal governments have their own legislation and enforceable regulations. The ADF&G Division of Subsistence provides a database and analysis of fishing and hunting patterns to support the implementation of the law by the Board of Fisheries and Board of Game. The Federal Subsistence Management Program's lead agency, the USFWS, manages hunting of most species of terrestrial mammals, grouse, ptarmigan, fish (except halibut), and shellfish. Residents of rural areas may harvest fish and wildlife under federal subsistence regulations, if a recognized, consistent, and traditional subsistence use of that species exists. Since statehood in 1959, ADF&G has managed all sport, subsistence, and personal use salmon harvesting under regulations set by the Alaska Board of Fisheries. Subsistence regulations have been in

place for state residents since 1961. The personal use category was adopted for non-rural communities beginning in 1982. In the mid-1980s, the state designated some historic fisheries and hunts that did not meet the required subsistence criteria or fit the definition of commercial or recreational uses as personal use. Personal use harvests receive no priority and are sometimes open only at times of a non-allocated surplus of a resource. Personal use harvests are open only to Alaska residents, and a resident sportfish license is required to participate (Subsistence Management Information, 2004).

Since 1990, salmon harvest under subsistence regulations has been authorized by the Board of Fisheries in discrete areas of Lynn Canal. Salmon are harvested in other areas of the Lynn Canal region under personal use regulations (ADF&G, 1994, 29). In the study area, customary and traditional use areas for salmon, Dolly Varden, smelt, and steelhead identified by the Alaska Board of Fisheries include the Chilkat, Chilkoot, and Lutak inlets, the Chilkat River and its tributaries, and Chilkat Lake (Figures 3-7 through 3-9). Customary and traditional use areas for shellfish, bottom fish, and herring identified by the Alaska Board of Fisheries include almost all of upper Lynn Canal and its inlets to just south of the southern end of Sullivan Island (ADF&G, 1991) (Figures 3-7 through 3-9).

No new subsistence surveys have been conducted since the Tongass Resource Use Cooperative Survey in 1988, which was referenced in the 1997 Draft EIS. Information included in the 1997 Draft EIS is still relevant. Federally recognized subsistence use of lands within the study area includes the residents of Klukwan, Haines, and Skagway. Currently available information was collected only for deer, salmon, non-salmon finfish, marine invertebrates, and marine mammals. No mapped, specific land-use information exists for other species in the study area. For a complete discussion of subsistence in the study area, refer to the *Land Use and Coastal Management Technical Report* (Appendix F).

Table 3-2
Key Demographic and Economic Data

Area	Percent Minority or Mixed Race	Median Household Income in 1999
United States	25	$41,994
Alaska	31	$51,571
Juneau City and Borough	25	$62,034
Census Tract 1 Total	**12**	**$78,875**
Block Group 1, Census Tract 1	9	$82,795
Block Group 2, Census Tract 1	13	$66,597
Block Group 3, Census Tract 1	15	$83,420
Block Group 4, Census Tract 1	10	$92,409
Census Tract 2 Total	**24**	**$70,167**
Block Group 1, Census Tract 2	19	$78,514
Block Group 2, Census Tract 2	18	$61,667
Block Group 3, Census Tract 2	28	$67,188
Block Group 4, Census Tract 2	17	$86,039
Block Group 5, Census Tract 2	35	$46,813
Census Tract 3 Total	**28**	**$56,603**
Block Group 1, Census Tract 3	30	$60,143
Block Group 2, Census Tract 3	26	$46,583
Block Group 3, Census Tract 3	34	$41,000
Block Group 4, Census Tract 3	20	$70,761
Census Tract 4 Total	**41**	**$53,622**
Block Group 1, Census Tract 4	56	$38,750
Block Group 2, Census Tract 4	36	$57,250
Block Group 3, Census Tract 4	53	$56,458
Block Group 4, Census Tract 4	20	$70,893
Census Tract 5 Total	**21**	**$53,622**
Block Group 1, Census Tract 5	9	$81,143
Block Group 2, Census Tract 5	25	$46,336
Block Group 3, Census Tract 5	26	$40,938
Block Group 4, Census Tract 5	13	$65,739
Census Tract 6 Total	**23**	**$60,729**
Block Group 1, Census Tract 6	17	$79,482
Block Group 2, Census Tract 6	29	$62,443
Block Group 3, Census Tract 6	22	$51,618
Haines Borough	17	$40,772
Census Tract 1 Total	**17**	**$40,772**
Block Group 1, Census Tract 1	8	$42,115
Block Group 2, Census Tract 1	21	$49,333
Block Group 3, Census Tract 1	20	$31,513
Skagway– Hoonah – Angoon Census Area	42	$40,879
Census Tract 1 Total	**8**	**$49,375**
Block Group 1, Census Tract 1	8	$49,375
Census Tract 2 Total	**90**	**$30,714**
Block Group 1, Census Tract 2 (Klukwan)	90	$30,714

Note: Highlighted block groups include portions of the existing Glacier and Haines highways.

Source: U.S. Census Bureau, Census 2000

3.1.6.1 Haines

Subsistence resource use categories in Haines consist of salmon, non-salmon finfish, marine invertebrates, marine mammals, black bear, brown bear, mountain goats, moose, and Sitka black-tailed deer. Deer are scarce in the upper Lynn Canal region. Hunting takes place on the south end of Sullivan Island, portions of Lincoln and Shelter islands, and the south shore of St. James Bay. Hunting also occurs in the lower Lynn Canal region and on Chichagof and Admiralty islands. Fishing occurs primarily in the Chilkoot River; Chilkoot Lake; the lower Chilkat River; Lutak, Chilkoot, and Chilkat inlets; and St. James Bay. Most invertebrate harvests in upper Lynn Canal areas close to Haines involve crab or shrimp harvest. Clams and cockles are harvested in more distant areas (St. James Bay and the inlets of Icy Strait). Trade with residents of other communities for locally unavailable marine invertebrates is common. Harbor seals have been the only marine mammals hunted by Haines residents for subsistence purposes.

The 1997 Draft EIS contained the following information on subsistence use in Haines:

> Haines was originally the site of a Chilkoot Tlingit seasonal camp near the mouth of the Chilkat River. Subsistence activities were surveyed in 1983 and 1987 and by telephone as part of the proposed project. The 1987 survey found 93 percent of the households used subsistence resources and 83 percent of households participated in subsistence harvests.
>
> Subsistence harvesters focus on river, upland, and marine environments. Salmon were harvested from the Chilkat River and from marine areas of upper Lynn Canal. Trout and eulachon were harvested from rivers and marine finfish were harvested from saltwater areas. Local roads and rivers were used to reach moose, mountain goat, bear, some fish, berry picking, and wood cutting harvest areas.

3.1.6.2 Juneau

Juneau has a relatively large native community and personal use of fish and wildlife is common, but the CBJ is not designated under ANILCA as a subsistence area.

3.1.6.3 Klukwan

Klukwan is a Tlingit community located near the confluence of the Chilkat, Klehini, and Tsirku rivers approximately 20 miles northwest of Haines. Subsistence is important economically and culturally to Klukwan residents, who continue to use the study area for these purposes. The people of Klukwan harvest salmon, non-salmon finfish (e.g., eulachon, trout, char, and halibut), black bear, brown bear, moose, mountain goat, marine mammals (harbor seals), and Sitka black-tailed deer. Deer are scarce in the Chilkat Valley and other mainland areas in the northern Lynn Canal area. Sitka black-tailed deer hunting occurs on portions of Lincoln, Shelter, Benjamin, and Sullivan islands. There is some moose harvest as well. Residents of Klukwan generally fish for sockeye, pink, and chum salmon in designated subsistence harvest areas near their community. Non-salmon harvest for Klukwan residents takes place in all waters of Chilkat River for eulachon, Chilkoot and Lutak inlets for halibut, and Lynn Canal from Point St. Mary (entrance to Berners Bay) to Seduction Point, including waters around Sullivan Island and in William Henry Bay, for halibut (ADF&G, 1994, Klukwan, 28).

The 1997 Draft EIS contained the following information on subsistence use in Klukwan:

> Subsistence fishing activities were surveyed in 1983 and 1987. The findings were similar, although the estimate of total pounds harvested was almost 22 percent higher in the 1987 survey. The survey found that 100 percent of Klukwan households used subsistence resources and 95 percent of households participated in the harvest of those resources.
>
> Resource harvest for Klukwan is strongly focused on riverine and inland environments for most of the resources harvested. Harbor seals were the primary marine mammals harvested. Moose, mountain goat, and bear were harvested along the local roads and rivers. Deer hunting was conducted along Lynn Canal by boat.

3.1.6.4 Skagway

As with Klukwan and Haines, relatively little deer hunting occurs in the vicinity of Skagway because of the scarcity of deer in the upper Lynn Canal area. Skagway residents hunt black bear, brown bear, moose, and mountain goat. Most Skagway residents fish Taiya Inlet and Burro Creek for chinook, coho, and pink salmon. The primary non-salmon finfish species harvested is halibut. Skagway residents fish for trout in creeks and lakes near the community. Invertebrate harvesting by Skagway residents is common along the beaches and in the bays and coves near town. In areas close to the community, including Dyea, Nahku Bay, and Taiya Inlet, residents harvest shrimp and crab. Skagway lacks good clam beaches; therefore, crab is more heavily harvested by Skagway residents (Betts et al., 1994). Harbor seals have been the only marine mammals hunted by Skagway residents for subsistence purposes.

The 1997 Draft EIS contained the following information on subsistence use in Skagway:

> The 1987 survey found that 96 percent of households used subsistence resources and 68 percent of household participated in harvest activities.
>
> Resource harvest focused near the community for marine fish species and invertebrates and inland for mountain goats. [Residents] primarily harvest salmon and other species with rod and reel from Taiya Inlet. Trout and char and eulachon were harvested from local rivers.

3.1.7 Transportation

The existing transportation network in Lynn Canal is described in Sections 1.2 and 1.3. As stated in those sections, access to Juneau is only possible by air and water. Juneau is the largest community on the North American continent not connected to the continental highway system.

Commercial jet aircraft provide access to Juneau. Commuter aircraft serve Haines, Skagway, and other communities that do not have the demand or facilities for jet aircraft service.

The AMHS is the only form of public transportation that carries passengers and vehicles in Lynn Canal. As of the summer of 2004, the Lynn Canal corridor is served by two mainline ferries originating from Bellingham, two mainline ferries originating from Prince Rupert, an occasional feeder vessel, and shuttle service by the motor vessel (*M/V) Fairweather*, Alaska's first fast vehicle ferry, five days per week to Haines and four days per week to Skagway. This vessel will be based in Juneau and will make a round-trip to Haines in the morning on Monday, Tuesday, Thursday, Friday, and Saturday and a round-trip to Skagway in the afternoon on Tuesday, Thursday, Friday, and Saturday.

Private ferry companies provide passenger-only service between Lynn Canal communities. This service is seasonal from mid-May to Mid-September. Multiple daily trips are scheduled between Haines and Skagway, as well as twice-weekly service between Haines and Juneau.

Pedestrians and bicyclists are also served by the AMHS. The 2002 passenger-to-vehicle ratio in Lynn Canal was 3.6. Assuming the actual number of passengers traveling with cars was closer to the highway average of 2.2, as many as 38,000 people may have been walk-on passengers on AMHS ferries in Lynn Canal in 2002.

The 1997 Draft EIS reports the following:

> At least ten rivers in the project area would be considered navigable by federal standards. These include the Antler, Gilkey, Lace, Berners, and Katzehin rivers on the east side and the Endicott, Sullivan, 'Unnamed' (north of Sullivan Island), North Glacier, and Chilkat rivers on the west side. Navigability needs will influence design parameters and construction methods for major bridges. The U.S. Coast Guard has jurisdiction for bridges over navigable rivers.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Geology

A geotechnical and geologic study was prepared in February 1994 by Shannon & Wilson, Inc. for inclusion in the 1997 Draft EIS *Juneau Access Improvement Reconnaissance Engineering Report.* Because geologic changes are not rapid occurrences, a new study was not prepared for the 2004 Supplemental Draft EIS. However, limestone features (termed karst) are located along the proposed alignment of the West Lynn Canal Highway alternative (Alternative 3), and a new study was completed in 2003 to further delineate and assess these features.

The 1997 Draft EIS included the following description of geology in the study area:

> Lynn Canal, Chilkat Inlet, Chilkoot Inlet, Taiya Inlet, and Berners Bay are all typical fjords occupying glacially sculpted valleys in the Southeast's coast mountains. These mountains rise steeply from the water to elevations greater than 2,000 meters (6,561 feet) and the valley sides dive steeply into the water reaching depths in excess of 300 meters (984 feet). Rock outcrops are pervasive in the steep areas.
>
> Glacially fed streams and rivers flow into the fjords from both sides, as well as from the heads of the valleys. Large amounts of sediment have been deposited as deltas where these streams and rivers enter salt water. A generally high water table and generally low soil density in the delta areas, combined with the large tide range and possibility of earthquakes, increases the potential for liquefaction and sloughing along the face of the deltas.

3.2.1.1 Geologic Features

Physiographic and Tectonic Setting – The northern part of Southeast Alaska is underlain by a complex heterogeneous assemblage of rocks, including sedimentary, volcanic, metamorphic, and intrusive rocks of Paleozoic, Mesozoic, and Tertiary age. These rocks were emplaced in the southeastern Alaska archipelago during a series of subductions and accretions by tectonic plates obliquely colliding with the ancient continental margin of western North America during Jurassic to early Tertiary time (Gehrels and Berg, 1992; 1994). Plate tectonic activity since the late Paleozoic has resulted in northwesterly trending curved bands of folded sedimentary, volcanic, and metamorphic rocks. Granitic batholiths, emplaced during the Cretaceous times,

are widespread and form the backbone of the Coast Range. Tectonic activity during the Tertiary age resulted in major northwest-trending fault zones.

Major contours in the region, such as fjords and river valleys, are likely controlled by major faults or fault zones (Lemke, 1974). The Chatham Strait/Lynn Canal/Chilkoot River fault system, which bisects the study area along Lynn Canal, trends northwest and apparently continues for over 300 miles, connecting with the Denali fault of interior Alaska (Miller, 1972).

While the faults are thought to control the orientation of features in the area, the fjords and U-shaped river valleys that characterize the region are the result of glaciation. These features were carved by glaciers that have been active since the Pleistocene. The weight of the ice, which at times has reached a thickness of about 5,000 feet, has caused the surrounding land mass to sink below its original level. Upon deglaciation, gradual rebound of the depressed ground has resulted in the emergence of marine deposits and has also caused uplifted rock faces to be exposed to the effects of shoreline erosion. This erosion forms benches or terraces at the lower elevations of the U-shaped valley walls.

Bedrock – Rock types encountered in the study area include deep to shallow marine sedimentary rocks, volcanics and their metamorphosed equivalents, and granite intrusive rocks. The proposed road corridors along both the east and west sides of Lynn Canal are roughly parallel or oblique to the rock units. Bedrock is visible along wave-cut shorelines, forms knolls and cliffs in the lower slopes, and occurs as bare or muskeg-covered slopes above the timberline on higher mountain slopes. In offshore areas and river drainages, the bedrock surface is often deeply buried beneath unconsolidated soils that are glacial or alluvial in origin.

Karst – The term “karst” is used to describe an area of limestone or carbonate rock in which the landforms are mostly soluble in origin and drainage is underground through enlarged fissures and conduits (Drew, 1999). Karst develops when acidic waters, enriched in humic and carbonic acids from natural soil decomposition, drain onto carbonate rocks, causing limestone to dissolve. The most favorable climatic environment for karst development occurs in alpine and cold temperate regions with high precipitation and runoff rates (Ford and Williams, 1994). These conditions are generally optimal in Southeast Alaska, creating one of the most actively developing karst regions in the world. The presence of muskegs and forested wetlands ensures that acidic water is generated, which results in aggressive solution activity where water drains onto carbonate rock. Through this chemical weathering process, surface and subsurface features such as interconnected channels are developed. These areas can collapse when limestone dissolved by water percolating downward, combined with removal of cavity roofs from below, weakens the span of surface bedrock or soil.

The Federal Cave Resources Protection Act (FCRPA) of 1988 (16 USC 4301-4310) requires protection of significant caves on federal lands. As described above, karst is a three-dimensional terrain developed on and within soluble, carbonate bedrock in which caves develop. Although the stated intent of FCRPA is to protect cave resources and not karst resources, the USFS recognizes that caves with associated features and resources are an integral part of the karst landscape, and that karst must therefore be managed as an ecological unit to ensure protection of cave resources.

Previous mapping studies (Shannon & Wilson, 1994; Dames & Moore, 1994; NLUR, 1994) indicated that carbonate rock and karst landscape exists on the western side of Lynn Canal in the area between Sullivan Island and William Henry Bay. Carbonate rock is not known to underlie East Lynn Canal. A karst assessment was conducted in summer 2003 to determine the extent of karst development along the Alternative 3 route (West Lynn Canal) and to evaluate whether the location and design of the highway would be protective of karst resources based on

vulnerability criteria and land use objectives established by the USFS for the Tongass National Forest.

A preliminary karst survey of the project area on the west side of Lynn Canal was performed in 1994. This survey was based primarily on literature and aerial photograph review and did not include a field survey (Dames & Moore, 1994). An archeological team investigating the route of Alternative 3 in 1994 documented a number of shoreline karst features during a ship-based survey (NLUR, 1994); however, a systematic karst survey of the project area was not conducted during these investigations.

A karst field survey was conducted for the project in 2003. The protocol for the survey was developed in coordination with and approved by the USFS. The survey corridor was 300 feet wide (150 feet on either side of a preliminary road centerline) and was expanded to 500 feet wide in areas where high-vulnerability karst was encountered.

Pertinent karst vulnerability rating criteria from TLMP and a Tongass Plan Implementation Team Clarification Paper were used to rate karst features encountered in the field. The criteria are as follows:

- **High Vulnerability** – Areas containing a high density of karst features and areas exhibiting openness to the subsurface. These areas are underlain by carbonate bedrock that is well drained internally.
- **Moderate Vulnerability** – Areas underlain by carbonate bedrock that is well drained internally. Areas often occur on knobs and ridges and on the dip-slope of carbonate bedding planes. The surface tends to be irregular and undulating and often open. The primary characteristic used to differentiate between moderate- and high-vulnerability karst is the degree of openness of the system.
- **Low Vulnerability** – Areas underlain by carbonate bedrock that are most commonly internally drained, but surface streams may be present. Generally, these areas have been greatly modified by glaciation and have a covering of glacial till or mineral soil.

The following paragraphs summarize the types of karstlands encountered along the West Lynn Canal project area based on the vulnerability criteria category. Figure 3-10 identifies their locations.

High-Vulnerability Areas – Linear strips of high-vulnerability karst were mapped along coastal cliffs in several areas where the Alternative 3 highway alignment comes close to shoreline and where caves or other potential karst features were observed in the cliffs. Similar features were also occasionally observed along inland cliffs along what may be raised wave-cut terraces. A number of the coastal caves observed have previously been mapped and named in the vicinity of Glacier Grotto (Allred and Allred, 1995; Dames & Moore, 1994; Love, 1999). Most of these caves lie outside of the eastern edge of the study corridor.

Many of the shoreline cliff features do not appear to be solutional in origin; rather, most appear to have been formed by cavitation and littoral erosion accompanied by block failure. Cavitation occurs as air is forced into joints or small solution cavities within the rock, and the hydraulic force of the water and pneumatic pressure of the trapped air interact to cause corrosion. The abrasive effects of cobbles and sand cause littoral erosion and undercutting of cliff exposures. Block failure along fracture planes enlarges the developing cavities. Although solutional connectivity appeared to be lacking in most of these features, the littoral caves were considered high-vulnerability areas nonetheless, because they met the FCRPA definition of a significant cave (36 CFR 290).

Low- to Moderate-Vulnerability Areas – Much of the karst encountered in the project area was of low to moderate vulnerability typical of other low-elevation karstlands around Southeast Alaska. Areas underlain by carbonate-bearing bedrock, which is otherwise dominated by non-carbonates (e.g., schist with minor marble interbeds or limestone-bearing conglomerates), were given a low-vulnerability rating. Within the alignment, these areas were characterized by shallow undulating terrain, thick glacial deposits, and rare bedrock exposures along benches and gentle slopes. Exposed limestone cliffs, ridges, and rock overhangs were characterized as moderately vulnerable if open fractures were observed that appeared to be soil-filled at shallow depths. Limestone cliffs and ridges with closed fractures were characterized as low vulnerability, as were lower slopes at the base of cliffs where covered by a thick section of colluvium or talus deposits.

No- to Low-Vulnerability Areas – Areas with underlying non-carbonate bedrock, such as volcanics and schist, were considered to have no karst vulnerability. Non-carbonate bedrock underlies more than 70 percent of the West Lynn corridor. The landscape over these rocks typically exhibits little to no karst characteristics.

Karst Resources on Alternative Alignments – No identified significant caves or other important karst features are within the current alignment of any alternative. Where significant caves or other important karst features were identified, DOT&PF moved the alignment to avoid them.

3.2.1.2 Geologic Hazards

It is important to recognize the potential for geologic hazards within areas considered for the project alternatives. Geologic hazards in the study area include avalanches, earthquakes, tsunamis, outburst floods, and landslides.

Avalanches – The most common geologic hazard within the study area is avalanches. The avalanche information presented in the 1997 Draft EIS has been updated. Steep slopes, heavy snowfall and precipitation, high winds, and a climate influenced by both maritime and continental systems contribute to this hazard. The proposed road alignments along both the east and west sides of Lynn Canal traverse areas that exhibit considerable evidence of ongoing avalanche activity. These areas are marked by a lack of timber in the avalanche chutes and, in some areas, by large accumulations of snow at the base of the chutes in the spring and well into the summer. The paths are described as small, medium, large, and very large based on starting height, amount of snow, and avalanche frequency. Occasionally, subpaths run off from the main path. Figure 3-11 shows the location of the avalanche paths. The *Snow Avalanche Report* (Appendix J) provides more detailed information on the snow avalanche paths mapped and rated along each side of Lynn Canal.

East Lynn Canal Alignment – The average annual snowfall for the East Lynn Canal, as a whole, is 147 inches. This high level of snowfall contributes to 74 avalanche paths, including subpaths, on the east side of Lynn Canal in the vicinity of Alternatives 2 through 2C. Of the paths identified, 11 are considered large or very large based on their high elevation starting zones and their tendency to produce frequent large avalanches. Runout from avalanche events in some of these paths would reach the highway only once in several decades, whereas, in the absence of mitigation efforts, runout from events at other locations could cross the highway more than once in an average winter.

Field observations have identified four avalanche paths from Echo Cove to a location three miles past Independence Lake. One is near Sawmill Cove in Berners Bay and three are north of Independence Lake. The first path north of Independence Lake is the widest on the alignment and is a frequent producer of large avalanches.

The area north of these paths to the Katzehin River, a distance of 21 miles, contains 36 avalanche paths. They are found in three clusters of multiple paths that include large and very large paths. The first cluster is located opposite Eldred Rock, the second group is south of Yeldagalga Creek, and the third group is north of Yeldagalga Creek.

From the Katzehin River north to Skagway there are 34 avalanche paths. These include a cluster of small but steep paths near Dayebas Creek and three large, narrow, high-elevation paths located approximately two miles north of the creek that produce frequent slides. The remaining paths are narrow, steep paths that generally reach saltwater. North of the Katzehin River, near the proposed Katzehin Ferry Terminal, is a large avalanche chute.

West Lynn Canal Alignment – Average annual snowfall for the West Lynn Canal area is 120 inches. The highway alignment of Alternative 3 on the west side of Lynn Canal is near 19 avalanche paths, including subpaths. Of the paths identified, 11 are considered large or very large.

Some of these avalanche paths occur in clusters. The first cluster consists of two paths, located between William Henry Bay and the Endicott River, which are considered medium in size. The second cluster of three paths is located approximately three miles north of Sullivan River to the northern tip of Sullivan Island, which are rated as large to very large. The third cluster consists of three paths located in the area just north of Glacier Point to Pyramid Harbor. These paths are also rated as large to very large.

See the *Snow Avalanche Report* (Appendix J) for further details on avalanche potential in the project area.

Earthquakes – Large earthquakes have occurred on the strike-slip faults associated with the Queen Charlotte/Fairweather fault system (Hanson and Combellick, 1998). This system, located along the outer coast of Southeast Alaska approximately 75 miles west of the study area, produces lateral motion parallel to the fault line. Within the last century, four earthquakes with magnitudes greater than 7.0 have occurred along the Queen Charlotte/Fairweather fault system (Hanson and Combellick, 1998). In addition to these well-recorded historic shocks on the main plate boundary, significant seismicity follows the southern end of the Denali fault system and has produced historic earthquakes of up to at least 6.4 in magnitude. The interior Alaska portion of the Denali fault was responsible for the 7.9 magnitude earthquake in November 2002. The Denali fault trends southeast beneath Lynn Canal and appears to join the Chatham Strait fault system, which continues south past the Juneau area. While little historic seismicity is associated directly with the Chatham Strait segments of this fault system, there is sufficient geologic evidence of activity to consider this fault capable of seismic activity.

Landslides – Landslides occur less frequently than snow avalanches. Most landslides are caused by the combined effects of geologic characteristics and soil types. Earthquakes are also a triggering mechanism for landslides in Southeast Alaska. Avalanche paths are also prone to slides during the summer months due to the lack of vegetative cover and the channel-like nature of avalanche chutes.

The 1997 Draft EIS identified five landslides in the vicinity of the East Lynn Canal alignment and two along the West Lynn Canal alignment. An additional slide occurred in 2001 on the east side of Lynn Canal north of Independence Lake. Figure 3-11 identifies the locations of the slides. The eight identified slides are all rock slides created when large rock fractures at the top of a steep slope released rock and the falling rock caused the poorly attached, vegetated slope below to slide. Little soil movement was involved because in these areas there is almost no soil between the vegetation layer and the underlying rock.

Outburst Floods – Glacial lake outbursts can result in flooding, the scale of which can be many times greater than the anticipated maximum flood event for a given basin. The proposed highway alignments on both the west and east sides of Lynn Canal cross rivers that drain glaciers and thus have the potential for outburst flooding.

The 1997 Draft EIS presented the following information about glacial outburst floods:

> Meade Glacier, located at the head of the Katzehin River, creates a glacially dammed lake which discharges annually, usually in late August. Glacial outburst floods also occur occasionally on the Gilkey/Antler River system in Berners Bay.

The Chilkat and Endicott rivers on the west side of the canal also have the potential for glacial outburst flooding from large glaciers at their headwaters.

Glacial Advance – The 1997 Draft EIS contained the following information about glacial advance:

> Numerous glaciers are located in the mountains around Lynn Canal. None of the glaciers in the project area would pose a hazard.

3.2.2 Hydrology and Water Quality

Lynn Canal, Chilkat Inlet, Chilkoot Inlet, Taiya Inlet, and Berners Bay are all typical fjords occupying glacially sculpted valleys in the coast mountains. The landscape is intensely glaciated and the mountains are heavily forested. The study area contains rugged topography with moderate to steep forested slopes, broken by raised benches and bare rock cliff bands. Drainage patterns are characterized by steep, deeply incised, first-order streams, which feed into wide, braided rivers in the base of glacially carved valleys. The wide valley bottoms are relatively flat due to infilling with unconsolidated sediments.

3.2.2.1 Climate

Lynn Canal has a maritime climate with temperatures in the range of 45 to 65 degrees Fahrenheit (°F) in the summer and 18° to 37°F in the winter. The north end of Lynn Canal around Haines and Skagway lies within a climatic transition zone that receives less precipitation than Juneau. Annual precipitation in the area ranges from 54 inches in Haines to 92 inches in the Endicott River Wilderness Area. Storms and rain showers occur throughout most of the year; however, precipitation is heavier and more frequent from November to January. The *Snow Avalanche Report* (Appendix J) estimates average snowfall for East Lynn Canal at 147 inches per year or approximately 12 feet per year, and for West Lynn Canal at 120 inches per year or approximately 10 feet per year. Melting snows and spring rains contribute large amounts of water to rivers and creeks within the study area.

3.2.2.2 Freshwater Environment

Glacially fed streams and rivers flow into the fjords from both sides, as well as from the heads of the valleys. Large amounts of sediment have been deposited as deltas where these streams and rivers enter saltwater. A generally high water table and generally low soil density in the delta areas, combined with the large tidal range and the possibility of earthquakes, increases the potential for liquefaction and sloughing along the face of deltas.

The 1997 Draft EIS included the following description of water quality:

Most streams in the project area originate in undeveloped alpine areas and are clear and low in dissolved solids. The larger rivers generally originate from glaciers and characteristically carry large silty glacial plumes into Lynn Canal off Berners Bay and the Katzehin delta. Overall, water quality in the project area is high except during periods of heavy runoff when plumes of silt can be seen at the mouth of most streams.

During winter and periods of low flow, streams generally carry less silt. During spring melt, streams carry higher silt loads.

There are 64 streams/rivers along the east side of Lynn Canal. The Antler/Gilkey river basin, Lace/Berners river basin, and the Katzehin River basin drain watershed areas that are each larger than 100 square miles. All of these watersheds include large glacial areas. These larger basins include areas behind the coastal ridge at high elevation. Several intermediate-sized drainages (between five and 20 square miles in area) also have relatively large areas covered by glaciers. The majority of streams are relatively small, draining steep watersheds of less than five square miles, and are confined to the seaward coastal ridge along Lynn Canal.

Freshwater resources on the west side of Lynn Canal in the project area include 28 streams/rivers, four of which drain major watersheds with basin areas greater than 20 square miles. Only one of these watersheds, Endicott River, drains an area greater than 100 square miles. All of these basins have relatively large glacial areas, except the Endicott River. The watersheds along this alignment all drain into Lynn Canal and are generally less steep than on the east side of the Canal. The terminus of Davidson Glacier is near the base of a watershed and occupies nearly the entire valley of the Glacier River. The larger drainages along this route all have deltas (alluvial fans) that have formed where the streams enter Lynn Canal.

3.2.2.3 Groundwater

Detailed hydrogeological information has not been obtained for the study area; however, general geologic considerations and base flow data/observations provide sufficient information to understand the groundwater regime. Groundwater along the roadway alignments occurs within the bedrock, shallow soils, glacial till sediments overlying bedrock, and alluvial deposits within floodplains. No groundwater wells are known to exist within the proposed alternative project alignments.

Due to the low bulk permeabilities and associated low yield, groundwater storage within bedrock formations generally does not constitute significant aquifers. One exception to this condition occurs in fractured and faulted zones, where permeability and storage are higher due to large fracture porosity. Groundwater seepage tends to be seasonal with large fluctuations. Shallow soils and glacial till found in the area would also be expected to yield low quantities of groundwater because of low permeability and storage potential. Levels of groundwater in these materials are very seasonal and do not provide significant base flow to streams and rivers.

Alluvial and glacial outwash associated with floodplains of larger streams and rivers in the area can be expected to have notable groundwater year-round. At the valley walls, groundwater levels are controlled by the water level in nearby surface waters, which are recharged by precipitation and snow melt. Relatively shallow groundwater levels are expected within the glacio-fluvial deposits in the alluvial valleys. Within these larger streams, including tributaries downgradient of the valley wall slope break, base flows are sustained by groundwater seepage.

3.2.2.4 Marine Environment

Lynn Canal and Chatham Strait, with a combined length of about 235 miles, comprise the longest and straightest fjord-like inlet in North America. Lynn Canal is the narrow, northern segment of this inlet, extending northward some 90 miles from its junction with Icy Strait, west of Juneau, between steep mountains where it splits into Chilkat and Chilkoot inlets at its north end. Marine access to the communities at the head of Lynn Canal is provided through Chilkoot Inlet and its northeasterly extension as Taiya Inlet.

The physical setting and oceanographic environment of Lynn Canal suggest that it is a fjord-type estuary. Pritchard (1967) defined an estuary as "…a semi-enclosed body of water which has a free connection with the open sea and within which fresh water is measurably diluted with sea water." Estuary settings range from coastal plain to steep-sided fjords such as Lynn Canal, but all have the common feature of serving as a mixing region for freshwater and saltwater. Density differences between freshwater and saltwater can drive circulation and hence influence mixing and flushing in estuaries. The net circulation depends on the amount and timing of freshwater and saltwater input as well as other influences such as winds, tides, topography, and continental shelf oceanic properties and processes. These influences can combine in various ways such that distinctly different circulations develop in otherwise similar estuaries.

Fjords are deep, narrow, and steep-sided estuaries that are peculiar to glacially carved coastlines and have hydrodynamic characteristics that distinguish them from shallower embayments. Most fjords have at least one moraine or bedrock sill that affects, if not controls, hydraulic communication with the adjacent ocean. Several major rivers and numerous streams discharge into the northernmost reaches of Lynn Canal, further supporting its classification as a fjord-type estuary and a presumption of estuarine circulation within it.

Studies of fjords show that deep or bottom water ranges from well oxygenated to poorly oxygenated. Because the bottom water in fjords that have sills at their entrances are not always oxygen deficient, there must be times when the deep waters undergo renewal and become oxygenated. The movement of water along the bottom and tidally driven mixing are probably the most effective mechanisms for increasing the oxygen content of the water. Details regarding typical oceanographic conditions in Lynn Canal are provided in the *Hydrology and Water Quality Technical Report* (Appendix K).

Tides in Lynn Canal vary during the year, with the maximum recorded level in the Juneau area being 23.8 feet. Available data show that the highest tide in the study area is 22.5 feet above mean lower low water at Chilkat Inlet near Pyramid Island. The more normal tidal range is 14 to 16 feet (Shannon & Wilson, 1994).

3.2.3 Floodplains

Executive Order 11988 (May 24, 1977), Floodplain Management, addresses the use of floodplains by federal agencies. The objective is to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains.

The following information about floodplains that was included in the 1997 Draft EIS is still relevant to the proposed project:

> The Federal Emergency Management Agency has not mapped floodplains in the project area. There is little information available about past floods. A floodplain analysis was conducted for this project. There are nine large rivers that potentially have extensive 100-year floodplains. From south to north, on the east side of Lynn Canal, these include the Gilkey, Antler, Lace, Berners and Katzehin rivers, and some of their tributaries. The west

side includes the Endicott, Sullivan, 'Unnamed' (north of Sullivan Island), and North Glacier rivers, in addition to Chilkat Inlet at the mouth of the Chilkat River.

The smaller, coastal streams have steep banks or channels that allow considerable overflows during floods. Although these channels carry floodwaters, they are not considered floodplains. Floodplains, which occur downstream in less steep areas, typically have braided channels, and can cover wide areas of up to several square miles. Seasonal flooding often causes changes in the channels.

Available data show that the highest tide in the project area is [22.5 feet] above mean lower low water at Chilkat Inlet near Pyramid Island. The coastal floodplain is in the area affected by tides. Tidal fluctuation and stormwaves dominate coastal floodplains. In addition, tides will affect velocity and flow dynamics within the tidal zone.

3.2.4 Wild and Scenic Rivers

The Wild and Scenic Rivers Act of 1968, as amended, was established to recognize and preserve certain rivers in a free-flowing state to better manage the development of river resources.

There are no designated Wild and Scenic Rivers in the project study area. Two rivers within the Lynn Canal corridor have been recommended by the USFS for designation: the Gilkey and the Katzehin rivers (Figure 1-1), both located on the east side of Lynn Canal. The Gilkey River joins with the Antler River, and the Antler River subsequently empties into Berners Bay. The lower 2 miles of the Katzehin River have been excluded from recommendation because this 2-mile segment is a designated transportation corridor.

Four additional rivers within the canal corridor are on the USFS list of potential Wild and Scenic Rivers but have not been recommended for designation: the Antler, Berners, Endicott, and Lace rivers. The Antler, Berners, and Lace rivers were not recommended because they are in a congressionally designated LUD II area that provides protection the USFS considers adequate. The Endicott River was not recommended because a majority of the river lies within the Endicott River Wilderness Area, and such a designation already serves to protect the river's values.

3.2.5 Air Quality

According to the 1994 air quality report prepared for the 1997 Draft EIS, ambient air quality is good and carbon monoxide levels are well below maximum allowable levels. This section describes applicable air quality standards, attainment status, and ambient air quality relevant to the project area.

3.2.5.1 Air Quality Standards and Relevant Pollutants

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual pollutants degrade the atmosphere by reducing visibility, damaging property, reducing vegetation productivity, or adversely affecting human and animal health.

Air quality is regulated at the federal level under the Clean Air Act of 1970 and the Final Conformity Rule (40 CFR, Parts 51 and 93). The Clean Air Act authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that pose a risk to public health. These primary standards represent the air quality levels, with an adequate safety margin, that are required to protect public health. EPA has established standards for seven criteria pollutants: carbon monoxide (CO), ozone (O_3),

particulate matter with an aerodynamic diameter of less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter of less than or equal to 2.5 microns ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and airborne lead. The Alaska Ambient Air Quality Standards mirror the federal standards for most of the pollutants. Table 3-3 shows the federal air quality standards for selected pollutants. Alaska has adopted the federal standards as state standards.

The federal standards require each state to submit a State Implementation Plan (SIP) detailing strategies for attaining the standards. Air quality is regulated at the state level under the Alaska Ambient Air Quality Standards promulgated in Title 18, Chapter 50, of the AAC.

In addition to the National Ambient Air Quality Standards (NAAQS), EPA has developed Prevention of Significant Deterioration standards that limit the incremental increase in air pollutant concentrations above the specified Prevention of Significant Deterioration standards. The study area is within the Southeast Alaska Intrastate Air Quality Control Region, where baseline dates have been set for sulfur and nitrogen dioxides, and incremental increases of these two pollutants must be below the levels set by EPA.

Table 3-3
National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary	Secondary
Carbon Monoxide (CO)	1 hour	35 ppm (40,000 µg/m^3)	Not Applicable
	8 hours	9 ppm (10,000 µg/m^3)	
Lead (Pb)	3 months	1.5 µg/m^3	Same as Primary Standard
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 µg/m^3)	Same as Primary Standard
Ozone (O_3)	1 hour	0.12 ppm (235 µg/m^3)	Same as Primary Standard
	8 hours [1]	0.08 ppm (157 µg/m^3)	
Respirable Particulate Matter (PM_{10})	24 hours	150 µg/m^3	Same as Primary Standard
	Annual	50 µg/m^3	
Fine Particulate Matter ($PM_{2.5}$) [1]	24 hours	65 µg/m^3	Same as Primary Standard
	Annual	15 µg/m^3	
Sulfur Dioxide (SO_2)	3 hours	Not Applicable	0.5 ppm (1,300 µg/m^3)
	24 hours	0.14 ppm (365 µg/m^3)	Not Applicable
	Annual	0.03 ppm (80 µg/m^3)	

Notes: µg/m^3 = micrograms per cubic meter ppm = parts per million
Standards from 40 CFR 50.8 and 18 AAC 50.010. Alaska standard for ammonia is not included in this table.
[1] No corresponding Alaska standard exists for $PM_{2.5}$ or 8-hour ozone (Register 168, 18 AAC 50.010).

3.2.5.2 Attainment Status of Study Area

The geographic region where the project is located has been designated an air quality attainment area or unclassifiable. This means that the project is in an area where the region meets the ambient air quality standard for each pollutant or there are insufficient data to make a determination. Therefore, the SIP does not contain any control measures, and conformity procedures do not apply to this project. A conformity determination is not required per 40 CFR 51.

Regions where monitored values of any pollutant exceed the NAAQS are formally designated by EPA as non-attainment areas. Both federal and state regulations require the preparation of strategies by which non-attainment areas can meet attainment for each pollutant where the NAAQS are exceeded. Documentation of this strategy and planning is then included in the SIP.

The nearest non-attainment area to the project is the Mendenhall Valley in Juneau (18 AAC 50.015). The Mendenhall Valley is approximately 40 miles south of the southern extent of potential highway construction. The existing Glacier Highway connects the Mendenhall Valley to the project area. The Mendenhall Valley area is designated as a non-attainment area for airborne particulate matter (PM_{10}). Air quality is impaired primarily during the winter when stable air masses and low winds trap particulate matter in the valley. No other criteria pollutants are above NAAQS for the Mendenhall Valley. On March 24, 1994, EPA approved the Mendenhall Valley PM_{10} attainment plan. The plan strategy for improving air quality in the Mendenhall Valley focuses on control of wood smoke emissions and fugitive dust sources (e.g., glacial silt and dust from unpaved roads) during the winter months.

3.2.5.3 Ambient Air Quality in the Study Area

Weather and topography influence air pollution concentrations. Hydrocarbon and NO_2 emissions from automotive sources, when exposed to sunlight, are a major component of photochemical smog. Still air and temperature inversions that result in heavy fog can result in high CO concentrations, if there are sufficient pollutant sources in the area. The potential for dispersion of airborne pollutants at the study area is determined by the stability class, or measure of atmospheric turbulence. Stability classes are divided into six categories, designated "A" through "F," with the greatest pollutant dispersion occurring for "A." The study area distribution of stability classes is expected to be similar to that found in all of Southeast Alaska. Stability class "A" occurs infrequently due to the lack of strong solar insulation. Stability class "D" occurs most frequently (55 percent of the time). The moderately high frequency of stable atmosphere classes ("E" and "F") occur 40 percent of the time. This indicates that the potential exists for elevated air pollution within the study area due to temperature inversions (USFS, 1992). Air modeling for the project assumed a conservative air dispersion stability class of "F" (little to no wind).

Air quality analyses must account for ambient concentrations of pollutants. With the exception of Anchorage, Fairbanks, and Juneau, Alaska does not have a statewide air toxics emission inventory (ADEC, 2004). The ambient air quality CO impact is rated insignificant for the study area, and no air quality sampling was completed to determine baseline conditions. Minimal to no development has occurred within the study area, except at the ends of the study area near Haines and Skagway. Air quality within the study area is estimated to be very good due to the absence of air pollution sources. Therefore, background levels of CO, O_3, sulfur oxides (SO_X), and nitrogen oxides (NO_x) are estimated to be low. This determination is further supported by data accumulated for the EIS for the Kensington Gold Project, which is within the project area, showing that background concentrations of air pollutants were significantly below NAAQS (USFS, 1997a). On rare occasions, elevated PM_{10} concentrations may exist in the study area

when wood smoke or smoke from fires is carried south from the Yukon via northerly winds (USFS, 1992).

3.2.6 Noise

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Response to noise can vary according to type and characteristic of the noise source, the distance between the noise source and receptor, the sensitivity of the receptor, and the time of day.

The perception of noise is dependent on land use and receptors. Most of the land adjacent to the proposed alternatives is undeveloped. Most of this land is multi-use including dispersed recreation, subsistence, and personal use hunting. Within and near the communities of Juneau, Haines, and Skagway, the presence and density of noise-sensitive receptors increases. Residential development, motels and hotels, recreation areas, parks, schools, churches, and hospitals are present in these urban areas.

Levels of noise are measured in units called decibels (dB). Since the human ear cannot perceive all pitches or frequencies equally well, measured sound levels are adjusted or weighted to correspond to human hearing. This adjusted unit is known as the "A-weighted" decibel. All references to noise in this report refer to A-weighted decibel levels or dBA.

Very few noises are constant; most fluctuate in decibel level over short periods of time. One way of describing fluctuating noise is to present the sound level over a specific time period as if it had been steady and unchanging. In this approach, a descriptor called the equivalent sound level, L_{eq}, is computed. L_{eq} is the constant sound level that, for a given situation and time period, conveys the same sound energy as the actual time-varying sound. The L_{eq} during the peak-hour traffic period is often used to determine necessary noise mitigation measures from roadway noise, and is used in describing noise in this report.

The FHWA specifies Noise Abatement Criteria (NAC) (codified in 23 CFR 772) for noise-sensitive human land uses. Noise abatement must be considered when the predicted future peak-noise-hour from highway traffic on new construction approaches or exceeds the NAC, or when a substantial increase occurs. DOT&PF Noise Abatement Policy (March 1996) has defined approaching the NAC as being within 2 dBA of the NAC. For example, Activity Category B land uses such as residences, schools, and hospitals, peak-noise-hour external levels of 65 dBA L_{eq} are considered to approach the NAC of 67 dBA. DOT&PF has also defined an increase in external peak-noise-hour of 10 dBA L_{eq} or more as a substantial increase in noise regardless of the peak hour L_{eq}. The following NAC apply to noise-sensitive land uses.

- **Activity Category A** – Exterior L_{eq} (hourly [h]), dBA 57: Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. (There are no Activity Category A land uses in the project study area.)
- **Activity Category B** – Exterior $L_{eq(h)}$, dBA 67: Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals (e.g., homes adjacent to new highway construction and the USFS cabin in Berners Bay).
- **Activity Category C** – Exterior $L_{eq(h)}$, dBA 72: Developed lands, properties, or activities not included in Categories A or B above (e.g., Juneau International Airport).

- **Activity Category D** – Undeveloped lands (e.g., undeveloped urban land in Juneau, Haines, or Skagway).
- **Activity Category E** – Interior $L_{eq(h)}$, dBA 52: Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums (e.g., the interior of homes and hotels and motels in Juneau, Haines, or Skagway).

In accordance with 23 CFR 772.11a, primary consideration is given to exterior areas in determining and abating traffic noise impacts. Noise abatement is usually considered only where frequent human use occurs and a lowered noise level would be of benefit to people. Exterior noise levels take precedence in the evaluation and mitigation of traffic noise because protection of exterior areas from noise typically achieves protection of interior spaces as well.

There are cases where exterior areas of Activity Category B land uses, such as residences, that would be affected by traffic noise do not receive "frequent human use" or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents a noise impact on exterior activities. For example, in a home situated close to a roadway (e.g., 20 to 40 feet), the residents may not use the outdoor area adjacent to the road for more than coming into and out of the house, and concentrate their outdoor activities to a back yard shielded from the road by the house. In these cases, 23 CFR 772.11b indicates that the interior NAC (Activity Category E criterion) should be used as the basis of determining noise impacts. The NAC categories and sound levels are also useful in evaluating noise impacts that occur as an indirect effect of a proposed project. FHWA regulations do not require consideration of noise abatement for these types of impacts.

A new noise analysis has been conducted for the 2004 Supplemental Draft EIS. Since most of the highway portions of the alternatives cross undeveloped lands where there are no noise sensitive receptors, much of the analysis was undertaken in an effort to disclose any indirect noise impacts associated with the predicted increases in traffic on the existing road systems of Juneau, Haines, and Skagway. Short- and long-term sound level measurement data were collected for this study. Short-term noise measurements have durations of less than one hour. Long-term measurements have durations of at least 24 hours.

For purposes of evaluating direct highway traffic noise effects, no noise sensitive receptors were evaluated in the vicinity of Juneau for any of the Build Alternatives other than the campground at Echo Cove where a short-term noise measurement was taken (ST-17). This is due to the fact that all of the proposed new highway sections of the Build Alternatives would begin north of Echo Cove. The short-term noise measurement at Echo Cove campground, the only identified sensitive receptor in the area, was 43 dBA.

Short-term measurements were collected at and near the USFS cabin at the head of Berners Bay. Alternatives 2, 2B, and 2C would pass within about 500 feet of this cabin. Meteorological conditions were mostly favorable when data were collected from September 10 to 16, 2003. Measurements were 49 dBA at the beach to the west of the cabin and 52 dBA at the cabin. The higher levels at the cabin were attributable to a nearby stream and rain falling through the trees. Noise in Berners Bay includes intermittent sounds from helicopters, small airplanes, and small boats including air boats, with the greatest frequency occurring in the summer.

No sensitive receptors were evaluated in Haines for direct noise impacts because the new highway segment associated with Alternative 3 would not be located in the vicinity of any receptors. Public comments on the 1997 Draft EIS expressed concerns that noise from a highway on the east side of Lynn Canal would result in noise impacts on the Chilkat Peninsula in the vicinity of Chilkat State Park. On September 10, 2003, a long-term sound measurement was collected near a residence at the end of Mud Bay Road (LT-2) overlooking Chilkoot Inlet

and opposite the southern end of the Katzehin River delta. Two short-term sound measurements were also taken near this location. The sound sources included vehicular traffic, boats, birds, distant aircraft, and rain. Measured sound levels ranged from a low of about 34 dBA to a high of 55 dBA.

The local topography confines the town of Skagway almost entirely to the Skagway River valley. The town is bounded by a railroad corridor to the east, an airport to the west, and boat docks to the south. Alternatives 2B, 3, and 4A through 4D would use the existing Skagway ferry terminal, with traffic traveling to and from the terminal via State Street. However, Alternatives 2, 2A, and 2C would intersect with 23rd Avenue and Main Street. Adjacent residences and other sensitive noise receptors would have a sound path to the highway as it descends the valley wall into town.

For assessing the potential of direct traffic noise impacts, long-term sound measurements were recorded in Skagway on September 12 and 13, 2003. One sound level meter was positioned in the backyard of a residence on 22nd Avenue and State Street facing 23rd Avenue and State Street (LT-3). This is in close proximity to the intersection of the alignment for Alternatives 2, 2A, and 2C with 23rd Avenue. Noted sound sources were vehicular traffic, railroad activity, aircraft, rustling leaves, and distant lawn maintenance activities and ship horns. A second monitoring station was located at a residence on Broadway and 12th Avenue (LT-4). The location was chosen because it was representative of sensitive receptors that were not on a main throughway but would have a view of the proposed highway. Noted sound sources were traffic, rustling leaves, railroad activities, and aircraft. At LT-3, ambient noise ranged from about 60 to 65 dBA between 11 a.m. and 5 p.m., dropping steadily after that time to a low of about 46 dBA between midnight and 5 a.m. Noise rapidly increased to 55 to 60 dBA shortly after 5 a.m. and remained at that level until 11 a.m. Ambient noise followed the same trend at LT-4 except it was typically about 5 dBA lower than at LT-3. Peaks that occurred simultaneously at both sites were likely attributable to passing trains or aircraft. Two short-term measurements were collected at midblock on 22nd Avenue between Main Street and State Street. These measurements recorded noise levels of 56 and 57 dBA.

Long-term and short-term sound measurements were collected in Juneau, Haines, and Skagway where increased traffic on local roads resulting from project alternatives could result in indirect noise effects to sensitive receptors. In Juneau, the Glacier Highway from downtown to Auke Bay is densely developed. Some residential noise receptors either abut the highway or have a direct line of sight to the highway without benefit of intervening structures. From Auke Bay to Echo Cove, development density decreases and sensitive land use is mostly residential. The Eagle Beach State Campground and a camping area at Echo Cove are located adjacent to the highway.

On September 14 and 15, 2003, long-term sound level measurements were collected in Juneau. One sound level meter was positioned at a residence adjacent to Glacier Highway between Auke Bay and Lena Cove. Noted sound sources were vehicular and helicopter traffic, birds, and rain. A second meter was placed at a residence adjacent to the Glacier Highway south of Auke Bay. The noted sound source was vehicular traffic. The measured noise levels at this location were above the noise abatement criteria thresholds of 67 dBA. The higher noise levels were associated with greater traffic volumes that included heavy trucks and buses that do not regularly travel north of the ferry terminal at Auke Bay. Both locations had sound level measurements that were dominated by traffic noise, with peak traffic noise occurring between 5:00 p.m. and 6:00 p.m.

Seven short-term measurements were collected on the Juneau road system including side yards at homes along Glacier Highway and at Bear Lair Cabin, Adlersheim Wilderness Lodge near Yankee Cove. Measurements varied from 45 dBA at the Bear Lair Cabin to 70 dBA at 4150 Glacier Highway overlooking Egan Drive near downtown.

Downtown Haines is mostly commercial with some residences, motels, schools, and a public library. Residences are scattered from the end of Mud Bay Road north to Haines and to the Lutak Ferry Terminal. Residences abut the existing roadway where the proposed West Lynn Canal Highway would intersect Mud Bay Road.

On September 10, 2003, a long-term sound measurement was collected in Haines adjacent to Lutak Road. The sound sources included vehicular traffic, boats, birds, distant aircraft, and rain. Measured sound levels ranged from about 40 to 50 dBA.

Six short-term measurements were collected at five locations in Haines. Those locations included a residence near the Alternative 3 crossing of the Chilkat River/Inlet, the camping area at Portage Cove State Recreation Site, downtown Haines between Soap Suds Alley and Portage Street, and the Haines School on 3rd Avenue adjacent to the playground. Noise levels varied from 43 dBA at the Portage Cove State Recreation Site to 57 dBA at Haines School located downtown.

Five short-term measurements were collected at four locations in downtown Skagway, including the front yards of residences at Spring Street and 10th Avenue and Main Street between 15th and 17th avenues, mid-block on 22nd Avenue between Main and State streets, Historic Moore Homestead, and Pullen Creek Shoreline Park. Recorded levels varied from 44 to 57 dBA, except for one peak measurement of 70 dBA caused by a barking dog in close proximity to the meter.

Additional information on noise can be obtained in the *Noise Analysis Technical Report* (Appendix L).

3.2.7 Hazardous Materials

A new Initial Site Assessment (ISA) was prepared in 2003 for the project area to determine the potential for encountering hazardous materials during construction of any alternative. The objective of the ISA process is to evaluate, based on readily available information, whether hazardous materials or petroleum products are likely to be present along the project corridor or are likely to exist in the future due to on-site or nearby activities or problems. Hazardous materials include soil and groundwater contamination due to leaking underground storage tanks, aboveground storage tanks, pesticides, and other chemical discharges.

The ISA was prepared in general accordance with the corridor screening requirements as defined by the American Association of State Highway and Transportation Officials (AASHTO) Hazardous Waste Guide for Project Development (AASHTO, 1990) and FHWA guidance documents on hazardous materials (FHWA 1988 and 1997).

Known and potential hazardous material sites in the project area were identified through review of federal and state databases, agency interviews, aerial photography, and site reconnaissance. Minimum search distances and the types of databases required for review were based on American Society for Testing and Materials standard E2247-02.

Based on the site visits, agency interviews, and federal and state database review, 29 sites were identified in the vicinity of the East Lynn Canal alternatives and three were identified in the vicinity of the West Lynn Canal alternative (Figure 3-12). Sites were given a hazard rating of

high, medium, or low. A high hazard rating was given to sites where commercial quantities of fuel or hazardous materials were used or stored at the site and there is a high potential for soil or groundwater contamination. A medium hazard rating was given to sites where commercial quantities of fuel or hazardous materials were used or stored at the site but further investigation would be needed to determine if there is soil or groundwater contamination. A low hazard rating was given to sites where only small quantities of fuel or hazardous materials were used or stored at the site and there is no existing evidence of spills or if there was a spill it was remediated to the satisfaction of regulatory agencies. No hazardous waste treatment, storage, or disposal sites exist within the project corridor. Contaminants of concern at the identified sites were predominantly petroleum hydrocarbons (e.g., fuel oil, gasoline, or diesel fuel).

Two EPA Comprehensive Environmental Response, Compensation, and Liability Act-listed sites are located in Skagway and are within 0.5 mile of the project corridor. However, both sites are outside of the proposed highway right-of-way for Alternatives 2, 2A, and 2C. Both the Skagway/Nahku Ore Terminal and WP&YR Railroad Yard sites had documented lead and zinc soil and marine sediment contamination from former ore management and transport activities associated with the railroad and dock facilities in Skagway. Cleanup actions at these sites have removed most of the lead and zinc contamination in surface soils within Skagway. The WP&YR Railroad maintenance yard also has known volatile organic compound contamination in soil and groundwater from former railroad maintenance activities at the railroad yard. The Skagway/Nahku Ore Terminal and Port area is downgradient and approximately 2,500 feet from the nearest point of the right-of-way for Alternatives 2, 2A, and 2C. The WP&YR Railroad Yard is located adjacent to the terminus of Alternatives 2, 2A, and 2C in Skagway.

One site with a high hazard rating is located within 150 feet of the alignment for Alternatives 2, 2A, and 2C in Skagway. That is the White Pass and Yukon Route Railroad Coach Cleaning Shop on 21st Avenue and State Street. The site is used by the railroad as a staging and storage area for cleaning supplies used to clean passenger cars on tourist trains. The site is listed as an ADEC contaminated site based on diesel fuel contamination to soil and groundwater. Some soil remediation for diesel fuel took place on the site in 2001; however, all of the contamination was not removed to ADEC cleanup levels and the site remains as an active cleanup site (ADEC, 2003a).

The Kensington beach facility, which has a medium hazard rating, is located about 150 feet from the alignment for Alternatives 2 through 2C at Comet. This facility contains three 20,000-gallon above ground diesel fuel storage tanks. There have been no reported spills from these tanks (ADEC 2003a and 2003b).

Two sites with a medium hazard rating are located adjacent to the alignment for Alternatives 2, 2A, and 2C in the Skagway area. The alignment for these alternatives would cross the former Skagway to Whitehorse fuel pipeline just before the alignment reaches 23rd Avenue. This 110-mile, 8-inch diameter diesel and gasoline pipeline operated from 1948 to 1996. Multiple historic spills have been recorded along the pipeline when it was in operation. All of the spills documented by ADEC have occurred outside the 300-foot study corridor for the Juneau Access Improvements Project. The other site with a medium hazard rating is the Skagway Alaska Power and Telephone, Inc. maintenance building and equipment yard located within 250 feet of the terminus of the alignment for Alternatives 2, 2A, and 2C immediately adjacent to 23rd Avenue. This site was assigned a medium risk because of possible PCB contamination from electrical transformers in the equipment yard. A review of the EPA PCB Activity Database indicates that the site was found to be out of compliance with PCB-record keeping requirements in 1991, but no other violations have been issued (EPA, 2003).

The AT&T Alascom Sullivan River Microwave Repeater Station is located one mile north of the Sullivan River and within 600 feet of the centerline for the Alternative 3 alignment. This station has a medium hazard rating because commercial quantities of diesel fuel are stored there in tanks. These tanks have leaked in the past but the spilled fuel has been cleaned up to the satisfaction of ADEC (ADEC, 2003a). For specific information on the ISA findings, ISA methodology, and identified hazardous materials sites, refer to the *Initial Site Assessment Technical Report* (Appendix M).

3.3 Biological Environment

3.3.1 Wetlands

Waters of the U.S., including wetlands, are regulated by the USACE under the authority of the Clean Water Act. Wetlands are defined in the following excerpt from the federal Clean Water Act:

> [Wetlands are] … those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

The Lynn Canal study area contains 13,710 acres of wetlands and aquatic beds (e.g.,lily ponds). The USFWS National Wetlands Inventory (NWI) has mapped wetlands in the region. The inventory has grouped wetlands into general wetland classes or complexes. The predominant wetlands in the project area consist of palustrine forested and scrub-shrub wetlands (and combinations) with an area of 10,562 acres, and palustrine emergent and palustrine emergent and emergent/scrub-shrub wetlands with an area of 2,152 acres. The combination of these classes of wetlands comprise about 93 percent of all wetlands in the project study area.

The least common wetlands in the study area consist of 966 acres of estuarine emergent wetlands and 30 acres of palustrine aquatic bed/open water. These wetlands comprise 7.1 and 0.2 percent, respectively, of all wetlands in the project area.

In the study area, the largest wetland areas occur on the east side of Lynn Canal at the northern end of Berners Bay and on lowlands between Slate Cove and Sherman Point (Figures 3-13 through 3-17). At the north end of Berners Bay, the Antler and Berners rivers and their tributaries support an extensive area of palustrine scrub-shrub/emergent, palustrine emergent, estuarine flooded and emergent, riverine flooded, and palustrine forested wetlands. Forested wetlands cover large areas between Slate Cove and Sherman Point with patches of emergent and scrub-shrub wetlands in depressions and areas of groundwater discharge. On the west side of Lynn Canal, the most extensive wetlands in the study area are present in the Endicott River and Sullivan River areas (Figures 3-15 through 3-17). The Davidson Glacier outwash plain supports a large number of relatively small wetlands and water bodies that have formed in the alluvial material including emergent wetlands, ponds with emergent or floating vegetation, and open water habitats.

The 1997 Draft EIS identified wetlands using existing USFWS NWI maps with some additional wetland field determinations performed in specific areas in accordance with methods presented in the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). The NWI groups wetlands into classes or complexes.

The alternatives evaluated in the 1997 Draft EIS have been modified and new alternatives are being evaluated. Agency comments on the 1997 Draft EIS, as well as 2003 scoping comments for the Supplemental Draft EIS, indicated that further analysis was needed for the proposed

project. For these reasons, a new wetlands analysis was conducted in 2003. This analysis focuses on wetlands in the immediate vicinity of the alignment for project alternatives.

The 2003 wetland analysis was based on new fieldwork and wetland delineations that were conducted in 2003. The following scope and methods for the 2003 wetlands assessment were agreed to by the USACE, USFS, National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS), USFWS, EPA, and ADNR Office of Habitat Management and Permitting (OHMP).

- **Methodology** – Wetlands were assessed as individual wetlands rather than complexes. Wetlands identified in the field were mapped and photographed. Soil profiles and site hydrology were evaluated and NWI classification was verified. A field data sheet was prepared for each wetland using the USACE 1987 methodology. A wetland functional assessment data form was also completed for each wetland based on the modified Adamus method used in a recent Juneau International Airport wetlands assessment (SWCA Environmental Consultants, 2002).
- **Fieldwork Locations** – Field surveys were conducted at individual wetlands that the proposed alignments or ferry terminals would impact in the following areas: Berners Bay, Katzehin River, William Henry Bay, Endicott River, Sullivan River, Davidson Glacier area, and Pyramid Island. Existing data were reviewed for background information on the project areas prior to the 2003 field investigation to assist in the delineation and evaluation of wetlands. The NWI maps and aerial photography were used to prioritize field survey site locations where additional investigations were needed. Areas that appeared to have extensive wetland coverage, high value wetlands, or questionable coverage were given the highest priority. In these priority areas, NWI wetlands within 300 feet of an alternative alignment were field checked and evaluated for functions and values. All proposed ferry terminal sites were evaluated for wetland and/or marine impacts.

Field methods for verifying wetland classification and boundaries were based on the presence of three parameters: hydrophytic vegetation, hydric soils, and wetlands hydrology, as outlined in the USACE Wetlands Delineation Manual. Information on general site hydrology was interpreted from aerial photographs. On-site observations of wetland hydrology included the following criteria: inundated or saturated soils, landscape position, oxidized or reduced root channels, or sediment and debris deposits from previous flooding. Qualitative field notes of functions and values were recorded on a modified version of the Juneau Airport EIS Wetland Functional Assessment Data Form.

The combination of field notes, aerial photography interpretation, and global positioning system (GPS) coordinates were used to develop wetland maps of the project area. Delineations of wetlands not recorded on the ground are primarily based on NWI delineations and aerial photography interpretation. Of the 116 wetland areas potentially impacted by project alternatives, 51 were field checked. This represents approximately 67 percent of the wetland acreage potentially impacted.

3.3.1.1 Wetland Classifications

The classification of wetlands in the project area follows the NWI Classification System and includes both freshwater and saltwater-influenced wetlands. Palustrine wetlands are nontidal wetlands with vegetation either dominated by persistent emergent vegetation (“emergent”), shrubs (“scrub-shrub”), or trees (“forested”), or by water bodies that lack such vegetation and have relatively shallow water (“aquatic bed/open water”). Estuarine emergent wetlands, or salt marsh communities, consist of salt-tolerant vegetation in areas that are subject to tidal

inundation and extend to the seaward limit of emergent vegetation and/or upstream where the ocean-derived salts measure less than 0.5 percent during low-flow periods. Figures 3-14 through 3-17 identify the locations of these wetlands within the project area.

Palustrine Emergent Wetlands – Palustrine emergent wetlands within the project area primarily occur in association with groundwater seeps (marshes or fens), muskeg or bog environments, and areas that are flooded to the extent that tree and shrub growth is inhibited. Sedges (*Carex* spp.) are typically the dominant species, with cottongrass (*Eriophorum* spp.) and water horsetail (*Equisetum fluviatile*) also found. These areas have a low shrub component of Labrador tea (*Ledum groenlandicum*), bog blueberry (*Vaccinium uliginosum*), or cloudberry (*Rubus chamaemorus*). Emergent wetlands are often components of larger wetlands complexes of scrub-shrub and forested wetlands and aquatic bed/open water features.

Palustrine Scrub-Shrub Wetlands – Scrub-shrub wetlands are dominated by shrubs and/or trees that are less than 20 feet tall. These wetlands are typically associated with muskegs and floodplains along rivers and streams. In the project area, scrub-shrub wetlands are dominated by either deciduous species such as Sitka alder (*Alnus sitchensis*), thinleaf alder (*Alnus tenuifolia*), and willow (*Salix* spp.) along rivers and streams. In muskeg environments, the common species include shore pine (*Pinus contorta*), mountain hemlock, and western hemlock (*Tsuga mertensiana*). Smaller shrubs in these communities include Labrador tea, deer cabbage (*Fauria crista-galli*), Alaska blueberry (*Vaccinium alaskaensis*), bog blueberry, and cloudberry.

Palustrine Forested Wetlands – Forested wetlands are dominated by trees taller than 20 feet and typically consist of layers of trees, shrubs, and herbaceous vegetation. Tree species found in the forested wetlands within the project area include mountain hemlock, western hemlock, and Sitka spruce (*Picea sitchensis*). The shrub understory consists of rusty menziesia (*Menziesia ferruginea*), tall blueberry (*Vaccinium ovalifolia*), and Alaska blueberry. The ground cover species layer is dominated by Canada bunchberry (*Cornus canadensis*), skunk cabbage (*Lysichiton americanum*), spleenwort-leaf gold thread, Alaska goldthread (*Coptis asplenifolia, C. trifolia*), and false lily-of-the-valley (*Maianthimum dilatatum*). Broad-leaved forested wetlands are found along river floodplains and are dominated by black cottonwood (*Populus balsamifera*) with typical understory species of willow and alder. Forested wetlands, mostly of the needle-leaved evergreen subclass, occupy the greatest area of wetland land cover within the project area.

Palustrine Aquatic Bed/Open Water – Palustrine aquatic bed wetlands are permanently flooded areas that contain vegetation that grows on or below the surface of the water for most of the growing season (Cowardin et al., 1979). These communities are considered “vegetated shallow” under the Clean Water Act. Dominant vegetation in aquatic bed wetlands of the project area consists of floating-leaf pondweed (*Potomageton natans*), northern burreed (*Sparganium hyperboreum*), and yellow pond lily (*Nuphar polysepalum*). Palustrine aquatic bed habitats are relatively scarce in the project area.

Estuarine Emergent Wetlands – Estuarine emergent wetlands, also called salt marshes, are found within the intertidal zone and are present in the project area. These areas vary in species composition depending on exposure to saltwater. Vegetation of upper beach areas consists of beach rye (*Leymus arenarius*), silverweed (*Argentina anserina*), beach pea (*Lathyrus japonicus*), and Lyngbye’s sedge (*Carex lyngbyei*); the substrate is mostly gravel and sand. Salt-tolerant forbs, such as seaside arrowgrass (*Triglochin maritimum*) and seaside plantain (*Plantago maritima*), occupy the areas irregularly exposed to salt water. Areas more frequently inundated support salt-tolerant alkali grass (*Puccinella* spp.), sea milkwort (*Glaux maritima*), and salt brush (*Atriplex alaskana*).

Marine Areas – Unvegetated intertidal flats, beach bars, and rocky shores are also included in the NWI and are classified as estuarine wetlands. They do not meet the USACE definition of wetlands and are therefore classified as other waters of the U.S. Rocky shores are the most extensive intertidal habitats in the project area and occur along extensive areas on both sides of Lynn Canal. Beach bars are found on active beaches with unconsolidated substrate. Descriptions of potentially impacted marine sites, including subtidal areas, are presented in the *Essential Fish Habitat (EFH) Assessment* (Appendix N).

3.3.1.2 Distribution Within the Project Area

The East Lynn Canal wetlands are bounded by the Juneau icefields to the east, the Lynn Canal marine waters to the west, Skagway to the north, and the northern extent of the Glacier Highway to the south. Approximately 11,259 acres of wetlands lie within the eastern side of the study area. Palustrine forested wetlands make up over half of the wetlands in this area (Table 3-4).

The greatest amount of wetland coverage extends from Slate Cove on the north side of Berners Bay to Sherman Point, where forested wetlands dominate with smaller amounts of muskegs or emergent wetlands. The most extensive areas of estuarine emergent wetlands in this region occur at the head of Berners Bay, at the mouths of the Antler and Berners/Lace rivers, and on the Katzehin outwash plain. Unvegetated intertidal flats are also associated with these rivers and glacial outwash plains. Unvegetated rocky shorelines are extensive along the coast especially in the northern portions of East Lynn Canal between Sherman Point and Skagway.

Table 3-4
Project Area Wetlands by Type

Wetland Type	Acres (Percent of Total)		
	East Lynn Canal	West Lynn Canal	Total Project Area
Estuarine Emergent	574 (5.1%)	392 (16.0%)	966 (7.1%)
Palustrine Emergent	1,812 (16.1%)	340 (13.9%)	2,152 (15.7%)
Palustrine Forested	6,720 (59.7%)	1,039 (42.4%)	7,759 (56.6%)
Palustrine Scrub-shrub	2,133 (18.9%)	670 (27.3%)	2,803 (20.4%)
Palustrine Aquatic Bed	20 (0.2%)	10 (0.4%)	30 (0.2%)
Total Wetlands	**11,259**	**2,451**	**13,710**

The West Lynn Canal wetlands are bounded by the Lynn Canal marine waters to the east, the Chilkat Range in the northwest, and the eastern boundary of the Endicott River Wilderness Area to the southwest. The northern extent of the highway at Mud Bay Road in Haines acts as the northern boundary, and William Henry Bay is the southern boundary. Approximately 2,451 acres of wetlands lie within the western side of the study area.

Forested wetlands are the dominant wetland type, similar to the East Lynn Canal wetlands (Table 3-4). These wetlands are most extensive on Sullivan Island and in the Endicott and Sullivan River areas. The Davidson Glacier outwash plain is different from other sections of this coastline in that it has numerous small, wet depressions that support a diverse range of emergent wetlands, aquatic beds, and open water habitats. Estuarine emergent wetlands are primarily found at the mouths of small rivers and the outer fringes of the glacial outwash plains and river deltas. Intertidal rocky shores occur along most of the coastline between the major rivers and outwash plains. Unvegetated intertidal flats occupy the outer fringes of most outwash plains and deltas.

3.3.1.3 Wetlands Functions

Wetlands functions are "the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of wetland ecosystems" (American Society of Testing and Materials International, 1999). Wetlands also provide many benefits to society, depending upon the wetland types and their location, including both consumptive and non-consumptive uses. Values assigned to specific wetlands are generally estimates, sometimes subjective, of the importance of wetland functions to people, fish, wildlife, water quality, etc. Values often include social values. The discussion of values of wetlands will specify the degree of importance as well as the entity for which the function is important.

A modified version of the Adamus Resource Assessment, Inc., Wetland Evaluation Technique (WET) (Adamus, 1987; SWCA Environmental Consultants, 2002) was used to evaluate the wetlands in the project area. The Interagency Working Group of the Juneau Airport EIS revised this primarily freshwater assessment methodology to consider coastal wetlands (SWCA Environmental Consultants, 2002). During 2003 scoping, resource agencies determined that this would be an appropriate method for the Juneau Access Improvements Project. All wetlands affected by the project were rated from high to low for each of the following functions:

- Groundwater recharge
- Groundwater discharge/lateral flow
- Surface hydrologic control
- Sediment/toxicants retention
- Nutrient transformation and export
- Riparian support
- Disturbance of sensitive wildlife habitat
- Regional ecological diversity
- Erosion sensitivity
- Ecological replacement cost
- Downstream/coastal beneficiary sites

There are intermittent palustrine forested wetlands along the east shore of Berners Bay from Echo Cove to the Antler River that are apparently fed by groundwater seeps from the hillside. These wetlands have a moderate to low wildlife habitat function; they provide forage and cover for several species such as deer, brown bear, black bear, marten, goat (in winter), and many species of birds, as does the surrounding upland forest. Their principal function is groundwater discharge and lateral flow and nutrient transformation/export.

The estuarine emergent wetland at the head of Berners Bay has high wetland function ratings for wildlife habitat, riparian support, regional ecological diversity, and ecological replacement cost. This rating is based on the documented use of the area by wildlife and because the wetland type is limited in distribution in Berners Bay and likely receives substantial use by wildlife. Riparian support is also important to fish.

There is a broad band of palustrine forested wetlands at lower elevations between Slate Cove and Sherman Point. Large patches of emergent and scrub-shrub muskeg wetlands occupy the lowest elevations in this area with expanses of seasonally flooded emergent wetlands in low lands west of Slate Cove. While the forested wetlands have a moderate to low wildlife habitat

function, the scrub-shrub muskeg provides blueberry foraging areas for bears as well as nesting and rearing habitat for songbirds in the summer. The principal function of these wetlands is sediment retention, groundwater recharge and discharge, and lateral flow.

The Katzehin River delta supports estuarine emergent wetland. These wetlands receive floodwaters and are rated high as wildlife habitat. The estuarine emergent wetland area is extensive in the Katzehin River outwash plain and a valuable habitat for wildlife. At the location of the proposed Katzehin Ferry Terminal, the intertidal rocky shore is rated high for fish and wildlife habitat. The rocky shore habitat north of the Katzehin River is extensive along the shoreline and a valuable habitat for fish and wildlife.

On the west side of Lynn Canal, between the Endicott River and the Davidson Glacier outwash plain, forested wetlands are the predominant wetlands. This area supports relatively large trees and is rated high for groundwater discharge, nutrient transformation, and wildlife habitat.

The Glacier River bisects the Davidson Glacier outwash plain, and the area supports a number of unique wetlands. Wetland types include emergent wetlands, ponds with floating vegetation, and open water habitats. They are generally rated high for groundwater functions, surface hydrologic control, and nutrient transformation and export. The groundwater and nutrient transformation and export functions are important to fish. The surface hydrological control is important for fish and wildlife, as it controls flooding and erosion.

Detailed wetland maps and additional information on wetland function ratings are provided in the *Wetlands Technical Report* (Appendix O).

3.3.2 Marine and Freshwater Habitat (Including Essential Fish Habitat)

Lynn Canal is a long and deep fjord-like estuarine inlet surrounded by rugged glaciated mountains with deep V-shaped and U-shaped valleys. Many of the bays in the project area have narrow margins of hilly moraines, with small flat-bottomed valleys at their heads. Most slopes throughout the project area are steep. Elevation ranges from sea level to over 4,000 feet. The marine and freshwater habitats in Lynn Canal support a variety of animal and fish species.

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to assess the effects of their projects on essential fish habitat (EFH) for commercial fish stocks in all life stages and associated habitats. This Act also calls for direct action to stop or reverse the continued loss of fish habitats. The Act requires consultation between NMFS, the Fishery Management Councils, and federal agencies to protect, conserve, and enhance essential fish habitat. Federal agencies are required to determine if their actions have a potential adverse effect on EFH and if so, they must prepare an EFH assessment. The Act defines EFH as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Act considers *"fish"* to include finfish, mollusks, crustaceans, and other forms of marine life excepting marine mammals and birds. The Act defines *waters* as "aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish, where appropriate"; *substrate* as "sediment, hard bottom, structures underlying the waters, and associated biological communities"; and *necessary* as "the habitat required to support a sustainable fishery and a healthy ecosystem." In considering an *adverse effect* to EFH, Subpart J, Section 600.810 of the Act defines an adverse effect to EFH as "any impact, which reduces the quality and/or quantity of EFH."

This section provides a description of essential fish habitat in the project study area. The section also describes habitat for shellfish, prey species, and resident fish that are not commercial fish stocks covered by the Magnuson-Stevens Fishery Conservation and Management Act.

3.3.2.1 Marine Habitat in Lynn Canal

Marine habitats considered for evaluation in this Supplemental Draft EIS include intertidal and subtidal zones in Lynn Canal that would potentially be affected by fill placement and/or sidecasting from construction of a road or new ferry terminal, and offshore waters that would potentially be affected by ferry traffic. The marine habitats in Lynn Canal support many species of both resident and transient marine mammals, terrestrial mammals (river otter), seabirds, fish, marine invertebrates, and vegetation, all of which are discussed in detail in subsequent sections of this Supplemental Draft EIS.

Lynn Canal provides an essential migratory corridor for all five species of Pacific salmon (*Oncorhynchus* spp.), which includes all estuarine and marine areas used by the fish. Marine habitat in Lynn Canal exists for such marine fish as sablefish (*Anoploma fimbria*) (estuarine waters), sculpin (Cottidea) (intertidal and subtidal sites), Pacific herring (*Clupea pallasii*) (kelp and eelgrass for spawning), skate (Rajiidae) (Berners Bay subtidal areas), and forage fish (prey species; estuarine and marine waters) such as eulachon (*Thaleichthys pacificus*) (Berners Bay and surrounding rivers for spawning), sand lance (*Ammodytes hexapterus*), and capelin (*Mallotus villosus*) (Berners Bay for spawning).

Field surveys were conducted in 2003 to obtain information on intertidal and subtidal habitat composition in Lynn Canal. Fieldwork and assessment methodologies were developed in consultation with the USACE, USFS, NMFS, USFWS, EPA, ADNR (OHMP and ACMP), and FHWA in 2003. Based on preliminary consultation with NMFS, DOT&PF determined that the proposed project alternatives may adversely affect the following EFH fish species including specific life stages, and prey species:

- Pink salmon (*Oncorhynchus gorbuscha*), chum salmon (*O. keta*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and Chinook salmon (*O. tshawytscha*) – eggs, fry smolt, and spawning adults
- Sablefish and other rockfish (*Sebastes* spp.) – adults; other life stages unknown
- Sculpin– eggs, juveniles, and adults
- Skate – adults; other life stages unknown
- Pacific herring – eggs, juveniles, and adults
- Forage fish (eulachon], capelin, and sand lance) – eggs, juveniles, and adults

Thirty-one subtidal areas were surveyed using the Seabed Imaging and Mapping System, which consists of a video camera that is towed just above the seabed and a video recording system that links GPS fixed locations to the imagery. Figure 3-18 shows the 14 general locations where these 31 subtidal surveys were conducted. Video data were classified for geological and biological features, providing a classification record for every two seconds of imagery.

Surveys of 49 intertidal sites were conducted during low tide from August 26 to 29, 2003. Forty-one of these sites were identified by DOT&PF as possible fill locations for highway construction. Four sites were investigated as representative of typical locations where, due to the steep terrain, rock from blasting would fall directly through the intertidal zone (uncontrolled

sidecasting) or the locations would be used for intentionally controlled sidecasting. The remaining four sites are situated at potential ferry terminal locations.

Intertidal Habitat – The nearshore coast or intertidal zones surveyed in Lynn Canal consist mainly of sediment beaches (boulder, cobble, gravel, sand, and/or mud), bedrock cliffs, and vertical rock faces. There are also a few tidally influenced sloughs and estuarine wetland habitats. Some sites consist of one shoreline classification, while others are a combination of two or more classifications. Characteristics of the zonation and types of organisms observed can differ greatly among locations and depend upon many variables including wave exposure and slope of the beach.

The sediment beaches that exhibit a low slope angle tend to have vegetation and low to medium wave exposure. Sediment beaches tend to support a higher diversity of species than shorelines with a higher angle or harsher wave action. Species observed at these high-angle sites form conspicuous bands or belts of varying widths (zonation).

Bedrock cliffs or vertical face shorelines can likely support prey species for many marine and anadromous species known to inhabit the study area. Due to their morphology, these sites are not important for the spawning, breeding, or growth to maturity for these fish species.

The nearshore waters of the intertidal zone are used by forage fish species (e.g., eulachon and capelin) for consumption of intertidal prey; some anadromous fish for consumption of prey as well as spawning and/or rearing; marine birds for feeding and/or nesting; and river otters, harbor seals, and Steller sea lions for feeding and haulouts. The project vicinity contains the following intertidal habitat areas:

Sawmill Cove – Vegetation coverage was linked to gravel presence. The rocky points at the north and south headlands of the cove are covered with dense *Fucus* (rockweed) to about the zero foot tidal elevation. In the lower intertidal zone, rockweed is interspersed with two kinds of large-bladed kelp (*Lamanaria saccharina* and *Agarum clathratum*). Foliose red and green algae and filamentous green algae are also present in the intertidal zone. Intertidal fauna was composed of barnacles, mussels, and anemones. Siphons of many mollusks were observed during a field survey.

Slate Cove – No intertidal vegetation or fauna were observed.

Katzehin Ferry Terminal Area – The intertidal area is a boulder-cobble-pebble dominant zone. Vegetation observed included stalked kelps in one location, foliose green algae, filamentous red algae, and rockweed.

Taiya Inlet – Typical zonation was observed on the rocky cliffs and bedrock outcrops in Taiya Inlet and on the boulder beaches north of the Katzehin River.

William Henry Bay – The intertidal area has gravel with boulders and cobbles along the western shore and mostly pebbles to the south. Intertidal vegetation observed included bladed kelps, coralline red algae, rockweed, filamentous red algae, and foliose red algae. Intertidal fauna observed included barnacles, blue mussels, sea cucumbers, and green urchins.

Subtidal Habitat – Subtidal areas are the areas extending below the intertidal zone along the seabed toward the offshore region. The substrate in the subtidal areas surveyed in Lynn Canal consists of boulders, cobbles, gravel sediments, and mud. Fish, invertebrates, and vegetation are present in the subtidal area; the concentrations of these species depend on the type of substrate. Offshore regions consist predominantly of mud and sand with a

minimum of vegetation, but observable populations of burrowing mollusks and fish occur. The subtidal areas nearer to the shore consist of a mixture of sandy and rocky substrates, with boulders and cobbles more concentrated toward the shore. The rocky substrates support a higher diversity of sessile fauna (e.g., cup corals and sea anemones) as well as mobile species (e.g., crabs and urchins) and algae (e.g., kelps and coralline reds). Areas where subtidal habitat surveys were conducted are noted on Figure 3-18. Site-specific observations are presented below.

Sawmill Cove – A 500-by-1,600-foot area was surveyed from the intertidal zone (at approximately +10 foot tidal elevation) to a depth of 100 feet. The seabed is composed almost exclusively of clastic sediment (muds, sand, and gravels) with occasional large cobble. Gravel content is highest in the intertidal zone and drops off rapidly in the offshore where sands and muds predominate. Rockweed was interspersed with large-bladed kelp. One species of this kelp (*Laminaria saccharina*) was sparse but persistent and evenly distributed throughout the site. No eelgrass, floating kelp, or giant kelp were noted at the site. Subtidal fauna included sea whips (*Halipterus* sp.), one location of orange sea pens, and one location with a bivalve and brozoan complex concentration. Mobile species were also recorded including yellowfin sole, rock sole, gunnels, snake pickleback, sculpin, sand lance, and a large school of young Pacific herring.

Slate Cove – A 980-by-2,600-foot area was surveyed from the intertidal zone (at approximately +6 foot tidal elevation) to a depth of 125 feet. The site has a highly uniform seabed consisting of mud. A few boulders and cobbles were observed. No sea grasses or kelps were noted. Subtidal fauna was sparse with a few unidentified fish, a few flatfish, and one anemone observed.

Representative East Lynn Canal Shoreline Between Comet and Katzehin River – Surveys were conducted at three locations along the east coast of Lynn Canal between Comet and the Katzehin River. The surveys were conducted from the intertidal zone (from approximately +10 to -4 feet tidal elevation) to depths from 100 to 128 feet. This section of shoreline is very steep and has substrate with varying amounts of bedrock, sediment veneer over bedrock, and boulder-cobble-gravel sediments. Shell fragments were noted throughout the survey areas. Coralline red algae were common at all three survey areas, whereas bladed kelps, fucus, filamentous red algae, and foliose red algae were uncommon. Bryozoan complexes dominated the deeper areas of all three areas. Unidentified fish were common at two of the areas, and anemones, sea whips, and mottled stars were uncommon at all three areas. Green urchins were common in the intertidal zone at two survey areas and uncommon at the other. Barnacles and mussels were noted but uncommon.

Katzehin Ferry Terminal Area – A 660-by-2,600-foot area was surveyed from the intertidal zone (at approximately +10 foot tidal elevation) to a depth of 85 feet. The subtidal seabed is composed of a muddy zone. No vegetation was observed. Subtidal fauna was sparse with a few unidentified fish, a few flatfish, and a single anemone.

Taiya Inlet – Two types of subtidal habitat were surveyed in the Taiya Inlet as representative of habitat potentially impacted by rock sidecasting. The first type represents a scenario where rock would land on an underwater outcrop (or ledge) of rock. The second represents a scenario where rock would fall into marine water with steep-sided shores. A survey area north of the Katzehin River where underwater bedrock outcrops were observed in deeper water represents the underwater outcrop scenario. The survey was conducted from the intertidal zone (from +6.5 foot tidal elevation) to a depth of 125 feet. Intertidal substrate was mostly boulder-cobble with offshore substrate mostly gravelly mud/sand. Shell fragments were sparsely distributed with higher concentrations associated with

bedrock areas. Vegetation cover was restricted to the intertidal area and dominated by bladed kelps and coralline red algae. At depths greater than 50 feet, mussels, shrimp, and unidentified urchins were common. Green sea urchins, crab, snails, unidentified fish, and flatfish were noted but uncommon.

Five steep-sided sites were surveyed in the Taiya Inlet. The surveys were conducted from the intertidal zone (0 foot tidal elevation to +11.5 foot tidal elevation) to depths from 100 to 148 feet. The shoreline was steep with variable substrate. Bedrock dominated the intertidal and shallow subtidal areas. Subtidal areas had rock with sediment veneers over bedrock. Shell fragments were common (30 to 50 percent coverage). Vegetation was observed in the shallow subtidal areas and primarily consisted of coralline algae, foliose green algae, fucus, filamentous red algae, and bladed kelp. Vegetation covers were typically low (e.g., one site had 25 percent coverage). Barnacles and mussels were common in the intertidal area, and shrimp were common in the subtidal areas. Sea urchins, anemones, bryozoan complexes, and fish were observed but were not common.

William Henry Bay – A 1,300-by-3,000-foot area was surveyed from the intertidal zone (at approximately +10 foot tidal elevation) to a depth of 70 feet. Fines rapidly increased in the offshore direction, with sands and muds extending to the 30 to 50 foot depth and muds predominate in deeper water. Vegetation was restricted to depths of less than 50 feet. Subtidal vegetation observed included minimal amounts of bladed kelp and filamentous red algae. Subtidal fauna observed included sea cucumbers; orange sea pens, which were common on the northern end of the survey area (33- to 65-foot depth); sea whips; anemones, which were common at depths greater than 33 feet; mottled sea stars, which were common between three and 20 feet; 18 crabs; and flatfish, which were common and had 44 individuals observed at depths greater than 23 feet throughout the survey area.

For further information on the marine environment in the study area, see the *Essential Fish Habitat (EFH) Assessment* (Appendix N).

3.3.2.2 Freshwater Habitat in Lynn Canal

Freshwater habitat in the study area consists of mountain lakes and side streams that were formed mainly by glacier melt. Most of the streams drain directly into Lynn Canal. The mixture of steep and gentle terrain along Lynn Canal produces a variety of stream types and habitat for freshwater and anadromous fish species. Mountain lakes provide habitat for some mammals and amphibians.

Approximately 90 streams are within the proposed project area, and about 28 percent of these streams (13 on the east and 12 on the west side of the canal) are known to support anadromous fish species (ADF&G, 2003b). Freshwater lake habitat in the area consists of high mountain lakes, which are usually surrounded by a variety of riparian vegetation.

Freshwater stream habitat in Lynn Canal consists of drainages within the deep V-shaped and U-shaped valleys that dominate the area. The river-carved V-shaped valleys lack the outwash region or floodplain characteristics of the more gently sloped U-shaped valleys, where many side channels and sloughs are usually located. Spawning habitat in the V-shaped valley streams is limited to the intertidal zone, and rearing habitat in these streams is usually limited to the main channel. Both of these features may restrict the variety of species able to use the area. The large, glacial, braided river systems contained within U-shaped valleys provide a greater potential for anadromous habitat located outside of the main channel. Side channels branch out into adjacent muskegs and floodplain areas associated with the river, providing varied and extensive rearing and spawning habitat within the river system, which promotes anadromous species diversity. Necessary characteristics of habitat required to support

anadromous fish species include ample spawning and rearing habitat. Depending on the species, one or both of these habitat types can be the limiting factor in the successful reproduction of the species.

Anadromous fish habitat has been identified along the east side of Lynn Canal within Berners Bay (the Berners, Gilkey, Lace, and Antler rivers); at Sherman, Sawmill, Johnson, Slate, and Sweeny creeks; and the Katzehin River (Figure 3-18). Three unnamed anadromous streams also occur on the east side of Lynn Canal. The Katzehin, Lace, and Antler rivers are large glacial river systems in U-shaped valleys. Many of these anadromous streams also support resident fish populations. There are several smaller streams with the potential to support resident fish; the remaining streams along the east side of the canal provide poor fish habitat and/or have steep waterfalls.

Anadromous fish habitat exists within rivers contained in floodplains and U-shaped valleys along the west side of Lynn Canal. Anadromous streams found in William Henry Bay are the Beardslee River and William Henry Creek. Other anadromous streams are the Endicott, Sullivan, and Chilkat rivers; Sullivan Creek; and six unnamed streams. As on the east side of Lynn Canal, many of the anadromous fish streams also support resident fish populations. Several smaller streams have the potential to support resident fish; the remaining streams along the west side of the canal provide poor fish habitat.

See the *Anadromous and Resident Fish Streams Technical Report* (Appendix P) for additional information on stream habitat in the project area.

3.3.3 Terrestrial Habitat

The landscape in Lynn Canal is intensely glaciated, and the mountains are primarily densely forested with a typically undisturbed coniferous closed canopy system, interrupted in a few areas by river valleys and glacial outwash plains. The study area contains rugged topography with moderate to steep forested slopes, interrupted by raised benches, bare rock cliffs, and steep avalanche chutes.

Terrestrial habitat in the Lynn Canal study area consists mostly of coastal coniferous rainforest, which occurs throughout the study area and is characterized by an overstory dominated by western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), and some scattered mountain hemlock (*T. mertensiana*), Alaska or yellow cedar (*Chamaecyparis nootkatensis*), and red alder (*Alnus oregona*). The TLMP refers to this climax stage of the spruce/hemlock or hemlock forest habitat as old-growth forest. Large trees, decaying logs, lush undergrowth, and multiple canopy layers characterize old-growth forest habitat. There is a total of approximately 150,749 acres of old-growth forest in the study area, with 76,279 acres along East Lynn Canal and 74,470 acres along West Lynn Canal (DOT&PF 1997). Old-growth forest typically extends from sea level to an elevation of approximately 2,500 feet, with subalpine and alpine habitats at higher elevations. In the typical Sitka spruce/western hemlock forest, the understory consists of shrubs such as Sitka alders (*A. crispa*), rusty menziesia (*Menziesia ferruginea*), blueberry (*Vaccinium ovalifolium and V. alaskensis*), red huckleberry (*V. parvifoloium*), salmonberry (*Rubus spectabilis*), shield ferns (*Dryopteris dilitata*), devils club (*Echinopanax horridum)*, and yellow skunk cabbage (*Lysichiton americanum*).

Deciduous forest or mixed deciduous/needleleaf forest communities are found in limited areas, primarily in association with floodplains of larger rivers. The dominant tree species in these areas are the black cottonwood (*Populus balsamifera*) with a shrub layer of Sitka alder (*A. crispa*), thinleaf alder (*A. tenuifolia*), and willow (*Salix* spp.).

Interspersed within the forest are open, poorly drained areas, including muskeg and bog communities. These wetland communities are discussed in Section 3.3.1 and described in the *Wetlands Technical Report* (Appendix O).

Shrub communities in the study area consist of open dwarf tree complexes, tall shrub communities, and low shrub communities. Dwarf tree communities are primarily dominated by mountain hemlock (*T. mertensiana*), smaller amounts of shore pine (*Pinus contorta*), and an understory of blueberry (*Vaccinium* spp.) shrubs. Tall shrub communities are found on steep slopes, along stream banks, and in floodplains. Dominant species on steep terrain typically include Sitka alder (*A. crispa*). A mixture of willow (*Salix* spp.), alder (*Alnus* spp.), and cottonwood (*Populus* spp.) is typically found near stream banks and floodplains of rivers such as the Antler River on the east side of Lynn Canal and the Endicott River on the west side of Lynn Canal. Low shrub communities are typically found in poorly drained bog habitat and are dominated by ericaceous shrubs such as Labrador tea (*Ledum groenlandicum*), crowberry (*Empetrum nigrum*), leatherleaf (*Chamaedaphne decumbens*), and deer cabbage (*Fauria crista-galli*).

The subalpine and alpine areas, with steep slopes and limited soil, support low shrub and dwarf shrub communities of blueberry (*Vaccinium* spp.), Aleutian heather (*Phyllodoce aleutica*), Arctic willow (*Salix arctica*), salmonberry (*R. spectabilis*), and a variety of grasses, wildflowers, ferns, and mosses. At elevations above the alpine vegetation, glaciers and snowfields dominate.

Herbaceous communities are typically found at lower elevations and consist of sedge/grass/forb meadow communities on outwash plains, wet meadow communities in poorly drained wetlands areas with emergent grasses, sedges (*Carex* spp.), and cottongrasses (*Eriophorum* spp.). Herbaceous salt marsh communities occur in tidally influenced areas, typically at the mouth of rivers, streams, or along outwash plains, and are dominated by salt-tolerant species such as sea beach lyme-grass (*Elymus mollis*), beach lovage (*Ligusticum scoticum)*, seaside plantain (*Plantago maritima*), and seaside arrowgrass (*Triglochin maritimum*).

Surveys for plants listed as threatened, endangered, or proposed under the Endangered Species Act, and plants on the USFS Alaska Region Sensitive Species List were conducted in the summer of 2004 along portions of the alternative alignments where they would be likely to occur. None of these species were found in the surveys.

3.3.4 Marine and Anadromous Fish and Shellfish

The waters in the Lynn Canal area support anadromous, resident, and marine finfish, and shellfish. The varied and dramatic topography of the area provides habitat for a diversity of fish species along the canal. See Section 3.3.2 for habitat descriptions.

3.3.4.1 Marine Finfish

The following marine fish in the Lynn Canal were assessed for the Supplemental Draft EIS: sablefish, yelloweye rockfish (*Sebastes ruberrimus*), other rockfish (*Sebastes* spp.), sculpin, skate, Pacific herring, and forage (prey) fish (eulachon, capelin, and sand lance).

Sablefish spawn at depths of 984 to 1,640 feet near the edges of the continental slope. Larval sablefish move into shallow nearshore waters for the first one to two years of their lives and begin moving offshore again to the continental slope and deep-water coastal fjords. Young sablefish have been known to occur in Lynn Canal estuaries (e.g., Berners Bay). Sablefish are highly mobile during part of their life. Substantial movement between the Bering Sea/Aleutian Islands and the Gulf of Alaska has been documented. Larval sablefish feed on small

zooplankton. Juveniles and adults are considered opportunistic feeders and feed on euphausiids, shrimp, cephalopods, squid, jellyfish, and other fish species.

Rockfish use three types of habitat: demersal shelf, pelagic shelf, and slope. Demersal shelf rockfish are nearshore bottom dwellers, inhabiting the continental shelf in rocky-bottomed areas. Pelagic shelf rockfish are nearshore schooling fish, inhabiting the continental shelf water column rather than along the ocean floor. Slope rockfish, which are deepwater species inhabiting the edge of the continental shelf, are unlikely to occur in Lynn Canal. Rockfish diet varies by species. In general, juvenile rockfish eat plankton and fish eggs, and adults feed on crustaceans and fish species.

Sculpins are bottom dwelling fish that lay adhesive eggs in nests against rocks. Larval sculpin are generally found in food-rich habitats, including fast-moving cold-water streams; rocky intertidal zones; and pier, wrecks, and reefs. Sculpin species have been caught near Skagway during marine and freshwater fish inventories and were observed in tidal pools during intertidal surveys conducted in 2003 for the Juneau Access Improvements Project. Sculpin feed on small invertebrates (e.g., shrimp, crab, barnacles, etc.), small flatfish, eelpouts, other sculpin, and smelt.

Skate inhabit inner and outer shelf areas, most commonly soft-bottom areas. Skates lay fertilized eggs on the ocean floor where they hatch and grow to maturity. Skates have been collected in Lynn Canal trawl surveys. Skate prey on pollock, shrimp, crab, small flatfish, sculpin, eelpouts, smelt, and other bottom-dwelling species.

Pacific herring spawn primarily in shallow, vegetated intertidal and subtidal areas. After spawning, adults move offshore to feed. The young rear in sheltered bays and inlets and appear to remain segregated from adult populations until they mature. Pacific herring currently spawn in Berners Bay. Young herring feed on small copepods and nauplii, diatoms, and ostracods, and change to feed on crustaceans and medium-size zooplankton as they mature. Adult herring feed on zooplankton, pollock larvae, sand lance, capelin, and smelt.

The Pacific herring population in Lynn Canal has been substantially reduced over the decades to the point that it is no longer a viable commercial fishery. Various hypotheses have been made about why the stocks have declined, although none have been substantiated by scientific analysis. These hypotheses include one or some combination of the following factors: overfishing, increased predator populations, disease, habitat alteration/degradation, water pollution, and unfavorable oceanographic conditions.

In a quantitative assessment of the frequency with which explanations have been attributed to herring stock collapses worldwide, Pearson et al. (1999) found that overfishing (74 percent of the cases) was the most frequently cited cause, followed by environmental change (50 percent of cases), changes in food supply (15 percent), predation (two percent), disease (two percent), and habitat modification (two percent). In most cases, these factors were seen to have acted in combination with others; single-factor causes other than overfishing (37 percent) or environmental change (13 percent) alone were rare.

Overfishing may have played a role in the initial decline of Lynn Canal herring stocks. As previously noted, stocks were harvested at a relatively low rate (<1,000 tons) until stock declines led to a fishery closure in 1982. Harvest did occur in some seasons when minimum spawning biomass thresholds were not met, and the Lynn Canal stock may have been especially susceptible to brief periods of overfishing due to poorly understood factors, such as its limited migratory range.

Eulachon aggregate near the bottom of estuarine and riverine channels prior to their spawning migration to the lower reaches of rivers with moderate velocities. Eulachon mass spawn at night. Most adults die following their first spawning. Newly hatched larvae are quickly flushed to the marine environment by the river currents where they will remain for several weeks. Juveniles and adults feed on planktonic prey. Eulachon spawn in Berners Bay rivers and the Katzehin and Chilkat rivers.

Capelin spawn in intertidal zones with coarse sand and fine gravel substrate. Very few adult capelin survive after spawning. Capelin feed on planktonic prey for the most part although marine worms and small fish are also consumed.

Sand lance spawn in coastal inshore waters. Newly hatched larvae and adults migrate offshore in early summer and return to inshore waters to overwinter. Sand lance feed in the water column on crustaceans and zooplankton when young and adults feed on fish larvae, amphipods, annelids, and common copepods.

3.3.4.2 Marine Shellfish

Shellfish species found in Lynn Canal include: red king crab (*Paralithodes camtschaticus*), blue king crab (*P. platypus*), golden king crab (*Lithoides aequispinus*), bairdi Tanner crab (*Chionoecetes bairdi*), Dungeness crab (*Cancer magister*), Pacific blue mussels (*Mytilus trossulus*), clams (*Macoma* spp.), and shrimp (*Decapoda* spp.). All of the shellfish except golden king crab inhabit the intertidal and subtidal zones at some time during their life history. Red and blue king, bairdi Tanner, and Dungeness crabs are all found at depths between the intertidal zone and approximately 600 feet (depending on their life stage), whereas golden king crabs are usually found much deeper, usually between 600 to 1,600 feet (ADF&G 2004). Mussels and clams, which are less motile than crabs, are restricted to the intertidal and subtidal zones. Shrimp species inhabit varying depths and habitat types, but are generally found between the intertidal zone and depths of 1,800 feet.

3.3.4.3 Anadromous Fish

Anadromous fish occurring in the Lynn Canal study area were identified by a 1994 field survey of streams in Lynn Canal and a recent review of OHMP's Catalog of Waters Important to the Spawning, Rearing or Migration of Anadromous Fishes. The anadromous fish species found in Lynn Canal are all five Pacific salmon species (chinook, coho, sockeye, chum, and pink), steelhead/rainbow (*O. mykiss*) and cutthroat trout (*O. clarki*), Dolly Varden char (*Salvelinus malma*), round whitefish (*Prosopium cylindraceum*), and eulachon .

Depending upon the species, anadromous fish spend from one to several years rearing in freshwater (chinook, coho, and sockeye salmon; rainbow/steelhead and cutthroat trout; and Dolly Varden) or leave immediately upon emerging from the spawning gravels (chum and pink salmon). Still others move into fresh water with the tides, spawn, and return to saltwater (eulachon). Steelhead trout, rainbow trout that have spent a portion of their lives at sea, commonly spawn more than once, unlike salmon.

Chinook salmon tend to favor large river systems such as the Chilkat River for spawning and rearing, while sockeye seek out river systems that include lakes, such as the Berners, Chilkoot, and Chilkat rivers. Coho salmon will rear in lakes but are usually found in small streams that empty directly into saltwater. In the Lynn Canal area, round whitefish are found only in the Chilkat River system. Round whitefish are less tolerant of the marine environment than other anadromous species, so during spring and summer, they move from freshwater out to nearshore brackish waters to feed, and then in fall move upstream to spawn and/or overwinter.

3.3.5 Wildlife

Hundreds of wildlife species (mammals, birds, and amphibians) live within or pass through the study area for the Juneau Access Improvements Project. The 1997 Draft EIS primarily analyzed five species based on 1994 agency scoping comments. The Supplemental Draft EIS has evaluated 29 species, including species identified in 2003 agency scoping comments. Some of these species were selected because they are listed on federal or state agency conservation plans. Other species are included because they are susceptible to the effects of highway construction or represent management concerns for similar species. The principal discussion on bald eagles is provided in Section 3.3.6. Federal and state threatened and endangered species (Steller sea lions [*Eumetopias jubatus*] and humpback whales [*Megaptera novaeangliae*]) are discussed in Section 3.3.7. Figures 3-19 through 3-21 depict wildlife and habitat locations.

Many species have been placed into various categories by the USFS, State of Alaska, or other agencies, according to multiple population characteristics, predictable responses to certain human activities, low abundance, or susceptibility to habitat disturbance or loss. The categories applicable to species found in the study area, and the species selected for analysis, are listed below.

3.3.5.1 Species Selected for Analysis

During 2003 agency scoping, resource agencies indentified species to be analyzed. The species selected for anlysis were drawn from USFS management indicator species, USFS species of concern, USFS sensitive species list, state species of special concern, and other species identified by agencies of particular concern or representative of a group of species.

USFS Management Indicator Species – Management Indicator Species (MIS) are species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements. The USFS recognizes limitations in the MIS concept but uses it to represent the complex of habitats, species, and associated management concerns for planning, assessment, and monitoring purposes (USFS, 1997). Seven mammal species and one bird species identified for analysis are included in this category: mountain goat (*Oreamnos americanus*), Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), river otter (*Lutra Canadensis*), marten (*Mares Americana*), brown bear (*Ursus arctos*), black bear (*U. americanus*), Alexander Archipelago wolf (*Canis lupus ligoni*), and bald eagle (*Haliaeetus leucocephalus*).

USFS Species of Concern – These species are considered vulnerable to habitat loss or overexploitation, at least on a localized basis. Species identified for analysis include four mammals and three birds: moose (*Alces alces*), Alexander Archipelago wolf, brown bear, marten, Queen Charlotte goshawk (*Accipiter gentiles*), marbled murrelet (*Brachyramphus marmoratus*), and great blue heron (*Ardea herodias*).

USFS Sensitive Species – These species are considered susceptible or vulnerable to habitat alterations and management activities to the extent that there is concern for the long-term persistence of the species. Two bird species identified for analysis fall under this category: trumpeter swan (*Cygnus buccinator*) and the Queen Charlotte goshawk.

State Species of Special Concern – This list includes species native to Alaska that have undergone a long-term decline in abundance or are vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. The management goals for these species include preventing them from declining to endangered status and focusing conservation efforts on ecosystem and

habitat-level problems. Six bird species and one marine mammal species are included for analysis under this category: American peregrine falcon (*Falco peregrinus*), Queen Charlotte goshawk, olive-sided flycatcher (*Contopus cooperi*), gray-cheeked thrush (*Catharus minimus*), Townsend's warbler (*Dendroica townsendii*), blackpoll warbler (*D. striata*), and harbor seal (*Phoca vitulina*).

Other Species – Species not included in the above categories but included in analysis for the Supplemental Draft EIS include two birds, one amphibian, and five marine mammals. Kittlitz's murrelet (*Brachyramchus brevirostris*) was petitioned for Endangered Species Act (ESA) listing in 2001. The USFWS designated this species as a candidate species in 2004[11]. Harlequin duck (*Histrionicus histrionicus*) is included as a representative species of the waterfowl that inhabit Lynn Canal. Wood frog (*Rana sylvatica*) is representative of other amphibians such as the spotted frog and boreal toad that inhabit Lynn Canal. Sea otter (*Enhydra lutris*), minke whale (*Balaenoptera acutorostrata*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), and killer whale (*Orcinus orca*) are included because they are found in Lynn Canal and they are species protected by the Marine Mammal Protection Act (MMPA) (16 USC 1361 *et seq.*).

3.3.5.2 Terrestrial Habitat Use

The dominant terrestrial cover type, Sitka spruce/western hemlock forest, provides habitat for a variety of both mammal and bird species. The presence of large trees, decaying logs, lush undergrowth, and multiple canopy layers that characterize the spruce/hemlock forest of the study area provide unique habitat for many species for foraging, resting, nesting or denning, and as escape cover from predators. Forested wetlands, muskegs and bogs, and emergent wetlands occur in small, isolated pockets or large expanses, provide openings or breaks in forest cover, and are important to the overall habitat diversity in the region by providing both food and cover for some species of wildlife.

Migratory birds are protected under the Migratory Bird Treaty Act of 1918, which regulates the taking of migratory birds and their eggs or nests. Forest habitat is used as foraging and nesting habitat by a number of migratory birds, several of which are species of special concern such as the olive-sided flycatcher, gray-checked thrush, Townsend's warbler, and blackpoll warbler. Marbled murrelets also use the forest habitat for nesting. Resident forest-dwelling bird species such as woodpeckers, finches, sparrows, and thrushes also use these areas for foraging, nesting, and rearing young.

Brown bears use forest habitat for feeding (during the summer) and cover. Forest habitat is important for cover and foraging for black bears during the spring, summer, and fall and for denning during the winter. Black and brown bears are attracted to palustrine emergent and scrub-shrub wetlands for berry-producing shrubs, wetland grasses, sedges, and forbs such as skunk cabbage. Brown and black bears migrate to estuarine areas in the spring and again in the fall along well-established corridors (Christensen and Van Dyke, 2004).

Forested wetlands provide a variety of plant forage species not found in upland forests. Other key forest-dwelling wildlife species in the study area include the marten and Alexander Archipelago wolf, both of which require forest habitat for foraging and reproduction. Forested areas are important for the Sitka black-tailed deer, especially to avoid deep snow during the

[11] Candidate species are plants and animals for which USFWS has sufficient information to propose them as endangered or threatened under the Endangered Species Act but for which development of a listing regulation is precluded by other higher priority listing activities. Candidate are not subject to regulatory protection and human activities that may effect them are not restricted.

winter, after spending summer months in alpine and subalpine areas feeding on herbs and shrubs.

Emergent and scrub-shrub wetlands provide habitat for wildlife such as the Alaska wood frog and the boreal toad. Alaska wood frogs are common in various types of wetland habitat (Broderson, 1994).

Moose populations in the Berners Bay watershed and Chilkat Range use primarily riparian forest and tall shrub communities along rivers and floodplain areas as forage habitat in the winter, and closed canopy Sitka spruce/western hemlock forest for cover and to escape from deep snow.

The higher alpine and subalpine habitats support mountain goats during the spring and summer. During winter, goats use forest habitats for cover when snow forces them out of higher areas. Subalpine and alpine habitats are used by black bears to forage, brown bears to den (winter), and Sitka black-tailed deer to forage in the summer months. Kittlitz's murrelets nest at scattered sites located high on recently deglaciated rocky slopes. This species forages in glacially-fed waters during the breeding season.

Salt marsh habitats are one of the more important habitats in the region and support a large number of resident and migratory waterfowl and shorebird species at certain times of the year, as well as resident water bird species such as great blue heron. These areas are also important for terrestrial mammal species such as brown bear and black bear for scavenging and foraging on vegetation during the spring. The mudflats adjacent to estuarine wetlands provide a resting place for harbor seals and their pups during low tide.

Proximity to the shoreline along either exposed coastline (beach fringe) or along protected bays and coves (estuary fringe) is an important wildlife habitat feature. Beach fringe habitat, a mixture of both uplands and wetlands, has high seasonal value for black and brown bears, river otters, bald eagles, and Sitka black-tailed deer. Estuary fringe habitat consists of upland forest, palustrine wetlands, and often extensive estuarine wetlands (salt marsh). The estuarine fringe habitat along Berners Bay has been identified as potentially high value for many wetland functions, including habitat for disturbance-sensitive wildlife, and provides important habitat for moose, brown and black bear, and several species of migrant and resident waterfowl species.

See the *Wildlife Technical Report* (Appendix Q) for additional information on wildlife in the study area.

3.3.5.3 Marine Habitat Use

Marine habitats in Lynn Canal are used by marine birds, Steller sea lion, humpback whale, harbor seal, sea otter, minke whale, harbor porpoise, Dall's porpoise, and killer whale. Steller sea lion and humpback whale are discussed in Section 3.3.7. The marine birds and other marine mammals are discussed below.

A variety of marine birds and waterfowl use Lynn Canal throughout the year. Harlequin ducks, common and king eiders, oldsquaws, and several species of scoter winter along the coast of southeast Alaska, including Lynn Canal. Mew gulls, kittiwakes, murres, and other marine birds feed on invertebrates and fish in the Canal.

Harbor seals occur in marine waters and estuaries throughout Alaska. They are most often found in water but come onto land to rest, birth, and care for their young. In the project study area, haulout sites include a number of sand bars and rocky beaches including sand bars in Berners Bay and at the mouth of the Katzehin River. Harbor seals feed on a variety of fish,

including pollock, Pacific cod, Pacific sand lance, sculpins, salmon and flatfishes, and oily fish such as capelin, eulachon, smelt, and Pacific herring. Harbor seals reach sexual maturity between three and seven years of age and females bear one pup between May and mid-July. Natural predators include transient killer whales, Steller sea lions, and sharks (NMFS, 2003). The stock structure of harbor seals is currently being reviewed in light of new genetic information (Angliss and Lodge, 2003). Population estimates are not available for the project study area but harbor seals appear to be increasing in most areas of Southeast Alaska (Angliss and Lodge, 2003).

Minke whales are relatively small baleen whales (up to 31 feet long) and are found in all oceans of the world (Leatherwood et al. 1982). Two minke whale stocks are recognized in U.S. waters; Alaskan stock and the California/Oregon/Washington stock (Angliss and Lodge, 2003). Minke whales are not listed as threatened or endangered under the ESA nor are they listed as depleted under the MMPA. It is not known whether the whales that occur in Southeast Alaska are from the Alaskan or California/Oregon/Washington stocks. No population estimates exist for the Pacific population as a whole or for the Alaskan stock. Females in the North Pacific reach sexual maturity at approximately 24 feet (7.3 meters) in length; males reach sexual maturity between 21 and 23 feet (6.4 and 7 meters; Horwood, 1990). Gestation time is estimated to be 10 months (Best 1982), resulting in birthing peaks from December through January and June through July (Horwood, 1990).

In Glacier Bay, west of the project study area, minke whale sightings of between five and eight individuals annually were reported between 1996 and 1999 (Gabriele and Lewis, 2000). From these numbers, relatively few minke whales are expected to occur in the project study area in Lynn Canal.

Research studies have identified 250 resident killer whales in Southeast Alaska as of 1999 (total for Alaska is approximately 745 residents). Of the four main pods that occur in Southeast Alaska, pods AF (42 individuals) and AG (24 individuals) are the most likely to occur in the project study area (Dahlheim et al., 1997). AF pod, the largest pod in the region, ranges from the inland waters of northern Southeast Alaska to Prince William Sound (Dahlheim et al., 1997). The number of transient killer whales that range within Southeast Alaska and British Columbia waters includes approximately 219 individuals in several pods and assemblages (Dahlheim et al., 2000; Angliss and Lodge 2003).

Harbor and Dall's porpoises are odontocetes (toothed whales), like the killer whale. Based on aerial surveys, the most recent estimate (1977) of harbor porpoise numbers in Southeast Alaska, including Lynn Canal, is approximately 11,000 individuals. Dall's porpoises are endemic to the northern North Pacific Ocean and adjoining seas, inhabiting both nearshore habitats and pelagic deep waters over the continental shelf and the oceanic basins (Rice, 1998; Angliss and Lodge, 2003).

The range of the Southeast Alaska stock of sea otters extends from Cape Yakataga to the southern boundary of Alaska (Gorbics and Bodkin, 2001). Until recently, the species was not present in Lynn Canal, but they are now beginning to move into the project study area. Sea otter densities are still very low, and aerial surveys of northern Southeast Alaska for sea otters in 2003 did not cover Lynn Canal due to the low numbers.

3.3.6 Bald Eagles

The Bald Eagle Protection Act of 1940 prohibits the taking or possession of bald (and golden) eagles, their body parts, nests, or eggs, with limited exceptions for religious and scientific purposes. The definition of "take" includes to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or "disturb" eagles. Regulatory authority resides with the

Secretary of the Interior and is delegated to the USFWS. The Migratory Bird Treaty Act and the Fish and Wildlife Coordination Act also provide regulatory authority to the USFWS for the protection of bald eagles.

Bald eagles are abundant in Southeast Alaska, with a population estimated at more than 19,000 adults (Jacobson and Hodges, 1999). They are common, year-round inhabitants of the Lynn Canal area. During the summer months, nesting pairs disperse to nest sites along the coast. In winter, they tend to congregate in areas where food resources are plentiful.

Nesting pairs of bald eagles usually return to their previous nest sites or begin seeking a new site in early March. Most pairs will have chosen a nest site or constructed a new one by May. In Lynn Canal, nests are typically found in old-growth Sitka spruce trees within 700 feet of saltwater (Hodges and Robards, 1982). Some nests are occupied more frequently than others, and the productivity of each nest varies greatly. Only 40 to 50 percent of available nests are occupied during any given year. Bald eagles are most susceptible to disturbance during the breeding and nesting season, which in Lynn Canal begins in March and continues through August.

In 1994, USFWS biologists conducted surveys from a helicopter outfitted with recording GPS instruments. Nests were spotted from the helicopter, which then hovered over the nest for 10 to 30 seconds while the GPS location was recorded. The positions of nests within 0.5 mile of the alternative highway alignments were incorporated into the Geographic Information System (GIS) project database.

The USFWS has conducted annual nest surveys along the East Lynn Canal route since 1997 with funding and administrative support from DOT&PF. These surveys recorded the locations of all observed nests, including some nests that were more than 0.5 mile from the proposed highway alignments, and also recorded information on reproductive success at each site. The 1997 to 2003 East Lynn Canal surveys were conducted from helicopters and consisted of two flights per season. Because the West Lynn Canal Highway was determined to be a reasonable alternative in 2003, USFWS biologists conducted two similar surveys for nests along the west side of Lynn Canal during the summer of 2003. The 2003 survey identified at least 37 active bald eagle nests along the east side of Lynn Canal (out of 100 nest sites within 0.5 mile of the alignment). On the west side of Lynn Canal, at least 22 active nests were documented out of 45 nest sites within 0.5 mile of the alignment. The locations of bald eagle nests relative to the highway alignments are shown in Figures 3-23 and 3-24 for the northern and southern ends of Lynn Canal, respectively.

The USFWS has conducted surveys to identify several key seasonal concentration areas for bald eagles within the study area (Jacobson, 2003). During spring and during spawning aggregations of certain fish species, eagle concentrations have been observed in Berners Bay, the Katzehin River, and the Endicott River. Similarly, in the summer months, the tributaries of the Lace and Berners rivers, the Katzehin River, the Endicott River, and the Chilkat River also have high bald eagle concentrations. In the fall, large numbers of eagles can be found in the Alaska Chilkat Bald Eagle Preserve feeding on late runs of chum salmon. Fish comprise the majority of the bald eagle diet. Eagles also prey on waterfowl, small mammals, sea urchins, clams, crabs, and carrion.

The USFWS is responsible for the conservation of bald eagles and has regulatory authority under the Bald Eagle Protection Act of 1940, as amended (16 USC 668–668d). This law prohibits the taking of bald eagles and the disruption of bald eagle nests. The Bald Eagle Protection Act applies to all nest sites, regardless of whether they are active in a particular year.

See the *Bald Eagle Technical Report* (Appendix R) for additional information on bald eagles in the study area.

3.3.7 Threatened and Endangered Species

Threatened and endangered species are plant and animal species that have been determined to be in danger of extinction based on criteria established by the Endangered Species Act of 1973. The Act defines an endangered species as one that is likely to become extinct in the foreseeable future. A threatened species is defined as one in danger of extinction throughout all or a significant portion of its range. The Endangered Species Act requires federal agencies to ensure that their projects do not have an adverse affect on populations of species protected under the Act. Section 7 of the Act requires consultation with the appropriate federal agency (USFWS and/or NMFS) to ensure that the project is not likely to jeopardize a threatened or endangered species or its habitat.

Of the wildlife species known to occur in the study area for the Juneau Access Improvements Project, two are considered in the threatened and endangered species analysis: humpback whales (endangered), and Steller sea lions (threatened). Figure 3-19 identifies locations within the study area that are frequented by humpback whales and Steller sea lions. The Kittlitz's murrelet listed as a candidate species by the USFWS in 2004 is also included in the wildlife analysis.

3.3.7.1 Humpback Whale

Humpback whales were decimated by commercial whaling until the International Whaling Commission imposed a moratorium in 1965. Humpback whales were listed as endangered under the ESA in 1973 and were consequently listed as depleted under the MMPA. Humpback populations are currently divided into management stocks based on their fidelity to particular summer and wintering grounds. The whales that spend the summer and fall in Southeast Alaska tend to winter in Hawaiian waters and are considered part of the Central North Pacific stock (Angliss and Lodge, 2003). Surveys conducted in Hawaii during the early 1990s provided an estimate of about 4,000 whales in this stock, with an estimated 961 whales migrating to Southeast Alaska in summer (Angliss and Lodge, 2003). NMFS is currently considering whether to designate the whales in Southeast Alaska as a separate stock under the MMPA, based on a lack of interchange with whales that summer elsewhere in the Gulf of Alaska (Angliss and Lodge, 2003).

3.3.7.2 Steller Sea Lion

The MMPA, as amended, gives management and regulatory authority for Steller sea lions to NMFS. The eastern stock of Steller sea lions, including the animals in Lynn Canal, are listed as threatened under the ESA of 1973 (16 USC 1531 et seq.). Only one site within the study area for the Juneau Access Improvements Project, the Gran Point haulout, has been designated as a Steller sea lion Critical Habitat Area (50 CFR 226.202). Under Section 7 of the ESA, as part of the consultations on the effects of the proposed project, DOT&PF agreed to monitor the use of the Gran Point haulout throughout the year. DOT&PF installed a remote video camera system in late 2002 to determine periods of Steller sea lion use.

There appears to be an east-west seasonal movement of Steller sea lions in southeast Alaska waters. Calins and Pitcher (1982) suggest that they shift from inside waters such as Lynn Canal that they use during the winter to more exposed, outside waters in the summer breeding season. Pupping and breeding occur in rookeries on remote islands, rocks, and reefs in the Gulf of Alaska. Immature animals tend to disperse farther than adults, but as they approach

breeding age, they have a propensity to stay in the general vicinity of the breeding grounds during the summer (Raum-Suryan *et al*., 2002).

Video camera monitoring at Gran Point in 2003 and 2004 indicates that Steller sea lions are typically present most days in the winter and spring months. Use of the haulout becomes more extensive in spring, with hundreds of animals present at the main haulout and smaller rocks within 500 yards to the north and south. Sea lions use other areas in Lynn Canal for haulouts, including one near Met Point. DOT&PF monitored the use of the Met Point haulout via commercial overflight in 1998 and 2004 and found that use of the haulout parallels use of the Gran Point haulout. Sea lions are also known to congregate in areas with spring spawning aggregations of herring and eulachon, particularly in Berners Bay, the Katzehin Delta, and Chilkat River. Sea lions use a seasonal haulout at Point St. Mary during the spring run of herring and eulachon, then tend to move northward during fish runs in rivers farther north. During June, the numbers of sea lions at haulouts tend to drop. Typically from mid-July to early September, the haulouts are vacant or have infrequent use by small groups.

The *Steller Sea Lion Technical Report* (Appendix S) includes additional information on Steller sea lions.