Alaska Roads Historic Overview

Applied Historic Context of Alaska's Roads

Prepared for

Alaska Department of Transportation and Public Facilities

February 2014

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Prepared for

Alaska Department of Transportation and Public Facilities

Prepared by

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Cover image: Valdez-Fairbanks Wagon Road near Valdez.
Source: Clifton-Sayan-Wheeler Collection; Anchorage Museum, B76.168.3

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List of Abbreviations/Acronyms

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ADH	Alaska Department of Highways
AIDEA	Alaska Industrial Development and Export Authority
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ARC	Alaska Road Commission
ASCE	American Society of Civil Engineers
BIA	Bureau of Indian Affairs
BPR	Bureau of Public Roads
CCC	Civilian Conservation Corps
CIP	Capital Improvement Program
CRNW	Copper River and Northwest Railway
CWA	Civil Works Administration
DMTS	DeLong Mountain Transportation System
DOH	(Alaska) Division of Highways
DOT&PF	(Alaska) Department of Transportation & Public Facilities
EPA	(United States) Environmental Protection Agency
FAHA	Federal-Aid Highway Act
FERA	Federal Emergency Relief Administration
FHWA	Federal Highway Administration

LSR&T Program	Local Service Roads and Trails Program
MAP-21	Moving Ahead for Progress in the 21st Century
National Register	National Register of Historic Places
NANA	Northwest Alaska Native Association
NHPA	National Historic Preservation Act
NHS	National Highway System
NPS	National Park Service
OPR	Office of Public Roads
OPRI	Office of Public Road Inquiry
ORI	Office of Road Inquiry
PLO	Public Land Order
PRA	Public Roads Administration
PWA	Public Works Administration
RD&T2	Research, Development, and Technology Transfer Program
ROW	Right-of-way
RS	Revised Statute
SHPO	State Historic Preservation Office
TAPS	Trans Alaska Pipeline System
Territorial Board	Territorial Board of Road Commissioners
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WAMCATS	Washington-Alaska Military Cable and Telegraph System
WPA	Works Projects Administration (originally Works Progress Administration)

Executive Summary

The development of Alaska's road network occurred later than elsewhere in the U.S. and remained comparatively less extensive until World War II and the postwar years. Alaska's size, limited population, and status as a territory until 1959 were factors in Alaska's road development story. In addition, the unique geography and climate posed challenges to road engineering, resulting in creative design and construction methods to address issues, including permafrost. Alaska entered the twentieth century with an overland transportation network made up primarily of trails and sled roads unsuitable for travel by trucks or automobile. Within 50 years more than 3,000 miles of roads were constructed in Alaska. The territory's rich resources and strategic military importance were key to the development of roads by the mid-twentieth century. Later road development was influenced by continued strategic military importance and resource extraction, in addition to statehood, increased population and automobile use, environmental legislation, and tourism. The Alaska Road Commission (ARC) and later Department of Highways (Department) served as the main road building agencies for the territory and state.[1] Their road building efforts at various times were supported by the Bureau of Public Roads, Territorial Board of Road Commissioners, and other federal agencies, including the National Park Service and U.S. Department of Agriculture (U.S. Forest Service).

Early road building by the ARC focused on wagon roads, often replacing a trail, to connect mining areas with navigable waterways, railroad lines, and ports (such as Valdez and Nome). Alaska's first highway was the Richardson Highway. Upgraded from a trail to a vehicular route by 1910, it served as the mail and supply route that connected the interior mining districts with the coast at Valdez. In 1920 the ARC was still constructing earthen wagon roads that were typically one-lane wide, with limited grades and curvatures. However, the ARC recognized that automobile traffic required higher-quality roads, and throughout the following decade began to upgrade roads accordingly by widening them and installing a gravel roadway surface.

In the 1930s the Great Depression reduced funding for the construction and improvement of roads. However, local roads were constructed to provide mining access along the Yukon and to encourage homesteaders in the Kenai Peninsula and Matanuska Valley. By 1940 Alaska's road system grew to 2,500 miles; however, for the size of the territory this was still a very limited network, much of which lacked interconnectivity with other areas.

With the onset of World War II, the 1940s were the beginning of several decades of increased federal funding and military influence on road development. The rapid construction of the Alaska Highway during World War II represented an extraordinary feat of logistics, engineering, and construction. Other major road projects during this period include the construction of the Glenn Highway and significant improvements to the Richardson Highway, although both these roads remained gravel surfaced. These efforts were undertaken to support expanded military facilities and the need for an improved interconnected transportation system tying together most major population centers and military facilities.

The postwar years saw great advancements in the condition and mileage of the overall road network. By the end of 1955 the ARC maintained 3,792 of the territory's overall 4,101-mile highway system, including 1,000 miles of all-weather routes. In the 1950s new roads, such as the Sterling, Seward, Taylor, and

[1] See Section 1.4 for use of acronyms for ARC and Department.

Denali Highways, were constructed to improve overall connectivity, support military Cold War and access resources. In the postwar period road improvements were also a focus, including hard surfacing of major transportation corridors and improving important roads to meet all-weather standards so they could remain open year round. New engineering approaches and technologies were developed to support these improvements. The ARC's postwar building program resulted in the reconstruction, widening, and paving of existing primary roads, including the Richardson, Glenn, and Alaska Highways, and application of national standards to new construction.

With the advent of statehood in 1959, responsibility for most of the road system shifted to the Department. From the 1960s through the present, Alaska expanded its overall population, grew its urban centers, and developed industries. Roads were improved and developed to support population expansion in urban areas, meet military needs, connect isolated areas, and support industries (including oil, timber, and tourism) within Alaska. New construction and improvement projects often included increased safety features, such as improved sight distances, gentle curves, and wider lanes in response to continued public demand for roads on par with those of the lower 48 states.[2]

A number of specific events in the 1960s and 1970s influenced road development in the state, including the Good Friday Earthquake in 1964, which required significant recovery efforts to repair roadways; the 1967 centennial celebration of Alaska's purchase and need for improved road amenities for tourism; and the 1968 discovery of vast oil deposits in the North Slope and the subsequent development of a road to this area. In addition, the state's timber industry expanded during this period, leading to significant road construction in the Tongass National Forest. Lastly, the Wilderness Act of 1964 and subsequent federal legislation in the following decades led to a debate over the balance between preservation of wilderness and economic development, thus impacting road development.

Two notable examples of more recent road construction are the Dalton and Parks Highways, both of which were built in the early 1970s. The former helped to open the North Slope to development after the discovery of oil at Prudhoe Bay, while the latter provided a more efficient link between two major population centers, reducing the travel time between Anchorage and Fairbanks and providing improved access to Denali National Park. In addition to these larger projects, the improvement and modernization of the existing system along with the construction of new roads to access resources, link communities, and support tourism remained the focus from the late 1960s to the present day.

Today, Alaska's 16,240-mile road network is maintained by a variety of federal, state, and local agencies and Native Alaskans, connecting most major population areas in the central interior of the state. Unique to Alaska is the fact that the road system is only one of the three main transportation modes, as some areas of the state are not connected by roads. Reliance on air and marine transportation, which was historically important, continues to play a key role in Alaska's transportation network due to the state's size and geography.

[2] Robert Knox, "Highways '66: Reconstruction," *Alaska Construction* (May-June 1966), 10.

1. Introduction

1.1 Project background

This *Applied Historic Context of Alaska's Roads* supports the implementation of the *Programmatic Agreement among the Federal Highway Administration, the Advisory Council on Historic Preservation, the Alaska Department of Transportation and Public Facilities, and the Alaska State Historic Preservation Officer Regarding Alaska's Highway System Roads Affected by the Federal-Aid Highway Program in Alaska* (Alaska Road PA). This study is being completed by the Alaska Department of Transportation & Public Facilities (DOT&PF) to assist in management of Alaska's historic roads as part of the environmental review process, in particular Section 106 of the National Historic Preservation Act (NHPA). The Alaska Road PA and this study are being completed in cooperation with the Alaska Division of the Federal Highway Administration (FHWA) and the State Historic Preservation Officer (SHPO). The *Applied Historic Context of Alaska's Roads* will facilitate DOT&PF and FHWA compliance with federal requirements under Section 106.

The NHPA of 1966 established a national policy for the protection of historic properties and archaeological sites, and outlined responsibilities for federal and state governments to preserve our nation's heritage. The NHPA created the National Register of Historic Places (National Register), which is the official list of sites, districts, buildings, structures, and objects of national, regional, or local significance. To qualify for the National Register, a property generally must be 50 years old, be associated with a significant theme, and retain the characteristics that make it a good representative of properties associated with the past. The National Park Service (NPS), within the U.S. Department of the Interior, is charged with maintaining the National Register. Historic roads are among the structures that may be listed in, or determined eligible for listing in, the National Register.

Historic roads are afforded consideration under the Section 106 regulations that were developed to implement the NHPA. Section 106 requires federal agencies and entities seeking federal assistance or permits to review actions that may affect a property listed in, or eligible for, the National Register and consider public views and concerns regarding impact to historic properties when making project decisions. The Section 106 process includes identifying historic properties, assessing the effect of proposed actions on historic properties, avoiding effects where possible, and, in the event of any adverse effects, developing agreements that specify mitigation measures.

1.2 Purpose and limitations of the study

The goal of the *Applied Historic Context of Alaska's Roads* is to provide a historic overview and methodology to assess National Register eligibility of historically significant roads with state, regional, or national significance. To date there has been limited guidance from the National Register on determining eligibility of historic roads. In Alaska, DOT&PF and FHWA projects have been slowed by limited information on the history of the state's road network and the lack of framework for eligibility decisions. To facilitate regulatory compliance for historic roads, the DOT&PF and FHWA need to have a methodology to determine which vehicular roads are historic and which are not.

The study's purpose is to assist with Section 106 for vehicular roads that are eligible for assistance from the Federal-Aid Highway Program and therefore are addressed by the Alaska Road PA. As a result, the development of roads owned by federal agencies, Native Alaskans, in private use, or other roads such as those designated as Indian Reservation Roads, which are not eligible for assistance from the Federal-Aid Highway Program, are not the focus of this study. These roads are discussed briefly in the historic overview to assist in the understanding of the state's overall road network. Similarly, the historic overview includes discussion of Interstate highways, because they are important to the overall history and development of Alaska's road system.[3] However, Interstate highways fall under an FHWA Interstate Exemption from consideration as historic properties under Section 106. For more information on FHWA assistance, see *Road Jurisdiction and FHWA Assistance* discussion below.

Road jurisdiction and FHWA assistance

Alaska's 16,301 miles of public roads are maintained by a variety of federal, state, and local entities. The DOT&PF maintains 35 percent of these roads, boroughs and local municipalities maintain 35 percent, and Native Alaskans[4], federal agencies (Bureau of Indian Affairs, NPS, U.S. Forest Service, and branches of the Department of Defense), and other state agencies maintain the remaining 30 percent.[5] Generally, roads maintained by the DOT&PF, boroughs, and municipalities qualify for and may receive technical assistance and funding through the FHWA's Federal-Aid Highway Program. In Alaska, this program includes 5,609 miles of Interstate highways and state-owned roads and 5,756 miles of locally owned roads, including certain roads located within the boundaries of the state's National Forests: the Chugach and Tongass.[6] In addition, a separate suite of federal programs provides technical assistance and funding for publically accessible roads to or through tribal or Federal lands, through the Federal

[3] Roads that fall under the FHWA Interstate Exemption from consideration as historic properties under Section 106 of the NHPA include the Alcan Highway, Glenn Highway, Parks Highway, Sterling Highway, Tok Cutoff, and portions of the Richardson and Seward Highways.

[4] The source uses the term Indian Nations.

[5] A public road is defined by FHWA as any road under the jurisdiction of and maintained by a public authority, open to the general public, and passable by standard passenger cars; "Certified Public Road Miles (CPRM)", Alaska DOT&PF, Transportation Information Group, available at http://www.dot.alaska.gov/stwdplng/transdata/public-road-data.shtml (accessed 17 June 2013).

[6] The National Forests contain a number of other roads, including logging and development roads, which are not eligible for Federal-Aid Highway Program funding. For further discussion, see Section 3.5.2.1.

"Federal-aid Highway Program", U.S. Department of Transportation, FHWA, available at http://www.fhwa.dot.gov/federal-aidessentials/federalaid.cfm (accessed 17 June 2013); "Financing Federal-Aid Highways," U.S. Department of Transportation, FHWA, available at http://www.fhwa.dot.gov/reports/fifahiwy/fifahi05.htm (accessed 17 June 2013) and "State of Alaska, Certified Public Road Mileage in Centerline Miles as of December 31,2012," Alaska DOT&PF, Transportation Information Group, available at http://www.dot.alaska.gov/stwdplng/transdata/public-road-data.shtml (accessed 17 June 2013).

Lands Highways (FLH) Division of the FHWA.[7] A variety of road owners may be eligible for FLH assistance and funding. Programs include Federal Lands Access, Park Roads and Parkways, Indian Reservation Roads (IRR) on reservations and in village communities, Public Lands, Refuge Roads, and Defense Access Roads Program.[8]

1.3 Research methodology

The first step of this project, this report, included research and developing historic contexts relevant to Alaska's road development, policy, planning, design and construction. This historic overview is intended to provide a foundation for understanding significant themes of road development at a state, regional, and national level, as feasible.

Research included investigating primary and secondary sources at major repositories in Alaska. Research materials were gathered from the following repositories and collections:

- DOT&PF collections, Northern Region – Fairbanks
- Office of History and Archaeology, Alaska Division of Parks and Outdoor Recreation – Anchorage
- Alaska State Library & Historical Collections – Juneau
- Alaska State Archives – Juneau
- University of Alaska Fairbanks, Elmer E. Rasmuson Library and Alaska and Polar Regions Department – Fairbanks
- University of Alaska Anchorage/Alaska Pacific University Consortium Library and Archives & Special Collections Department – Anchorage
- Anchorage Museum at Rasmuson Center, Bob and Evangeline Atwood Alaska Resource Center – Anchorage
- Anchorage Public Library – Anchorage

[7] The Federal Lands Highway Division of the FHWA provides assistance but does not have ownership of roads.

[8] The Forest Highways Program was replaced by Federal Lands Access in 2012 based on Moving Ahead for Progress in the 21st Century Act (P.L. 112-141); "Federal Lands Highway," U.S. Department of Transportation, FHWA, available at http://flh.fhwa.dot.gov/ (accessed 17 June 2013); "FHWA Field Organization", U.S. Department of Transportation, FHWA, available at http://www.fhwa.dot.gov/about/field.cfm (accessed 17 June 2013). In order to understand the big picture of road development in the state, research was conducted into the role of the FHWA, beyond Federal Aid Highway funding, including conversations conducted with cultural resource professionals at Western FLH and Tongass National Forest. Gaining a full understanding of these programs and road development history is complicated due to limited availability of primary records, administrative histories, and secondary scholarly works that adequately address the subject. Mark McCallum, Tongass National Forest, and Michael Schurke, Western Federal Lands Highway Division, Phone interviews by Chad Moffett, Mead & Hunt, Inc., 18 June 2013.

- Alaska Resources Library & Information Services – Anchorage

- Wisconsin Historical Society and University of Wisconsin, Wendt Engineering Library (for national journals)

This research was supplemented with applicable online sources including Alaska's Digital Archives (Vilda).

Research did not focus on local repositories because detailed investigation into specific roads, especially roads within individual communities, was outside of the scope of this project. The DOT&PF contacted local governments, tribes, local historical societies and museums via letter seeking information on local roads. Information from responses was incorporated into the overview, as appropriate.

1.4 Historic overview

This *Historic Overview of Alaska Roads* is the first component in the DOT&PF's effort to develop guidance for the identification and evaluation of historic roads. A historic overview or context provides the framework within which to understand historic properties and is a summary document of relevant information to support the "relevance, relationships, and the importance of the properties to be considered."[9] This overview report presents the trends and developments in Alaska road building history and engineering through the present time. The contexts and themes described here serve as the basis for developing criteria for evaluating the state's roads based on the criteria of the National Register.

The timeframe for the overview of road development was defined to begin in the late nineteenth century to the present time to address publically accessible roads specifically built for vehicular use. The overview focuses on road development and does not cover other modes of overland transportation in Alaska, including trails, unless they developed into roads or other modes of transportation, including rail, marine, and air. The focus of the study is on state and regional roads within the broader context and is not intended to provide for a history of local roads or road development within local communities. The historic overview focuses on the broader overall road development and is not intended to provide complete individual road histories. Specific roads mentioned in the overview are used as examples to illustrate road building efforts. A discussion of roadside-related properties and features outside of the right-of-way is beyond the scope of this project.

The historic overview contains three main sections as follows:

- *Section 2: The National Stage* provides an overview of the development of a modern roads system in the U.S. beginning in the early nineteenth century to parallel the timeframe in Alaska. This section focuses on promotion of roads and subsequent direct federal involvement in road building through funding and policies that shaped the road network of the lower 48 states. This national perspective is presented to provide a context and show the contrast between efforts in the lower 48 and those within Alaska. Alaska's story is unique based on its geography, climate,

[9] National Park Service, *National Register Bulletin: How to Complete the National Register Multiple Property Documentation Form*, 1991, 11.

territorial status, size, population, and funding. It would largely not be until the Federal Aid Highway Act of 1956 finally included Alaska that the two would be on a more parallel path in terms of road funding and development.

- *Section 3: On the Road: Alaska's Road Development* begins with an overview of Alaska's geography and climate to set the stage for a discussion of road development and its unique challenges. The section then presents a chronological discussion of road development, policies, and funding from the limited road network of the late nineteenth and early twentieth century to the present. Early on trails, sled roads, and waterways served as the main transportation network. The establishment of the ARC and continued exploration and mining discoveries led to efforts to build roads to access mining areas and support agricultural development. The story continues with efforts during the Depression era with work-relief funding and programs focusing on roads. World War II and the postwar years saw increasing road construction to serve military needs and a shift towards an interconnected road system. With the initiation of statehood in 1959, Alaska entered a new phase of road development headed by the Alaska Department of Highways that included expansion of the existing highway system, upgrading roads to new design standards, improving safety, and connecting growing metropolitan communities. The latter half of the twentieth century and into the twenty-first century saw new and improved roads constructed to tourist destinations, natural resources, and rural areas.

- *Section 4: Road Engineering* begins with how development of a transportation network had to address particular geographic and climatic challenges in Alaska. The state's terrain, soil, and areas of permafrost, tundra, and muskeg posed difficulties for road design and construction. The section continues with a focus on road-building methods and materials utilized and a discussion of the evolution of road design and construction, including technological advances. Road-building efforts began with the application of existing principles, but evolved through trial and error to cope with the specific challenges presented in Alaska. Following World War II, the road system was modernized through increased reliance on engineering and scientific advances. Section 4 includes brief discussions of national trends in road design to provide perspective and context for the discussion of road development in Alaska.

Finally, *Section 5: The Present Alaska Road System* concludes the Overview with a summary of the present Alaska road system.

Report guidance and acronym use

Throughout the state's history various road building agencies, with subsequent name changes due to reorganization, have been in charge of road building. In the historic overview, the common term Alaska Road Commission, or acronym ARC, is used interchangeably for the Alaska Road Commission and the Board of Road Commissioners of Alaska. This agency, officially named as the Alaska Road Commission in 1926, was the main agency responsible for territorial roads from 1905 to 1956. The term Department is used in this document interchangeably for the period from 1957 to the present to refer to the various names of the territory and then state agencies with the main responsibility for Alaska's roads. A table of the main road building agencies is included in Section 3.3.

Through the years the federal agency responsible for assisting with road building efforts also underwent name changes and reorganizations. Known in 1905 as the Office of Public Roads, it was renamed the Bureau of Public Roads in 1918 until becoming the Public Roads Administration in 1939 and back to the Bureau of Public Roads in 1949. The name Bureau of Public Roads (BPR) is used throughout this document interchangeably to refer to the federal agency until it became the FHWA in 1967. A list of the national highway agencies is found in the sidebar titled *Chronology of National Highway Agencies* in Section 2.1.

Many of Alaska's main road and highway names have also changed over time, often beginning with termini as their titles and later renamed or dedicated to its present name. A table of major roads identifying present name and previous names is included in Appendix B for reference, along with brief biographies of some of the individuals for which roads have been named. Throughout the document the present road name is used with an introduction at its first use to identify earlier naming conventions.

2. The National Stage

This section presents a brief history of road building in the U.S. to provide a context and set the stage for understanding subsequent efforts to develop a road network in Alaska. Local, state, and national road networks in the lower 48 states were established well before such systems were initiated in Alaska. In nineteenth-century America, relatively few roads were built and local governments often bore this responsibility. Railroads provided for transport of goods nationally. One early way road development was encouraged by the federal government was the enactment by Congress of Revised Statute (R.S.) 2477 in 1866, allowing for construction of highways across public lands. States first formed highway commissions in the 1890s and, with the growing population of the Good Roads Movement, became involved in improving state road networks in the early 1900s.[10] With the exception of its early effort with the National Road and military routes, the federal government was generally not directly engaged in road building before the 1890s.

By the 1910s most states had organized a highway commission to lead their road-building efforts.[11] Alaska, then a U.S. territory, would not have a parallel organization until 1959. The role of the federal government in road building, as reflected in the federal legislation that set standards, provided funding and led to expansion of the transportation system at all levels (local, state, and national), is an important theme nationally. State governments were responsible to administer funds and implement transportation programs. Interstate commerce, connections between and among cities and towns, and access to natural resources were all supported by transportation initiatives made possible by federal legislation. Significant legislation passed in the 1950s further transformed communities and improved interstate commerce by facilitating road transportation across greater distances.

2.1 From early road building to the Great Depression

In the nineteenth century, roads were generally recognized as a responsibility of state and local governments and had limited geographic reach.[12] Private companies constructed toll roads, or turnpikes, in certain locations to support increased settlement or agricultural production.[13] The few long-distance roads were those that had developed along long-established overland routes and traces used by Native Americans or as migratory routes for buffalo. With its construction of the National Road beginning in 1811, the federal government ventured into road building at a broader scale in an effort to unify the country and bolster western migration.[14]

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[10] Bruce E. Seely, *Building the American Highway System: Engineers as Policy Makers* (Philadelphia, Penn.: Temple University Press, 1987), 13, 21, 30-34.

[11] Seely, 32-34.

[12] Richard F. Weingroff, "Federal Aid Road Act of 1916: Building the Foundation," *Public Roads* 60, no. 1 (summer 1996), http://www.fhwa.dot.gov/publications/publicroads/96summer/p96su2.cfm (accessed 18 April 2013).

[13] Donald F. Carmony, *Indiana, 1816-1850: The Pioneer Era. The History of Indiana* Vol. II (Indianapolis, Indiana Historical Bureau & Indiana Historical Society, 1998), 179.

[14] Rickie Longfellow, "Back in Time: The National Road," *Highway History*, http://www.fhwa.dot.gov/infrastructure/back0103.cfm (accessed 18 April 2013).

The National Road, also called the Cumberland Road, began in Cumberland, Maryland, with the original goal to connect the Potomac and Ohio Rivers. By 1818 the roadway reached the Ohio River in Wheeling, Virginia, and work continued across Ohio toward Indiana. By the late 1820s efforts to extend the road across Indiana from the Ohio border commenced. Between 1829 and 1838 Congress provided the funding for clearing the route of trees, grading and surfacing the road with stone and gravel, and erecting culverts and bridges of stone. After its completion in 1838, the federal government turned over the National Road to the states, which in turn gave control of sections of the road to counties and private toll companies.[15]

The National Road was heavily used in the years immediately following its construction. With the construction of railroads, its popularity waned.[16] By 1840 enthusiasm for railroads had resulted in reduced focus on road building. Further hampering progress, numerous states adopted constitutional amendments forbidding expenditure of public funds on infrastructure improvements like roads in response to state bankruptcies in the 1830s. Federal government involvement in road building ended with an exception only for western military routes.[17] It would be many decades before the federal government would again support better roads.

A nationwide movement to promote improved travel by road began with bicyclists in the 1880s and 1890s, and gained momentum with the development of the automobile. The League of American Wheelmen, a group of bicycle riders formed in 1880, was the first organized protagonist for better roads. The group organized and founded the National League for Good Roads at an 1892 conference of the National Grange of the Patrons of Husbandry. The push for improved roads was furthered by the federal government's establishment of Rural Free Delivery mail service in 1896, which required a road serving as a mail route, known as a post road, to be passable in all weather. Increased auto ownership also led to a desire for improved roads for vehicular use. The growing and widespread interest in promoting improved roads, first by cyclists and then by auto enthusiasts, became known as the Good Roads Movement.[18]

The formation of the Office of Road Inquiry (ORI) within the United States Department of Agriculture (USDA) in 1893 inaugurated a new era of federal involvement in road building. The office initially focused on rural farm-to-market roads, believing that interstate transportation needs would continue to be served by the railroads that were then the reigning carriers. ORI engineers supported the Good Roads Movement and served as a source of technical information regarding roads. The ORI was involved in data collection and produced bulletins and circulars addressing road construction and issues related to the administration of roads.[19] The vision of an automobile (and truck)-dominated transportation system involving major, paved, interstate highways was not embraced by the federal administrators, despite their

[15] Carmony, 139-140.

[16] Longfellow.

[17] Seely, 8.

[18] Seely, 12-15.

[19] Seely, 11-14.

own engineers' understanding of the need for improved roads for autos.[20] The ORI and its successors were the predecessors of the FHWA (see sidebar below).

Rapidly expanding automobile ownership and use spurred efforts to enlarge and improve the country's highway system. In 1904 there were over 55,000 vehicles in use across the U.S. Large-scale car manufacturing began in 1908 in Detroit, when Henry Ford introduced the low-priced, mass-produced, Model T, a car the average person could afford.[21] Thanks to Ford's production methods and inexpensive Model T, the number of autos on American roads skyrocketed to one-half million by 1910.[22]

As touring became popular, drivers had to contend with frequently muddy and impassable roads. The vehicles damaged the macadam and gravel surfaces of rural roads. Farmers and recreational drivers called for rural road improvement. Nationwide, farmers, bicyclists and automobile owners, local commercial clubs, business associations, automobile clubs, and merchants worked jointly to contribute labor and funds to bring new national roads through their towns and improve their local roads. The Good Roads Movement gathered strength and spawned the formation of other organizations, such as the American Automobile Association, which became a strong advocate for federal involvement in road improvement. Despite these efforts, in 1904 less than 10 percent of the country's over two million miles of road were improved in any way.[23]

The development of cross-country memorial highways, of which the Lincoln Highway was the most prominent example, were "the best indication" of support for good roads nationally in the mid-1910s, observed Bruce Seely in *Building the American Highway System*. Beyond simply interest and support, however, the "real proof of change came with the introduction of sixty road bills in Congress" in a 6-month period in 1911 and 1912. *Engineering News* reported "widespread demand" for congressional action. The number of automobile registrations in the country had reached 2.3 million by 1916 and motorists continued lobbying heavily for programs and funds to improve roads.[24]

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[20] James L. Cooper, *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900-1942* (N.p.: James L. Cooper, 1997), 110-111.

[21] M.G. Lay, *Ways of the World: A History of the World's Roads and of the Vehicles That Used Them* (New Brunswick, N.J.: Rutgers University Press, [1992]), 164, 168.

[22] George E. Koster, *A Story of Highway Development in Nebraska*, Rev. ed. (Lincoln, Neb.: Nebraska Department of Roads, 1997), 7.

[23] Laurence I. Hewes and Clarkson H. Oglesby, *Highway Engineering* (New York: John Wiley & Sons, Inc., 1954), 3; Weingroff, "Federal Aid Road Act of 1916: Building the Foundation"; Seely, 8.

[24] Seely, 25, 38.

Chronology of national highway agencies

The federal government became more involved in road construction activities in 1893 with the organization of the ORI. This agency underwent several name changes and reorganizations over the years. In 1939 the agency was named the Public Roads Administration (PRA), which it remained until it became the Bureau of Public Roads (BPR) in 1949. The BPR is the federal agency that provided state departments of transportation guidance on bridge design, materials to use on roads, and innovations. The BPR became the FHWA in 1967.

1893-1898	Office of Road Inquiry
1899-1905	Office of Public Road Inquiry
1905-1915	Office of Public Roads
1915-1918	Office of Public Roads and Rural Engineering
1918-1939	Bureau of Public Roads
1939-1949	Public Roads Administration
1949-1967	Bureau of Public Roads
1967-present	Federal Highway Administration

Source: "Names of the Nation's Highway Agency-1893 to the Present," *FHWA By Day*, n.d., www.fhwa.dot.gov/byday/acronyms.htm (accessed 30 January 2013).

Public demands for action were answered in the Federal-Aid Road Act of 1916. With this legislation, Congress outlined the first formal highway policy with regular appropriations of funds to the states. Approximately $5 million was appropriated the first year, with funding escalating $5 million annually over 5 years to reach $75 million. The Secretary of Agriculture managed the funding and allocated it to states by a formula based on a state's population, land area, and road mileage. Under this act the federal government would finance up to 50 percent of the cost of construction, not to exceed $10,000 per mile.[25]

Most states had already formed highway commissions by this time. However, in order to obtain federal funds, each state's highway commission had to meet new federal government standards as follows:

- Maintain a state highway department to administer the Federal-Aid Road Act
- Assume responsibility of all roads on which federal funds were spent (this could be delegated to local governments)
- Classify federal-aid eligible mileage based on traffic needs and services rendered
- Agree to uniform standards of construction and design
- Meet inspection requirements before bills were paid
- Match federal funds under mutually acceptable standards

State highway commissions had responsibility for the preparation of plans and specifications and construction and maintenance on federal-aid projects, while the federal government held the right to

[25] Seely, 42-43. Alaska was not then a state and was not included.

inspect all projects.[26] This was the beginning of a state and federal government partnership to provide a better network for transportation by road.

Congress further committed federal funding for highway construction under the Federal Highway Act of 1921. This act provided states financial aid for the construction of highways under the 7-percent system, in which each state was eligible for assistance for the construction of 7 percent of its highways. Within two years, each state was required to designate 3 percent of their primary roads and 4 percent of their secondary roads as part of the federal-aid highway system; as a result, these roads would be eligible for assistance. Federal funding was to be matched by state funds on a 50/50 basis. The 1921 act also designated previously established post roads as important interstate throughways to be developed into an integrated national road system. The federal government set standards for road design including minimum width, grade, and adequacy of roadbed type for the traffic load.[27]

During the 1920s automobile registrations increased nationally, keeping pace with both the federal government's new investment in road building and states' growing expenditure on roads. Travelers sought to go longer distances and at increased rates of speed. For transportation of people and goods, highways began to replace railroads. The Great Depression largely destroyed the optimism of the 1920s and many states' grand road-building schemes were put on hold. The federal government would need to step up its efforts to sustain any momentum in providing for a national road network.

2.2 Depression and New Deal era programs

Triggered by the stock market crash on October 29, 1929—Black Tuesday—the Great Depression witnessed widespread unemployment and economic distress across the U.S. Beginning in 1930 President Herbert Hoover authorized large sums for highway projects to stimulate employment. Hoover's highway spending was minor compared to what President Franklin Delano Roosevelt's administration would provide later, but it firmly established highway work as the leading solution to unemployment.[28] When Roosevelt came into office in 1933 he began to implement what he had proclaimed a year earlier: "a new deal for the American people." FDR's New Deal has been synonymous with the infusion of federal power and money into the national economy.[29]

A major component of the New Deal to combat widespread unemployment was "make work" transportation improvement projects. To provide employment to the greatest number of people possible, provisions established by the Emergency Relief and Construction Act of 1932 were continued as part of Roosevelt's New Deal programs. These provisions limited workers to 30 hours per week and specified the use of hand labor rather than machines for certain types of work. Road-related work, including highway planning, brought employment opportunities close to the homes of the jobless, and it was estimated that for every person directly employed on roads, at least two others were working in the

[26] Seely, 43.

[27] Seely, 62: Indiana Department of Public Works, *Fifteenth Biennial Report of the Department of Public Works 1923-1924*, 14.

[28] Seely, 89.

[29] James S. Olson, ed., "New Deal," in *Historical Dictionary of the New Deal* (Westport, Conn.: Greenwood Press, 1985), 369-370.

manufacture and transportation of roadway materials and equipment. Besides being a leading solution to unemployment, road-related work produced physical improvements that were needed in practically every county in every state.[30]

New Deal era programs came in a rush of names and associated acronyms often called the "alphabet agencies." Important agencies that funded road and bridge construction include:

- Public Works Administration (PWA) – Created soon after Roosevelt took office, the PWA distributed nearly $6 billion for construction projects in the 1930s and in 1933 alone it accounted for a third of all construction in the U.S. From March 1933 to September 1936, PWA funds built 60,361 miles of roads and 2,641 grade-crossing viaducts nationally.[31]

- Federal Emergency Relief Administration (FERA) – Created by Congress in May 1933, FERA empowered Roosevelt to spend $500 million in cash grants to state and city work-relief projects, providing one federal dollar for three local dollars. FERA work typically involved grading and/or graveling of county roads or city streets, with culverts and bridges built where needed. FERA ended in 1935, and unfinished work was taken over by the Works Progress Administration.[32]

- Civil Works Administration (CWA) – A program that lasted from November 1933 to March 1934 as a short-term supplement to FERA, the CWA worked entirely on the federal level, employing workers directly rather than providing relief money to projects.[33]

- Works Progress Administration, begun in May 1935 and renamed the Works Projects Administration (WPA) in 1939 – The WPA, along with the Social Security program, was intended to replace FERA; it continued until 1943. The WPA funded the building of 572,000 miles of highways, 67,000 miles of city streets, and 78,000 bridges.[34]

- Civilian Conservation Corps (CCC) – Created in March 1933 at the outset of the Roosevelt administration, the CCC was designed to provide jobs for men between the ages of 17 and 24 whose families were already on relief. The CCC was under the administrative control of the U.S. Army, and was organized into work camps for construction projects, including roads and bridges, usually administered by another agency. At its peak in 1935 the CCC employed a half-million men. Congress ended appropriations in 1942.[35]

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[30] Ellis L. Armstrong, ed., *History of Public Works in the United States, 1776-1976* (Chicago: American Public Works Association, 1976), 84; Seely, 88-89.

[31] Olson, 398; Seely, 90.

[32] Olson, 177-178. Typical projects under FERA, and the short-lived and related CWA, are based on an analysis of individual original reports and letters at the county and municipal levels submitted to the State Appraisal Committee for Oklahoma as part of the U.S. Community Improvement Appraisal Reports (CIAR). This provides a snapshot of activities in one state; Oklahoma Depression-era Road-related Resources and Bridges, 1933-1945 (revised draft; prepared for Oklahoma Department of Transportation by Mead & Hunt, Inc., June 2012), 21.

[33] Olson, 83-84; Seely, 90.

[34] Olson, 548-551; Seely, 90-91.

[35] Olson, 85-87.

Nationwide, federal relief programs kept the highway building boom of the 1920s alive through the 1930s, with 35 to 45 percent of all workers on federal relief building roads. Because of changes in federal appropriations in 1933, the Bureau of Public Roads (BPR) was required to devote some funds to roads outside the existing federal-aid system. Receiving aid now were farm-to-market roads in rural areas and railroad grade crossings and feeder roads to the federal-aid networks in cities. Because of Depression-related budget cuts on the local level, officials became dependent on the new assistance. During the New Deal, federal highway funding was so powerful that almost no other area of the economy "recovered" so quickly. Between 1930 and 1940 surfaced highways in America doubled from 694,000 miles to 1,367,000 miles.[36]

With the advent of World War II, the federal government restricted funds to those roads and bridges that served wartime needs, such as those providing access to military facilities or defense plants. Even before the U.S. became involved in the war, President Roosevelt backed a serious reduction in "nonessential" highway funding.[37] Following the attack on Pearl Harbor on December 7, 1941, the BPR, under the direction of the War Department, began to target national highway contracts to state highways designated as part of the strategic defense network. The strategic highways included all roads that the military felt to be of importance for the movement of troops and war materials.

2.3 Federal funding and policy transforms post-World War II roads

As the war ended in 1945, many state transportation agencies turned their attention back to highway-building programs that had been severely restricted by war-related shortages of personnel, equipment, and supplies. Nationally, federal funding for highways increased, leading to the expansion of primary roads throughout the country and eventually to construction of the Interstate Highway System. Important national developments in road building were made possible through funding and new policy provisions provided in a series of legislative acts adopted between 1944 and 1956.[38]

The Federal-Aid Highway Act (FAHA) of 1944 expanded the federal-aid primary road system, encompassing roads that states had designated as main transportation routes of the national highway system. The act also provided new funding for construction of secondary roads (also known as feeder roads, which included farm-to-market roads, rural free delivery routes, and public school bus routes) and urban highways in areas with a population over 5,000. Previous federal aid focused largely on primary roads and restricted the miles of secondary roads that could be improved with federal funds. The 1944 FAHA was the first time funding was provided for urban and secondary highways, without mileage limitations.[39]

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[36] Seely, 88-96; Federal Highway Administration, *America's Highways 1776-1976: A History of the Federal-Aid Program* (Washington, D.C.: United States Department of Transportation, Federal Highway Administration, 1977), 123.

[37] Seely, 176.

[38] The territory of Alaska did not receive support under this legislation until 1956.

[39] Seely, 189-191.

The act provided $500 million over a three-year period, with $225 million allocated to primary roads, $150 million to secondary roads, and $125 million to urban roads. Although a large sum, the money proved to be somewhat limited when distributed among all states. Funding for urban highways was distributed by population and for rural highways it was distributed to the states in proportion to rural population, geographic area, and post-road mileage (roads along postal routes). States had to match federal allotments on a 50/50 basis.

The 1944 act did not anticipate the dramatic increase in automobile ownership and truck use in the postwar era. The unexpected flood of cars and trucks caused congestion in urban areas, increased pressure on the overall transportation network, and created greater maintenance costs for roads and bridges. The act did, however, update and expand the federal-aid process and create a framework for highway funding and planning at the state level.[40]

The FAHAs of 1950, 1952, and 1954 were less consequential overall than those of 1944 and 1956, both of which played larger roles in the creation of the Interstate System. The acts of the early 1950s moved the focus of federal spending for construction more toward the cities. A significant event during this period was the Korean War, which reduced federal highway spending as money was diverted to defense needs. At the same time, however, that war also provided the opportunity for Interstate supporters to again argue, as in 1944, for a highway system based on requirements for national defense. This, in turn, led to reasons to argue for increased federal highway funding.[41] This discussion largely evaporated when the Interstate System and its massive new funding mechanism emerged in 1956.

The modern era of the Interstate began in the early 1950s as lobby groups pushed for a nationwide road network. In 1952 the FAHA included the first authorized federal funds for Interstate construction, a nominal $25 million nationally.[42] The federal share of Interstate construction increased from 50 to 60 percent with the passage of the FAHA of 1954. President Eisenhower, recognizing the importance of a national highway system for defense, appointed a committee to study American highway needs in 1954 at the height of the Cold War. The committee advised Eisenhower that an Interstate System was needed.[43]

The FAHA of 1956 overshadowed earlier highway acts. This act not only increased federal appropriations to states for primary, secondary, and urban highway construction, it more importantly made the first substantial appropriations for construction of the Interstate Highway System. The act brought uniformity to nationwide road-building efforts and included a provision requiring the BPR to work with the American Association of State Highway Officials (AASHO) to develop design standards to

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[40] A.E. Johnson, ed., *Published on the Occasion of the Golden Anniversary American Association of State Highway Officials: A Story of the Beginning, Purposes, Growth, Activities and Achievements of AASHO* (Washington, D.C.: The American Association of State Highway Officials, 1965), 153; Seely, 191.

[41] Seely, 199-203.

[42] Lay, 313; Seely, 204.

[43] David A. Pfeiffer, "Ike's Interstate at 50: Anniversary of the Highway System Recalls Eisenhower's Role as Catalyst," *Prologue* 38, no. 2 (summer 2006): n.p.; Robert A. Caro, *The Power Broker* (New York: Alfred A. Knopf, 1974), 921.

accommodate traffic forecasts through 1975. Standards were meant to ensure national uniformity of design, provide for full control of road access, and eliminate at-grade crossings.[44]

The Highway Revenue Act, also of 1956, provided the funding for programs outlined in the FAHA. Provisions were included for expansion of the nation's Interstate System to 41,000 miles with allocations for 90 percent of construction costs. States would be responsible only for the remaining 10 percent, a major departure from earlier 50/50 matches. The entire Interstate System was anticipated to cost more than $27 billion nationwide. In order to finance construction, the legislation created the Highway Trust Fund, which was supported by an increased federal tax on gas and diesel fuel. The 1956 legislation also authorized an initial 13-year construction period for Interstate highways, which would eventually be extended as states faced routing and funding difficulties.[45]

With the authorization of the U.S. Department of Transportation in 1966 and its start in April 1967, the functions of the BPR transferred to the new Federal Highway Administration (FHWA). The FAHA of 1968 again authorized the Interstate System's expansion, this time to 42,500 miles; minor changes in mileage and funding eligibility were also made in 1973 and 1978. Notable policy changes affecting transportation projects during the 1970s, with continued impacts on project planning and development to the present day, was the passage of federal legislation that called for protection of the environment and Native American rights (see sidebar titled *Influential federal legislation for the environment and Native American rights* in Section 3.7.1.5). The FHWA's current role is to provide financial and technical assistance to state and local governments in support of their efforts to maintain and improve highways and bridges.

Though the story of the inception and expansion of a national transportation network in the continental U.S. has little in common with the history of Alaska's roads, the importance of federal government policy and funding to support transportation is a shared theme. State highway commissions, later reorganized as departments within state government, administered programs that met federal standards introduced and expanded in a series of legislative acts through the twentieth century. The most impactful of these to Alaska was the last addressed, the FAHA of 1956, which for the first time included the territory in its provisions.

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[44] Johnson, 181; Tom Lewis, *Divided Highways: Building the Interstate Highways, Transforming American Life* (New York: Viking, 1997), 121; Richard F. Weingroff, "Federal-Aid Highway Act of 1956: Creating the Interstate System," *Public Roads* 60, no. 1 (Summer 1996). http://www.fhwa.dot.gov/publications/publicroads/96summer/p96su10.cfm (accessed 18 September 2012).

[45] Johnson, 181; Lewis, 121; Weingroff, "Federal-Aid Highway Act of 1956: Creating the Interstate System."

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3. On the Road: Alaska's Road Development

This section tells the story of road development in Alaska, from the territory's early trail system to an interconnected road system supported by other modes of transportation. First is a discussion of the unique climate and geography that created challenges for road building. The section continues with a chronological discussion of the creation of a road system focusing on the construction of roads, their need and purpose, and the agencies that facilitated their funding and construction. This begins with Alaska as a territory with land transportation of mostly trails and sled roads that, over the next century, would be transformed into a substantial road network through various road-building initiatives ranging from the need to access resources and agricultural areas, to supporting military needs, and the desire to create a transportation network that would connect communities and rural areas.

3.1 Influence of Alaska's geography and climate

The geography and climate of Alaska have had a significant impact on the ways in which the road network evolved. The territory and later state's location, topography, and natural resources have influenced patterns of development. In order to serve population centers, resource extraction sites, agricultural areas, and military installations, and to create connectivity with other forms of transportation such as rail, air, or water, the road system spanned great distances across varied topography and climates.

With a total land area of 586,412 square miles, Alaska is approximately one-fifth the size of the lower 48 states (see Figure 1).[46] Its boundaries span 20 degrees of latitude, with coastlines on the Arctic and Pacific Oceans to the north and south and the Bering Sea to the west. Surrounded on three sides by water, the whole of Alaska forms the largest peninsula in North America and can be divided into three physiographic areas: the Pacific Mountains, the Central Plateau, and the North Slope. The Pacific Mountain area is essentially a continuation of the Pacific Mountain system of British Columbia. Following the coastline of the Gulf of Alaska, it includes the Chugach and Kenai Mountains, the crescent of the Alaska Range, and the Alaska Peninsula, forming fjords along the coastline and valleys further inland. The southeastern portion, known as the "Panhandle," is connected to the rest of the state by a narrow strip of land and separated from Canada by mountains; a substantial percentage of the area is made up of islands. The Chugach and Tongass National Forests are located in the Pacific Mountain region and contain dense spruce and hemlock forests.

More than half of the designated wilderness in the United States is located in Alaska, comprising approximately 16 percent of the state's land. Much of this land is administered by the Bureau of Land Management (BLM), NPS, Fish and Wildlife Service, and the Forest Service, totaling over 228 million acres.[47] National Forest land constitutes approximately 5 percent of the total area of Alaska, and much of the area along the Gulf of Alaska is included in one of two large reserves, the Chugach and Tongass

[46] Grace Edman, Alice Hudson, and Sam Johnson, *Fifty Years of Highways: Alaska Department of Public Works, Division of Highways* (Nome, Alaska: Department of Public Works, Division of Highways, 1960), 1.

[47] Ross W. Gorte, *Wilderness: Overview and Statistics* (Washington, D.C.: Congressional Research Service, 2010), http://polis.house.gov/uploadedfiles/wildernessoverviewcrs.pdf (accessed 19 June 2013).

National Forests.[48] These two National Forests are particularly important in the history of Alaska's roads, as they contain a number of cities, towns, and natural resources that have spurred road development. The Tongass National Forest includes most of southeast Alaska, and surrounds several cities and towns such as Haines, Klukwan, Skagway, Ketchikan, Hoonah, and the capital, Juneau. The Chugach National Forest encompasses the Kenai Peninsula, part of the Kodiak archipelago, the islands and coast of Prince William Sound, and the Gulf of Alaska coast east to Controller Bay, and includes within it cities such as Seward, Kenai, and Cordova.

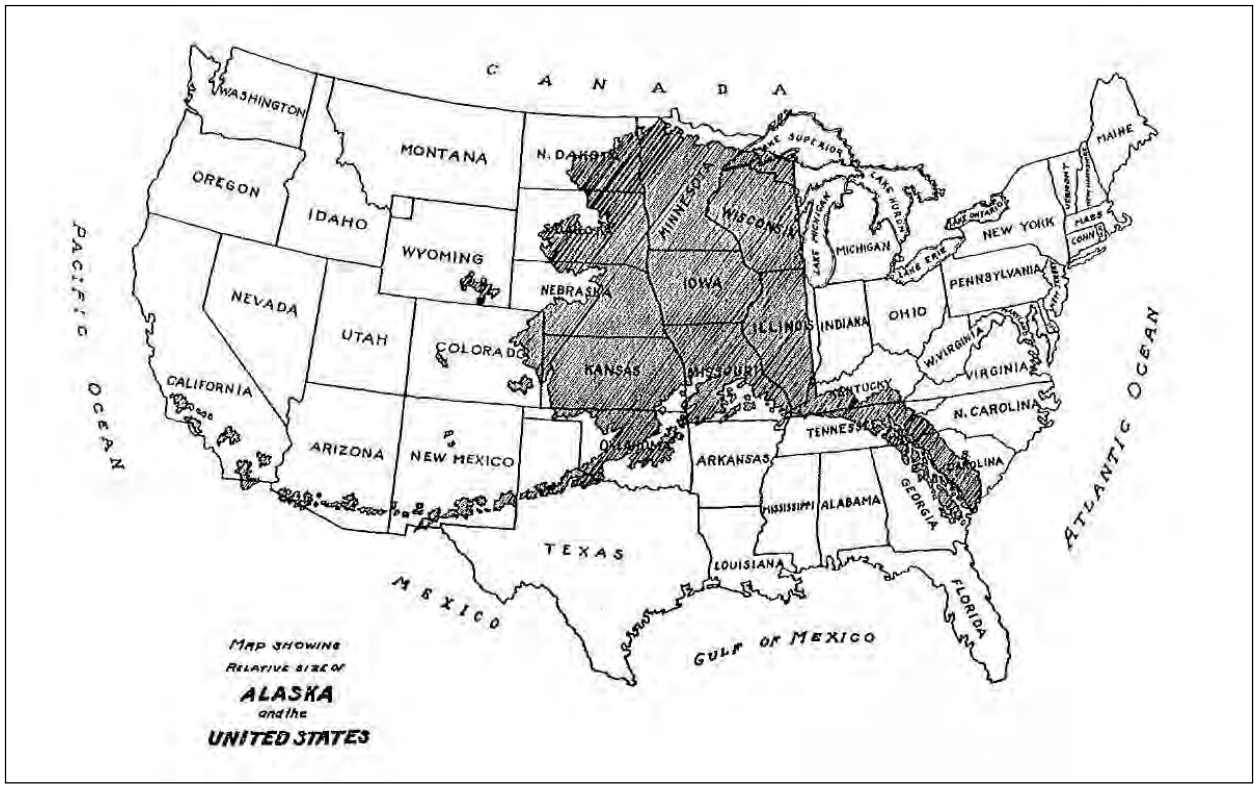

Figure 1. Map showing relative size of Alaska and the lower 48 states. Source: Alaska Road Commission, 1955.

Inland, the Central Plateau spans the width of the state from the Bering Sea to the Canadian border, and is bounded on the south by the Alaska Range and on the north by the Brooks Range. It contains major gold-producing regions in the Fairbanks vicinity and the Seward Peninsula. The landscape of the Central Plateau is less densely forested than the coastal region, with a mix of tundra and wooded areas. The Yukon River, along which a number of gold deposits were discovered, runs from the Canadian border across the entire plateau before emptying into the Bering Sea. North of the Central Plateau, the North Slope stretches from the northern slope of the Brooks Range through foothills and across a coastal tundra plain to the Arctic Ocean.[49] This portion contains petroleum reserves but is minimally populated.

[48] Board of Road Commissioners for Alaska (ARC), 1932, 8.

[49] Edman, Hudson, and Johnson, 1-3.

In addition to the great distances and varied terrain, Alaska's high latitude and low average annual temperatures create a variety of cold-weather construction and maintenance complications, in particular those related to permafrost. This permanently frozen soil or subsoil is a remnant of the Ice Ages and underlies 80 percent of Alaska's land area.[50] The condition occurs in both continuous and discontinuous zones; the continuous zone includes the North Slope and much of the Seward Peninsula, while the discontinuous zone includes all of the Central Plateau (see Section 4.2.2). Where permafrost is found, its depth can reach up to 1,000 feet below the surface. When thawed, it can be an extremely unstable platform for structures such as roads, leading to sloughing, subsidence, landslides, and pavement failure.

The map in Figure 2 highlights Alaska's major topographic features and cities.

[50] Arvind Phukan, "Design Consideration for Roadways on Permafrost," prepared for State of Alaska Department of Transportation & Public Facilities, January 1980, 1.

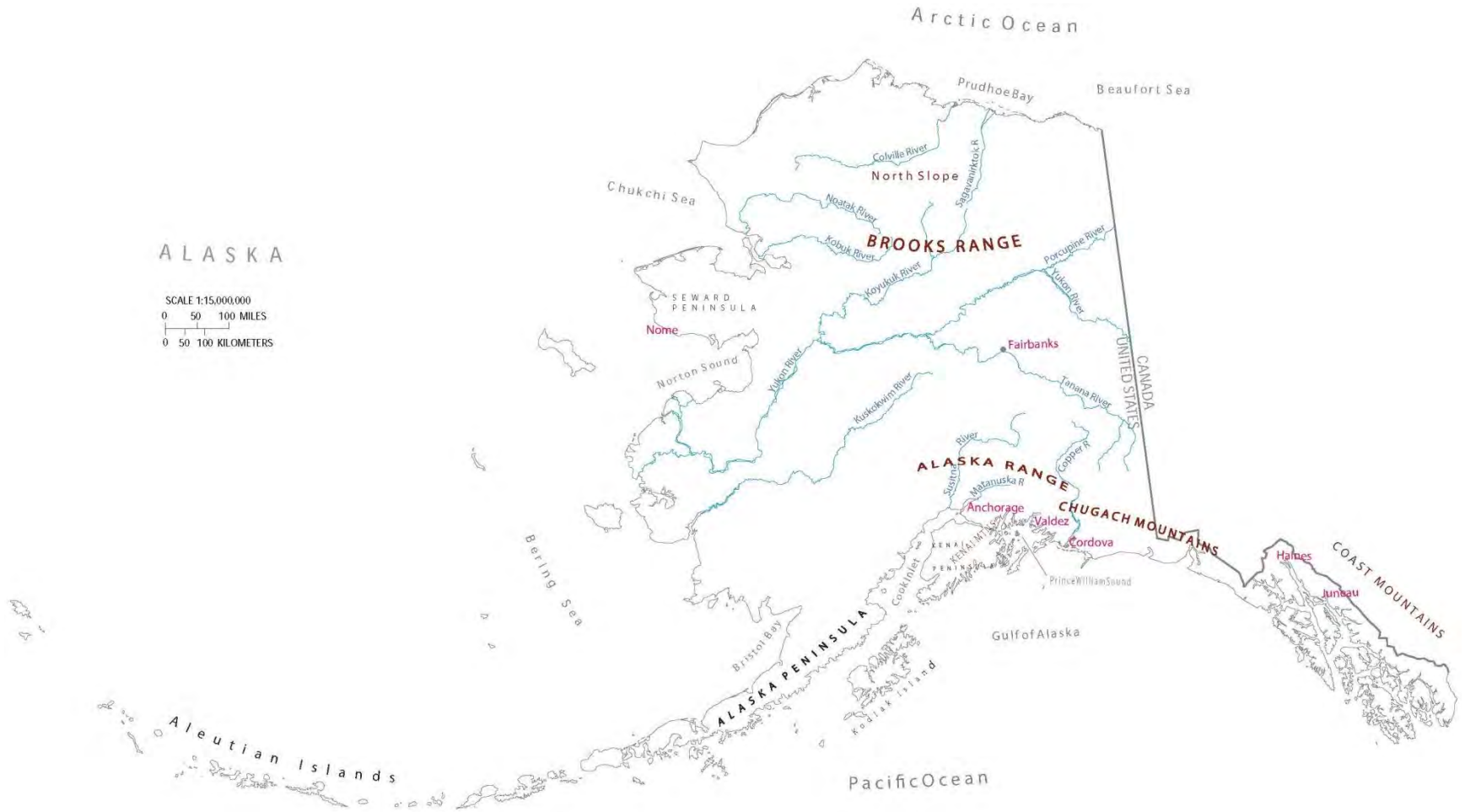

Figure 2. Map of Alaska highlighting major topographic features. Map prepared by Mead & Hunt, Inc., modified from U.S. Geological Survey digital data.

From the outset, Alaskan weather and soil conditions were recognized by engineers and builders as distinct influences on road construction. Road building efforts began with the application of existing principles, but evolved through trial and error to cope with the specific challenges presented by the territory. Permafrost, tundra (the delicate vegetation that protects the permafrost), and muskeg bogs presented scenarios for which engineers in the lower 48 states never had reason to develop design or construction criteria, and as late as 1940 the ARC acknowledged that while "standard construction and maintenance methods are employed in Alaska so far as practicable, it is necessary to vary therefrom in some instances because of special physical and climatic conditions."[51]

Because much of Alaska's early development was spurred by resource extraction, the early intent of the road designers was to connect resource-rich areas with seaports, river access points, or rail lines. In order to link the mining areas along the Yukon River in the Central Plateau with the southern coast, overland transportation had to contend with several mountain ranges. While trails were built in many areas, only the more important routes were developed into the forerunners of the present vehicular road system. As a result, throughout the twentieth century most road-building activity was concentrated in areas between the eastern half of the Central Plateau and the Gulf of Alaska, where corridors link Fairbanks and the towns along the Yukon River with Valdez, Anchorage, and the Kenai Peninsula. The Panhandle region, due to the large number of islands, is primarily served by waterways, and the western half of the state is lightly populated with the Seward Peninsula and Yukon-Kuskokwim Delta largely being the exceptions. Western Alaska is not connected by road to the rest of the state; inhabited areas tend to be located on rivers or the coast, allowing access by watercraft. Today these areas have local roads and are also connected to the rest of the state by airplanes; commuter airlines serve regional hubs such as Bethel, Nome, Kotzebue, Dillingham and Kodiak, and chartered bush planes are also a common means of travel over large distances. Only the southern Seward Peninsula has a road network of any substantial mileage, where roads connect Teller, Council, and Taylor with the port city of Nome.

3.2 Alaska's early trails and roads (1886 – 1904)

Where mining, fur trade, and exploration provided the impetus for road development in the Alaska territory in the late nineteenth to very early twentieth century, the outcome was most often a passable trail or occasionally a wagon road, frequently connecting to other transportation types. Alaska remained well behind the lower 48 states in its development of an interconnected road system, and was largely untouched by the Good Roads Movement of the late nineteenth century and burgeoning interest in automobile touring of the early 1900s.

3.2.1 Setting the stage for road development and exploration (American Period – 1886)

Thousands of years before the arrival of Russians and Americans to Alaska, Native Alaskans used coastal waterways, navigable and frozen rivers, and established some trails to travel between communities and to reach resource locations. Many of these same travel routes were used during the Russian and early American periods by fur traders and mining prospectors. At the time of Alaska's purchase from Russia by the U.S. in 1867, less than 5 miles of wagon roads existed in the territory of

[51] Alaska Road Commission, 1940, 5.

more than 586,000 square miles.[52] Russian communities were located on the coastline or on navigable rivers since they were principally interested in Alaska's marine coastal fur-bearing resources. The Russians had conducted limited interior investigations. Inland travel in the summer was by foot or packhorse along Native and game trails or by boat on navigable waterways. In the winter, frozen rivers and trails were used for travel. Spring was a difficult period when the terrain in many areas turned into "morass and swamp, through which travel on foot or on horseback is a slow and laborious process."[53]

After 1867, Alaskan residents and visitors continued to use the same means of travel. Revised Statute (RS) 2477, an act passed by the U.S. Congress in 1866 to encourage settlement and the development of highways through the use of trails, appears not to have had an impact in these early years. The War Department, followed by the Treasury Department, and later the U.S. Navy, governed what was officially designated the Department of Alaska from 1867 until the institution of an appointed civil government in 1884. The Department of Alaska was then redesignated the District of Alaska.[54] Between 1868 and 1886 the U.S. military made some road improvements and performed a small amount of road construction in southeastern Alaska at Sitka, which served as the territory's capital. More significantly, the U.S. government sponsored surveys and explored and mapped the territory, and documented conditions and geographic hurdles that road builders would need to overcome.[55]

During the early American period a small amount of U.S. government-funded exploration under the direction of the Army, and private exploration by fur traders, prospectors and miners, and adventurers set the stage for the development of Alaska's interior road system. The first official U.S. expedition into interior Alaska, and the only one for many years, was led by Captain Charles Raymond of the USACE in 1869. Raymond was sent to explore the Yukon River and determine the location of the Hudson's Bay Company trading post of Fort Yukon in relation to the Canadian-U.S boundary.[56]

Immediately after Alaska's purchase, fur traders for several private companies began to travel along the Yukon River, other major waterways, and the trails developed by Native peoples. Mining prospectors soon followed the fur traders, first venturing from Sitka. The discovery of gold in 1871 in the Cassiar District of British Columbia drew thousands of prospectors to Wrangell in southeast Alaska on their way to the new discovery. Some of the miners stayed and found gold on coastal streams in Southeast Alaska.[57] In the Yukon valley, Leroy Napoleon (Jack) McQueston, Alfred Mayo, and Arthur Harper arrived at Fort Yukon in 1873. While they worked as fur traders, they were more interested in locating gold deposits, and began to prospect the following year. The three men are "credited with being instrumental in opening

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[52] Alfred Hulse Brooks, *Blazing Alaska's Trails* (Fairbanks, Alaska: University of Alaska and the Arctic Institute of North America, 1973), 420-421. Sled roads are also sometimes referred to as sled trails. The term sled roads will be used throughout this document.

[53] Board of Road Commissioners for Alaska (Alaska Road Commission [ARC]), 1913, 6; 1914, 6, 7.

[54] Governor of Alaska, 1902, 6. The Treasury Department briefly took over rule of Alaska from 1877 to 1879.

[55] Brooks, 420-421.

[56] Charles W. Raymond, *Report of a Reconnaissance of the Yukon River, Alaska Territory, July to September, 1869* (U.S. Congress, Senate Executive Document 12, 42nd Congress, 1st Session, 1871), 16.

[57] Brooks, 299.

up the Yukon River valley to miners" over the coming decades. In 1874, believing the location was in Alaska, François Mercier established a trading post called Fort Reliance at the site of a Han Gwitch'in village about six miles down the Yukon River from a stream called the "Clondike", leaving McQueston in charge as the agent. In 1880, Mercier established another trading post named Belle Isle about 80 miles downriver from Fort Reliance close to what would later prove to be the Alaska/Canada border.[58] With the support available from the trading posts along the Yukon, prospectors began to try their luck on tributaries such as the Fortymile, the Koyukuk, Birch Creek, and the Tanana.

In the late 1870s information about gold ore in the vicinity of Alaska's capital, Sitka, made its way, via soldiers who had been stationed there, to miners in California. In 1879 mining engineer George Pilz traveled to Sitka, where he found gold near Silver Bay.[59] The following year Pilz sent prospectors Joseph (Joe) Juneau and Richard T. Harris to look for the source of the gold ore that Auk tribal head Kowee (Kawa.ée) had brought him; they discovered gold in Silver Bow Basin on Gold Creek. The road that prospectors established in 1882 to their claims on Gold Creek began as a 2-mile-long horse trail. The town of Juneau was soon established at the coast end of the trail. In 1885 the Johnson Mill and Gold Mining Company made improvements to this trail, known at the time as Johnson Road.[60] Later known as the Perseverance Trail, it was the first wagon road constructed during the U.S. administration.

With prospectors exploring interior Alaska since the 1870s, and gold discoveries in Juneau and the upper Yukon in the 1880s, miners became increasingly interested in Alaska. As Alaska's population began to grow with the arrival of miners and prospectors, so did the need for improved transportation. It was miners who called for roads to the point that the U.S. Congress ultimately appropriated funds to explore, survey, and build roads in Alaska.

The Army increased its exploration of Alaska in the early 1880s as more prospectors were attracted north. Sent in 1883 to gather information about the interior, First Lieutenant Frederick Schwatka crossed the coastal mountains into Canada via the Chilkoot Trail and traveled down the Yukon River to its mouth. He recorded information about the lands immediately adjacent to the river. In 1884 Lieutenant William R. Abercrombie led a reconnaissance mission to the Copper River, which he ascended 60 miles as far as the Miles and Childs glaciers; he also visited Valdez in Prince William Sound.[61] This set the stage for the most valuable Army exploration of the time, that of Lieutenant Henry T. Allen. Beginning in March 1885, Allen and two men covered approximately 1,500 miles in about 23 weeks.[62] They traveled up the Copper River, crossed overland via the Suslota Pass to the Tanana River, traveled down the Tanana River to the Yukon River, traveled north up the Koyukuk, and returned south and west down the Yukon to St. Michael.

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[58] François Xavier Mercier, *Recollections of the Youkon*, Alaska Historical Commission Studies in History No. 188 (1986), xiv,1,7,9.

[59] Charles B. Hawley and David B. Stone, *George Pilz (1845-1926)*, Alaska Mining Hall of Fame Foundation, http://alaskamininghalloffame.org/inductees/pilz.php (accessed 31 December 2012).

[60] Sean M. Boily, *Perseverance Trail: Last Chance Basin to Silver Box Basin Historic Inventory and Report* (Juneau, Alaska: The City and Borough of Juneau Parks and Recreation Department, 2004), 4, 9, 10; Brooks, 421.

[61] Brooks, 276; U.S. Army, Alaska, 24.

[62] Allen, Henry T. Report of An Expedition to the Copper, Tanana, and Koyukuk Rivers in the Territory of Alaska, (Washington: Government Printing Office,1887; Anchorage: Reprint by Publication Consultants, 2009), 35, 113.

They mapped their route and described the country through which they traveled, including the almost pure copper deposits in the Chitina River Valley. Their maps and descriptions would prove extremely valuable to later government and private explorers, and road builders.

Population increase and the discovery of gold encouraged the creation of a government in Alaska. Alaska officially became a U.S. district when Congress passed an Organic Act in 1884. This provided a simple civil government with officials appointed by the U.S. president, and applied the U.S. mining laws and the general laws of the State of Oregon. It did not make any changes to RS 2477, or add provisions for the development of trails or roads.

3.2.2 Gold rushes and development of early transportation routes (1886 – 1904)

Gold discoveries along tributaries of the Yukon River in interior Alaska, on the Kenai Peninsula in southern Alaska, and on the Seward Peninsula began in 1886 and continued into the early 1900s. The result was the creation of new towns and the first government-funded trails and roads. In 1886 the discovery of profitable amounts of gold in the Fortymile River drainage on the U.S. side of the Alaska/Canada boundary set off the first gold rush in interior Alaska. Three new towns—Dawson City, Fortymile City and Eagle—sprang into existence on the Yukon River near the Alaska/Canada border to provide services to miners. Fortymile City, at the mouth of the river bearing the same name in Canada, grew from the location of a trading post established forty miles downriver on the Yukon from Fort Reliance. Dawson City (in Canada) was established in 1896 about six miles upriver from Fort Reliance at the mouth of the Klondike. Eagle, Alaska was established by miners and prospectors in 1898 near Belle Isle. The gold discoveries led to miners improving indigenous trails and pioneering new routes over the rugged terrain to bring supplies and equipment from the west coast to the Yukon River and from the new towns to mining camps and claims. [63]

[63] Brooks, 313-320, 328; Rolfe G. Buzzell, *Cultural Resource Survey of the Taylor Highway MP 64.5 – 95.6 and the Top of the World Highway MP 0.0 – 13.5 (Jack Wade Junction to the U.S. – Canadian Border), Project No. 66446*, Office of History and Archaeology Report Number 94 (Anchorage, Alaska: Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation, 2003), 13, 24; Mercier, 3,9,10.

Figure 3. Cropped portion of "Map Showing Routes to Alaska via St. Paul or Omaha" showing routes to the gold fields of Alaska and portions of the Northwest Territory from Southeastern Alaska in 1897. Red dashed lines indicate overland trails and steamship routes; black dashed and dotted line indicates Canada-Alaska boundary. Source: University of Alaska Fairbanks. Rare Maps Collection, Alaska & Polar Regions Collections, UAF-M0482. (The full version of this cropped map is presented in Appendix A.)

As in other western territories of the U.S. in the late 1800s, Alaska's governor was required to report annually on the status of the territory to the Department of the Interior. In his 1886 annual report, Alaska's second governor, Alfred P. Swineford, expressed frustration with the lack of transportation that hindered his efforts to visit various areas of Alaska:

> When the fact is taken into consideration that the geographical subdivision known as Southeastern Alaska is but a mere fraction of the whole Territory, that there are no roads, that all travel must necessarily be by water, and that the means of communication with other parts of the country are entirely lacking…

The lack of roads to aid in the enforcement of law and order was an ongoing concern expressed by Alaska's governors over the next few decades.[64]

In 1893 there was a gold rush to Birch Creek, a tributary of the Yukon River west of the Fortymile River. By 1896 the town of Circle, established as a landing point for mining supplies boated up river from St. Michael, had grown into the largest town in the region. To support their camps, miners either brought enough supplies for a year by sled upstream along Birch Creek during the winter, or arranged with a supplier to have goods brought overland via existing trails by pack train during the summer.[65]

Prospecting in the Rampart Mining District, west of the Birch Creek Mining District, began as early as 1893. The area became an active gold producer by 1896, and by the winter of 1898-1899 the town of Rampart swelled to about 1,500 people, serving as the district's point of supply on the Yukon River. With limited transportation modes, supplies were hauled to the mines in the summer by pack trail and in the winter by dog sled, although winter travel was preferred as the packhorse trails were wet and boggy. The main trail ran south from the town of Rampart along Minook Creek, with branch trails to the various mining camps along the tributary creeks.[66]

In 1895 gold seekers began arriving on the mountainous northern Kenai Peninsula, approximately 500 miles south and 115 miles west of present day Valdez. They established the towns of Sunrise and Hope on the southern shore of Turnagain Arm and explored the northern shore and created the town of Girdwood. In the mountains to the south, S.J. Mills staked the first claims on Mills Creek and near the confluence of Canyon, East Fork, and Sixmile Creeks. The real rush to the mining district began in the following year, precipitated by Mills' discoveries.[67] Miners soon built trails from Sunrise up the Sixmile Creek valley to haul in supplies and equipment to their camps, and by 1898 a "good pack trail" ran along the western side of Sixmile Creek to the "forks."[68]

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[64] Governor of Alaska, 1886, 937; 1898.

[65] Brooks, 332; L.M. Prindle, *The Yukon-Tanana Region, Alaska. Description of the Circle Quadrangle*, U.S. Geological Survey Bulletin 295 (Washington, D.C.: Government Printing Office, 1906), 22.

[66] L.M. Prindle, "Geography and Geology," in *The Rampart Gold Placer Region Alaska*, U.S. Geological Survey Bulletin 280 (Washington, D.C.: Government Printing Office, 1906), 6.

[67] Mary Barry, *A History of Mining on the Kenai Peninsula, Alaska* (Anchorage, Alaska: Privately published, 1997), 34-35; Fred H. Moffitt, "Gold Fields of the Turnagain Arm Region," in *Mineral Resources of Kenai Peninsula, Alaska*, U.S. Geological Survey Bulletin 277 (Washington, D.C.: U.S. Government Printing Office, 1906), 8-9.

[68] Rolfe G. Buzzell, *Cultural Resource Investigation of Erosion, Culvert and Drainage Ditch Sites along Hope Road, Mile 1.8 to Mile 14.7, for the Hope Road Pavement Rehabilitation Project*, Short Report 2004-09 (Anchorage, Alaska: Office of History and Archaeology, Alaska Department of Natural Resources, 2005), 6.

In southeast Alaska gold lode mining in the mountains around Juneau necessitated hauling in heavy machines to process the ore. To meet this need, in the late 1880s the Alaska Eastern Mining Milling Company improved the Johnson Road east of Juneau to wagon road standards and built a segment to Silver Bow Basin. This project was funded entirely by the local mining industry. It was difficult to build because it passed in part through a steep-walled valley and required blasting and construction of wooden trestles. It took nearly a year to complete and was expensive, costing $10,000. From 1890 onward, however, the wagon road enabled large-scale mining and milling to take place in this region.[69]

After gold was discovered on the Klondike River in 1896, miners began traveling from the southeast Alaskan towns of Skagway and Dyea to reach the gold fields along this Yukon River tributary in Canada and others downstream, such as the Fortymile (see Figure 3 above).[70] The steep Chilkoot Trail ran from Dyea over the Chilkoot Pass, while the White Pass Trail, surveyed and constructed beginning in 1897, stretched for 40 miles over an equally steep route from Skagway to Lakes Bennett and Tutshi. However, it soon became apparent that a more dependable route from Skagway was needed to reach the gold fields on the Klondike, as wet conditions turned the White Pass Trail into a quagmire.[71]

Another route that ran from Pyramid Harbor, on the western side of the Lynn Canal, along the west side of the Chilkat River and the Klehini River to interior gold fields (see Figure 3), became known as the Dalton Trail. Originally a trading route known as the "Grease Trail" used for years by Chilkat Tlingits, entrepreneur Jack Dalton developed a series of trading posts along the trail after 1891. In 1898 or 1899 Dalton began to charge prospectors a toll to use the trail, which was suitable for pack horses. The number of people using the trail to reach interior Alaskan and Canadian destinations had declined to a very small number even before the completion of the White Pass and Yukon Railroad from Skagway to Bennett in 1900.[72]

One partially successful route was a wagon road proposed in 1897 by several local Skagway businessmen. In October they convinced George Brackett, a Minnesota entrepreneur with contracting experience on the Northern Pacific, Great Northern, and Canadian Pacific Railroads, to become a director of the Skagway and Yukon Transportation and Improvement Company. The other directors eventually dropped out and Brackett ended up as the sole owner of the company. Brackett assembled surveyors

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[69] Boily, 10-11; Brooks, 421.

[70] National Park Service, *Cultural Landscapes Inventory: White Pass Historic Transportation System Klondike Gold Rush National Historical* Park (2002), Report on file at the Office of History and Archaeology, Anchorage, Alaska, 3; Claus-M. Naske and Herman E. Slotnick, *Alaska: A History of the 49th State* (Norman, Okla., University of Oklahoma Press, 1994), 77.

[71] Naske and Slotnick, *Alaska: A History of the 49th State,* 3, 15; Chris Rabich Campbell, *An Archaeological Reconnaissance Survey of Sections of the Brackett Wagon Road and the Remains of the Scenic Viewing Station at Pitchfork Falls in Conjunction with the Proposed Goat Lake Hydro Electric Project FERC Project No. 11077*, Prepared for Alaska and Power and Telephone Co. Port Townsend, Washington (1994), Report on file at the Office of History and Archaeology, Anchorage, Alaska, E-14.

[72] Brooks, 422.

and laborers, who began construction of the road in the fall of 1897.[73] By early spring of 1898 they had built approximately 10 miles of wagon road from Skagway towards White Pass.

Congress passed a Homestead Act for Alaska on May 14, 1898, of which Section 6 allowed private individuals and companies to apply for a permit from the Secretary of the Interior for a right-of-way of not more than 100 feet to build wagon roads in Alaska and collect tolls. Brackett applied for and received such a permit to charge a toll for the use of his road. Unfortunately for Brackett, suppliers in the area were unwilling to pay a toll on a former sled road that they had used for free earlier in the year.[74] As a result, the Brackett Road was never completed to the summit of White Pass and ended about a mile north of White Pass City, a little more than 10 miles from tidewater. It was used for several more years, but then abandoned. Its eventual demise was also due to completion of the White Pass and Yukon Railroad in February 1899, which followed the same route and went all the way to the summit of the pass and later to Whitehorse.[75]

Another road built in 1898 was a 6-foot-wide wagon trail on Baranof Island constructed by the Pande Basin Gold Placer Company to reach their purported gold claims at the Pande Basin. It ran 10 miles from Sitka to the Pande Basin to the east, but was only used for about a year. Geologist Alfred Brooks suggested that "the toll road and bridge act of 1898 [Homestead Act] was entirely ineffective in opening up Alaska," because few people took advantage of this opportunity. The disinclination of road users to pay to use a route that they had previously traveled for free, may also have played a part in the failure of toll roads.[76] In any event, the provision of the 1898 Homestead Act that allowed for toll roads had little impact on the construction of wagon roads in Alaska.

Meanwhile, on the Bering Sea coast, three prospectors made a significant gold strike in 1898 at Anvil Creek on the Seward Peninsula.[77] Miners began construction of transportation routes upstream to their claims that same year. The gold rush to Nome began the following year, and by the fall of 1899 more than 3,000 men were in Nome working claims.[78] However, few roads were initially built to mines in the Nome Mining District, in part because of the difficulty of the terrain, but also because three small railroads provided transportation in the early 1900s: the Nome Arctic, Solomon River, and Council City and Ophir Creek Railroads. Road development in south-central Alaska was also slowed, although not stopped, by

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[73] Edwin C. Bearss and Bruse M. White, "George Brackett's Wagon Road," in *Minnesota History* (Summer 1976), 46, 47-57.

[74] United States, Fifty-Fifth Congress, Session II, Chapter 200, 1898, 410; Bearss and White, 52.

[75] Campbell, E-18; National Park Service, *Cultural Landscapes Inventory: White Pass Historic Transportation System Klondike Gold Rush National Historical Park*, report on file at the Office of History and Archaeology, Anchorage, Alaska, 2002, 17; Brooks, 422.

[76] Brooks, 422; Bearss and White, 56-57.

[77] Naske and Slotnick, *Alaska: A History of the 49th State,* 80.

[78] J. David McMahan, *Cultural Resources Reconnaissance of the Nome-Council Road MP 14-33 (Project 66038/ER-0066[1]*), Office of History and Archaeology Report Number 38 (Anchorage, Alaska: Division of Parks and Outdoor Recreation, 1994), 12.

construction of the Alaska Central Railroad, which began in 1904 at the newly created town of Seward on Resurrection Bay on the Gulf of Alaska, and ultimately reached several important mining districts.[79]

During the 1890s, prompted by mineral discoveries reported from different parts of Alaska, Congress began to appropriate funds for the U.S. Geological Survey (USGS), part of the Department of the Interior, to investigate Alaska's mineral resources and to map travel routes. In 1895 George F. Becker and Dr. William H. Dall led expeditions to investigate gold and coal deposits, and in 1896 a USGS party that included J.E. Spurr, H.B. Goodrich, and F.C. Schrader traveled down the Yukon to visit "the more important placers" and map the topography and geology of the region.[80]

Two years later, in 1898, the War Department issued General Orders 8, under which the Army and USGS began systematic surveys of the interior to map travel routes, mainly along the major rivers and in surrounding areas.[81] The expeditions were intended to gather information:

> …valuable to the development of the country regarding topographical features, available routes of travel, feasible routes for railroad construction, appropriate and available sites for military posts, mineral resources, timber, fuel, products, capability of sustaining stock of any kind, animals, etc.[82]

In 1898 the Army sent Captain William Abercrombie to explore the Copper and Tanana Rivers and some of their tributaries and to find a suitable route from Valdez to Fort Egbert at the town of Eagle on the Yukon River in the Fortymile Mining District.[83] Meeting the challenge, his expedition mapped routes north from Valdez. He surveyed the Lowe River valley as a possible route and found a Native trail there that headed north through Keystone Canyon. He then traveled over the Valdez Glacier and the Chugach Mountains and up the Copper River to the Klutina River. Abercrombie noted existing settlements, such as Copper Center and John's Village, and trails, such as the Millard Trail between those two settlements (see Figure 4). The expedition descended the Tetlin River, crossed the Tanana, and traveled through the Fortymile drainage to the Yukon. One of Abercrombie's parties was led by W.J. Peters and included USGS geologist Alfred H. Brooks, who surveyed the Tanana and White Rivers.[84]

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[79] Board of Road Commissioners for Alaska (ARC), 1905, 303; Governor of Alaska, 1904.

[80] Brooks, 282.

[81] Brooks, 283.

[82] U.S. Army, Alaska, 34.

[83] Clause-M Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission* (Lanham, Md.: University Press of American, Inc., 1986), 7; U.S. Army, Alaska, 7, 38.

[84] Brooks, 285.

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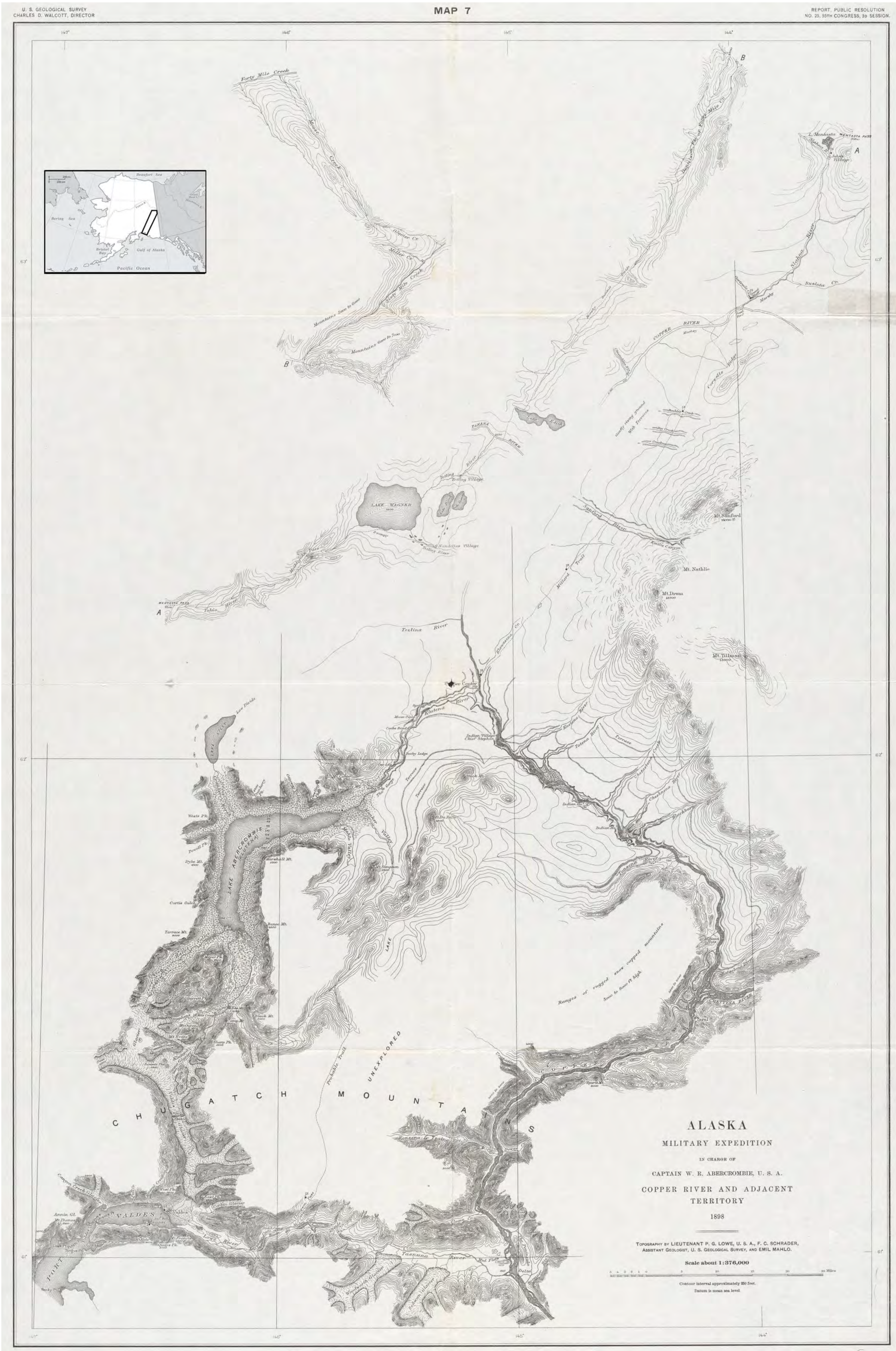

Figure 4. Map showing route of Abercrombie's expedition from Valdez to the Yukon in 1898; modern locater box in upper left. Source: University of Alaska Fairbanks. Alaska military expedition in charge of Captain W. R. Abercrombie, U.S.A., Copper River and adjacent territory. Rare Maps Collections, Alaska & Polar Regions Collections, UAF-G4371 R1 1898 U5 sheet 7.

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Also under General Orders 8, Captain Edwin F. Glenn oversaw an expedition in 1898 to look for routes to the Copper and Susitna Rivers from Prince William Sound and find ways to cross the Tanana River to access the Yukon from Cook Inlet. He was accompanied by USGS geologist Walter C. Mendenhall.[85] They explored, mapped, and documented the major rivers that drained into northern Cook Inlet, and they noted routes that would be suitable for roads and railroads.

With completion of the 1898 expeditions, the War Department issued General Orders 51 on March 20, 1899, and sent Captain Abercrombie to oversee building a trail from Valdez to Copper Center, and from there find the best route to Eagle.[86] The Army established Fort Egbert at Eagle in 1899 on the Yukon River near the Alaska-Canada border to "provide law and order, protect commerce, care for impoverished miners, build roads and trails, and develop better communication with the nation."[87] The first part of the route from Valdez was changed in 1899 from the dangerous Valdez Glacier route, used by prospectors to reach the interior, to go up the Lowe River valley, through Keystone Canyon, and over Thompson Pass to the Tonsina Valley.[88] By the end of the 1899 construction season, 93 miles of "road" had been built that were suitable for pack horses.[89] Pack trails were similar to winter sled roads in that their cost was a small fraction of the expense of a wagon road. They were narrow, with little concern for grade or surface inequalities, and were not crowned, ditched, or drained (see Section 4.3 for further discussion).[90]

Also under the direction of General Orders 51, Captain Glenn supervised explorations from Cook Inlet to the Matanuska, Susitna, Yentna, and Kuskokwim Rivers.[91] Glenn's main goal was to locate a route to the Tanana River and from there to two military posts—Fort Gibbon and Rampart—both located on the Yukon River.[92] He divided his expedition into four separate units investigating the upper Kuskokwim, Knik Arm to Eagle, and one unit tried to reach the Tanana from Cook Inlet, but turned back at the Cantwell River.[93] Glenn's unit surveyed a route from the west coast of Cook Inlet to the head of the Susitna River.[94] All of the information gathered during these expeditions proved useful in future efforts to build roads to mining districts south of the Yukon River.

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[85] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 35; Brooks, 284.

[86] U.S. Army, Alaska, 41-42; Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 7.

[87] U.S. Department of the Interior, Bureau of Land Management, *Historic Fort Egbert: History of the Fort*, http://www.blm.gov/ak/st/en/prog/culture/fort_egbert/ft_egbert_history.html (accessed 7 January 2013).

[88] U.S. Army, Alaska, 41-42.

[89] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 7.

[90] Board of Road Commissioners for Alaska (ARC), 1907, 119.

[91] U.S. Army, Alaska, 42; Naske, 1986, 7.

[92] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 7. Naske refers to Rampart as "Fort" Rampart.

[93] Brooks, 289.

[94] U.S. Army, Alaska, 42.

The gold rushes of the late 1800s, and continued discoveries of gold and other minerals in the early 1900s, continued to bring national attention to Alaska. Between 1900 and 1905 there were senatorial visits to Alaska, as well as administrative changes and congressional funding aimed at improving transportation and communication. Congress passed a civil code and procedure in 1900 to provide additional governmental functions for Alaska.[95] By 1900 the War Department had established military posts at Fort Davis near Nome, Fort St. Michael near the mouth of the Yukon River, Fort Gibbon near Tanana, Camp Rampart on the middle reach of the Yukon River, Fort Egbert at Eagle near the Canadian border, Fort Liscum near Valdez, and Fort William H. Seward in Haines. The Army began to build trails to connect these locations and support the Washington-Alaska Military Cable and Telegraph System (WAMCATS).[96] In 1901 Congress appropriated $100,000 to the War Department to build roads and trails in Alaska, but because of the influx of population into the Fortymile area during the gold rush, most of the money was spent on further development of the pack trail that Captain Abercrombie began from Valdez, on the Pacific Coast, to Eagle, on the Yukon River.[97] Governor Brady's 1902 report to the Secretary of the Interior appealed for wagon roads, in addition to railroads, to solve Alaska's transportation problems and enable miners and traders to move their goods. In 1903 Brady again reported to the Secretary of the Interior that people in Eagle, Valdez, Rampart, and Nome were clamoring for roads and trails to access the mining camps, and requested that the Valdez-Eagle pack trail be widened to wagon road standards.[98]

An event in 1903 that would prove important in the development of Alaska's roads was the decision by the Senatorial Committee on Territories to appoint a subcommittee of four senators who visited Alaska to investigate its conditions, resources, and needs. Senator W. P. Dillingham of Vermont was the committee chair, and other members were senators Henry E. Burnham of New Hampshire, Knute Nelson of Minnesota, and Thomas M. Patterson of Colorado. Over a period of two months they visited southeast and interior Alaska, the Aleutian Islands, and north Pacific coast settlements and took testimony from 61 witnesses in 11 communities. They heard from numerous people concerned about the lack of roads and trails, and the high cost of transporting supplies via boat. Miners suggested that if the U.S. government would just help develop major roads through Alaska, they would be willing to build feeder roads.[99]

Early in 1904, the subcommittee recommended the federal government build a wagon road along the same general route that Abercrombie had opened as a pack trail between 1899 and 1901 between Valdez and Eagle. This was also part of the route of the recently completed WAMCATS line. The subcommittee suggested that funding road construction come from taxes on the Alaska salmon industry and "already available revenues" consisting mainly of taxes that could be levied by the District of Alaska under a clarifying act instituted by Congress in 1899. Later that year, Senator Nelson introduced federal

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[95] Claus-M. Naske, *Alaska Road Commission Historical Narrative*, Prepared for the Alaska Department of Transportation and Public Facilities, Division of Planning and Programming Research Section (Fairbanks, Alaska: n.p., 1983), 8.

[96] Naske, *Alaska Road Commission Historical Narrative*, 8-10, 12

[97] Board of Road Commissioners for Alaska (ARC), 1914, 7; Governor of Alaska, 1901, 36.

[98] Governor of Alaska, 1902, 17; 1903, 6.

[99] Naske, *Alaska Road Commission Historical Narrative*, 15-18; Naske, *Paving Alaska's Trails,* 11.

legislation to create a Board of Road Commissioners for Alaska and provide for funding for road building, using a slightly different funding source.[100] The Nelson Act provided for the creation of the "Alaska fund," from "all moneys derived from and collected for liquor licenses, occupation, or trade licenses outside of the incorporated towns in the District of Alaska," of which 70 percent would be "devoted to the construction and maintenance of wagon roads, bridges, and trails" in Alaska.[101]

The USACE surveyed the route from Valdez to Eagle during the summer of 1904 and estimated that it would cost approximately $3,500 per mile, or about $1.5 million, to build the proposed wagon road. In an effort to augment resources, Alaska District road tax law, 33 Stat. 391, was passed in 1904 that required all men between the ages of 18 and 50 who had lived in Alaska for 30 days to work two eight-hour days per year building roads and trails or pay an $8.00 road tax.[102] A supervisor was appointed in each judicial district to manage road-building activities.

Up until the end of 1904 virtually all wagon roads built, or attempted, in Alaska were constructed in the southeast part of the territory. The few gold rush-related roads over the passes into Canada and the road from Sitka to the fraudulent Pande claims were quickly abandoned. Only the wagon road (Johnson Road) to the producing mining claims east of Juneau in the Silver Bow Basin proved continuously successful. Much of the travel remained on pack trails, sled roads, and via water.

3.2.3 Conclusion

After the U.S. purchased Alaska from Russia and as settlement occurred in new areas, a number of U.S. government and privately sponsored expeditions into the interior of Alaska prefaced the development of a road system. Fur traders and mining prospectors used Native trails and built trails, sled roads, and wagon roads into the interior of Alaska in the late 1800s to reach their trading posts and mining camps.

3.3 Development of Alaska's early road system (1905 – 1929)

After years of governors' entreaties, exploration and survey by the U.S. Army, and investigations and initial actions by Congress, on January 27, 1905, President Theodore Roosevelt signed the legislation introduced by Senator Nelson creating the "Alaska Fund" for construction and maintenance of roads in the District of Alaska. Concurrently, the act established a Board of Road Commissioners under oversight from the War Department to administer the fund. This board was commonly referred to as the Alaska Road Commission, or ARC.[103] Alaska's main road agency would go by several names throughout the years, as shown in Table 1.

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[100] Naske, *Alaska Road Commission Historical Narrative*, 8, 22, 24.

[101] United States, Fifty-Eighth Congress, Chapter 277, 1905.

[102] Board of Road Commissioners for Alaska (ARC), 1913, 9; Governor of Alaska, 1904, 50.

[103] Board of Road Commissioners President Steese began to formally refer to the organization directed by the Board by its long-used common name, the "Alaska Road Commission", in 1921. Annual reports after 1926 included "Alaska Road Commission" in their titles, rather than "Board of Commissioners." It is referred to in this document by this more common name or its acronym [ARC]).

Table 1. Alaska's main road agencies through the years*

Agency's Name	Years
Board of Road Commissioners of Alaska	1905 – 1920
Alaska Road Commission (renaming of Board of Road Commissioners of Alaska became official in 1926)	1926 – 1956
Alaska Highway and Public Works Department (created under BPR; oversight of territorial roads transferred from ARC)	1957-1958
Department of Public Works, Division of Highways (established following statehood)	1959 –1962
Alaska Department of Highways (renaming of Department of Public Works)	1962 – 1977
Alaska Department of Transportation & Public Facilities (renaming of Alaska Department of Highways)	1977 – present

** Note: The Territorial Board of Road Commissioners, created in 1917, was a separate entity from the Alaska Road Commission, though the two agencies often worked together and the Territorial Board of Road Commissioners provided funding to the ARC. The Territorial Board of Road Commissioners remained in place until the 1950s.*

The years between 1905 and 1917 were a pioneering period in the development of Alaska's roads and trails as new communities emerged—often where gold had been discovered—and trails were built to reach them. This work would lay the foundation for the territory's road system. The ARC quickly initiated a petition system, which remained in place throughout the existence of the organization, that allowed Alaskans to request construction of particular roads. By 1917 the ARC and its employees developed a basic network of roads and trails across interior Alaska and a growing network in western, southern, and southeastern Alaska. Between 1917 and 1920, federal appropriations for Alaska's roads were as much as 80 percent less than previous years, because of the Army's need to divert funds to fight World War I. As a result, the ARC was, at best, only able to focus on maintenance, and some road projects simply stagnated. Although funding amounts continued to be generally unpredictable during the 1920s, the ARC reopened some of the roads and trails neglected during World War I. Under the Board of Road Commissioners, which later became the ARC, the 1920s were a time of planning, building, and adapting, to continue to develop a useful system of roads for Alaska that would accommodate vehicle traffic.

During this period, the ARC quickly learned of the challenges of road building in Alaska. The greatest obstacle, aside from cost, was permafrost. Each region required a different method of road construction depending on the soil type and whether or not the ground was permanently frozen. Road width varied depending on conditions, the amount of traffic, and available funding.[104] These challenges affected road construction and maintenance in several ways, including route selection, the type of construction offered, and upgrades over time. For example, the most direct route between two places may originally have

[104] Board of Road Commissioners for Alaska (ARC), 1905, 308; 1906, 12-13.

been suitable only for winter trails, so as the route was upgraded to a wagon road and beyond, the original route may have been altered or abandoned completely (see Section 4 for further discussion of road engineering challenges).

Construction of roads to connect mines and communities with other modes of transportation, including access to the Alaska Railroad and the Copper River and Northwest Railway (CRNW) became a focus of the ARC during the second half of this period. In the 1920s the growing field of aviation necessitated the addition of airfields to the territorial transportation system. The ARC began to build airfields and provide access roads to them. The 1920s were a time of planning, building, and adapting, to continue to develop a useful system of roads for Alaska. In addition to the ARC, three other agencies were involved in the development of Alaska's transportation system: the Department of Agriculture's BPR, which funded National Forest roads; the Department of Interior, which funded the Alaska Railroad; and the NPS, which funded roads in the national parks.

3.3.1 Establishment and early efforts of the Alaska Road Commission

The ARC was made up of three U.S. Army officers who reported to the War Department through the Chief of Engineers. Wilds P. Richardson, having remained in Alaska since his deployment to the lower Yukon River region in 1897, was appointed as the first president of the board, a position he held until 1917.[105] The other board members were Lieutenants George B. Pillsbury and Samuel C. Orchard. After meeting in Skagway, all three commissioners traveled to various parts of Alaska during the summer of 1905 to examine regions, particularly mining districts, that needed roads.

Although the ARC reported to the Department of War for general Alaska road construction, it was also responsible for building roads on U.S. forest lands administered by the Department of Agriculture in southeast Alaska, and eventually on the Kenai Peninsula. Initially, this was only the Alexander Archipelago Forest Reserve, established in 1902. However, when the Tongass and the Chugach National Forests were established in 1907, and the Alexander Archipelago Forest Reserve was included in the Tongass National Forest in 1908, the ARC shouldered responsibility for road work in these forests, as well.[106] The Tongass National Forest included most of southeast Alaska and surrounded several cities and towns such as Haines, Klukwan, Skagway, Ketchikan, Hoonah, and the territorial capital, Juneau. The Chugach National Forest encompassed the Kenai Peninsula, part of the Kodiak archipelago, the islands and coast of Prince William Sound, and the Gulf of Alaska coast east to Controller Bay, and included within it towns and cities such as Afognak, Seward, Kenai, Cordova, and Katalla.

From the start, Richardson realized that the monies available through the Alaska Fund were insufficient to meet Alaska's road-building needs, and stated so in his first annual report. Also, the funds were not provided on a regular schedule, making it difficult to plan for the next season's work. Congress responded in 1906 by putting the collection of license money on a regular schedule and appropriating

[105] Governor of Alaska, 1927, 10; Naske, *Alaska Road Commission Historical Narrative*, 30.

[106] Lawrence Rakestraw, *A History of the United States Forest Service in Alaska*, reprinted by the USDA Forest Service, Alaska Region, 2002, 17, 22-23, 44.

$150,000 to be used as prioritized by the ARC.[107] In addition to the Alaska Fund, the ARC received an annual appropriation from Congress through the War Department and could take contributions from other entities, including private individuals. For example, the citizens of Nome raised private funds that the ARC accepted in 1906 to build a road to mining claims. By 1913 the ARC had received donations from the towns of Fairbanks, Nome, and Cordova, as well as large mining operators, totaling about $20,000. In 1913 Congress amended the 1905 act, reducing the portion of the Alaska Fund set aside for road building from 70 percent to 65 percent. Lack of dependable or predictable funds from one year to the next would be a common theme.[108]

To make their relatively limited funds reach the most people, the ARC decided to build road or trails appropriate to the type of transport that would most often be used. Where heavy machinery needed to be hauled into mining claims, a wagon road might be most appropriate, but in other places a pack trail might suffice. At this time the ARC defined three different road and trail classifications: wagon road, winter sled road, and dog-team and pack trail:

> The designation "wagon road" is applied in a restricted sense, embracing only that class of road intended to meet the conditions of an all-year-round traffic of considerable tonnage, located with suitable grades, crowned, ditched and drained, and corduroyed or planked when necessary. The "winter sled road"…is designed to meet the requirements of winter travel only, although many portions are suitable for light-wheeled traffic in summer. It differs from the "wagon road" in not being crowned, ditched and drained, nor extensively corduroyed, and from the "dog-team and pack trail" in being of suitable width through the timber and side hill cutting for double teams, of proper grade for roads, and with the principal stumps and surface inequalities removed to give an even bearing.[109]

Flagged trails were another important type of temporary trail that were extensively surveyed only for winter use by dog teams and horse sleighs.[110]

The ARC described the wagon roads built in Alaska as "good country highways," as there was not enough traffic on the roads or enough time to warrant anything more elaborate. Initially, the ARC regarded the cross-country sled roads as its "most important work." These sled roads kept communication open between communities during the winter, which generally lasted from November to April in the southern, and longer in the northern part of Alaska. The dog-team and pack trails were reserved for areas with low traffic or where it was cost prohibitive to build a better type of road, such as the sections through Keystone Canyon and Thompson Pass on the Valdez to Fairbanks route. This type of route was narrower than a sled road "and with less attention to grade and surface inequalities." Along with annual appropriations for road and trail construction, money was provided to construct shelter cabins, beginning in 1917, as it was "inconvenient, if not dangerous, to camp out in the interior in the winter time."[111]

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[107] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 31-33.

[108] Board of Road Commissioners for Alaska (ARC), 1906, 6; 1913, 6, 9.

[109] Board of Road Commissioners for Alaska (ARC), 1907, 119.

[110] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 230.

[111] Board of Road Commissioners for Alaska (ARC), 1906, 12, 15; 1907, 119; 1925, Part II, 62.

The ARC and its engineers did not initially anticipate motorized vehicles on its roads. By 1913 automobiles were used during the summer in Juneau, Fairbanks, Nome, and between Valdez and Fairbanks.[112] The ARC realized that citizens wanted to own and drive autos and trucks, which cost less to operate than horse-drawn vehicles. They proposed but were not able to convince Congress to provide funds to upgrade the entire road system to an improved gravel surface suitable for automobile use. Gravel remained Alaska's highest level of road surfacing for many years.

3.3.2 Road building in response to economic development

The ARC's initial focus was the construction of roads and trails to support economic development of Alaska. So many requests were received from miners and residents for new road and trail construction all over Alaska that the ARC found it necessary to issue a "circular" in 1907 that explained the difference between the Alaska Fund and Congressional appropriations, and to set up a petition system by which people could request road construction, and provide required information about the desired road.[113] A flood of requests for roads followed the initiation of the petition system from mining concerns all over Alaska and led to a surge in road and trail building. Petitions from residents and businesses around Alaska continued to be a common method of requesting road work through the 1930s, and later.[114] The ARC's work in trail and road building resulted in improved services and record mail and freight delivery times that were praised by constituents and noted in the ARC's annual reports.

3.3.2.1 Roads to support mining

When ARC members first traveled around Alaska in 1905 to consider transportation needs in the territory, they were most interested in providing roads to mining ventures, and doing so in a way that would be the best expenditure of public funds. Richardson took notes on the amount of gold being produced in different mining districts, the freight shipping rates, and the amount of time it took to transport people, goods, and mail at different times of year. The ARC's first annual report, in 1905, describes plans for trails and roads that were thought to be important in opening up Alaska to development. The Yukon and Tanana Valley drainages north of the Alaska Range, which encompassed a larger area than the southern and southeastern parts of Alaska, were expected to need the most work. Soon after the ARC was established, the northern terminus of the Valdez Trail was diverted from Eagle to Fairbanks because of recent gold discoveries, and the influx of population to Fairbanks.[115] The ARC expected that travel along this route was going to be heavy and began making plans for improvements:

> The Board gave early consideration to the improvement of the route from Valdez to Fairbanks, with a view of facilitating the service of the mails for the winter and to meet the demand of large prospective travel by that route before the opening of navigation next year. This route is made up of three separate trails—the first, from Valdez to Copper Center, being mostly over the old military trail and

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Naske, 1983, 74.

[112] Board of Road Commissioners for Alaska (ARC), 1914, 12, 17.

[113] Board of Road Commissioners for Alaska (ARC), 1907, 115-117.

[114] Petitions archived at DOT&PF Northern Region, Fairbanks.

[115] James Gordon Steese, "Across Alaska by Automobile," *American Motorist* (March 1923), 13.

> wagon road located and opened up by Major Abercrombie from Valdez to Eagle; the second leading up the Tanana River from Fairbanks; the third connecting these two from Copper Center to mouth of the Big Delta, or Isabelle Pass.[116]

Work on the Valdez-Fairbanks trail began quickly. It included repairs on the Valdez to Eagle portion, reconnaissance surveys, location and partial trail construction on the Copper Center to Big Delta and the Tanana River sections, and bridge building.[117] Much of the ARC funding and manpower over the next five years was put into upgrading the Valdez-Fairbanks trail to a wagon road (later renamed the Richardson Highway). The road was considered the main arterial to which other roads did or would attach. By 1911 it was the longest route in Alaska at 379.5 miles. The Fairbanks area to which it led had a population of over 13,000 people.[118] The ARC regarded the Valdez-Fairbanks Road as "the most important route of the Territory," because it was a mail and supply route that connected the interior mining districts with the coast at Valdez. The first wheeled vehicle trip over the entire route occurred in summer 1910, and took 14 days.[119]

Surveys were conducted in 1905 for several prospective roads in the Fairbanks and Nome areas. Planned roads to mining communities in the Fairbanks area included Gilmore to Summit, Summit to Cleary City, Summit to Fairbanks Creek, Fox Gulch to Dome Creek, and Fairbanks to Gilmore. These roads formed the basis for local roads in the Fairbanks area. During this same period, the Alaska Central Railroad, which had started building a line from the Pacific coast at Seward to the interior of Alaska, asked the ARC to build a trail from the planned railroad terminus to the Tanana River, although ARC President Richardson advised not committing funds to that project until the railroad was closer to completion.[120]

Local wagon roads connected the small settlements around Fairbanks with the Tanana Valley Railroad, and sled roads connected Circle and Birch Creek mining areas, and Fort Gibbon (see Figure 5). By 1912, the ARC reported 27 roads and trails under construction or receiving maintenance in interior Alaska.[121] The Ruby-Long Creek Wagon and Sled Road, and its feeder roads, became important after the gold rush to the area in 1910, although the mining district began to decline by 1917.

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[116] Board of Road Commissioners for Alaska (ARC), 1905, 299.

[117] Board of Road Commissioners for Alaska (ARC), 1905, 308-310; 1906, 19-24.

[118] Board of Road Commissioners for Alaska (ARC), 1912, 7, 9; Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 38.

[119] Board of Road Commissioners for Alaska (ARC), 1910, 7; 1912, 6; 1913, 9.

[120] Board of Road Commissioners for Alaska (ARC), 1905, 300-301,312.

[121] Board of Road Commissioners for Alaska (ARC), 1907, 132-133; 1912, 17-21.

Figure 5. Roads and trails west of Fairbanks, 1909 (detail of larger map). Source: University of Alaska Fairbanks. Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255 sheet 1. (The full version of this cropped map is presented in Appendix A.)

On the Seward Peninsula, several private railroads provided transportation to some of the mining areas, but there was still a great need for roads. Improvement and relocation of the route between Nome and Council was considered of the utmost importance because of the heavy traffic to and from the mines (see Figure 6).[122] Completed in 1906, this route, which included both trail and road sections, also

[122] Board of Road Commissioners for Alaska (ARC), 1905, 305.

encompassed the Nome-Fort Davis wagon road that ran east from Nome along the coast and the Cunningham-Cape Nome route that ran from the south coast of the Seward Peninsula to the northern part of the peninsula near Deering.[123] In years to come this would become an arterial road, with feeders to other mines leading from it.

Figure 6. Roads and trails in the Nome area, 1909; (detail of larger map). Source: University of Alaska Fairbanks. Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255 sheet 1. (The full version of this cropped map is presented in Appendix A.)

[123] Board of Road Commissioners for Alaska (ARC), 1906, 29; 1908, Appendix B, 112; 1909, 21.

Although the Nome Mining District was, by modern accounts of production, the second most important placer mining district in Alaska, the ARC was consistently unable to procure funding to build a planned wagon road to the district from Fairbanks.[124]

In the winter of 1908, in an effort to find a faster travel route to the Seward Peninsula, the ARC surveyed a route from Mile 54 of the Alaska Central Railroad on the Kenai Peninsula to Nome. The route went along the head of Turnagain Arm; over Crow Creek Pass to Knik; up the Susitna River to the Yetna, Skwentna, and Happy Rivers; over Rainy Pass and to the Kuskokwim River; on to McGrath and up the Takotna River to Ophir Creek; to Dishakaket and up the Yukon River to Kaltag; and finally connecting with the mail trail from Unalakleet to Nome. Gold discoveries in the Kuskokwim and Innoko River valleys and establishment of the towns of Iditarod and Flat City necessitated changes in the location of the trail. Since the routes from Iditarod to Nome had already been located by the ARC, two small construction parties—one working from Iditarod and one from Seward—were sent in November 1910 to set the final location for the Iditarod to Seward segment of the trail.[125] Although parts of the route were constructed as wagon roads, trails, and sled roads, the road to Nome was never completed.

Road construction continued on the Seward Peninsula to serve the residential and mining communities. In 1912 the ARC constructed its first "Telford gravel macadam" road on the Nome-Bessie Road, which ran north out of Nome. The justification for using this more costly material was that it provided a significant lowering of the summer freight rate, from $10 per ton to $5 per ton, with the result that "the road has paid for itself nearly eight times in six years." In 1914 and 1915 improvements were made to the Cape Nome section of the road, under contract to the ARC.[126] The road was considered an important route because of its heavy traffic, and received annual maintenance by the ARC despite its much higher than average cost.

Elsewhere, roads continued to be constructed to serve mining areas. As the Alaska Central Railroad construction progressed north from the town of Seward, the ARC began construction in 1907 on the Hope Road to connect the mining towns of Hope and Sunrise on the Kenai Peninsula with the rail line and the coastal port (see Figure 7).[127] Two important early trail and road projects in southeast Alaska mentioned in annual reports include the road from the town of Haines, on the coast, to the Porcupine Mining District at the headwaters of the Chilkat River; and Portage Road on Prince of Wales Island that provided Ketchikan with access to the western side of the island. In addition, the Silver Bow Basin Road (formerly the Johnson Road) to the Perseverance Mine in Juneau was taken over by the ARC in 1915.[128]

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[124] USGS Mineral Resources On-Line Spatial Data, Alaska Resource Data File, Nome Mining District. http://mrdata.usgs.gov/ardf/show-ardf.php?ardf_num=NM250 (accessed 15 January 2013).

[125] Board of Road Commissioners for Alaska (ARC), 1908, 95; 1912, 6, 24

[126] Board of Road Commissioners for Alaska (ARC), 1912, 8; 1916, 16.

[127] Board of Road Commissioners for Alaska (ARC), 1907, Volume I, 141-142.

[128] Board of Road Commissioners for Alaska (ARC), 1908, 101-102; 1917, 18.

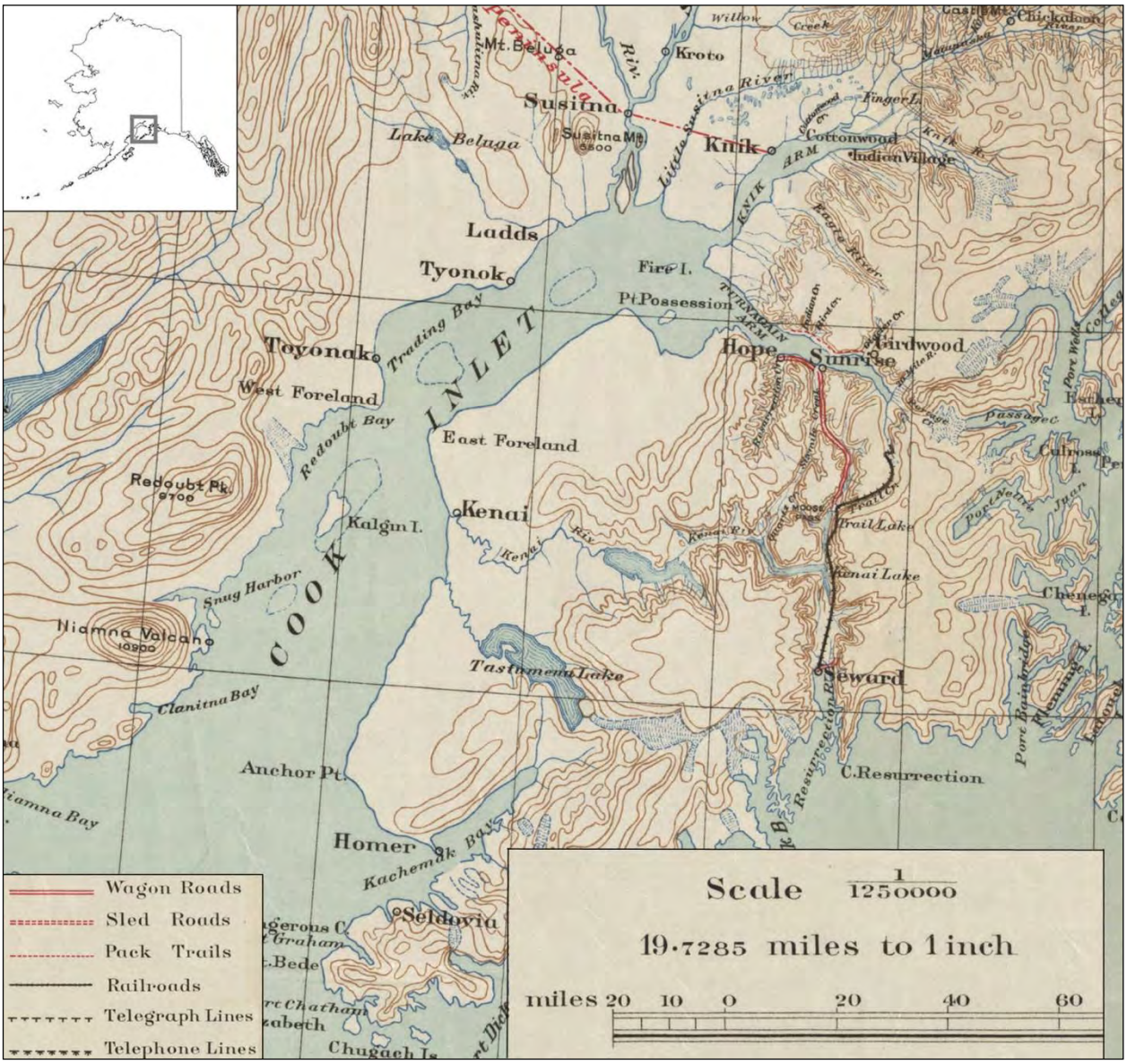

Figure 7. Hope Road (red parallel lines), in 1909, connecting the town of Hope with the Alaska Central Railroad. Source: University of Alaska Fairbanks (detail of larger map). Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255 sheet 3. (The full version of this cropped map is presented in Appendix A.)

In the Susitna and Matanuska River valleys in south-central Alaska, miners built several trails that were later taken over by the ARC. One of these was the Carle Wagon Road (known today as the Palmer-Fishhook Road) built by miners to their claims in 1909, and taken over, by the ARC in 1912. An important new project in 1912 was construction of a 12-mile long connection between the Moose Pass Sled Road and the Kenai Peninsula to serve the Moose Pass and Canyon Creek mining districts. Reconnaissance for the 29-mile-long Ruby-Long Creek Sled Road, which would serve miners and prospectors and become part of the Iditarod Trail, was considered one of the most important new projects of 1912, as was

the 10-mile extension of the Circle City-Central House wagon road in the Birch Creek mining area northeast of Fairbanks.[129]

3.3.2.2 Roads supporting agricultural and other economic ventures

In addition to petitions from miners, the ARC also received petitions to build roads to agricultural areas that would help move perishable farm products to markets.[130] Small farms were associated with mining camps and settlements in southeast and south-central Alaska, around Fairbanks, and along the Valdez-Fairbanks Road and its feeder roads. In the years just before the creation of the ARC, the U.S. Department of Agriculture established agricultural experimental stations at Sitka, Rampart, Kenai, and Copper Center.[131] An experimental station was established in the Tanana Valley west of Fairbanks in 1906.[132] In 1913 the ARC reported that the development of farmland was tied to population growth, the success of the mineral industry (particularly gold mining), and the forest industry. Those farmers who had ready access to local markets grew tubers, root crops, berries, and cereal crops.[133]

In southeastern Alaska the most important projects during the 1910s were those that connected mining and agricultural areas. A short wagon road, now known as the Thane Road, linked Juneau to the extensive mine workings on Sheep Creek and the Douglas-Gastineau Channel Road connected settlers, and their dairies and farms, on Douglas Island with the city of Douglas. The Juneau-Eagle River Road, originally built by the ARC in 1909 to reach mines north of Juneau, provided access to several dairies and ranches between Juneau and Eagle River and at Auk Bay by 1918.[134]

On the Kenai Peninsula, the ARC constructed an agriculture-related road from Seward to Bear Lake in 1907 in a cooperative effort with the community at the lake. In 1917, because of the demands by farmers in the Matanuska region, the ARC began construction of a road from Palmer, an Alaska Railroad whistle-stop with a store and a post office, to Mile 26 on the Knik-Willow Creek Road to provide a better way for farmers to get their produce to market.[135]

The ARC received petitions for other types of trails and roads as well. It supported construction of the Iliamna Bay-Pile Creek Road that ran west from Williamsport on the west side of Cook inlet, opposite Homer, with the intention of connecting to Iliamna Lake It is an example of a trail that was petitioned for improvement to facilitate communication and the transport of supplies. Later, it would become a road to transport fishing boats from Cook Inlet to Lake Iliamna (see Section 3.4.1.2). Also known as the Iliamna

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[129] Board of Road Commissioners for Alaska (ARC), 1912, 7, 16.

[130] Board of Road Commissioners for Alaska (ARC), 1926, 23.

[131] Governor of Alaska, 1903, 16.

[132] University of Alaska Fairbanks, Agricultural and Forestry Experimental Station (AFES), http://www.uaf.edu/snras/afes/ (accessed 18 April 2013).

[133] Board of Road Commissioners for Alaska (ARC), 1913, 6.

[134] Board of Road Commissioners for Alaska (ARC), 1909, 11; 1912, 9; 1918, 3, 843; 1929, Part II, 49.

[135] Board of Road Commissioners for Alaska (ARC), 1907, 142; 1917, 10, 24-25.

Bay-Iliamna Lake Road, the 12-mile long portage road, on which construction began in 1916-1917, eliminated the need for an expensive ocean voyage of about 1,000 miles around the Alaska Peninsula.[136]

3.3.3 Administrative and funding changes as Alaska becomes a territory

The 1905 Act of Congress that established the ARC provided for road building across all of Alaska. However, legislation over the next 12 years had an effect on both funding and ARC responsibilities. With the Second Organic Act of 1912, Alaska gained Territorial status, with resulting changes in funding for and management of roads. The territorial legislature at its first meeting in 1913, repealed the 1904 road tax law and replaced it with a $4 flat tax on men living within and outside of incorporated towns.[137] At the second meeting of the Territorial Legislature in 1915 the legislature formed territorial road districts that corresponded with Alaska's judicial districts, each with an elected road commissioner. These road districts were the First District in Southeast, the Second District in the west, the Third District in South Central, and the Fourth District in the interior.[138] Although there was little structure to the territorial road districts at this time, the territorial commissioners worked with the ARC on projects such as replacement of the Nome-Council Road. Two years later, on May 3, 1917, the Territorial Legislature passed an act creating a Territorial Board of Road Commissioners (Territorial Board), consisting of the governor, secretary, and treasurer of Alaska. This legislation established divisional boards for the road districts, each composed of an elected chairman and secretary and two members appointed by the Territorial Board. The road districts each had an equal share of a $400,000 territorial appropriation to be used over a two-year period.[139]

The Territorial Board was totally separate from the ARC, and the legislation made little provision for the two entities to work together, although informal agreements were not precluded. The ARC did participate with the Territorial Board on a few small projects. The Territorial Board spent its appropriation in localities where the ARC did not operate and, ironically, on some roads originally built by the ARC that had been turned over to the local authorities with a "general informal agreement to relieve the Territory of all work…while depending upon the local authorities to take care of the roads of other sections." The Territorial Legislature of 1919 passed a law that allowed the Territorial Board to enter into cooperative agreements with the Department of Agriculture and the ARC for construction and maintenance of roads, bridges, and ferries in Alaska.[140] This led to closer ties between the Territorial Board and the ARC.

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[136] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 69-70.

[137] Board of Road Commissioners for Alaska (ARC), 1914, 9; Naske, *Alaska Road Commission Historical Narrative*, 83.

[138] Board of Road Commissioners for Alaska (ARC), 1924, Part II, 17; Naske, *Alaska Road Commission Historical Narrative*, 83; Territorial Board of Road Commissioners (ARC), 1921-1923,

[139] Board of Road Commissioners for Alaska (ARC), 1916, 16; Territorial Board of Road Commissioners (ARC), 1921-1923, 8, 9.

[140] Board of Road Commissioners for Alaska (ARC), 1917, 9; 1919, 2, 98; 1921, Part I.

3.3.4 World War I and Alaska's road system at the end of the war

The ARC's 1913 road plan recommended spending $7.25 million on roads over 10 years. However after the U.S. joined World War I in 1917, however, federal funding for building and maintaining roads and trails in Alaska became a low priority. On December 29, 1917, ARC President Richardson resigned from his position to return to active duty with the Army and the Secretary of War placed the ARC under the supervision of the Chief of the USACE.[141] During the last two years of World War I, appropriations for road work in Alaska were reduced to $100,000 for each year. This was a huge reduction from the $500,000 the ARC had received each of the last two years of Richardson's term. Although funding for Alaska's roads remained low, the advantages of road building with military surplus equipment allowed for some continued construction and upgrades.[142]

By the end of 1919 the ARC had built 1,031 miles of wagon roads, 636 miles of sled roads, and 3,222 miles of trails. Some were in disrepair or even impassable as a result of lack of maintenance during years when funding was low. Others had been abandoned in favor of other methods of transportation. For example, the 114-mile long Tasnuna Trail that connected Valdez with Chitina was abandoned when the Copper River and Northwestern Railway was built north from Cordova in 1911.[143]

3.3.5 Alaska's road system: The ARC's 10-year plan

In 1920 the ARC prepared a new 10-year plan for road construction and maintenance. Goals included repairing and reconstructing roads that had been neglected or even abandoned during the previous years of lean appropriations, and strengthening and developing Alaska's young road system. The ARC prepared a proposal with care, taking into consideration geologic and topographic conditions, populated areas, locations of existing roads, and locations of resource explorations. Coming shortly after the end of World War I, this proposal was made at a time when there was a national expectation of federal funding provisions for domestic projects, and hope in Alaska for recognition of the industrial promise of mineral prospects throughout the territory.

The 10-year plan proposed new construction of 700 miles of arterial or feeder highways, construction of "development" roads in newly emerging oil and mineral districts, and maintenance projects.[144] Both existing roads and trails, and proposed new roads, were illustrated in an accompanying map (see Figure 8). The highest priority of the program was new construction on arterial highways throughout the road system, with the exception of southeast Alaska. No new construction was planned for the latter area, with the exception of possible development roads to open up new areas.

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[141] Naske, *Alaska Road Commission Historical Narrative*, 114; Board of Road Commissioners for Alaska (ARC), 1922, Part I, 2,234.

[142] Naske, *Alaska Road Commission Historical Narrative*, 108,114; 1986, 83.

[143] Board of Road Commissioners for Alaska (ARC), 1921, Part II, 18; 1927, Part II, 12.

[144] Board of Road Commissioners for Alaska (ARC), 1921, 61, 63-65.

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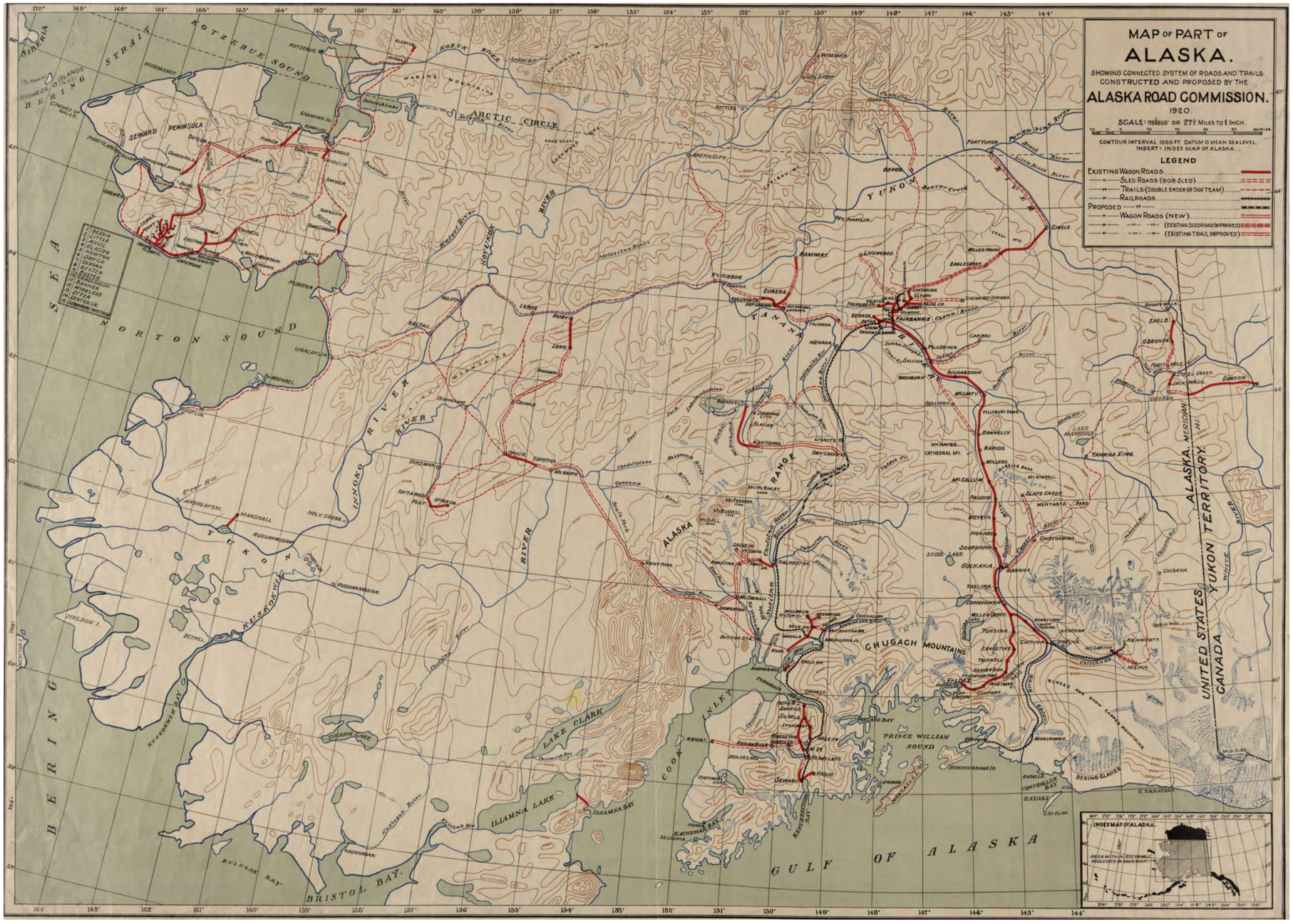

Figure 8. Existing and proposed ARC roads and trails, 1920. Source: University of Alaska Fairbanks. Map of part of Alaska showing connected system of roads and trails constructed and proposed by the Alaska Road Commission (Manuscript Maps Collection, Alaska & Polar Regions Collections, 1920), UAF-00689.

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Four of the proposed arterial roads were in interior Alaska:

- Roosevelt-Glacier-Riley-Creek, 75 miles long, within Denali (formerly Mt. McKinley) National Park, connecting the Kantishna Mining District with the Alaska Railroad

- Eagle-40-Mile[145]-Boundary, 50 miles long, improving and extending an existing road and sled road and connecting it at the Canadian border with the Miller Creek Road leading to Dawson City, Canada

- Chatanika-Miller House, 80 miles long, connecting two earlier ARC projects and providing access between Circle City on the Yukon River and the Alaska Railroad at Fairbanks

- Rampart-Hot Springs, 21 miles long, connecting two old road projects at the town of Rampart, on the Yukon River, with the town of Hot Springs, now Manley Hot Springs, on the Tanana River

A fifth, 40-mile-long arterial road, joining the Richardson Trail to Eagle, was proposed from Gulkana, on the Copper River, to Chistochina. The remaining two, and longest, proposed arterials were in western Alaska. The shorter of the two, on the Seward Peninsula, was to run 135 miles from tidewater at Davidsons Landing through the Kougarok Mining District to Candle, on Kotzebue Sound. The longest, at 280 miles, was proposed to begin at Ruby on the Yukon River and run south and east through Ophir, and ultimately end in Talkeetna, where it would meet the Alaska Railroad.

Over the next ten years, Congressional appropriations were lower than the amounts requested, as had been the case since the ARC's creation. Work nevertheless progressed on several of the proposed arterial/feeder roads, albeit at a slower rate than anticipated. By 1930 the usable length of the Gulkana-Chistochina Road was 37 miles, and the Chatanika-Miller House Road was complete and part of the Steese Highway. In conjunction with the NPS, the ARC constructed quite a few miles of road within Denali National Park.[146] Some work occurred on the Talkeetna-Takotna-Ophir-Ruby Route in western Alaska, but by the end of the 1920s, aviation fields were being built which would ultimately lessen the need for roads in the area. Repair and maintenance work was done on the Rampart-Hot Springs Route, but it was not upgraded. The situation was similar for the Eagle-40-Mile-Boundary Route, where the mining industry was in decline. The amount of construction work on development roads over the decade varied greatly, as was expected.[147] Work proceeded on some roads, such as Nome-Kougarok, Beaver-Caro, Nizina River to Nizina, and Iliamna Lake to Lake Clark, while little or no work was performed on others.

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[145] Later referred to as Fortymile.

[146] Denali National Park was formerly known as Mt. McKinley National Park. Throughout this document it will be referred to as its current name of Denali National Park.

[147] Board of Road Commissioners for Alaska (ARC), 1929; Board of Road Commissioners for Alaska (ARC), 1931, 32, 42, 52, 64-75.

3.3.6 Cooperation between road-building agencies and changing responsibilities

The roles and responsibilities of the ARC, BPR, Department of the Interior, and NPS in transportation administration in Alaska changed throughout the decade. The ARC worked closely with the Territory of Alaska during the early 1920s on road improvement and construction. Of $200,000 allotted by the Territorial Board for cooperative agreements, nearly half was spent on projects with the ARC. The Territorial Board also spent money on road projects that they supervised. In March 1921 Alaska decided not to maintain a separate road-building organization. The ARC president was appointed Consulting Engineer for the territory on November 21, 1921, and assumed direct charge of all Territorial public works. Territorial funds were available year round to the ARC, which handled all work and assumed overhead expenses for construction and maintenance of the territory's roads.[148]

The ARC also entered into a cooperative agreement with the Department of the Interior to build and maintain roads in the Sitka National Monument and Denali National Park. The NPS provided funds to the ARC for work on the portion of the Sitka-Indian River Road that provided access from the town of Sitka to the national monument.[149] The ARC was also authorized by a 1924 Act of Congress to construct and maintain the Denali Park Road, which was part of the Roosevelt-Glacier-Riley Creek arterial mentioned in the ARC's 10-year plan of 1920.[150] This road began at Mile 348 on the Alaska Railroad and ran through Denali National Park. It was used by fur trappers, miners, and tourists.[151]

In contrast to this cooperative arrangement, responsibility for construction and maintenance of roads and trails in National Forests was transferred from the ARC to the BPR, an organization formed in July 1920 as part of the USDA. Table 2 provides a list of roads transferred to the BPR.[152] The BPR received funds through the 1916 Federal Highway Act (also known as the Federal Aid Highways Act), from which Alaska was intentionally excluded because of its tremendous size. This provided an indirect source of federal funding for U.S. Forest Service roads (the Forest Service, like the BPR, was part of the USDA). These funds were applied to forest roads in southeast and south-central Alaska. This meant that ARC funds that would have otherwise been spent on forest roads were available for use in other parts of the territory.

[148] Board of Road Commissioners for Alaska (ARC), 1921, Part I, 41-42; 1924, Part II, 20, 21-22, 24.

[149] Board of Road Commissioners for Alaska (ARC), 1921, Part II, 27; 1927, 21.

[150] Denali National Park Road was formerly known as Mt. McKinley National Park Road. Throughout this document it will be referred to as its current name of Denali Park Road. Board of Road Commissioners for Alaska (ARC), 1927, 21.

[151] Board of Road Commissioners for Alaska (ARC), 1924, 116.

[152] Board of Road Commissioners for Alaska (ARC), 1921, 5; 1922, Part I, 2242; 1926, Part II, 17.

Table 2. Roads and trails taken over by BPR in the Tongass and Chugach National Forests by 1924[153]

Historic Route No.	Route Name (Tongass)	Historic Route No.	Route Name (Chugach)
1	Prince of Wales Island Portage	10	Seward-Kenai
2A	Auk Bay Extension	24	Mile 29 ANRR-Sunrise
43	Petersburg-Scow Bay	12	Sunrise-Hope
52	Ketchikan-Wards Cove	19	Girdwood-Crow Creek
58	Hyder-Salmon River	24A	Lynx Creek-Sixmile Creek
2B	Mendenhall-Glacier Extension	55	Quartz Creek-Russian River
2C	Eagle River Extension	56A & 56B	Katalla Road
2D	Juneau-Duck Creek		Cordova-Eyak Lake
14	Sitka-Indian River		
39	Juneau-Sheep Creek		
44	Skagway Valley		
44A	Skagway-Smuggler's Cove		
45	Silver Bow Basin		
50	Stikine River		
72	Wrangell Oil Dock		
82	Taku Reconnaissance		
91	Yakutat		

In 1923 the administration of President Warren G. Harding consolidated the functions of the ARC and the recently completed Alaska Railroad under the Department of the Interior, which had prior responsibility for the railroad but no organization for, or expertise in, road building. Within six months, it became clear that the merger would not work, and it was dissolved. However, over the next few years, proponents of the Alaska Railroad and a centralized administration for Alaskan transportation—including Congress and the Department of the Interior—sought to abolish the ARC. There was also internal conflict within the War Department over whether administration of the ARC should be shifted to another department, such as the BPR. Ultimately, the War Department continued to administer the ARC through the 1920s.[154]

3.3.7 Roads to areas other than mines

In the 1920s the ARC continued to improve and build roads to agricultural areas, particularly in south-central Alaska, on Kodiak Island, and in the Fairbanks area. On the northern Kenai Peninsula, the Quartz Creek-Russian River Road, under construction by the ARC in 1920, led from Mile 8 on the Moose Pass Road along Quartz Creek to Kenai Lake, then along the Kenai River to the Russian River, with the intent of providing access to potential farmland.[155] On the southwestern Kenai Peninsula, a road ran along Homer

[153] Territorial Board of Road Commissioners, *Biennial Report of the Territorial Board of Road Commissioners for the Territory of Alaska, April 1, 1921, to March 31, 1923*, 14; Board of Road Commissioners for Alaska (ARC), 1924, 54.

[154] Naske, *Paving Alaska's Trails: the Work of the Alaska Road Commission*, 191.

[155] Board of Road Commissioners for Alaska (ARC), 1920, 100.

Spit from Kachemak Bay to area farmlands.[156] The 2.5 mile Seward-Nash Road, a feeder road branching from Mile 3 of the Seward-Kenai Lake route, passed through rich agricultural and timber lands towards Resurrection Bay on the southeastern Kenai Peninsula. The ARC began the Kodiak-Abberts Road in 1922 on Kodiak Island to connect the town of Kodiak with ranches a few miles south of town.[157]

The 1925 ARC annual report noted that there was "an excellent" road system around Wasilla in south-central Alaska that served both miners and farmers. The Matanuska Trunk Road connected local farms with the Wasilla-Matanuska Road, and the Palmer-Matanuska Road ran through farmland between the towns and along the Matanuska Branch of the Alaska Railroad. The latter road began as Native trail, was explored by Lieutenant Castner in 1898 as part of the Glenn expedition, and was improved by coal miner Frank Watson from a pack trail to a wagon road between 1904 and 1910 to reach his claim in Chickaloon. The trail was extended to the Nelchina Mining District when a gold rush began there in 1913, and was known as the "Chickaloon-Knik-Nelchina trail." The Alaska Railroad used this wagon road and trail to haul construction materials while building the Matanuska Branch.[158]

Anchorage had a good road system, but it was less extensive than Wasilla's. Anchorage area agricultural roads included Eagle River to Anchorage; the Anchorage-Lake Spenard Road, from Mile 114 on the Alaska Railroad in Anchorage to Lake Spenard; and Whitney Road, used by motorists, ranchers, and wood-haulers, from Alaska Railroad Mile 114 to Whitney's Ranch.[159]

The ARC also reported in 1925 that the maintenance of local roads around Fairbanks was "of extreme importance" as they served both the miners and farmers in the area. Maintenance of the Fairbanks-Chena Hot Springs Road was important because it provided an outlet not only for farmers, but also for miners, wood haulers, and people visiting the hot springs. The Farmers' Birch Hill Road connected farms from the Fairbanks-Gilmore Road to the Fairbanks-Ester Road. Route 46F ran from Nenana to the town cemetery, serving several farms along the way.[160]

A few ARC roads were built to canneries, which were typically situated on the coast, although roads were sometimes needed to towns and residential areas.[161] By 1924 another mile had been added to the Wrangell-Oil Dock Road that ran from Wrangell to the Standard Oil Company's dock and the local

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[156] Board of Road Commissioners for Alaska (ARC), 1926, 75; Brian Phelps, Personal Recollections of Harold B. Phelps, Lt. USN (ret), Radio Station Operations in Kodiak, Alaska, in 1942-1925, Part II, http://www.phelpsfamilyhistory.com/branches/phelps/bart_phelps_radioman_b.asp (accessed 22 December 2012).

[157] Board of Road Commissioners for Alaska (ARC), 1926, 121; 1923, 55.

[158] Board of Road Commissioners for Alaska (ARC), 1922, Part II, 45; 1924, 121.

[159] Board of Road Commissioners for Alaska (ARC), 1921, Part II, 34.

[160] Board of Road Commissioners for Alaska (ARC), 1925, 77; 1922, Part II, 61; 1926, 70.

[161] Board of Road Commissioners for Alaska (ARC), 1921, Part I, 50.

cannery.[162] The Yakutat Road was a pack trail from the Libby, McNeill and Libby cannery to the Yakutat post office and the nearby Native village. The Haines-Chilkoot Road ran from Haines to the cannery and homesteads on Chilkoot Inlet, while the Tongass Highway connected the city of Ketchikan with several canneries.[163]

The ARC also built roads to coal and oil fields, such as the 1920 Katalla-Chilkat Road that provided access to the Katalla oil fields and the Bering River coal fields. On the Alaska Peninsula, the Standard and Associated Oil Companies engaged in a cooperative road-building project in 1924 with the ARC to connect their oil drilling operations on Pearl Creek Dome with the town of Kanatak at Portage Bay, a distance of 19.5 miles. The oil companies spent roughly $40,000, while the ARC spent just under $20,000 on construction.[164]

Land-based tourism was not a major driving force in Alaska's early-twentieth-century economy or road-building strategies. With the exception of roads to national parks and monuments, such as to Denali National Park and Sitka National Monument, roads to accommodate tourists were not part of ARC's road construction. However, by the mid-1920s the Richardson Highway had become part of a "circular route" promoted to visitors that included the Alaska Railroad and the Copper River and Northwestern Railway. This circular route was known in the lower 48 states as the Golden Belt Tour and was a tourist attraction. ARC President James G. Steese, in his 1923 article for the national magazine *American Motorist* about touring Alaska by automobile, described the Horseshoe Tour, which involved traveling into the interior of Alaska from Seward to Fairbanks on the Alaska Railroad and then from Fairbanks to Valdez by automobile over the Richardson Highway. Use of the road system by tourists increased over the years. Governor Bone reported in his 1924 annual report that the tourist season that year was the largest to date, and was directly related to the transportation improvements in Alaska.[165]

3.3.8 Roads to connect transportation modes

During this period, both the railroad and airplanes competed with automobiles as important modes of transportation. The ARC supported these modes by providing roads to connect rail stations and airports with existing main roads. Aviation as a mode of transportation gained popularity in the 1920s. Although the earliest flights through Alaskan skies had taken place in 1914 at air shows, the potential of commercial flights for passengers, mail, and freight did not catch the attention of Alaskans until 1925. That year the Territorial legislature appropriated $5,000 for construction of airfields, and the Territorial Board authorized the ARC to build a permanent airfield at a site near the high point of Bessie Road near Nome. The ARC received many requests after this and was soon building airfields in locations around

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[162] Bureau of Public Roads, "Biennial Report on Forest Road Project Activities by Bureau of Public Roads, U.S. Department of Agriculture, Period 1923 and 1924," in *Biennial Report Territorial Board of Road Commissioners for the Territory of Alaska, April 1, 1923 to March 31, 1925 (*Juneau, Alaska: Alaska Daily Empire Print, 1925), 72.

[163] Bureau of Public Roads, 25, 26, 71.

[164] Board of Road Commissioners for Alaska (ARC), 1920, 2, 100; 1924, 119-120.

[165] Board of Road Commissioners for Alaska (ARC), 1924, 49-50; James Gordon Steese, "Across Alaska by Automobile," *American Motorist* (March 1923), 13; Governor of Alaska, 1924, 9.

Alaska under their existing cooperative agreement. By 1930 they had built 61 fields, were in the process of building five more, and had five "natural" fields, on which no work had been done.[166] Increased use of airplanes led to decreased use of some trails and roads, and in some cases to their decreased maintenance or abandonment.

In addition to roads to access the new aviation facilities, the ARC built roads to connect to the Alaska Railroad. The ARC was of the opinion that the Alaska Railroad would be of limited value unless "tributary highways" were built connecting the railroad with mining and agricultural areas. Governor Bone echoed these sentiments, urging the completion of such roads and trails, and arguing that the railroad alone would not solve Alaska's transportation problems. By 1922, just before the completion of the Alaska Railroad, the ARC completed many feeder roads along the railroad between Seward and Fairbanks. Of the 31 roads and trails in use in 1922 south of the Alaska Range, in south-central Alaska, 29 were roads or trails connecting with the Alaska Railroad. In interior Alaska, the road that later became the Steese Highway also connected with the railroad. Named in honor of Army General James G. Steese, president of the ARC from 1920 to 1927, who oversaw its planning and construction, it ran from Fairbanks to the Circle Mining District.[167]

3.3.9 1920s road building in perspective

Congress appropriated less than half of the ARC's requested annual funding during the first five years of the 1920s, leading the commission to revise appropriations requests downward for the second half of the decade. The revised requests also were not met, but the ARC managed to maintain roads and trails, and even build new ones. This allowed the ARC to follow its 10-year plan, increasing the number of miles in the road system, and especially of sled roads and trails, during the decade (see Table 3). This was in part due to funding from other sources, such as the Alaska's Territorial Board, the NPS, and cooperating private enterprises and organizations.

Table 3. Number of miles of various types of ARC transportation routes in 1919 and 1929[168]

Type of Route	Number of Miles in 1929	Number of Miles in 1919	Percent increase from 1919
Road/Wagon Road/Tram road	1,676.50	1081	55%
Sled Road	1,404.75	636	120%
Trail	7,148.00	3223	122%
Flagged Trail	712.00	Not available	-

[166] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 145; Board of Road Commissioners for Alaska (ARC), 1930, 31.

[167] Board of Road Commissioners for Alaska (ARC), 1920, 61; 1922, Part II, 37; 1929, 8; Governor of Alaska, 1921, 11.

[168] Board of Road Commissioners for Alaska (ARC), 1919, 58-59; Board of Road Commissioners for Alaska (ARC), 1929, 8.

By the end of the 1920s the ARC was making an effort to provide gravel surface roads suitable for automobiles and light trucks. Statistics showed a steady increase in the number of motor vehicles on the roads, with an overall increase of 24.1 percent from 1928 to 1929, from 19,598 vehicles in 1928 to 24,318 vehicles in 1929. Trails continued to be used by dog and horse-drawn sleds in the winter and by packhorses in the summer, but winter sled roads were beginning to be used by caterpillar tractors.[169]

3.3.10 Conclusion

Different modes of transportation came into use during this period, such as the automobile, rail, and airplane, and some roads were built to improve access to these alternate transportation modes. Roads were built to support mineral and oil extraction, fishing and fish processing, provide access to timber resources (including in National Forests), and link settlements and connect them with railroads and local airfields. Roads allowed farmers to bring their products to market and provided tourists and local residents access to national parks.

3.4 The impact of the Depression years on Alaska (1930 – 1940)

The 1930s include two significant events in twentieth-century American history: the Great Depression and the New Deal. Unlike other aspects of the economy, which suffered business failures and unemployment, the work of building and maintaining public roads and bridges was well-funded and very active from a *national* perspective. Roads and other transportation improvements were a direct beneficiary of government efforts to combat unemployment and provide emergency relief. Federal dollars flowed into road and bridge projects through new relief programs for the jobless in the 1930s.

In Alaska, funding for roads was not as readily available through federal relief programs as it was in the rest of the country. The 1930s began in Alaska with no indication of the Depression that would affect the territory's economy and road funding within just a few years. The population of Alaska, which was about 55,000 in 1920, had grown by only about 4,000 people by 1930. However, it grew during the 1930s by over 13,000, as mining increased with the rise in the price of gold and other precious metals. In addition, over 200 Midwestern farm families relocated to Alaska in 1935 under a federal relief program.[170] This population swell caused an increased need for roads. At this time, however, annual Congressional appropriations to the ARC were cut to levels that were barely adequate for maintenance of the existing system. Congressional acts that established federal relief agencies, which then provided special funding for roads, partially filled the financial gap and created jobs for hard-hit citizens. The 1930s were characterized by the ARC's struggle to maintain the existing transportation system and to make progress, however small, toward meeting the transportation needs of a growing population.

3.4.1 ARC and BPR efforts during the 1930s

The ARC and the BPR were two of three agencies responsible for road construction and maintenance in Alaska during the 1930s. The ARC, under the Department of War, was transferred to the Department of the Interior in 1932, and the BPR was part of the USDA. The third agency, the Territorial Board, did not

[169] Board of Road Commissioners for Alaska (ARC), 1929, Part II, 10-11; 1930, 39.

[170] Alaska Department of Labor and Workforce Development, Alaska Population Counts 1990-1900, http://labor.alaska.gov/research/census/hist.htm (accessed 11 January 2013).

build roads, but provided funding and entered into cooperative road-building agreements with the USDA, ARC, and other federal agencies, as it had in the1920s. Despite the change in its oversight department, the ARC continued to provide the Territorial Board with road services, under the direction of the ARC Chief Engineer.

By 1930 the ARC had mechanized its work, using hand labor only on small jobs in remote areas. They had developed fairly standard methods of dealing with permafrost and stream control in arctic and subarctic conditions.[171] Alaska's road and trail network spanned a total of 11,007.25 miles in 1930 (see Table 4 and Figure 9). There were still many more maintained trails than roads at this time, although their number decreased as aviation became increasingly more important.

Table 4. Miles of roads and trails created and maintained by the ARC in 1930

Type	Total Mileage
Wagon Road	1,707.5 miles
Sled Road	1,403.75 miles
Trail	7,184 miles
Flagged Trail	712 miles

Source: Board of Road Commissioners for Alaska (ARC), 1930, 7.

Putting the mileage into perspective, the ARC stated in its 1930 annual report that:

> The magnitude of the task and extent of territory covered by the wide-flung activities of this Commission may be realized from the fact that it would take two years of continuous traveling on the ground with the best facilities available for a single individual to make a complete inspection of the entire mileage for which the Commission is responsible.[172]

The transportation system was maintained and roads were slowly expanded throughout the 1930s as funding permitted.

[171] United States Department of the Interior, 1939, 5-6.

[172] Board of Road Commissioners for Alaska (ARC), 1930, 27.

Figure 9. The extent of the Alaskan transportation network in 1930. Source: Board of Road Commissioners for Alaska (ARC) 1930, 28.

The Richardson Highway, the longest highway in the territory and the only highway connecting the Pacific coast with the interior, remained the most important road in Alaska throughout the 1930s due to the amount of freight and passenger traffic along the route. Improved to the point where it was suitable for all forms of vehicular traffic, the highway provided a link between the interior communities and the port of Valdez during the snow-free months, and opened up new regions to mining. The average time for a two-ton truck to travel the 370 miles from Valdez to Fairbanks was only about 18 hours.[173] Many residents had vacation and hunting cabins along the highway, and tourism increased as the condition of the road improved. Important roads branching from the Richardson Highway included the Elliott and Steese Highways, the Gulkana to Nabesna Road, and the local road network surrounding the city of Fairbanks. The Steese Highway, extending 162 miles northeast from Fairbanks on the Tanana River to Circle on the Yukon River, provided a vital link to mining operations in that region.

New roads were needed in many parts of Alaska due to the increasing population and requirements of the mining industry. In some cases, mining companies provided the ARC with equipment in order to assist in road construction efforts that would further their businesses. The Territorial Board reported that:

> Road and aviation field construction today is hopeless without the use of modern equipment to carry on such work and since this equipment is necessary, if not indispensable, in most of the mining operations of today, these concerns that seek aid in the construction of roads and aviation fields are usually prepared to some extent to provide this equipment. This makes road building exceedingly advantageous, both to the Territory and to those who require such aid.[174]

Throughout the 1930s the ARC and BPR organizations, as well as their roads, remained separate, largely because of the geographic and topographic challenges of joining their systems. The BPR was charged with constructing roads in National Forests, which constituted approximately 5 percent of Alaska. By the mid-1930s the BPR, charged with constructing roads in National Forests, had constructed about 304 miles of roads in the Tongass National Forest in southeast Alaska, and Chugach National Forest in south-central Alaska. Due to the rugged topography in southeast Alaska, road engineers from an early stage saw transportation in this region as water-based, and built short and intermittent road systems, serving towns and cities such as Hyder, Wrangell, Petersburg, Sitka, Juneau, Ketchikan, Haines, and Skagway. In south-central Alaska the main towns served by roads were Seward and Cordova. The BPR roads were constructed to higher standards of widths and surface thickness than the ARC roads, and were open for most of the year. However, they were short, did not connect towns, and were in southern parts of Alaska with more moderate winters than most regions where the ARC was building roads.[175]

3.4.1.1 Funding ARC road work during the Depression era

Funding for road construction and maintenance in Alaska during 1931 and 1932 was similar to the moderate level of the late 1920s. The Depression only began to have a significant negative impact on

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[173] United States Department of the Interior, 1938, 10.

[174] Territorial Highway Report, 1939-1940, in Alaska Department of Transportation & Public Facilities, *Fifty Years of Highways* (1960), Alaska State Archives, Juneau, Alaska, Record Group 13.

[175] Board of Road Commissioners for Alaska (ARC), 1932, 8; Naske, *Paving Alaska's Trails: the Work of the Alaska Road Commission,* 133,180.

funding Alaska's transportation system in 1933. At that time, Congressional appropriations to the ARC and BPR decreased, but federal work relief programs provided some alternative funding.

The Congressional appropriation to the ARC in 1933 of $448,778 was a decrease of about 40 percent from the 1932 amount and was barely sufficient to allow minimum maintenance of the system already in place. For the rest of the decade, the annual federal appropriations remained at about the same level. Maintenance costs, however, rose with increased usage of the roads by automobiles and large trucks.[176] The cost of annual maintenance of wagon roads was estimated at $300 per mile versus only $25 per mile for sled roads and $10 per mile for trails. Annual maintenance costs for the trails in existence at the start of the decade totaled about $619,184. Even with Territorial funding from the Alaska Fund, and funds from the NPS and other entities, the total ARC budget decreased by about a third in 1933, from $1,039,030 the previous year to $695,036. Exacerbating the problem of road funding during the Depression was the fact that Alaska remained excluded from the Federal Aid Highway Act, which could have provided increased federal funding.[177]

Beginning in 1933, the ARC used funds from the Public Works Administration (PWA) and the Federal Emergency Relief Administration (FERA) for new road construction. Between 1933 and 1939 the ARC received $2,717,500 in federal relief aid: $1,596,000 was from the National Industrial Recovery Act through the PWA and the remaining $1,121,500 was Emergency Relief Act funds distributed by the FERA. The CCC also provided federal relief funds for work on roads and trails during the Depression, but in Alaska the Forest Service administered these funds. ARC contracts let using PWA funds could pay up to 20 percent less per hour for skilled workers than in the general workplace, with some restrictions.[178] As a result, the ARC was able to accomplish road work more economically than under ordinary circumstances. For example, of $1,746,000 in federal funds budgeted to the ARC during the 1934 fiscal year over $1,146,000 came from various New Deal programs, with which the ARC was able to construct "136 ¼ miles of road, 35 miles of trail, 820 linear feet of bridges over 60-foot span, 4,703 linear feet of trestle span bridge and 3 airplane landing fields."[179]

The continuing increase in the use of airplanes as a mode of transportation also played a part in decreased appropriations for the ARC. The ARC continued to construct more airfields in the early 1930s, making many winter sled roads obsolete. Mail runs by airplane could be made in a matter of hours rather than the days required by dog sleds or horse sleighs. As a result of the increase in air travel, and the greatly decreased funds available during the first year of the Depression, the ARC closed its Kuskokwim

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[176] Board of Road Commissioners for Alaska (ARC), 1930, 38-40.

[177] Ernest Gruening, *The State of Alaska: A Definitive History of America's Northernmost Frontier* (New York: Random House, 1954), 299. With the passage of the FAHA of 1916, the federal government began providing funding to states for road-building efforts. However, Alaska as a territory was not eligible to receive funding under this and future FAHAs.

[178] United States Department of the Interior, 1939, 56; Ike P. Taylor, "Memo to Governor – Reference Hours and Wages," 8 October 1934, Alaska State Archives, Juneau, Alaska, Record Group 101, Series 130, Box Number 392.

[179] United States Department of the Interior, 1934, 1-2; United States Department of the Interior, 1935, 9.

District office in 1933. The ARC headquarters in Juneau subsequently handled all roadwork in that area. Although the Territorial Board's 1933-1934 highway report highlighted the need for continued appropriations for winter roads and shelter cabins, Congress argued that sled roads were no longer a priority, and did not provide all of the requested funding.[180]

By the last two years of the decade, even relief aid funds were limited. In 1938 the ARC had a balance of $388,000 available from a previous Works Progress Administration (WPA) emergency allocation that was used for completion of roads and airfields. Available funding expended by ARC from relief funds in 1939 was under $14,000. New construction in these two years came from Territorial or other sources, and consisted only of branch roads or short extensions of existing roads.[181]

3.4.1.2 Prioritizing roads and ARC accomplishments during the Depression era

Throughout the 1930s, the Richardson and Steese Highways had the most automobile traffic and therefore received most of the maintenance and improvement funding. The ARC and the Territorial Board both faced the task of determining which other roads and areas would receive higher priority. Decisions were ultimately based on the urgency of the need for a project.[182] In the first half of the decade, agricultural roads were not as high a priority as roads to mineral resources, although the ARC tried to maintain such roads, along with other roads in the system.

Gold, one of Alaska's primary exports, increased in both value and production throughout the 1930s. In 1933 a Presidential order raised the price paid for gold from $20.67 to $35 an ounce. Increased production was spurred by this and decreased costs of operation labor. In 1933 Alaska produced $9,701,000 of gold, and by 1940 $26,178,000. Production of other minerals increased as well, such as coal from the Matanuska Valley, and minerals such as silver, copper, platinum, gypsum, and mercury from many mines across Alaska.[183] All were dependent for transport, at least in part, on the road system.

Beginning in 1933, projects on 14 routes received new construction funding from PWA and FERA (see Table 5). Nine projects had been started before the Depression and 11 were related to resource and mine access.

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[180] United States Department of the Interior, 1933, 8; Territorial Highway Report, 1933-1934, in Alaska Department of Transportation & Public Facilities, *Fifty Years of Highways*.

[181] United States Department of the Interior, 1938, 6; 1939, 2, 6.

[182] Territorial Highway Report, 1939-1940, in Alaska Department of Transportation & Public Facilities, *Fifty Years of Highways*.

[183] Gruening, 298-299.

Table 5. Fourteen important routes to receive construction funding in the early 1930s

Route	District/Sub-district	Purpose
McCarthy to Nizina	Chitina	Mining
Gulkana to Nabesna, a branch of the Richardson Highway	Chitina	Mining
Olnes to Livengood, later became the Elliott Highway	Fairbanks District	Mining
Medfra to Nixon Mine	Kuskokwim District	Mining
Long to Poorman	Kuskokwim District	Mining
Dillingham to Snag Point	Kuskokwim District, Bethel Sub-district	Mining
Nome to Sunset Creek	Nome District	Mining
Nome to Council	Nome District	Mining
Denali Park Road	Southwest District	Mining/Tourism
Lucky Shot Mine to Willow Station	Southwest District	Mining
Anchorage to Matanuska, later became part of the Palmer and then the Glenn Highway	Southwest District	Agriculture
Kodiak to Mill Bay	Southwest District	Agriculture
Cantwell to Valdez Creek	Southwest District	Mining
Juneau-Douglas Bridge	Southeast District	Community access

Source: Board of Road Commissioners for Alaska (ARC), 1931, 1932, 1933, 1934.

The Elliott Highway, originally constructed by the ARC as a 10-mile road between Fox and Olnes and a 61-mile sled road between Olnes and Livengood, was one of the major projects undertaken by the ARC in the 1930s.[184] This highway branched off the Steese Highway. In 1931, renewed interest in gold mines near Livengood led to a call for a highway to accommodate automobiles. Work progressed as funding permitted. By 1936, 30 miles had been surfaced with gravel, although the road was still used mainly as a winter sled road. By 1939 the ARC considered the Elliott Highway an all-weather road, and between 1939 and 1940 over 5,000 tons of freight related to the mining industry moved along the road from Fairbanks into the Livengood mining region.[185]

The goal of a branch road off the Richardson Highway in the Chitina District from Gulkana to Nabesna, was to open the rich Nabesna mining region north of the Wrangell Mountains. By 1934 the route was 107 miles long and almost half of it had been improved from a trail suited for tractors to a road suitable for automobiles.[186] A portion of this road later became part of the Glenn Highway/Tok Cutoff.

[184] The terminus of the Elliott Highway was extended to Manley Hot Springs in the late 1950s.

[185] United States Department of the Interior, 1936, 7, 12; Territorial Highway Report, 1939-1940, in Alaska Department of Transportation & Public Facilities, *Fifty Years of Highways*, 93.

[186] United States Department of the Interior, 1934, 10.

Construction on the Denali Park Road continued through the Depression era, funded by relief era programs and NPS. This 91-mile cooperative road-building project, which provided tourists with access to the park and also served the Kantishna Mining District, was mostly complete by the end of the decade.[187]

A major project of the PWA, the Juneau-Douglas Bridge, spanned Gastineau Channel and provided a road link between the southeast Alaska communities of Juneau and Douglas.[188] The ARC built the bridge beginning in 1934; the BPR took over maintenance in 1937.

Miners in the Willow Creek Mining District began asking the ARC to build a road from the Willow railroad station to the mines in the west on Craigie Creek and the upper Willow Creek soon after the railroad was built to that point in 1917. However, construction only began in 1931 on what was then known as the Lucky Shot Willow Station Road (Route 35DB). The road included part of the Fishhook Extension (Route 35D), also known as the Willow Creek Extension, that branched off of the Wasilla Fishhook Road (Route 35E) and followed along Hatcher Creek to Hatcher Pass and over the pass to Craigie Creek. The Willow Creek Mines Company paid one-fourth of the cost of building the Lucky Shot Willow Station Road. By 1934 the road had been upgraded for automobile use in dry weather.[189]

One of the major road projects in 1935 and 1936, and one of the few related to agriculture, was the completion of the Anchorage to Matanuska Road, or Palmer Highway, which later became part of the Glenn Highway, with funds from the FERA. Begun as a joint project by the ARC and the City of Anchorage in the 1920s, and called the Anchorage Loop or the Anchorage-Eagle River Road the ARC took over its maintenance and began improving and extending it from Anchorage to the communities of Chugiak and Peters Creek in 1933.[190] In 1935, the Matanuska Colony project near Palmer provided a reason to complete the Anchorage-Palmer Highway to transport agricultural products from the Matanuska Valley to markets in Anchorage. Earlier, farmers used the Alaska Railroad to transport their goods. Completion of the road became a priority in 1935, and by freeze-up in 1936, a car could travel the rough road between Anchorage and Palmer, although its sharp curves often caused flat tires. The road was open year-round, though in the winter a snowplow took at least two days to travel from Anchorage to

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[187] United States Department of the Interior, 1933; United States Department of the Interior, 1939, 11.

[188] Trevor M. Davis, *Douglas Bridge Grand Opening 10/13/1935*, http://vilda.alaska.edu/cdm/singleitem/collection/cdmg21/id/7254/rec/8 (accessed on 20 November 2012); Naske, *Paving Alaska's Trails: the Work of the Alaska Road Commission,* 178.

[189] Board of Road Commissioners for Alaska (ARC), 1931, 49-51; 1934, 10; Rolfe G. Buzzell, *Willow Fishhook Road Cultural Resource Survey Mile 25 – Mile 39, Hatcher Pass, Project No. 55500.* Office of History and Archaeology Report Number 97 (Anchorage, Alaska: Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation, 2003), 19; Board of Road Commissioners for Alaska (ARC), 1934, 10.

[190] United States Department of the Interior, 1934.

Palmer. The ARC, in cooperation with the Alaska Rural Rehabilitation Corporation, also constructed 26 miles of new branch farm roads in 1935-1936 for the Matanuska Colony.[191]

Miners in the Willow Creek Mining District, north of the Matanuska Colony, also had been limited to the railroad. In the mid-1930s, there were over 500 active mines in that region.[192] The completion of the Anchorage to Matanuska Road also helped them.

During this period, shorter roads were built and existing corridors were extended in other parts of Alaska. An increase in settlers in the Homer area on the south end of the Kenai Peninsula led to a small amount of road construction in that area at the end of the decade. Road building occurred in mining districts near Talkeetna, Takotna, Dillingham and Nome. The Anchorage local road system was extended for a few miles because of the increase in population in the area. Begun in 1916 for the fishing community of the Iliamna Lake area in southwest Alaska, the Iliamna Bay-Pile Creek portage road was finally extended the final 2.5 miles to Iliamna Lake in 1938 (see Section 3.3.2.2).[193]

By the end of the decade, the Richardson Highway was kept open between June and October for all forms of vehicular traffic. Connector roads to the Richardson Highway were improved. Steady improvements over the decade to the Steese Highway, which connected to the Richardson and was also a seasonal road, ensured that it was open to all but the heaviest truck traffic by 1939.[194]

3.4.2 CCC involvement in road and trail construction

As noted earlier, the Forest Service oversaw CCC activity in Alaska, most of which focused on transportation needs.[195] As a result, CCC road and trail construction occurred primarily in the Tongass and Chugach National Forests. CCC projects in the Chugach National Forest typify those accomplished elsewhere in Alaska. The Port Graham-Nanwalek Trail Project on the Kenai Peninsula employed almost all of the local young Native men. This trail connected Port Graham and Nanwalek residents to seasonal fishing camps and a cannery, providing an alternative to coastal water travel when the ocean was too rough.

Another significant CCC project in the Chugach National Forest was the expansion of the Cooper Landing Truck Trail begun in 1937. Originally a dogsled trail, it was expanded to a service road and eventually

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[191] Marjorie Cochrane, *Between Two Rivers: The Growth of Chugiak-Eagle River*, Alaska Historical Commission Studies in History No. 26 (N.p.: Alaska Historical Commission, 1997), 27-28,30; Naske, *Paving Alaska's Trails: the Work of the Alaska Road Commission*.

[192] Donald McDonald, *Report: Proposed Location Reed to Palmer Anchorage Matanuska Road*, 1934, in Alaska Department of Transportation & Public Facilities, *Fifty Years of Highways*.

[193] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 184,188; United States Department of the Interior. *Annual Report of Alaska Road Commission 1939*. United States Government Printing Office, Washington D.C., 1939, 6-7.

[194] United States Department of the Interior, 1939, 23.

[195] Rakestraw, *A History of the United States Forest Service in Alaska,* 1981.

became part of what today is the Sterling Highway (becoming Route 510 in 1957). CCC and civilian crews worked year round for two years to complete this project. Inadequate equipment, small crews, and the need for numerous bridges made this an extremely challenging project. The road had several steep hills and was only wide enough for one lane of traffic, making hauling large loads difficult.[196]

Another CCC project in south-central Alaska was the 1938 construction of a mile-long spur road off the Palmer Highway between Eagle River and Eklutna. The CCC designed a ski training area at the end of the road that was apparently used for Army ski training early in World War II.[197]

3.4.3 Competition between the ARC and the Alaska Railroad

The emerging importance of the territory's road network, and especially the Richardson Highway, is demonstrated through the competition between the road system and the Alaska Railroad in the 1930s. Begun as the Alaska Central Railroad, and purchased by the Alaska Northern Railroad in 1909, the line was taken over by the U.S. government in 1914. ARC President Richardson had advised as early as 1909 that the construction of railroads and wagon roads be considered together because of their intimate connections, warning of "the high rates which must inevitably result from a continuation of the past methods of railroad promotion." His advice went unheeded, and the U.S. government-owned railroad, run by the Department of the Interior, struggled as a result of competition with truckers and other users of the federally funded ARC road system. While the highway and trail feeders providing access to railroad were vital to the railroad's success, the increased use the Richardson Highway by travelers and freight trucks took away business and revenue, contributing to the Alaska Railroad's operating deficit. [198] Between 1930 and 1942 Congress, followed by the Department of the Interior, tried to limit transport of freight to communities along roads, particularly the Richardson Highway, in an attempt to increase the amount of freight shipped on the railroad, and make the railroad profitable.

Although the Richardson Highway was only open and maintained between the Pacific coast and Fairbanks during the snow-free season from June through October, and the railroad still provided the main transportation of supplies to communities from November through May, the lower cost of transporting freight along the highway in summer was causing the railroad to lose money. Between 1930 and 1931, travelers on the Richardson Highway increased approximately 35 percent. In an attempt to minimize losses, Congress increased railroad freight rates in 1931. Trucks could use the Richardson Highway and transport freight at significantly lower cost, and the freight rate increase caused the railroad to lose more business.[199]

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[196] Dennis McCart, *The Hope Truckline and 75 miles of Women* (Portland, Ore.: Binford and Mort Publishers, 1983), 34-35.

[197] Cochrane, 102-103.

[198] Board of Road Commissioners for Alaska (ARC), 1909, 9; 1931, 2,276.

[199] Board of Road Commissioners Alaska (ARC) 1931, 8; 1932, 17; Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 172,191-192.

Increasing use of the road system by former rail passengers also diverted revenue from the railroad.[200] In 1932 a one-way bus ticket from Valdez to Fairbanks over the Richardson Highway cost $10, while a one-way ticket from Seward to Fairbanks on the railroad cost $47.

In an effort to consolidate the territory's transportation infrastructure and eliminate competition between rail and highway transport modes, President Hoover proposed legislation to transfer the ARC from the War Department to the Department of the Interior. The legislation passed and the official transfer occurred on July 1, 1932. Aside from removal of the military personnel, the staffing and structure of the ARC remained the same as it had been under the Department of War.[201]

The consolidation allowed the Department of the Interior to charge new fees for use of the Richardson Highway. In February 1933 the Secretary of the Interior adopted regulations that controlled the weight and size of vehicles using the highway, and required them to be registered and licensed, with an associated fee. These regulations were aimed especially at larger vehicles. The license fees were controversial, unpopular, and ultimately unsuccessful, as there was no system of enforcement in place.

In 1935, with licensing fees failing to increase revenue and decrease competition with the railroad, the ARC and railroad administrators proposed a toll at the Tanana River crossing. Truckers were required to pay to cross the river on the ferry. For the first two years, the plan appeared to work, as overall highway tonnage decreased. However, by 1939 truckers evaded paying the tolls by operating their own ferries. The Department of the Interior removed the toll in 1942, effectively giving up the struggle to force the Alaskan residents and businesses to use the railroad rather than the road system.[202]

3.4.4 Proposed International Highway

In 1930 President Hoover approved an act of Congress to set up and fund a commission to study the feasibility of a Pacific-Yukon Highway, envisioned as a "highway to connect the northwestern part of the U.S. with British Columbia, Yukon Territory, and Alaska."[203] He appointed Major Malcolm Elliott, then president of the ARC, as one of the commissioners.[204] Donald McDonald, a former ARC commissioner and the ARC's senior highway engineer, who was also a member of the International Highway Commission and nicknamed the "Father of the Alaska Highway," pointed out in a 1933 letter to the Assistant Secretary of State the need, especially during times of economic depression, for a highway connecting Alaska to the rest of the U.S. through Canada. He argued that valuable resources existed in Alaska and that a road linking the territory to the lower 48 states was the only feasible means of extracting and economically transporting these goods. The road, he argued, would create jobs in

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[200] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 192.

[201] United States Department of the Interior, 1933, 6.

[202] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 202.

[203] Alaska Road Commission, 1931, 22; Donald McDonald, House Joint Memorial in the Legislature for the Territory of Alaska, 1933, Sheldon Papers (On file, University of Alaska, Anchorage).

[204] Alaska Road Commission, 1931, 23.

resource-related endeavors, attract new settlers and tourists, and road construction itself would provide jobs.

The International Highway that McDonald originally envisioned would extend between Fairbanks and Seattle, using existing segments of road, as feasible, throughout Alaska, British Columbia, the Yukon Territory, and Washington. This patchwork of roads would result in a highway nearly 2,000 miles long, with only 200 of these in Alaska, at a cost of $14 million and with roughly 1,000 miles of new construction (see Figure 10).[205]

Several alternative routes were proposed over the decade. Although the International Highway Commission continued planning throughout the 1930s, conflicts over possible routes and costs, and who would pay for them, restricted the progress of the project. Proponents of the International Highway believed the military value of such a road was well worth the approximately $14 to $20 million price tag. However, in 1938 the U.S. Army Chief of Staff agreed with project opponents that the road would be of little military value to the U.S.[206] It would take the U.S. entry into World War II to change views on the need for such a highway, and the ultimate route differed significantly from that proposed by McDonald.

[205] McDonald, House Joint Memorial in the Legislature for the Territory of Alaska, 1933.

[206] Jerome Sheldon, "The Alaska Highway – Road to the North," unpublished manuscript on file at the University of Alaska, Anchorage Special Collections, Sheldon Collection, Box 6, Folder 1.

Figure 10. 1931 map of Route A of the proposed International Highway Route from Seattle, Washington, to Nome, Alaska, through Canada. The Canadian section up to Whitehorse was not constructed on this route, but further inland. Source: Alaska State Library, Juneau, Alaska. Record Group 25, Series 1380, Pocket 11, Folder 3. Alaska Road Commission. International Highway-Airway.

3.4.5 The close of the 1930s

By the close of the decade, the ARC was responsible for 10,411.6 miles of roads and trails (see Table 6). There was a decrease in the number of trail miles, and a 30 percent increase in the number of road miles. The miles of sled road changed very little, increasing by only about 4 percent. The number of miles of flagged trail decreased by 66 percent, while the number of miles of pack-type trails decreased by about 10 percent. Because the Richardson Highway was not open from November through May, and other areas of Alaska were not connected by good wagon roads, pack trails and winter sled roads were still very important at the end of the decade.

Table 6. Total mileage maintained by the ARC in the 1940 fiscal year[207]

Type of Route	Number of Miles
Road	2,212.5 miles
Sled Road	1,464.75 miles
Trail	6,494.25 miles
Flagged Trail	240 miles

Continued exclusion of Alaska from the Federal Highway Act during the late 1930s limited the development of "planned and systematic road construction in Alaska." By 1938, aside from funds for roads in National Forests and parks, there were no new federal relief funds available for new road construction. As a result, at the end of the decade the ARC increasingly played the role of assisting federal agencies and the territorial government in building roads with the limited funding available to these entities.[208]

Between the economic situation and the lack of funding from Congress, the ARC struggled to maintain the system that existed in 1932 and to meet some of the petition requests that it received. Overall, appropriations for the ARC under the Department of Interior were consistently less, beginning in 1932, than they had been in the previous 10 years under the War Department. Despite the lower Congressional appropriations, the ARC was able to maintain the important roads of the existing system such as the Richardson Highway, and make small improvements to roads such as the highway through Denali National Park. Important construction projects during the decade included extending roads to connect mines with ports and railroads, such as the road between the Takotna and Ophir mining districts and the Kuskokwim River, and the road from mines on the west fork of the Chulitna River to the Alaska Railroad. Extension of the Bunker Hill-Kougarok Road took much of the decade. Road construction to provide access to communities included such roads as the local system at Anchorage, the Anchorage-Palmer Road, and the Dillingham-Snag Point Road.[209]

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[207] United States Department of the Interior, 1940, 8.

[208] Territorial Highway Report, 1939-1940, in Alaska Department of Transportation & Public Facilities, *Fifty Years of Highways*, 87-88; United States Department of the Interior, 1938, 5.

[209] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 189; Alaska Road Commission, 1939, 6-7, 10.

3.4.6 Conclusion

Government funding for road and bridge projects in Alaska during the Depression led to continued, but constrained, improvement of the transportation network. New gold discoveries and increased mineral production necessitated the construction of roads, and roads continued to be built to support timber harvesting and fishing and canneries. The growing population prompted the need for more local roads connecting communities. Roads allowed new farmers to quickly reach markets with their produce, and continued to provide tourists and local residents access to national parks and forests.

3.5 World War II and the postwar years transform Alaska (1941 – 1958)

In Alaska, prior to World War II, the territory's road system was very limited, with only about 2,500 miles of roads that lacked interconnection and no road from a port that was open consistently all winter long. Roads were established in central/interior and western Alaska (Nome and Seward peninsula). Alaska had only a few long-distance roads, the Richardson and Steese Highways. The Richardson Highway connected Fairbanks with the Valdez port and the Steese Highway connected Fairbanks to the Yukon River at Circle. These two roads (along with their feeder roads to mining regions) consisted of 950 miles of gravel surface equal to 40 percent of the entire Alaskan automobile road system.[210] With the exception of these long-distance roads, the majority of roads were isolated and short, connecting communities to water transportation, mines, or mineral facilities. In 1940 the ARC maintained approximately 1,933 miles of roads used by automobiles (as well as 3,276 miles of wagon and sled roads which served as a means of year-round travel).[211] In 1941 approximately 73,000 people resided in the territory, some of whom lived in communities that relied on water, rail, or air transport and not served by the road system at all.[212]

World War II, followed by the Cold War, put the territory in new perspective for the U.S. government. As a strategic military location, Alaska was important to national defense and, as a result, the need for an improved interconnected transportation system tying together most major population centers and military facilities became a priority. In 1950 Alaska's Governor Gruening pointed out "that wars are known chiefly as great destroyers, but that they are also great constructors, especially in Alaska."[213] Several entities, including the ARC, the BPR (formerly known as the Public Roads Administration until 1949),[214] the Territorial Board, and the U.S. Army, transformed and modernized Alaska's roads to a degree previously unimaginable due to limited funds.

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[210] Naske and Slotnick, *Alaska: A History*, 162, 203; *Report of the Alaskan International Highway Commission to the President* (Washington, D.C.: U.S. Government Printing Office, 1940), 23.

[211] The mileage statistic only includes roads maintained by ARC and is not the total road mileage in the state at the time, which was around 2,500 miles. Alaska Road Commission, 1940, 7.

[212] State of Alaska Department of Transportation & Public Facilities, *Vision 2020 Update: Statewide Transportation Policy Plan*, Draft, "Section Two: Background/Resource Papers" (Spring 2002), 14.

[213] "The Sterling Highway," *Anchorage Daily Times*, 7 September 1950.

[214] The Public Roads Administration, under the Federal Works Agency since 1939, was renamed the Bureau of Public Roads in 1949 when it was placed under the direction of the Department of Commerce. See sidebar in Section 2.1. Throughout this report BPR will be used to identify this agency.

Road construction supported the territory's settlement and economic development. Federal funding during and after the war reached levels never seen before in Alaska, which led to the reconstruction and improvement of existing highways and the construction of new highways. [215]

Despite increased funding, the ARC faced labor shortages and also increased road construction costs due to labor and material shortages during the war. The average cost of construction of one mile of gravel-surfaced road was $7,500 in 1941; by 1944 it doubled to $15,000.[216] Non-military road development projects, including some routes to fishing and mining areas, declined as these industries were reduced during the war effort.[217]

Following World War II, Alaska continued to be an important military location and postwar federal funding continued at significant levels. In addition to supporting military missions, overall improvement of the connectivity of the road network was a focus of the ARC. Roads were constructed to link the interior road system, as well as to allow for continued access to areas of agricultural and mining potential. The ARC's contributions to the territory's road network would end in 1956 when Alaska was included in the Federal Aid Highway Act for the first time. This inclusion would provide a steady and predictable funding level for Alaska's roads.

By 1956 the ARC maintained slightly less than 3,595 miles of automobile roads, or 48 percent more miles than before World War II, which connected many communities and military facilities within the territory, as well as connecting the territory to the lower 48 via Canada for the first time. This road system supported the territory's population growth, which rose from 103,000 in June 1946 to 128,643 in 1950, and to 212,400 by 1956.[218] The roads were also in response to the increased automobile ownership in the postwar years. For example, car registration in Anchorage increased 1,390 percent in a decade.[219]

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[215] Road funding during this period continued to come from four primary sources: (1) Federal government appropriations to the Department of Interior in accordance with the 1905 act, as amended; (2) The Alaska Fund (derived from special federal taxes on industries in the territory); (3) Territorial legislature (funds used for Territorial Board projects with cooperation from the ARC); and (4) The NPS, for projects within national parks and monuments. Minor amounts of funding also came from contributions from private companies and individuals. Alaska Road Commission, 1941, 1; 1942, 4. The funding sources cited do not appear to include funding for U.S. Forest Service roads or the Alaska Highway.

[216] Alaska Road Commission, 1941, 9; Alaska Road Commission, 1944, 9.

[217] Rolfe G. Buzzell, "Bridging Alaska: Historic Context for the Inventory of Alaska's Highway Bridges" Draft, September 2007, 18; Hummel, 47; Edman, Hudson, and Johnson, 9.

[218] Alaska Road Commission, 1956, 24; United States Department of Commerce, Bureau of Census, "1950 United States Census of Population," (1950), vii, http://labor.alaska.gov/research/census/histpdfs/1950inhab.pdf (accessed 18 January 2013).

[219] Specific dates are not given in the text but the discussion is in context of the postwar years. Naske and Slotnick, *Alaska: A History*, 205.

3.5.1 War and military impact on road building

Alaska became important to the U.S. military prior to and during World War II, primarily as an area to be protected because it could be a stepping stone to an attack on the lower 48. In 1939 Congress passed a bill (later known as the Initial Defense Appropriation Act) that provided federal funding to states and territories for military readiness. In Alaska, the bill increased the territory's military build-up and led to the development of Army airbases in Anchorage and naval airbases at Kodiak, Sitka, and Unalaska.[220] Following Hitler's attack on the USSR, Alaska was also recognized as an air-corridor connection to America's Soviet allies under the Lend-Lease program, with a corresponding increase in activity at Alaska's airbases.[221]

The military installations placed new demands on the territory's limited road system. Increased road mileage was needed to improve access and existing roads needed improvements to satisfy increased volume and loads from truck traffic that were damaging existing roads. From 1941 to 1945 about $600 million was spent on transportation projects, 20 times as much as had been spent total in the territory from 1867 to 1940.[222] Transportation projects included construction and reconstruction of roads both by the ARC and by the U.S. Army. The construction of the Alaska and Glenn Highways and reconstruction of the Richardson Highway, along with other road construction during this period, was a direct result of the strategic importance of the territory during World War II and the Cold War. The U.S. Army's efforts to construct the Alaska Highway and provide the first overland route to Alaska via Canada was an engineering feat during the war (see Section 3.5.1.1 for further discussion of the Alaska Highway). Specific federal appropriations provided the ARC with funding to reconstruct the Richardson Highway and construct the Glenn Highway. The BPR also constructed access roads to support military installations around Anchorage and on Kodiak Island and smaller surrounding islands.[223]

ARC's focus during the war was to support military needs through improved transportation networks. Improving territorial defense was a priority for Governor Gruening, who in the fall of 1940 requested that the ARC focus on the following routes that could contribute to national preparedness:

- Connecting link from Anchorage road system to Richardson Highway (future Glenn Highway)
- Extending the road from Seward around Turnagain Arm to Anchorage (Seward Highway)
- Improving the Richardson Highway (major corridor from Fairbanks to the port at Valdez)

Gruening claimed that these projects were "indispensible from a military standpoint, but also would be of inestimable benefit for Alaska's development."[224]

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[220] "Building for Defense," *Engineering News-Record* (24 October 1940), 38.

[221] Laurel J. Hummel, "The U.S. Military as Geographical Agent: The Case of Cold War Alaska," *Geographical Review* (January 2005), 47.

[222] State of Alaska Department of Transportation and Public Facilities, 14.

[223] Naske, *Alaska Road Commission Historical Narrative*, 403-404.

[224] Naske, *Alaska Road Commission Historical Narrative*, 400.

With the exception of a few major projects, most new roads constructed by the ARC were only short extensions to existing routes.[225] Routine maintenance, only undertaken if essential to the war effort, led to regrading and widening of important existing roads along with resurfacing, as needed.[226] During this period, the ARC used experienced foremen to complete the work, referencing in its 1941 annual report that it did not maintain an in-house engineering staff. The foremen were advised by superintendents who were engineers or had engineering experience in Alaska. Despite having experienced staff, the ARC reported labor shortages during the war due to competition with defense jobs.[227] To alleviate this shortage, from 1942 to 1945, for the first time in 22 years, the ARC recruited employees from Seattle.

ARC funding provided by Congress for roads greatly surpassed the pre-war average (see Appendix C). Congress made special wartime appropriations, beginning with the First Deficiency Bill on April 1, 1941, including $1 million for the construction of the Palmer–Richardson Highway, later known as the Glenn Highway. Secretary of War Henry L. Stimson supported the project, which would provide an overland road to connect air bases in Fairbanks (Ladd Field) and Anchorage (Fort Richardson). The following year an additional $500,000 from the Third Supplemental National Defense Appropriation Act provided increased funds.[228] Opened for travel in 1943, the Glenn Highway was built contemporaneous to the Alaska Highway. It was named after Captain (later Major General) Edwin Forbes Glenn, who explored the Copper and Susitna Rivers in 1898 and 1899, looking for a route to the Tanana River from the Cook Inlet.[229] The 141 miles of the Glenn Highway between Palmer and the Richardson Highway received a gravel surface within the next few years.[230]

The passage of the First Deficiency Appropriation Act of 1942 provided $2.2 million for the construction of bridges and widening and realignment of the Richardson Highway. Although previously improved to automobile standards, the Richardson Highway saw heavy traffic and needed modernization to serve military needs. By the end of fiscal year 1943 the ARC estimated that an additional $2 million was needed to continue improvements and bring the Richardson Highway up to the standards being planned for the Alaska Highway (see Section 4.4.3). The First Supplemental National Defense Appropriation Act of 1944 provided an additional $500,000 for construction of the Richardson Highway and $300,000 for

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[225] Alaska Road Commission, 1941, 6, 8.

[226] The Defense Highway Act of 1941 provided $93,500 in fiscal year 1943 for the construction of access roads. Alaska Road Commission, 1943, 1.

[227] Alaska Road Commission, 1941, 5, 10.

[228] Alaska Road Commission, 1941, 1; Buzzell, "Bridging Alaska: Historic Context for the Inventory of Alaska's Highway Bridges" Draft, 17; Naske, *Alaska Road Commission Historical Narrative*, 401; Alaska Road Commission, 1942, 1.

[229] Naske, *Alaska Road Commission Historical Narrative*, 402.

[230] Alaska Road Commission, 1946, 12. The Glenn Highway designation later incorporated an existing road between Anchorage and Palmer (known as the Palmer Highway), built during the late 1930s and opened in 1937 (see Section 3.4.5). The Anchorage to Palmer section was incorporated into the Glenn Highway prior to the late 1940s, when reconstruction and paving was conducted on this section between 1949 and 1951. The mileage total reflects the mileage prior to the incorporation of the Anchorage to Palmer section. Today, the Glenn Highway is approximately 180 miles from Anchorage to the Richardson Highway.

what was termed "extraordinary" maintenance.[231] From 1942 to 1944 the ARC constructed a number of new bridges on the route and completed relocation and reconstruction work, improving geometry and surfacing to address narrow roadways and poor road conditions.[232] Although many improvements had been made, the ARC's 1944 annual report noted a continued need for Richardson Highway construction funds.[233]

At the end of World War II Alaska had an expanded and transformed transportation system, largely in part due to its strategic importance. Road construction and reconstruction during the war years constructed or improved the Alaska Highway with the Haines Cutoff (today the Haines Highway in Alaska), Glenn Highway, and Richardson Highway.[234] These roads were the principal truck routes serving the territory, connecting major communities and military facilities (Anchorage and Fairbanks), and providing access to the port at Valdez and overland access to the lower 48. In addition, ports were updated, 54 airports and air bases were built by the Army Air Corps and Civil Aeronautics Administration, and maritime freight and passenger service increased.[235] Figure 11 shows the principal road system that had developed by 1944, and Table 7 lists the principal roads and the local road network in place by 1946 and maintained by the ARC.

[231] Alaska Road Commission, 1942, 1; Alaska Road Commission, 1943, 8; Alaska Road Commission, 1944, 1.

[232] W.H. Spindler, "Rebuilding Alaska's Richardson Highway," *The Highway Magazine* (September-October 1944), 124-129.

[233] Alaska Road Commission, 1944, 8.

[234] The Haines Cutoff portion in Alaska is known today to as the Haines Highway and this name will be used throughout the report. The section in Canada is referred to on maps as the Haines Cutoff. Historically, the road segments in Alaska and Canada were collectively referred to as the Haines Cutoff.

[235] State of Alaska Department of Transportation and Public Facilities, 15.

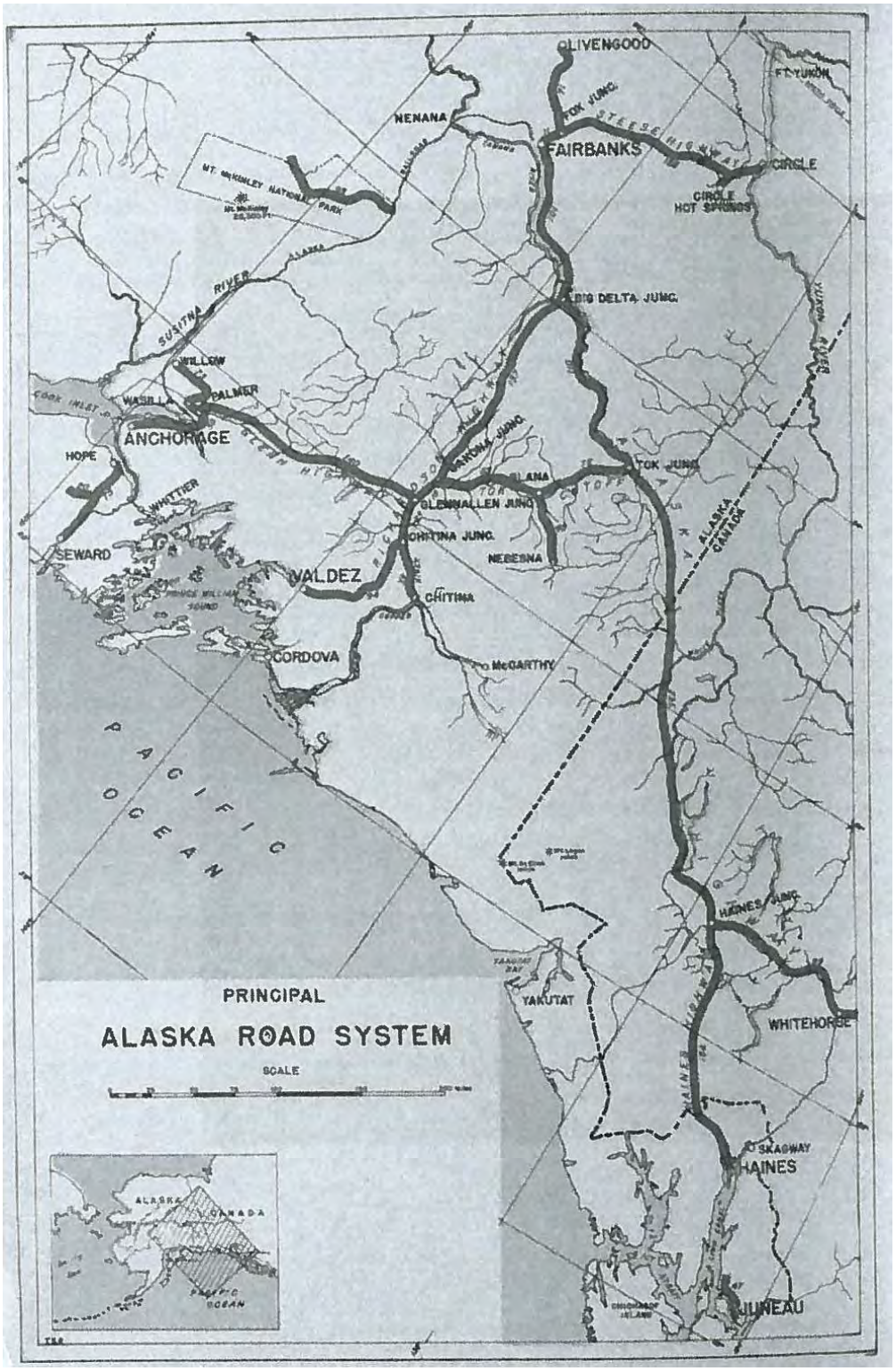

Figure 11. Principal Alaska road system, c.1944 (note that roads on the Seward Peninsula are not shown). Source: Biennial Report of the Alaska Territorial Highway Engineer and Superintendent of Public Works, 1943-1944.

Table 7. Alaska road system in 1946*

Principal Roads	Miles
Richardson Highway	368
Glenn Highway	189
Steese Highway	162
Tok Cutoff	136
Alaska Highway and branches	210

Local Roads	Miles
Nabesna Branch	44
Feeder Roads, Richardson Highway	72
McCarthy Tram and Road system	90
Livengood Road and branches	87
Feeder Roads to Steese Highway	134
Anchorage local roads	54
Fairbanks local roads	46
Palmer system	200
Nome system	167
Seward peninsula mine roads	94
Seward peninsula tram road	80
Takotna system	71
Flat system	36
Manley Hot Springs system	48
Ruby system	66
Haines system	62
Homer system	33
Feeders to the Alaska Railroad	94
Eagle System	32
Iliamna system	26
Isolated roads connecting with river or ocean transportation	121
Denali (Mount McKinley) Park Roads	91
Total	**2,813**

* Excludes forest roads. *Source: Alaska Road Commission, 1946, 8-9.*

Military needs in the postwar period continued to provide the greatest impetus for road building and transportation development in the territory. With the onset of the Cold War, the territory had a new strategic importance due to its proximity to the USSR (Russia), which had become the primary enemy of the U.S. In addition, Alaska's natural resource wealth included a number of the minerals that the U.S.

government had designated as "strategic" and "critical" for Cold War industry and military needs.[236] Military bases in Fairbanks (Fort Wainwright and Eielson Air Force Base) and Anchorage (Fort Richardson and Elmendorf Air Force Base) and other facilities (Fort Greely near Big Delta, Kodiak, Shemya, and Adak) became important facilities during the Cold War.[237] Due to Alaska's proximity to the USSR, the U.S. military established a number of missile sites, outposts, and Distant Early Warning Line stations across Alaska. According to historian Naske, "Between 1940 and 1950 the federal government spent an estimated $2 billion on Alaskan projects, including military bases, power plants, recreational facilities, railroad improvements, wharfs, roads, housing, and airfields."[238] The construction of a port and military facility in the Prince William Sound known as Whittier and the construction of a railroad spur and tunnel to access the port played a role in future road development (see the discussion of Whittier Tunnel in Section 4.4.6 and 4.4.6.4).

The military growth and influx of new residents after the war increased the demand for roads.[239] Outspoken Territorial Representative Edwin L. ("Bob") Bartlett explained the importance of road development in Alaska in 1958, saying: "Every additional mile of road built in Alaska aids national defense because the Territory is a strategic outpost of permanent importance."[240] The ARC focused postwar road construction, paving, and other improvement in the south-central and interior part of the territory, near population centers and military bases. The northern, western, and southeastern areas of the territory were not served by highways, with the exception of the Haines Highway, which with the White Pass & Yukon Route Railroad was the only land transportation route into the southeastern region.

The federal government provided substantial federal funding to Alaska in the postwar period for road maintenance, reconstruction, and new construction. Of primary concern for the Secretary of Defense in 1947 was upgrading the Alaska, Richardson, and Glenn Highways to all-weather standards and completion of the Seward-Anchorage Highway (known as the Seward Highway) to access the Kenai Peninsula and supply a vital artery from the sea to strategic military installations in Anchorage.[241] In addition to upgrading roads to all-weather standards, it was a defense program priority to keep the Glenn Highway open year-round, as winter conditions necessitated the closure of some portions of the Glenn and Richardson Highways (see Section 4.4.4.5 for more information on year-round winter maintenance).[242]

To address the military needs, Congress authorized a major "six-year accelerated road-building" program in 1948 that was supported by the U.S. Army. Federal funding increased dramatically to $24.3 million in

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[236] Hummel, 48; John B. DeMille, "Strategic Minerals: A Summary of Uses, World Output, Stockpiles, Procurement," (New York: McGraw Hill, 1947), 2-4, 11.

[237] Naske and Slotnick, *Alaska: A History*, 203.

[238] Clause Naske, "Alaska in the Mix," *Alaska History*, 16 (Spring/Fall 2001), 17.

[239] Alaska Road Commission, 1945, 9.

[240] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 326-327.

[241] Originally known by its termini, the Seward-Anchorage Highway became known as the Seward Highway. Throughout this document it will be referred to as the Seward Highway. Rolfe G. Buzzell, "Bridging Alaska: Historic Context for the Inventory of Alaska's Highway Bridges" Draft, 19.

[242] Naske, *Ernest Gruening: Alaska's Greatest Governor*, 58.

1949 and $30.5 million in 1951. In addition, the 1948 Supplemental Appropriation Act provided $4 million to continue construction of the Seward Highway.[243] The final segment of the Seward Highway was scheduled to be finished in summer 1951; when completed, the Seward Highway linked Anchorage with the Kenai Peninsula by road for the first time.[244]

3.5.1.1 The Army's Alaska Highway and its heritage

The story of the Alaska Highway has been recounted in many books and articles over the last 70 years, from the detailed accounts of its construction that appeared in several engineering journals in 1942 and 1943, to the academic papers collected from the symposium that celebrated the route's 40th anniversary (edited by Kenneth Coates) and a pictorial history that celebrates the role of black Army regiments in the highway's construction (William E. Griggs's *The World War II Black Regiment That Built the Alaska Military Highway: A Photographic History*). The highway also has a listing in *The Reference Guide to Famous Engineering Landmarks of the World*. This section provides a brief summary of the highway's origin, construction, and subsequent use. It focuses on the portion in Alaska, but also provides an overview of the entire Alaska Highway. The feat of its rapid construction during nine months in 1942, as addressed in Section 4.4.3, adds much to the highway's historical allure. Figure 12 provides a map of the Alaska Highway's route through Alaska and Canada.

Figure 12. Map of the Alaska Highway route. Source: http://www.alaskahighwayarchives.ca./en/resources/hwymap.php (accessed 22 March 2013).

[243] United States Department of the Interior, 1949-1951, 2-3, 19.

[244] The final section of the Seward Highway was the Turnnagain Arm segment outside of Anchorage.

Construction of the Alaska Highway did not become a priority until its strategic military value was recognized following U.S. entry into World War II. An ARC engineer had first proposed a highway from Hazelton, British Columbia, to Fairbanks in 1928. In 1933 a commission appointed by President Herbert Hoover produced a study of possible routes, though the proposed highway through Canada connecting the U.S. to Alaska was sidelined during the Depression. In 1938 Congress passed legislation creating a second Alaskan International Highway Commission to study the benefits and feasibility of constructing an international highway. In 1940 the Commission recommended construction, emphasizing expected benefits from accessing mineral deposits and natural resources and an anticipated market for long-distance tourist traffic.[245] In 1939 Alaska's new Governor, Ernest Gruening, promoted its construction for defense purposes. In June 1941 Congressman Magnuson of Washington, chair of the commission, advocated immediate construction so as not to miss another construction season.[246] However, these recommendations failed to gain support from the War Department.

The U.S. entry into World War II changed views on the need for the highway. A highway came to be seen as a defense measure and an essential connection for the chain of airfields recently established throughout Canada and Alaska. On February 11, 1942, President Roosevelt authorized the highway's construction. An agreement with Canada specified that the U.S. would maintain the highway until the end of the war, and six months after the war's conclusion would turn over the Canadian section for integration into that country's national highway system with the condition that U.S. citizens be permitted to use it freely.[247]

The route extended roughly 1,500 miles, with all but 150 miles as an entirely new route. It began at an established rail head at Dawson Creek, British Columbia, crossed west towards Watson Lake in Canada's Yukon Territory, and continued northwesterly until entering Alaska at Boundary. The portion within Alaska continued for approximately 200 miles before reaching a junction with the Richardson Highway just south of Big Delta. The route differed from that recommended by the Alaskan International Highway Commission, which would have remained closer to the coast. The selected route better connected the series of Alaskan and Canadian airfields that had been improved by the U.S. Army Air Corps along the Northwest Staging Route and aided in transporting gasoline to refuel airplanes.[248] The "technical end" of the Alaska Highway was its junction with the Richardson Highway, about 10 miles south of where the Richardson Highway crosses the Tanana River.[249] To complement the project, the 88-mile portion of the Richardson Highway from Big Delta to Fairbanks was improved by the ARC in the summer of 1942.[250]

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[245] *Report of the Alaskan International Highway Commission to the President*, April 1940, 11-13.

[246] "International Highway Commission Recommends Immediate Start," *Alaska Weekly*, 20 June 1941.

[247] "U.S. Will Maintain Alaska Highway," *New York Times*, 19 March 1942.

[248] Harold W. Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," *Engineering News Record* (17 December 1942), 86.

[249] United States Department of the Interior, National Park Service, *Recreational Resources of the Alaska Highway and Other Roads in Alaska* (Washington, D.C.: United States Government Printing Office, 1944), 23.

[250] Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," 94.

Governor Gruening persuaded the Army to build a branch road, which was not included in the original plans, between Haines on the Alaska coast and the Alaska Highway. This "stub" connected with the Alaska Highway 65 miles west of Whitehorse and provided an alternative to the railway line that served this coastal area.[251] The Haines Cutoff, as it was known (currently known as the Haines Highway for the portion in Alaska), provided truck access to a coastal port and facilitated distribution of military supplies. For 42 of its 159 miles, it followed a road built by the ARC from the port of Haines to the Canadian border. The ARC's road was the successor to the Dalton Trail built during the 1898 gold rush along an important pre-existing Tlingit trade route over the Chilkat Pass.[252]

Construction of the Alaska Highway proceeded with haste; the first engineering troops arrived in Canada on March 9, 1942. The pioneer road was completed through the joint efforts of engineering troops from the USACE, BPR employees, and civilian contractors under the BPR's direction. The general route was determined by the Army and BPR using airplane and ground (sled) reconnaissance. The detailed route for the pioneer road was then established by regimental commanders on the ground.[253]

Engineering troops were initially assigned to complete the rough road with the BPR and its contractors following behind to widen the road, improve the alignment, and provide a gravel-surfaced finished road. This method proved slow, however, so in August the BPR ordered that some of the contractors assist in constructing the pioneer road so a route serviceable for military vehicles would be ready by winter of 1942. The Army and contractors worked together to complete a passable road as quickly as possible. Planes fitted with skis moved crews to build temporary bridges ahead of road construction. Ferries and pontoon bridges were used for crossing larger rivers, while smaller streams were crossed with timber trestles.[254]

The Army's 97th regiment was assigned to work on sections of the road within Alaska proper, along with Iowa contractors C.F. Lytle Company and Green Construction Company.[255] The 97th Regiment, a segregated unit, arrived at Valdez, Alaska, charged with improving the existing Richardson Highway north from Valdez to Gulkana, as well as the existing road from Gulkana to Slana. They then constructed a

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[251] Clause-M. Naske, *Ernest Gruening: Alaska's Greatest Governor* (Fairbanks, Alaska: University of Alaska Press, 2004), xviii; Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," 96.

[252] United States Department of the Interior, National Park Service, *Recreational Resources of the Alaska Highway and Other Roads in Alaska*, 22; Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," 96.

[253] Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," 83-86; Griffith H. Williams, "Alaska's Connection: The Alcan Highway," *The Pacific Northwest Quarterly* 76, no. 2 (April 1985), 61; Clarence L. Sturdevant, "The Military Road to Alaska: Organization and Administration Problems," *Military Engineers* XXXV, no. 20 (April 1943), 175, 177.

[254] Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," 83-84; Harold W. Richardson, "Alcan – America's Glory Road: Part III – Construction Tactics," *Engineering News Record* (14 January 1943), 123-137.

[255] H. Milton Duesenberg, *Alaska Highway Expeditionary Force: A Roadbuilder's Story* (Clear Lake, Iowa: H & M Industries, Ltd., 1994), 24.

new road northeast from Slana to the Tanana River, completing what is now known as the Tok Cutoff.[256] From there, they pushed southeast, constructing a pioneer road to meet men of the 18th Regiment working north from Whitehorse.[257]

The final gap was closed on October 29, 1942, south of Kluane Lake. In *North to Alaska*, historian Kenneth Coates records an observer's account of this seminal event:

> The final meeting between men working from the south and men working from the north was dramatic. They met head on in the forest. Corporal Refines Sims, Jr., a negro from Philadelphia [of the 97th Engineers]…was driving south with a bulldozer when he saw trees starting to topple over on him. Slamming his big vehicle into reverse he backed out just as another bulldozer driven by private Alfred Jalufka of Kennedy, Texas, broke through the underbrush. Jalufka had been forcing his bulldozer through the bush with such speed that his face was bloody from scratches of overhanging branches and limbs. That historic meeting between a negro corporal and white private on their respective bulldozers occurred 20 miles east of the Alaska-Yukon Boundary at a place called Beaver Creek. – Malcolm MacDonald, British high commissioner to Canada[258]

As relayed in a story entitled "The Road to Civil Rights" on the FHWA's website, a wire-service photographer took a picture of the two men standing on bulldozers while shaking hands (see Figure 13).[259] Historian Douglas Brinkley recognizes the work of the segregated regiments on the Alaska Highway as a significant step forward in the African American struggle for equality and attributes their work here to assisting in integration of the U.S. Army, which officially began in 1948.[260] The official dedication of the highway took place November 20, 1942, when U.S. and Canadian authorities assembled near Kluane Lake, 165 miles west of Whitehorse in Yukon Territory.[261]

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[256] The Tok Cutoff today ends at Tok and the stretch north from Tok to the Tanana River is known as the Old Alaska Highway. Presently, the Tok Cutoff is considered to be part of the Glenn Highway. Lyman L. Woodman, *Duty Station Northwest: The U.S. Army in Alaska and Western Canada, 1867-1987¸vol. 2* (Anchorage, Alaska: Alaska Historical Society, 1996), 187-188.

[257] Williams, "Alaska's Connection: The Alcan Highway," 63-65.

[258] Ken Coates, *North to Alaska* (Fairbanks, Alaska: University of Alaska Press, 1992), 130-131.

[259] U.S. Department of Transportation, Federal Highway Administration, "The Road to Civil Rights: World War II – The Alaska Highway," *Highway History*, available at http://www.fhwa.dot.gov/highwayhistory/road/s16.cfm (accessed 20 December 2012).

[260] Douglas Brinkley, "The Alcan Highway," in William E. Griggs, *The World War II Black Regiment That Built the Alaska Military Highway: A Photographic History* (N.p.: University Press of Mississippi, 2002), 9-10, 12; U.S. Department of Transportation, Federal Highway Administration, "The Road to Civil Rights: World War II – The Alaska Highway."

[261] Richardson, "Alcan – America's Glory Road: Part I – Strategy and Location," 84.

Figure 13. Photograph of Corporal Refines Sims, Jr. (left) and Private Alfred Jalufka (right) shaking hands upon meeting to close the final gap of the Alaska Highway in 1942. Photograph from U.S. Army Corps of Engineers.

After the dedication, work halted for the winter. Though the Army had carved a primitive road through the wilderness, the highway was far from complete. In the 1943 construction season, the BPR, civilian contractors, and Army engineers started converting the pioneer road into an all-weather highway by improving portions of the alignment and constructing permanent bridges. As the perceived strategic importance of the highway declined over the course of the year, the Army's priorities shifted and the construction standards were downgraded. By the summer of 1943 Brigadier General O'Connor complained to his commanding general that the BPR believed that "their mission is to construct a finished highway of the highest peace time standard," a mission no longer in line with the Army's needs. The reduction in standards enabled the completion of an all-weather road before the end of the season, and major construction was concluded in the fall of 1943.[262] William S. Howland, reporting for LIFE magazine in 1943, travelled the highway and described the nearly completed road as a "rough, military road over most of its length," though he took pains to point out the notable improvements in ride quality and traffic volume in comparison to a visit he had made the previous year. At the time of Howland's second trip, most of the gravel portions could be traveled at speeds of 35 mph, and areas where the BPR had built to the original standards could be driven at 70 mph.[263]

[262] Duesenberg, 29; Kenneth Coates, "The Civilian Highway: Public Works Canada and the Alaska Highway, 1964-83," in Kenneth Coates, ed., *The Alaska Highway: Papers of the 40th Anniversary Symposium* (Vancouver: University of British Columbia Press, 1985), 146-148.

[263] William S. Howland, "LIFE's Reports: Alaska Highway," *LIFE*, 18 October 1943, 12-16.

The road was initially referred to as the Alcan Highway, but on July 19, 1943, Canada and the U.S. exchanged diplomatic notes formally naming it the Alaska Highway. The Alaska Highway is primarily recognized for being a remarkable feat of construction: it was constructed as a pioneer road in just nine months in 1942. A joint force of BPR employees, contractors, and engineering troops overcame severe weather and challenging topography in remote lands to build the highway. The project also exposed many engineers, contractors, and workers to permafrost construction for the first time.[264]

The postwar Alaska Highway

The ARC took over maintenance of the highway within Alaska following World War II.[265] The Canadian portion was turned over to Canada's Department of National Defense (DND) to maintain for military purposes in what was envisioned as a temporary solution before a more appropriate authority could be found. The route attracted soldiers being transferred to Alaska stations, civilians looking for jobs or homesteads, and adventurers seeking a wilderness experience.[266] With military need for the highway largely dissipated, the route was opened for public use, and a long history of benign neglect of the Canadian portion of the Alaska Highway began.[267]

Interest groups and certain U.S. officials began to encourage paving the entire route, arguing that such improvements would increase tourist travel and hauling of freight by truck, as well as enhancing the road's military value. The ARC advocated for improvement of the Alaska Highway in Canada as one of its five priorities in its 1949 "A Plan for Alaska." During the 1950s the ARC made steady progress on paving its 271-mile section of the Alaska Highway, and in 1950 it reported work including surfacing with gravel and installing metal culverts. A "very rough and dusty part of the main route" was eliminated in a 1953 construction project, and several sections were paved in 1953 and 1954.[268]

When the Alaska Highway first opened to the public in 1948, it was still a rough road with few amenities. With the road opening, tourists began using the road from the lower 48. The first edition of a new guidebook, *The Milepost,* was published in 1949 to assist travelers in planning their trip on the Alaska Highway. *The Milepost* contained maps and mileage logs that provided mile-by-mile descriptions of the Alaska Highway from south to north as well as a number of other connected highways in Alaska and Canada. The first edition of the booklet contained logs of the Alaska Highway and seven other highways, including the Richardson and Glenn Highways, as well as "helpful information" on preparation, accommodations, hunting, and fishing. Subsequent editions added new highways and additional "side

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[264] U.S. Department of Transportation, Federal Highway Administration, "The Road to Civil Rights: World War II – The Alaska Highway"; "Alaskan Army Engineers Battle With Permafrost," *Fairbanks Daily News-Miner,* 12 November 1963.

[265] Prior to 1946 the ARC maintained the Alaska Highway for the U.S. Army on a reimbursement basis. Alaska Road Commission, 1946, 7, 10.

[266] David A. Remley, *Crooked Road: The Story of the Alaska Highway* (N.p.: McGraw-Hill Book Company, 1976), 187.

[267] Coates, "The Civilian Highway: Public Works Canada and the Alaska Highway, 1964-83," 133-135.

[268] Remley, 193-194; United States Department of the Interior, 1949-1951, Appendix 1, 2; Frank Nash, District Engineer, Alaska Road Commission, Fairbanks District, "Situation Report for the Fairbanks District for the Month of August, 1950," 5 September 1950; Edman, Hudson, and Johnson, 111, 120.

trips," and by 1967 the guide included the Alaska, Glenn, Richardson, Sterling, Seward, Steese, Elliott, Taylor, and Denali Highways. Today, in its 65th year of publication, *The Milepost* contains logs for 88 major highways and secondary roads in the U.S. and Canada.[269]

3.5.2 Improved access and connectivity during the postwar era

In 1947 the territory had 2,785 miles of road, of which more than half or 1,720 miles were unconnected local roads. Feeder and local roads disconnected from the main highway system served isolated communities and mining areas, with one of the larger networks in and around Nome (constituting about 275 miles).[270] An ARC annual report described these early territory roads:

> The resultant low standard, disjointed road system contributed much to the early development of the Territory, but fell far short of providing the overland transportation facilities necessary for substantial development of the Territory's tremendous mineral, petroleum and timber products potential.[271]

Federal appropriations to Alaska for roads between 1949 and 1955 totaled an unprecedented approximately $135 million, enabling the transformation of the road network to more than 5,100 total miles, many of which served as an interconnected roadway system by 1957.[272] Significant projects undertaken during the postwar period sought to improve overall connectivity. The ARC focused on highway reconstruction and construction to improve access to the interior, upgrade existing highways, and construct farm and industrial roads.

In these postwar efforts, the ARC remained the major road-building agency in the territory and was responsible for everything from conducting surveys to design, construction, and contract administration. These responsibilities were supported by efforts of the BPR, which was responsible for roads within the territory's National Forests, and the Territorial Board (see further discussion of the BPR and Territorial Board efforts below). With substantial postwar funding came new challenges for the ARC in implementing a road-building program at a scale not seen before.

The Department of the Interior reorganized Alaska's road agency in 1948 and Colonel John R. Noyes (former officer of Alaska's Board of Road Commissioners) was appointed to the newly created position of Commissioner of Roads for Alaska to address road funding and construction needs.[273] In the report "Operations for 1949-51," Noyes stated that the ARC was "quite capable of dealing with these problems on a small scale. It was not capable, however, of dealing with the great expansion of work." To meet the

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[269] *The Milepost*, "About the Milepost," Morris Visitor Publications, http://www.milepost.com/publisher_information/about_the_milepost (accessed 24 June 2013); *The Milepost*, 19th ed. (Juneau, Alaska: Alaska Northwest Publishing Co., 1967), 2.

[270] Hummel, 60. The 1947 figure is slightly lower than the 1946 mileage listed in Table 6; according to the ARC annual reports, between these two years 30.7 new miles were added while 59 miles were abandoned, reclassified, or transferred

[271] United States Department of the Interior, 1955, 2.

[272] Hummel, 60 and Naske, *Alaska Road Commission Historical Narrative*, 436.

[273] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 229.

demands, the ARC began to enlarge itself by recruiting additional professional staff and hiring contractors to assist with the accelerated road-building program and new focus of the Department. The use of contractors was a significant change for the ARC since most work was previously completed by in-house staff.[274] The ARC, recognizing that it lacked experience in handling large-scale paving projects, chose to put these out for bid by private contractors. Firms based in Alaska, the Pacific Northwest, and as far away as Iowa, assisted the ARC with modernization and paving projects.[275]

Commissioner Noyes outlined the ARC's priorities in the 1949 "Plan for Alaska Roads," including the "improvement and extension of the interior road system of Alaska, as necessary and improvement of the road from Haines to central Alaska and the seaport of Haines." Other transportation priorities included improvement of roads in Canada connecting to Alaska, including the Alaska Highway, and the establishment of a car ferry service and related infrastructure for the southeastern region.[276] Commissioner Noyes was not shy in stating that to meet their goals, the continued efforts of the ARC would be dependent upon appropriation of federal funds and emphasized that "the need is great."[277]

Linking and extending the territory's main system of interior roads, of which a portion was isolated, would provide additional connections to population centers and military facilities, as well as access to areas of farming, industry, and mineral potential. The ARC's emphasis on interconnection was a broader approach to road construction than that of the pre-war period, which had focused on connection of communities and mining areas with rail or water transportation.[278] While some interconnection existed in the interior with the Richardson, Glenn (and Tok Cutoff), Alaska (with the Haines Cutoff/Highway), and Steese Highways providing connection for communities like Anchorage, Fairbanks, and Valdez, growth areas, such as the Kenai Peninsula, were still underserved by roads.

With the goal of an upgraded and interconnected main highway system, the ARC engaged in a number of significant projects including continued improvements to the Glenn, Alaska, and Richardson Highways; reconstruction of the Haines Highway and Tok Cutoff; and construction of the Parks Highway, begun in the late 1950s to provide a direct route between the state's two largest communities: Anchorage and Fairbanks.[279]

In the early 1950s the reconstruction and paving of the Tok Cutoff was undertaken. This improvement provided a year-round paved highway connection between the Alaska Highway and communities and military installations in Valdez, Fairbanks, and Anchorage, as well as what the ARC termed "complete

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[274] United States Department of the Interior, 1949-1951, 3.

[275] Alaska Road Commission, 1952, 10.

[276] United States Department of the Interior, 1949-1951, Appendix 1, page 5

[277] John R. Noyes, Commissioner of Roads for Alaska, "Alaskan Roads in 1951," 17 December 1950 (University of Alaska Fairbanks Archives, Bartlett Collection, Series 1, Subseries 19R, subseries 1, Box 8).

[278] Buzzell, "Bridging Alaska: Historic Context for the Inventory of Alaska's Highway Bridges" Draft, 20.

[279] Alaska Road Commission, 1946, 6; Alaska Road Commission, 1947, 6.

integration of Alaska's paved primary highway network."[280] Reconstruction of a 40-mile section of the Haines Highway in Southeastern Alaska started in 1950 with the addition of a bituminous surface. The Haines Highway connected roads and ocean terminal facilities and the improved road was intended to facilitate an increase in commercial activity in the region. However, competition with other routes, winter route closures, the lack of ferry terminal facilities at Haines, and lack of interest by Canada were limiting factors to achieving increased commercial activity in 1950.[281] Despite this effort, road development in Southeastern Alaska continued to be limited during this period.

Another major focus of the postwar period was hard-surfacing and reconstruction of roads targeting asphalt paving and the elimination of hazards of major roads.[282] A program of bituminous-surfacing of major routes began in 1948 as part of the ARC's goal to pave all through roads in the territory. Work began on the Alaska, Glenn, and Richardson Highways and expanded annually with the overall number of paved miles increasing from 148 miles in 1950 to 577 miles in 1953 and 756 miles in 1955. The ARC also undertook the reconstruction of roads to eliminate excessive grades and curves, widen bridges, provide crushed-rock surfacing of high traffic sections, and install traffic safeguards.[283]

During this period, the territorial government also supported improvement of the transportation system and conducted projects. Its role was modest due to the relatively small amount of funding that it was able to provide, which came from four sources: motor fuel tax, driver's license fees, 75 percent of the Forest Reserve Fund, and the General Fund.[284] Historically, the Territorial Board did not fully operate as a separate agency; rather, it contributed funds and guidance to other federal agencies, including the ARC. Correspondence between the ARC and the Territorial Board during the period demonstrates that the Territorial Board provided input to the ARC on priorities for projects.[285] According to Naske:

> The Territorial government never maintained a highway department, due, in part to restrictive federal legislation, the unwillingness of the Alaska legislature to impose an adequate system of taxation, and the expectation on the part of northern residents that road construction and maintenance were a federal responsibility.[286]

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[280] Alaska Road Commission, 1953, 3.

[281] John R. Noyes, Commissioner of Roads for Alaska, "Report on Maintenance and Year Round Operation of the Haines Highway, Alaska and Canada," 18 August 1950 (University of Alaska Fairbanks Archives, Bartlett Collection, Series 1, Subseries 19R, subseries 1, Box 8).

[282] United States Department of the Interior, 1949-1951, 1.

[283] Alaska Road Commission Reviews Highway Work of Past Year; Explains Contemplated Projects" *Fairbanks News-Miner*, 16 January 1950; Alaska Road Commission, 1953, 1-4; Edman, Hudson, and Johnson, 121.

[284] Under Federal law the Forest Reserve Fund was 75 percent of 25 percent funds received by timber sales in Tongass and Chugach National Forests. Alaska Legislative Council*, Progress Report to the Legislature of the Territory of Alaska – Highway and Road Finance* (Juneau, Alaska, 1954), iii.

[285] Irving Reed, Territorial Highway Engineer, letter to A.F. Ghiglione, Commissioner of Roads, 28 September 1955.

[286] Claus-M. Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956, the Work of the Bureau of Public Roads and the Transition to Statehood*, prepared for the State of Alaska, Department of Transportation and Public Facilities (July 1987), 166.

Although it continued to have a limited role in direct road construction, following a reorganization in 1953 the Territorial Board hired engineers to review and supervise construction work by contractors that could not be completed by the ARC. [287]

3.5.2.1 Roads to access agricultural areas and to support industry

New highway construction in the postwar period included building roads to reach agricultural and mining areas of the state, support logging and tourism, and provide access to ports. Roads were chosen for construction based on requests and the ARC's policy was that they be limited to areas with "definite" farming or mining possibilities. The ARC referred all requests/petitions for construction of farm roads to the Bureau of Land Management for a recommendation on whether the area was suitable for farming. Similarly, the ARC sent requests for mining roads to the Bureau of Mines for review. If approved, the ARC constructed the road based on request order and available funding.[288] In 1953 the ARC constructed 40 miles of access roads with an additional 40 miles annually planned for the period from 1954 to 1960.[289]

Federal funding provided to the ARC financed the construction of farm and access roads through 1954, when the annual appropriation was halted. This left the territorial government with the responsibility for construction of these roads. Although the Territorial Highway Engineer stated that this work would be done with funds from the recently increased gas tax; this impacted the agency's ability to complete other road construction projects. Ultimately, the ARC agreed to assume the maintenance of the farm and access roads constructed by the territorial government. Later, following inclusion of Alaska in the 1956 FAHA, the Department took responsibility for farm access and non-system roads that were not eligible for federal funding. As a result, the Department reviewed and investigated any petitions for road work not covered under federal-aid monies.[290]

To assist in agricultural transport and also open areas to tourism, work began on the Sterling Highway in 1946 to connect the Kenai Peninsula agricultural area with Seward. This highway honors Hawley W. Sterling, lifetime ARC engineer who served as assistant chief engineer from 1932 until his death in 1948.

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[287] In 1953, the composition of the Board of Road Commissioners (originally Governor, Territorial Treasurer and Territorial Highway Engineer) was reorganized as a board with the Territorial Highway Engineer and one member appointed by the Governor from each of the four Judicial Divisions of the Territory. "Office of the Territorial Highway Engineer, Bulletin 2," January 1956, 1.

[288] John R. Noyes, Commissioner of Roads for Alaska, *Memorandum to File, Subject: Statement of Policy on Construction of Farm Roads*, 21 December 1949, (Alaska DOT&PF Northern Region files, Naske research from Federal Record Center Series 65425); John R. Noyes, Commissioner of Roads for Alaska, *Memorandum to File, Subject: Statement of Policy on Construction of Farm Roads and Mining Roads*, 16 January 1950 (Alaska DOT&PF Northern Region files, Naske research from Federal Record Center Series 65425).

[289] Alaska Road Commission, 1953, 3; "Six-Year Plans Include Paving, Farm-Mine Roads," *Fairbanks News-Miner*, 19 November 1953.

[290] "Office of the Territorial Highway Engineer- Bulletin No. 2," January 1956, 1-2 (University of Alaska Fairbanks archives, Bartlett Collection, Series 1, subseries 19R , Box 4, Folder 23); Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 186, 188.

The importance of the Sterling Highway was described in the *Anchorage Daily Times* article on its dedication in 1950:

> It is the great achievement in the penetration of barriers that have kept Alaska's development confined to shoreline establishments dependent upon marine transportation. The new road will give otherwise isolated peninsula farms access to markets for their farm products. In another year it will link the communities with Anchorage by way of the Turnagain Arm road, and all the cities of the continental United States by the way of the Alaska Highway. It opens up the great potential tourist and sportsmen developments by making the fishing, lakes and streams readily accessible by automobile. Alaska families will be able to live year round on their homesteads or fishing sites now that the Sterling Highway and its side roads enable their children to commute to school, give them access to medical aid and make it possible to move supplies as needed.[291]

The Sterling Highway opened to traffic during the winter of 1950, when temperatures below freezing made it possible to travel over the unfinished surface. However, the highway required grading and gravel surfacing before being ready for summer traffic the following year.[292]

To serve the Fortymile Mining District, located south of the Yukon River near the Canadian Border, the ARC began construction of a 161-mile road from the Alaska Highway northeast to Eagle in 1946. The road was named the Taylor Highway to honor Ike P. Taylor. The Taylor Highway opened in 1953 when the road linked up with existing local roads south of Eagle.[293] Another major planned highway project was the construction of the Copper River Highway along the abandoned right-of-way of the Copper River and Northwestern Railway, parallel to the Copper River. Although never fully completed, this route was intended to create a fourth road to an ice-free port by providing overland access to Cordova from the Richardson Highway west of Chitina.[294] Another new project was the construction of the 160-mile Denali Highway, which began in 1950 to support tourism by providing road access to Denali (formerly Mt. McKinley) National Park. The road opened by 1957 and linked the Richardson Highway starting at Paxson (south of Fairbanks) to the park via Cantwell just south of the park.[295]

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[291] "The Sterling Highway," *Anchorage Daily Times*, 7 September 1950, 2.

[292] "Large Program Planned for Alaska Road Construction, Maintenance," *Fairbanks News-Miner,* 5 April 1950.

[293] Alaska Road Commission, 1947, 7, 9; "New Road Named Taylor Highway," *Anchorage Daily Times*, 25 June 1951; ARC 1947, 7;.ARC 1954, 24

[294] "Six-Year Plans Include Paving, Farm-Mine Roads," *Fairbanks News-Miner*, 19 November 1953. The Copper River Highway began with the conversion of a portion of the Copper River and Northwestern Railway. The rail line originally extended from Cordova to Kennecott by way of Chitina and was abandoned in 1938. In 1945, the Forest Service converted the first 13 miles out of Cordova for vehicular use, and in the 1950s and 1960s, construction efforts continued to push north. Construction was halted by the 1964 earthquake that destroyed the Million Dollar Bridge, and while further efforts have converted some additional mileage to a gravel surface, the goal of connectivity between Cordova and Chitina remains unrealized.

[295] Today the Denali Highway connects the Richardson Highway to the Parks Highway (dedicated in 1971) at Cantwell south of the park's entrance. United States Department of the Interior, 1954, 24; "ARC Maps Road Plans," *Anchorage Daily Times*, 16 March 1950.

A postwar shortage of newsprint and increasing demand for rayon led to renewed interest in the development of Alaska's forest product resources. This led to a corresponding increase in the construction of roads for timber harvest and transportation to processing facilities. The Tongass Timber Sales Act of 1947 opened the Tongass National Forest for large-scale harvest by private companies. Large-scale timber harvesting and pulp mill operations were established in Ketchikan in 1954 and Sitka in the Tongass National Forest in 1959, bringing a boom in development and economic prosperity to the region.[296] Prior to the 1940s, most logging occurred at the tidewater and along shorelines. Few logging roads existed, as overland transportation was impractical and cutting operations were water-based. The first known logging road was constructed in 1938 on Long Island, but the only instance of substantial road-based logging occurred on Kosciusko Island as part of a program to harvest spruce for airplane construction during World War II. With the establishment of the pulp mills, however, logging began to move further inland, necessitating the construction of roads to move equipment and harvested logs. Between 1954 and 1959 the volume of timber cut commercially in southeast Alaska's National Forests nearly tripled, and continued to rise sharply for the next 20 years.[297] Many additional logging roads were constructed in southeast Alaska's panhandle during this time period.

While private companies constructed offshoot logging roads, the National Forests also contained roads built by the BPR and the USFS. The 1921 FAHA divided the classification of roads within the National Forests into two categories. The first category, Forest Highways, are public roads, owned by a public authority (usually State- or locally-owned), that serve the National Forest system. The second category, Forest Development roads and trails, were built and owned by the U.S. Forest Service. Forest Development roads and trails are defined as roads and trails serving the National Forest System "that the U.S. Forest Service deems necessary for protection, administration, and use for the National Forest System and the use and development of its resources." These were typically built to less than highway standards and carried traffic for purposes directly related to the use of the National Forests; some served as access spurs to logging roads. Usually planned during the negotiations of timber sales contracts, these spur roads were constructed taking the possibility of recreational use into consideration.[298] The Forest Service built spur roads that led from existing roads into the sale area, and the timber companies would then construct the offshoot roads to access specific areas for harvest.[299] Those spur roads that

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[296] Walter Borneman, *Alaska: Saga of a Bold Land* (New York: Harper Collins, 2003), 382-383; Alaska Division of Economic Development, "An Historical Overview," *Forest Products*, available at http://commerce.alaska.gov/ded/dev/forest_products1.htm (accessed 12 March 2013); Borneman, 383 and Naske and Slotnick*: Alaska: A History,* 249-250.

[297] United States Forest Service, PNW-66 (1978), 25, 54, 56.

[298] United States Forest Service, *Travel Management Glossary*, http://www.fs.fed.us/r2/recreation/travel_mgmt/glossary/terms_081607.pdf (accessed 2 December 2013); United States Department of Agriculture - Forest Service, *A Development Program for the National Forests* (U.S. Government Printing Office, 1961), 13; Wilbur Smith and Associates, *Alaska Highway Study*, prepared for the United States Department of Commerce, Bureau of Public Roads (1965), *Alaska Highway Study*, 40.

[299] The understanding of the construction of these logging roads is based on research and discussion with the DOT&PF Cultural Resources team and cultural resources staff at the Tongass National Forest. McCallum and Schurke. Phone interviews by Chad Moffett, Mead & Hunt, Inc., 18 June 2013; Wilbur Smith & Associates, 40.

continued to be used recreationally were maintained, but the smaller offshoots that were not expected to be used after the timber harvest was completed were cross-drained and left unmaintained.[300]

Throughout the 1940s and 1950s, the BPR remained directly responsible for the construction of the public roads designated as Forest Highways that served the National Forest System.[301] Unlike the Forest Development roads, the Forest Highway system was primarily conceived as a network of through roads that carried traffic from one destination to another.[302] The majority of Forest Highways are located in the southeastern region of Alaska and areas surrounding Prince William Sound. Forest Highways constituted 7 percent or approximately 310 miles of the highways in the territory in 1954 and served seven communities located within their boundaries, including Juneau, Ketchikan, Sitka, Cordova, Petersburg, Wrangell, and Seward.[303] Some of these highways were built to serve the logging industry while others were constructed to improve connections to communities within the forest boundary, many of which expanded in the 1950s and 1960s as a result of the rapid growth of the timber and pulp industries at that time.

The BPR, in its postwar plan, called for reconstruction projects in National Forests since only essential maintenance had been done during the war. It was anticipated that the Forest Highway Act of 1944 would provide $1.5 million for forest highways each year for five years and planned reconstruction efforts focused on the Tongass, Glacier, Seward, Douglas, Moose Pass, Cordova, Mitkof, Wrangell, and Kenai River Highways. However, funding was not allocated at the anticipated level and some roads were built with funds appropriated by the territorial government.[304]

In 1949 BPR Commissioner Thomas H. MacDonald proposed a road building program to help Alaska, including the extension of roads from main highways to settlement areas.[305] At this time, communities within the forest reserves and the ARC were lobbying for increased road construction to serve southeast Alaska. During fiscal year 1953 the BPR constructed 12 improvement projects in the forests near Ketchikan, Juneau, and Sitka, with the largest projects being the reconstruction of approximately 7 miles of the Tongass Highway, reconstruction of approximately 5 miles of the Sitka Highway, bituminous

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[300] Wilbur Smith & Associates, 40.

[301] Forest Highways should not be confused with the more general term "forest roads," as they were built under different jurisdictions and their construction reflected different needs.

[302] United States Department of Agriculture - Forest Service, 13

[303] "Annual Report of the BPR to the Governor for the Fiscal Year 1954," 1 (Alaska State Archives, Juneau, Record Group 25, Series 729, Box 4898); George Sundberg, Consultant, letter to Major General Phillip B. Fleming, Administrator, Federal Works Agency, 22 October 1948 (University of Alaska Fairbanks Archives, Gruening Collection, Series 3A, subseries 2, Box 28, Folder 194).

[304] Chr. F. Wyller, Acting District Engineer of Federal Works Agency, Public Roads Administration, Division Eight, Alaska District, letter to Hon. Ernest M. Gruening, Governor of Alaska, 23 January 1946 (Alaska State Archives, Juneau, Record Group 25, Series 729, Box 4898).

[305] "10-Year Road Plan Urged for Alaska," *Fairbanks News-Miner*, 18 May 1949; George Sundberg, Consultant, letter to Major General Phillip B. Fleming, Administrator, Federal Works Agency, 22 October 1948.

surfacing of the Douglas and Glacier Highways, and construction of approximately 3 miles of minor roads near Ketchikan. The following fiscal year the BPR reported 14 construction projects totaling approximately $6.9 million, including completion of reconstruction work of the last section of the Seward Highway, a 4-mile section of the Mitkof Highway near Petersburg, and an approximately 9-mile section of the new Copper River Highway between the Cordova airport and Alaganik.[306] These projects demonstrate the typical construction activities undertaken by the BPR.

3.5.3 Alaska's inclusion in the FAHA

The inclusion of Alaska in the FAHA was long desired as a means to receive consistent federal funding through the federal grant-in-aid formula that provided funds for road building directly to states as established under the 1916 Federal Aid Road Act. As a territory, Alaska instead received federal funding for roads as a direct congressional appropriation provided to the Department of the Interior. The grant-in-aid formula, established under the FAHA, used a state's land area, population, and road mileage to determine allocations. States were required to match federal funds at 50 percent, and funds could only be used for road construction efforts, not maintenance work. In 1924 Congress extended the law to the territory of Hawaii, and by 1938 to the territory of Puerto Rico; however, despite territorial delegates' best efforts, Congress did not provide a similar opportunity to Alaska.[307]

After World War II, interest to include the territory under some measure of the FAHA grew amongst territorial citizens, businesses, and legislators. For Alaska's administration and the ARC, inclusion in the FAHA meant orderly progress on the highway program, which was plagued by unpredictable annual funding. Advocates for Alaska's participation in the FAHA understood that Alaska could not be considered under the same provisions as the 48 states. Under the federal-aid formula, Alaska would have received more than $27 million in funding, but would have to finance many million dollars in matching funds, an amount it could never meet without a drastic increase in taxes.[308]

To demonstrate the financial advantage of being included in the FAHA, the Alaska Legislative Council made a comparison of the amount provided in 1954 by federal appropriation versus what would be available using the FAHA grant-in-aid formula. Instead of the $14.6 million Alaska received by federal appropriation, the territory would have been provided $21.6 million if they had been under FAHA. At the same time, the grant-in-aid under FAHA required a match that would have been difficult to reach with the territory's two-cent motor fuel tax. The other potential disadvantage of the grant-in-aid program was that

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[306] "Annual Report of the Bureau of Public Roads to the Governor for the Fiscal Year 1953," 1-2 (Alaska State Archives, Juneau, Record Group 25, Series 729, Box 4898); "Annual Report of the BPR to the Governor for the Fiscal Year 1954," 1.

[307] Everett P. Wood, letter to E.L. Bartlett, 3 May 1955 (subseries 19R, Box 4, Bartlett Collection, Alaska and Polar Region Collections & Archives, Elmer E. Rasmusen Library, University of Anchorage at Fairbanks, Fairbanks, Alaska); Congress House Committee on Roads, *Federal Aid Highway Act: Hearings Before the Committee on Roads, House of Representatives Seventy-Fifth Congress* (Washington, D.C.: U.S. Government Printing Office, 1938), 39, 366.

[308] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 4, 12, 16.

the federal government did not provide funds for maintenance; under the existing arrangement, the ARC was receiving about $3 million in maintenance funds.[309]

To demonstrate Alaska's dedication to participating in the FAHA grant-in-aid program, the territorial legislature increased the motor fuel tax from two to five cents per gallon in 1955 to help pay for any matching requirements.[310] According to an *Anchorage Daily Times* editorial, the gas tax increase removed all impediments to Alaska's participation in the Federal Aid Highway program and "should overcome the objections of those congressmen who said gruffly that Alaska should first attempt to aid itself before coming begging to Congress for more money."[311]

Many felt it unfair that though Alaska was excluded from the federal-aid funding for road development, the territory was not exempt from the federal gas tax increase that provided funds for the FAHA. As a result, Alaska, though not a participant in the FAHA, provided $700,000 to the program in 1955, ultimately paying for other states' road projects. Additionally, with a vast amount of the territory's land area owned by the federal government, proponents felt that "road building is clearly a federal responsibility," and deserved to be included in the FAHA.[312]

Although earlier proposals and efforts to have Alaska included in FAHA in the late 1940s failed, a proposed amendment to the bill eventually won support in the Senate, with the provisions that the territory would have 33 percent of its land area used in the apportionment formula, the territory would contribute no less than 10 percent to the apportioned funds for each fiscal year, federal-aid funds could be used for construction and maintenance, and all road functions would transfer from the ARC to the BPR. In June 1956 President Eisenhower signed the updated FAHA into law, which authorized funding through 1959. Under the agreed amendment, Alaska's portion of federal aid was more than $2 million in 1957 (due to previous Department of Interior appropriations of $11 million) and more than $14 million in 1958 and 1959. The 10 percent matching grant meant that the territory had to present a match of $190,000 in 1957 and about $1.3 million in 1958 and 1959. Revenue from the territory's five-cent gas tax covered these matching requirements.[313]

Within 90 days of the enactment of the 1956 FAHA all duties, equipment, and employees and 3,594 miles of territorial roads transferred from the ARC to the BPR, and the ARC was dissolved. The BPR continued to improve principal highways, largely as an extension of ARC's established programming. The BPR promoted expansion of the primary highway routes (see Table 8) in order to connect roads to areas of industry, agriculture, recreation, and tourism; plan for a ferry system and connect roads to other transportation systems in the territory; and expand forest highways. For example, in the late 1950s the

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[309] Alaska Legislative Council*, Progress Report to the Legislature of the Territory of Alaska – Highway and Road Finance*, 1954, 16.

[310] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 19.

[311] "We Need Federal Highway Aid," *Anchorage Daily Times*, 28 December 1955.

[312] "Alaska Left Out," *Washington Post,* 1 May 1956; "Highway Sophistry," *Anchorage Daily Times,* 27 December 1955.

[313] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 24, 25, 28, 34.

BPR planned construction of about 120 miles of forest highways near Wrangell (Forest Highway Route 16), Ketchikan (Forest Highway Route 1), and Juneau (Forest Highway Routes 2 and 31).[314]

The BPR worked with the newly formed Territorial Alaska Highway and Public Works Department to set priorities and spend federal-aid funds and they worked together to develop the FAHA appropriation proposal for 1958, which ultimately netted $13.9 million and $14.2 million for the 1960 and 1961 fiscal years (see the sidebar titled *Alaska Highway and Public Works Department* below).[315] BPR's oversight in Alaska's road-building history continued until Alaska was admitted as the 49th state of the union.

Table 8. Alaska's principal highways in 1956[316]

Highway	Improvement status
Richardson Highway	365-mile route between Valdez to Fairbanks with 232 miles paved. (The remaining unpaved portions under contract to be paved by 1957.)
Alaska Highway	Undergoing widening and paving from the Canadian border to Big Delta.
Glenn Highway	Entire highway paved.
Taylor Highway	Gravel-surfaced road only open during the summer months.
Seward Highway	Entire route paved.
Sterling Highway	Gravel-surfaced from Soldotna to Homer with steep grades. (Highway under contract for reconstruction and relocation by 1957.
Steese Highway	Primarily a "low standard" gravel-surface road, except a small paved portion outside of Fairbanks
Elliot Highway	Gravel-surfaced from Fox to Livengood. Expansion of the road contemplated by the territorial government to the mining communities of Eureka and Manley Hot Springs, west of Fairbanks.
Haines Highway	Paved from Haines to the Alaska-Canada border
Denali Highway	Gravel-surfaced road with narrow width and winding alignment undergoing construction.
Copper River Highway	Unsurfaced road with steep grades with portions undergoing improvement (portions of the road not constructed).

[314] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 41, 44, 169-174, 202-222, 217-223, 265.

[315] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 326. Over the coming decade to 1970, the state received allocated federal highway funds under a revised annual FAHA. Legislation dictated Alaska's funding appropriation would not change between each annual act, but rather be maintained until specific legislation was passed altering the State's status under the program.

[316] The BPR identified these as Alaska's principal highways following inclusion in the 1956 FAHA. Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* see footnote 7 on pages 58-60.

Alaska Highway and Public Works Department

Following the 1956 FAHA and while under BPR oversight, the Alaska territorial legislature created the Alaska Highway and Public Works Department as a way for Alaska to assist the BPR in setting priorities and spending federal-aid funds. Edgar H. Swick, BPR Regional Engineer for Alaska, welcomed the formation of the Alaska Highway and Public Works Department and assisted in writing legislation. The "Act Creating the Alaska Highway and Public Works Department," formed a separate highway division and public works division, supervised by two separate directors. Also under the legislation, the Territorial Governor appointed a five-member Alaska Highway and Public Works Board to oversee supervision of the departments, accept federal funds, sign contracts, and approve right-of-way and access control issues. Additionally, the board worked closely with the BPR on federal-aid planning and funding requests.

The newly formed agency, as it name implies, was split into two divisions. The Highway Department, under the direction of Lee Hubbard, oversaw Alaska's road planning, construction, and maintenance program, while the Public Works Department performed other public works planning and construction activities.

See Table 1 in Section 3.3 for a listing of Alaska's main road agencies through the years.

Source: Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 182-186.

3.5.4 Conclusion

In less than two decades between the beginning of World War II and the inclusion of the territory in the FAHA, the road system in Alaska was greatly expanded and updated. Figure 14 shows the overall progress of the ARC in just over 50 years of road-building efforts. With this expansion of vehicular roads, the more than 3,000 miles of wagon and sled roads that served as a main part of the territory's transportation system in 1940 were obsolete, in part because the road system had been greatly improved. New areas could be reached by roads, principal cities and military installations were connected, and the ice-free ports of Valdez (via the Richardson Highway), Seward (via the Seward Highway), and Haines (via the Haines Highway/Cutoff) were accessible on all-weather routes. Major highways were generally improved in design and paved, and there was connection to the lower 48 states via the Alaska Highway. By the end of 1955 the $150 million Alaska highway program begun in 1948 was 90 percent complete.[317] The ARC's responsibility included 3,792 of the territory's overall 4,101-mile highway system. This included the maintenance of principal roads with 1,000 miles of all-weather routes and a 570-mile secondary road system serving farms, mines, and industry, and connecting populated areas with air, rail, or water transportation.[318] In the postwar decade, areas of the territory not served by roads continued to be connected with other modes of transportation, mainly marine and air travel, making Alaska unique to have three primary modes of transportation.

[317] "Alaska Road Commission Will Begin Nenana Highway Work this Season," newspaper unidentified, 4 February 1956 (State Library, Juneau, MS83-3 Series 1, Vol. 1-5 1951-57).

[318] "Alaska Road Commission Will Begin Nenana Highway Work this Season," February 1956 (MS 83-3 Series, State Library, Juneau, Alaska); Edman, Hudson, and Johnson, *Fifty Years of Highways*, 124.

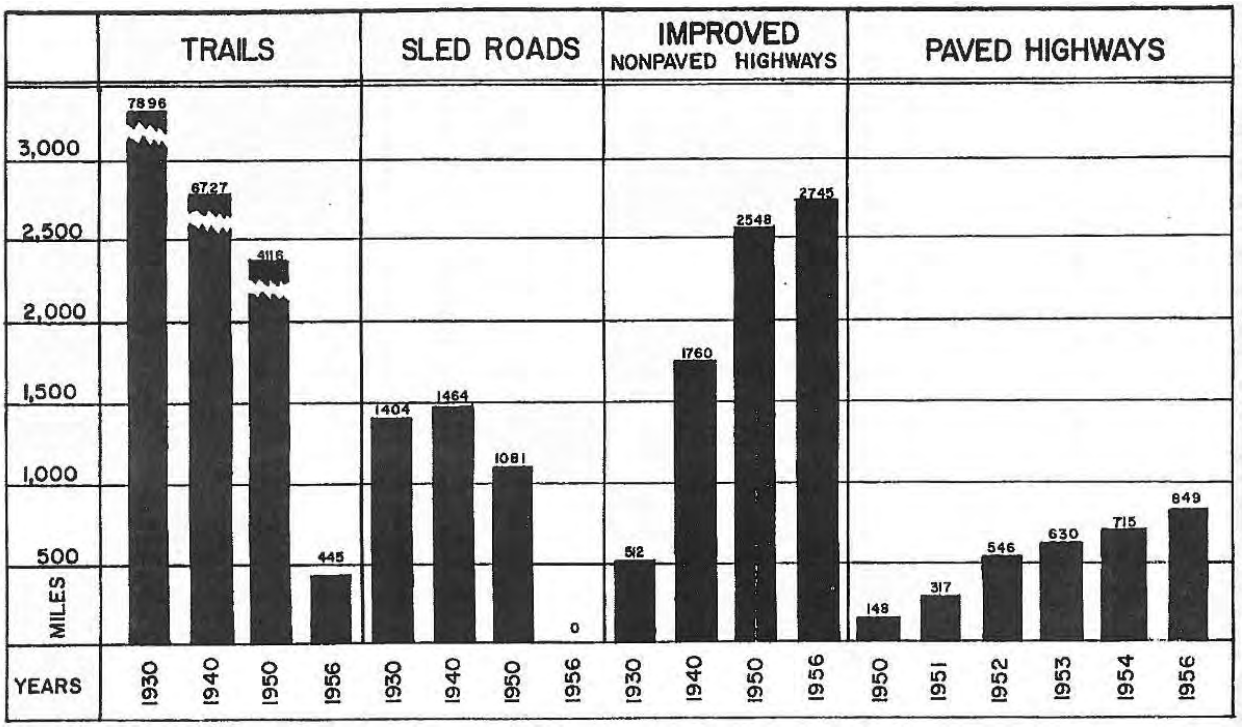

Figure 14. Progress of road construction in Alaska. Source: ARC 1956, 31.

3.6 Transition to statehood and expansion of highways (1959 – 1965)

In the early 1960s Alaska expanded its overall population, grew its urban centers, and developed industries. At the time of statehood, Alaska had a population of 226,167 with only 40 cities and remained a vast land with a limited overall population.[319] Less than half of these cities had a population of 1,000 or more in 1960, with Anchorage and Fairbanks possessing the largest populations with 44,000 and 13,000 residents respectively. Economic development following statehood was anticipated for the state's existing small lumber industry as well as other industries, including mining, oil, fishing and tourism. The transfer of significant acres of land (103.5 million acres) to the state from the federal government, which held 99.8 percent of the land in Alaska prior to statehood, was anticipated to assist in the state's economic development. Another economic driver of this period was continued defense spending through the mid-1960s.[320] In fact, according to historian Laurel Hummel, "the defense industry in Alaska was the biggest employer and biggest spender in the state from the 1940s to the 1970s," surpassed only by the oil industry in the late 1970s.[321] Roads were improved and developed to support this period of growth, military needs, and industrial development within Alaska. In addition, at this time preservation of wilderness areas was also initiated. Under the Wilderness Act of 1964, federal land management agencies were to identify areas under their jurisdiction without roads that could be recommended to

[319] Richard Forstall, "Part II. Population of the United States and Each State: 1790-1990" in *Population of the States and Counties of the United States: 1790-1990* ([Washington, D.C.:] Department of Commerce, U.S. Bureau of the Census Population Division), 2.

[320] Naske and Slotnick, *Alaska: A History*, 205, 249, 257, 260.

[321] Hummel, 58.

Congress to be included in a national wilderness preservation system. The Wilderness Act and subsequent federal legislation in the next decades led to a debate in the state over the balance between preservation of wilderness and economic development. Roads as a transportation mode that supports economic development became part of this discussion and the concern was summarized by Naske as "…how could the state's needs for transportation corridors across Alaska's vastness be satisfied without adversely affecting natural values in the areas crossed?"[322] Road planning and building would face new questions following the legislation (see sidebar titled *Influential federal legislation for the environment and Native American rights* in Section 3.7.1.5*).*

This section provides an overview of road development following statehood, focusing on the state and federal priorities and goals to address transportation needs and expansion of the highway system related to increased population, economic development with a focus on accessing resources, and national military needs. From an administrative perspective, Alaska's road-building story more closely parallels that of the lower 48 states as it relates to funding, development, and adherence to national standards. Inclusion in the FAHA provided consistent funding and led to formation of a state highway agency responsible for road building. A significant event, the Good Friday Earthquake of 1964, would greatly impact the state and its road network in the south and central areas and would force the Department to drastically scale back its infrastructure development goals and shift priorities toward road repair in the immediate aftermath of the earthquake.

3.6.1 Statehood and the Omnibus Act of 1959

Alaska's strategic importance to U.S. military efforts during World War II aided its admission as the 49th state in 1959. Most importantly, military efforts in Alaska during World War II and the Cold War gave the territory a larger population base and growing economy, both factors in convincing legislators that Alaska could successfully self-govern.[323] President Dwight D. Eisenhower finalized the statehood legislation by signing the bill into law on July 7, 1958, with the official proclamation on January 3, 1959.[324]

Due to Alaska's statehood, road development shifted from a federal responsibility of the BPR (assumed from the ARC since 1956) to a state-led effort under a newly formed Division of Highways (Department). Statehood afforded additional rights not previously available, including the responsibility to fund and maintain roads. Road funding, for both construction and maintenance activities, was the single largest challenge facing the new Alaska state highway agency.[325]

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[322] Naske and Slotnick, *Alaska: A History*, 309-310, 312.

[323] Hummel, 58; Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 327.

[324] The overwhelming majority of Alaskans supported statehood, as evidenced in a territorial vote in late 1958. Hummel 58; Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 327.

[325] After statehood, Alaska's state highway agency changed names three times, from the Department of Public Works, Division of Highways to the Alaska Department of Highways and finally to the current Alaska Department of Transportation & Public Facilities. This report refers to Alaska's state highway agency as "the Department" (see Table 1). Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 341.

With admittance as a state, the U.S. Bureau of Budget concluded that the special status afforded to the territory under the 1956 FAHA should be repealed. As a result, all of the state's land area was used in the appropriation formula and highways, outside of roads in National Forests, transferred from the BPR to the new Department. The repeal of the special territorial status resulted in greater matching obligations and required the state to fund maintenance activities without federal support. For newly elected Senator Bob Bartlett, these conditions were harsh as the fledgling state could not meet the 14 percent requirement for matching funds and assume responsibility for all road maintenance (excluding roads on federally owned land). To aid in the transition to statehood and relieve some of the financial burden of the FAHA requirements, the Bureau of Budget recommended that Congress award the state $27.5 million in transitional grants to use at its discretion over a five-year period on a gradually decreasing scale. The Bureau of Budget also advised Congress to award the state $4 million each year between 1960 and 1964 to assist with the maintenance of roads. The Bureau of Budget assumed that by 1965 state revenues, especially from taxes on natural resource extraction, would be adequate to maintain roads and meet the federal fund matching requirements.[326]

While Alaska would receive nearly equal treatment as other states, the BPR suggested waiving a provision under the 1921 FAHA specifying that each state's federal-aid primary and secondary highway system could not exceed 7 percent of the total highway mileage that existed in 1921 (urban areas and federal lands excluded). The 1921 provision likely ensured that the federal government did not pay for all road development in the state. If Congress did not waive the 1921 provision, Alaska's primary highway system would be very short as the state's total highway mileage in 1921 was 2,000 miles. Exclusion of Alaska under the provision had precedent, as Congress had previously exempted the primary highway systems in Hawaii, Puerto Rico, and Washington, D.C. from the 7 percent requirement.[327]

After much debate between legislators, Congress agreed to the BPR's recommendations of transitional funds for Alaska's road maintenance efforts as well as exception under the 1921 FAHA provisions. On June 25, 1959, the Omnibus Act was signed into law, starting the transition from BPR oversight to a new state-run highway program.[328]

3.6.2 State highway department road building focus and initiatives

Following statehood and into the early 1960s, the state focused on learning policy and procedure, and growing a successful highway department. For additional information on this Department's administration, see the sidebar *Highway department administrative history* later in this section. The Department made its priorities public with the release of its 1961 annual report, which specifically outlined its goals to improve and provide highways to the state's natural resources and to connect rural and urban communities. T.D. Sherard, the Department's first Director of Highways, stated the Department's intentions:

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[326] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 341, 343-344.

[327] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 346.

[328] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 348; for additional information on statehood, the omnibus act, and the transition between the BPR and the new highway division, see Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956*.

> While we are pleased with the accomplishments made during this past year, we fully realize that much remains to be done. Alaska is a changing state. Our economy moves forward with each new industry attracted by our vast and rich natural resources. This, in turn, creates the need for new and improved transportation networks which must be built to satisfy our rural and urban needs. Our new and improved highway systems will become a tremendous asset in selling Alaska's scenic wonders and unsurpassed natural resources to the rest of the world. In the requirement to be met in the years ahead, the Division of Highways stands ready to provide the necessary modern highways essential to the continued growth of the great State.[329]

In the early 1960s the Department made progress on ongoing, large-scale highway projects. For example, the state accomplished "major new construction" on portions of the Copper River Highway north of Cordova and south of Chitina, continuing the construction of this road planned in the mid-1940s. It also completed portions of the Parks Highway from Willow to Kashwitna (see Section 3.7.1.3 for further discussion of the development of the Parks Highway).[330] At this point, these roads were gravel with planned future paving. For all new road construction, the Department initiated a policy that required bituminous pavement to "give a good all-weather dust and mud free surface for travel" and "provide a pleasant driving surface."[331] Road upgrades included reconstructing portions of "low standard" roads to improve safety and reduce maintenance costs. Reconstruction occurred on portions of the Sterling Highway between Soldotna to Homer, the Richardson Highway between Delta Junction and Fairbanks, and the Edgerton Highway between Richardson and Chitina.[332]

By 1964 the Department maintained nearly 4,500 miles of roads. At this time, Omnibus Act of 1959 provisions, which provided transitional funds for maintenance, expired. Despite the additional financial burden of road maintenance, the state continued to expand, upgrade, and repair its road system. The state's annual engineering and construction contracts totaled more than $84 million in 1964. This figure represented an $11 million increase from 1963 and more than $59 million increase from 1961 in the total contract price of projects under construction in Alaska. These figures reflect a growing effort in the state to improve and expand its highway system. According to Department reports in the early 1960s, "Alaska enjoyed the largest highway construction program in its [the Department's] history."[333]

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[329] See State of Alaska Department of Public Works, Division of Highways, letter from T.D. Sherard to Commissioner Richard Downing, transmitting the annual report, 1961, 2.

[330] The Parks Highway was originally known as the Anchorage-Fairbanks Highway from 1958-1974. In 1975 the highway was renamed the Parks Highway after George Parks, former territorial governor from 1925-1933. Throughout this document the highway corridor will be referred to as the Parks Highway. D.A. McKinnon, Commissioner of Highways, letter to Governor William Egan, 30 November 1962, 6, 8, available in the Box 5, Subseries 19R, Bartlett Collection, University of Alaska – Fairbanks, Fairbanks, Alaska.

[331] D.A. McKinnon, Commissioner of Highways, letter to Governor William Egan, 30 November 1962, 7, 8.

[332] D.A. McKinnon, Commissioner of Highways, letter to Governor William Egan, 30 November 1962, 6; "State Highway Department Cities Progress for Year," *Juneau Alaska Empire*, 8 December 1964.

[333] State of Alaska, Department of Highways, 1964, 40; "Road Construction for 1964 Revealed," *Fairbanks Daily News-Miner*, 4 January 1964; State of Alaska, Department of Highways, 1963, 1, 3, 7.

The Alaska Highway

Throughout the 1950s and into the 1960s the Department continued maintenance and paving efforts on the Alaska Highway, started by the Alaska Highway Commission in 1949. Paving the highway was a result of American interests to benefit the growing, inter-modal transportation network in the state. By the early 1960s, Alaska had built a "marine highway," making the state more accessible for tourists and connecting previously unconnected towns in Southeast Alaska to the southern terminus in Washington state. Those arriving by ferry and wishing to travel inland used the Haines Highway to the Alaska Highway through the Yukon Territory and a portion of British Columbia. Members of the U.S. Congress felt it was vital to pave that portion of highway due to its increased use since the ferry system became operational in 1963.[334]

The Canadian provincial governments did not share the U.S. interest in improving portions of its highway system at the Canada-Alaska border, including the Alaska Highway and Haines Cutoff/Highway noting problems of terrain, sparse population, and an inadequate tax base. They were unprepared to undertake a complete rebuilding program even at shared cost with the U.S., preferring to devote resources to improving those sections in more populated areas.[335] A June 24, 1964, newspaper article reported that the entire 271 miles of the Alaska Highway within Alaska and the 83 miles north of Dawson Creek in Canada were paved, but the remaining 1,252 miles in Canada were still gravel.[336] This unpaved route included the Haines Junction, which was of particular interest to Alaska as the inland route from the marine highway. Discussion with Canadian officials, uninterested in financing paving efforts, stymied improvement efforts through the 1960s and much of the 1970s.

Highway department administrative history

Since statehood, Alaska's highway department oversaw state efforts in road building. The Department had two major reorganizations since its establishment at Statehood. While reorganization did not significantly impact road development plans and priorities, it did bring about changes to the organization's leadership and structure. This brief narrative of Alaska's highway department administrative history provides a general framework for understanding the Department's mission and organization.

Administration of Alaska's roads shifted from federal to state-led oversight in 1959 with passage of statehood. As a result, all former BPR and Territorial Alaska Highway and Public Works Department work was suspended as responsibility transferred to the newly established Department of Public Works. The Department of Public Works held responsibility for the construction and maintenance of state highways, ferries, roads, bridges, and traffic signs and signals. Within the Public Works Department, the Division of Highways (Department) oversaw planning, design, construction, and maintenance of Alaska's roads.[337]

[334] "Hearing Before the Subcommittee on Roads of the Committee on Public Works, United States Senate," 3.

[335] "Hearing Before the Subcommittee on Roads of the Committee on Public Works, United States Senate," 7, 8.

[336] "Alaska Highway Paved with Good Intentions," *Fairbanks Daily News-Miner*, 24 June 1964.

[337] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 359; Letter to Mr. R.J. Martin from an unknown author, regarding the Organization and Functions in Alaska, 14 December, 1959, in Naske's *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 389.

As part of the transition to a state-run highway program, the BPR continued to provide technical assistance to the newly established Department.[338] The Department confirmed the need for the BPR's expertise in its annual report, stating, "Liaison work between the Road Design Section and the Bureau of Public Roads is essential at this state of project development to insure a minimum of costly changes at a later date." For example, the BPR administered construction of a portion of the Glacier Highway (State Highway 7) and 10 miles of the Mitkof-Stikine Highway (currently the Mitkof Highway, in the area extending from Blind Slough to Dry Straits. As Department engineers gained experience and former BPR engineers joined the agency, the BPR's consulting role phased out by the end of 1961.[339] At this time, the BPR took on the traditional role typically found in the lower 48 states, notably oversight of projects using federal-aid funds.

In March 1962, Governor Egan made the Division of Highways its own department and renamed it the Alaska Department of Highways (Department). The reorganization provided better organization, monitoring, and financial transparency of highway development.[340] Now removed from the Public Works department, the Department held all "duties, powers, and responsibilities involved in the construction, maintenance and operation of all state highways, roads, bridges, traffic signs and signals, and other like facilities."[341] A commissioner led the department, which functioned as its own department within the state for 15 years, from 1962 to 1977. During this time, the organization oversaw reconstruction efforts following the Good Friday Earthquake, completion of the Parks Highway, and construction of new roads to resources.

In the late 1970s, under Governor Jay Hammond, the Department recombined with the Public Works Department to form the Department of Transportation & Public Facilities (Department), which it remains today. By grouping the Public Works Department with the Highway Department, the state removed duplication of efforts, improved intermodal transportation planning, and reduced spending. The newly combined department provided for stronger intermodal connections between highways, airports, and harbors. According to newly appointed Commissioner Donald Harris, "the guiding goal [of the Department] is overall planning," which included land-use and natural resource considerations, life-cycle cost, and public benefit.[342] Since 1977 the Department has continued to modernize its road systems, expand the highway system in urban areas, enhance access to resources through both state-led and public-private partnerships, and improve connections to tourist destinations.

[338] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 363, 365.

[339] State of Alaska, Department of Public Works, Division of Highways, 1961, 3, 19, 51, 377-379.

[340] "Highway Department Created," *Fairbanks Daily News-Miner*, 15 March 1962; "Veteran Highway Engineer Calls for Separate Units," *Fairbanks Daily News-Miner*, 6 February 1962.

[341] "State Division of Highways Created by Eagan," *Daily Sitka Sentinel*, 15 March 1962.

[342] Alaska Department of Transportation and Public Facilities, 1978, 1, 3.

3.6.2.1 Accessing resources

While typical road construction and improvement activities continued, the Department's greatest aim in the early 1960s was to provide transportation to the state's abundant natural resources. Many of Alaska's natural resource industries were booming. Alaska's first major oil discovery occurred in 1957 at the Swanson River field, near Soldotna, bringing with it a swell of industrial, commercial, and residential development in the Kenai Peninsula.[343] In southeast Alaska's panhandle, the timber and pulp operations established in the 1950s continued to expand and spur development in the decade that followed.[344]

The start of the Pioneer Access Road Program in 1962-1963 shows the state's effort to access resources. The purpose of the program was to "provide access to isolated areas of the State that are rich in natural resources."[345] In 1963 the Department constructed 63 miles of pioneer access roads at a cost of $438,000. Pioneer road projects highlighted in the 1963 annual report included 1- to 9-mile roads connecting mining, oil, and agricultural areas to primary highways or other modes of transportation, including air and marine. Examples of road development efforts highlighted in the annual report include:

- Construction of one mile of the MacLauren River Road to complete the connection with the MacLauren Mining Company (unspecified location) via an existing pioneer road
- Construction of the Chandalar Lake Road to complete the connection of the airfield at Chandalar Lake to a series of mines in the mountains (unspecified location).
- Extension of an existing roadway (unspecified location) from the North Kenai road near the Standard Oil refinery to serve "a rapidly growing agricultural area"
- Construction of the half-mile Chilkat Lake Road to connect the airfield at Chilkat Lake to the boat landing[346]

The work mentioned above illustrates another important departmental aim during this period, namely intermodal connections between the various forms of transportation in the state. The state provided increased funding to air and ferry transportation to facilitate the transport of goods, services, and resources. Roads were an important connector to these other modes of transportation. For example, the Alaska Marine Highway System, established in 1948 by private individuals and operated by the state in the 1960s, connected the highway systems of Juneau and Skagway to the Haines Highway. In the early 1960s, Alaska supported four international air carriers and nine interstate carriers, for a combined 20,000

[343] Borneman, 409-410.

[344] Alaska Division of Economic Development, "An Historical Overview," *Forest Products*, available at http://commerce.alaska.gov/ded/dev/forest_products1.htm (accessed 12 March 2013).

[345] State of Alaska, Department of Highways, 1963, 18.

[346] State of Alaska, Department of Highways, 1963, 18, 26.

miles of routes in the state served by air.[347] Airports provided international and interstate access to remote locations as well as to the major urban centers of Anchorage, Fairbanks, and Juneau.

Additionally, agriculture continued to be an important industry in Alaska, as indicated by the state's continued efforts to provide access roads to fertile farming areas. The state established roads and constructed bridges in the agricultural region of the Matanuska Valley to shorten distances and improve connection of farms to markets in Anchorage and the surrounding areas. In 1962 the state constructed a portion of the Parks Highway and a portion of the Chena Hot Springs Road, "which will open a good farming and recreation area" for use.[348]

3.6.3 Federal road-building efforts in Alaska

Development of roads, including roads to resources, was not singularly a state endeavor. Though the BPR's oversight of projects ended with statehood, it continued federal construction efforts in Alaska's National Forests. As reported by Commissioner McKinnon in a letter to Governor Egan, in 1962 the BPR undertook $2.8 million in forest highway engineering and construction.[349] Under an agreement with the BPR, the state assumed maintenance of the forest highways. The BPR supervised highway personnel on the construction of a $2.3 million section of the Mitkof Highway in the Tongass National Forest between Blind Slough and Dry Straits, near Petersburg on Mitkof Island, in this same year. By 1964 Alaska had 261 miles of designated forest highways, of which 240 miles were located on the Sterling, Seward, Tongass, Glacier, and Copper River Highways located in the Chugach and Tongass National Forests.[350]

Other federal agencies participated in forest and park road development in the state. The U.S. Forest Service, for example, developed roads and trails in National Forests to access marketable timber, funded through Congressional appropriation. Roads in these forests, in the 1960s, were not typically maintained after timber was harvested and transport facilities were abandoned. The NPS maintained National Park roads, including 100 miles of roads in Denali National Park largely comprised of the Denali Park Road. The Denali Park Road, the only main road in the park, was developed by the ARC between 1922 and 1938 through the park to reach the Kantishna mining community.[351]

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[347] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956,* 265; Alaska Department of Transportation & Public Facilities, "The Alaska Marine Highway Celebrates 50 Years!" http://www.dot.state.ak.us/amhs/presskit.shtml (accessed 7 January 2012); Wilbur Smith and Associates, 12.

[348] Ryan Madden, *On-the-Road Histories: Alaska* (Northampton, Mass: Interlink Books, 2005), 164-165, 167; State of Alaska, Department of Highways, 1962, 6.

[349] McKinnon's letter to Governor Egan did not include any particular details on the BPR projects or how the agency expended the $2.8 million.

[350] D.A. McKinnon, Commissioner of Highways, letter to Governor William Egan, 30 November 1962, 7- 8, available in the Box 5, Subseries 19R, Bartlett Collection, University of Alaska – Fairbanks, Fairbanks, Alaska; Wilbur Smith and Associates, 118.

[351] Wilbur Smith and Associates, 118; Jeremy Karchut, Denali Park Road Determination of Eligibility, National Park Service, July 2009.

The U.S. military also continued to influence road construction to support its missions throughout the Cold War. The federal government, motivated by the ongoing military activities of the Cold War, funded road projects to meet both military and civilian needs. In the late 1950s the Department of Defense looked to link its military installations in Anchorage and Fairbanks. The military wanted a more direct highway route between the bases to meet national defense interests and replace the circuitous route along the Richardson and Glenn Highways.[352] A direct route between Anchorage and Fairbanks, begun in 1958, was eventually realized with the dedication of the Parks Highway in 1971 (see Section 3.7.1.3 for further discussion of the Parks Highway development).

3.6.4 Good Friday Earthquake impacts the road network

The Good Friday Earthquake, which rocked south-central Alaska on March 27, 1964, damaged a portion of the state's road network and altered the state's road-building efforts. The 1964 annual report noted that the Good Friday Earthquake (also called the Great Alaskan Earthquake) "created a significant change in the emphasis on the program of the Department of Highways."[353] The state shifted federal funding from construction efforts to emergency repairs, rebuilding, maintenance, and safety. Recovery efforts lasted until the late 1960s, and directly influenced development of highways in the state.

The Good Friday Earthquake was the largest earthquake in North American history to date.[354] The earthquake occurred deep underground in Prince William Sound, approximately 75 miles east of Anchorage and 56 miles west of Valdez, and registered 9.2 on the Richter scale. The earthquake and following tsunami caused significant damage to Alaska's roads, especially in south-central Alaska and on Kodiak Island. The Richardson and Seward Highways, along with portions of the constructed Copper River Highway, were located near the epicenter and experienced the most damage.[355]

The Department immediately began emergency repair work on roads and bridges to enable supplies to reach hard-hit areas and restore traffic in urban areas. Work proceeded rapidly as the Department paved a 13-mile stretch of the Sterling Highway, between Soldotna and Kasilof, at a rate of 3,000 feet per day.[356] Engineers worked around the clock on preliminary road design, with copies of plans sent to the Washington Highway Department's computer design lab for processing. For more information on how computers aided in reconstruction efforts and modernized road design in Alaska, see the sidebar titled

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[352] Naske, *Alaska's Inclusion in the Federal-Aid Highway Act of 1956*, 131-132.

[353] State of Alaska, Department of Highways, 1964, 1.

[354] There are conflicting sources on the magnitude of the 1964 earthquake, ranging from 8.3 to 9.2 on the Richter scale. According to the USGS, the 1964 Prince William Sound earthquake was the largest in the United States, measuring at 9.2; see USGS, "Largest Earthquakes in the United States," *Earthquake Hazards Program*, http://earthquake.usgs.gov/earthquakes/states/10_largest_us.php (accessed 7 December 2012).

[355] John Galvin, "Great Alaskan Earthquake and Tsunami: Alaska, March 1964," *Popular Mechanics*, n.p., http://www.popularmechanics.com/science/environment/natural-disasters/4219868 (accessed 7 December 2012); Gary G. Sturman, "The Alaska Highway System," in *The Great Alaska Earthquake of 1964* (Washington, D.C.: National Academy of Sciences, 1973), 989-992, 999.

[356] Katherine Parker, "Road Being Paved at Rapid Rate," *Anchorage Daily Times*, 8 July 1964.

ADH technological advancements: Use of computers to aid in road design in Section 4.4.5.2. Three months after the earthquake, the Department reestablished highway access from Anchorage to the Kenai Peninsula and from Cordova to the Cordova airport. However, repair work was a long process due to the amount of damage sustained, short construction season, time-consuming soil testing, and simply the challenge of rebuilding sunken or twisted portions of roads.[357] As a result, the Department suspended all previously planned highway work until they completed cleanup and emergency road restoration.[358] The Department was not alone in its funding efforts to repair or rebuild roads. Immediately following the earthquake, President Johnson appointed the Federal Field Committee for Development Planning in Alaska in 1964 (later known as the President's Review Committee for Developmental Planning in Alaska). The committee oversaw and coordinated federal earthquake relief efforts as well as made recommendations for reconstruction and economic development in the state. With the recommendations of the committee, Congress provided additional funds to repair and reconstruct highways, railroads, airports, and harbors, as well as fund capital improvements in communities.[359] Additionally, in the months following the earthquake the BPR earmarked $18.3 million in federal emergency relief funds to repair damaged Alaska highways, an additional $4.6 million to reconstruct portions of the Richardson Highway, and $1.9 million in aid in repairs to the Glenn, Richardson, Sterling, and Seward Highways, bringing the total federal aid to over $22 million. The USACE also spent $110 million clearing debris and rebuilding roads.[360]

By the end of 1964 over $10 million had been spent on emergency construction work on roads, with 197.6 miles of road repaired. The Department restored seven miles of the Seward Highway at the east end of Turnagain Arm to pre-quake levels. It let other contracts to restore damage on 102 miles of the Seward and Sterling Highways, 62 miles of the Richardson Highway, and 6 miles of the Copper River Highway. Despite these efforts, the Department still had much to do to correct damage to principal state highways and structures on the Glenn, Seward, Richardson, Tok Cutoff, and Copper River Highways, which was estimated at greater than $65 million.[361]

Due to the extent of damage caused by the earthquake, repair efforts directly associated with it extended into the late 1960s. Emergency repair work to roads and bridges deferred the majority of planned highway projects for a few years in areas not impacted by the earthquake. One road permanently impacted by the earthquake was the not-fully-completed Copper River Highway. At the time of the earthquake, the Department was constructing a portion of the highway into the interior to connect with the

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[357] State of Alaska, Department of Highways, 1964, 31; Murlin Spencer, "Quake Reconstruction a Long, Slow Process," *Anchorage Daily Times*, 1 July 1964.

[358] State of Alaska, Department of Highways, 1964, 1, 6, 7.

[359] U.S. Federal Reconstruction and Development Planning Commission for Alaska, *Response to Disaster* [Alaskan earthquake, March 27, 1964] (Washington, D.C.: [Government Printing Office], 1964) 6, 15, 18, 20, 25.35.

[360] "Highway Fund Increased," *Fairbanks Daily News-Miner*, 9 June 1964; "$2 Million for Highways," *Anchorage Daily Times*, 20 July 1964; Galvin, n.p.

[361] State of Alaska, Department of Highways, 1964, 2, 31, 38.

Edgerton Highway at Chitina.[362] The earthquake almost completely destroyed the road. A.W. Balvin, a Department district geologist, concluded in a *Fairbanks Daily News-Miner* article that, due to the damage the road sustained, it was not possible to repair. The Department estimated damage on this highway alone to be $34.6 million. While the Department conducted surveys for a new Copper River Highway route the following year, stating that the route was "of special interest," they did not undertake any work and the original plans for the Copper River Highway to extend from Cordova to Chitina were never fully realized.[363] Today the road extends from Cordova to the Million Dollar Bridge. For more information on how the earthquake impacted road engineering and design, see Section 4.4.5.2.

3.6.5 Conclusion

Under the leadership of a newly established highway department, Alaska entered a new era of road development following statehood. The Department immediately focused on expansion of the highway system and made accessing areas of resources and industry a top priority. However, the Department faced great challenges following the Good Friday Earthquake and, as a result needed to shift its road development priorities to rehabilitation, reconstruction, and repair.

3.7 Reawakening of old priorities and development of new aims: earthquake reconstruction to the oil boom (1965-1977)

For Alaskans, a number of specific events defined the1960s and 1970s, and influenced road development in the state. Notably, the mid-1960s began with reconstruction and redevelopment of southeastern Alaska following the Good Friday Earthquake, with repair efforts continuing well into the later-half of the decade. The 1967 centennial celebration of Alaska's purchase inspired construction of new tourist destinations and amenities to serve the thousands of visitors to the state. The discovery of vast oil deposits in the North Slope in 1968 renewed interest in natural resource extraction and stimulated debate on Native Alaskan land claims and environmental issues. In addition, the state's timber industry continued to grow, reaching $77.7 million in estimated end product value by 1967, which was an increase of approximately 64 percent since 1960. Finally, environmental legislation established in the late 1960s through the 1970s set aside vast areas of Alaska's natural wilderness from development. In total, about 120 million acres of Alaska lands were withdrawn from possible development under environmental legislation created between 1969 and 1979.[364] The impact of environmental and Native Alaskan land claim legislation is further discussed in the sidebar *Influential federal legislation for the environment and Native American rights* in Section 3.7.1.5.

This section details Departmental and federal road-building efforts from the mid-1960s through most of the 1970s. Notably, this period was one of expanding and upgrading the state-wide road system in both urban and rural areas. Achievements included completion of the Parks Highway and construction of new

[362] State of Alaska, Department of Highways, 1964, 1, 6; Sturman, 1001.

[363] Dave Gilbert, "Death Blow Dealt to Cordova Highway," *Fairbanks Daily News-Miner*, 6 April 1964; State of Alaska, Department of Highways, 1965, 13.

[364] Naske and Slotnick, *Alaska: A History*, 263, 313.

access roads to natural resources in remote areas of the state. It is also during this period that numerous miles of forest roads were being developed in the Tongass National Forest by the U.S. Forest Service to support the growing timber industry.

3.7.1 State road-building initiatives

The decade following the earthquake can be categorized as a multi-faceted approach to road development as road repair, reconstruction, and upgrade were occurring at the same time as highway expansion, development, and construction. State initiatives included connecting major communities, expanding urban transportation systems, fostering rural road development, and accessing natural resources. These initiatives were a result of the needed rehabilitation of roads following the earthquake, public demand, and growing industry. Additionally, the 1965 *Alaska Highway Study*, an independent study of the state's road system, was also influential in developing state-led road development programs.[365] See the sidebar *Alaska Highway Study* below.

As it had since statehood, the federal government primarily funded these road building efforts. In 1966 alone the federal government funded 79 percent of the Department's $91 million budget.[366] Despite federal funding restrictions in the late 1960s, which resulted in an estimated delay of almost a year for some planned state highway programs, the state forged ahead with accomplishing its goals.[367] By the early 1970s the state had an operating budget of over $100 million (with 65 percent dedicated to engineering and construction divisions). Congress continued to allocate increased federal funding to the state, which had an operating budget of over $117 million by 1974, with 74 percent provided from the federal government.[368]

The *Alaska Highway Study*

The *Alaska Highway Study*, released in 1965, was one of the most influential reports on the direction of road development in the state. Congress required the study under the 1962 FAHA to better understand the existing road system. The consultants who prepared the study reviewed Alaska's existing transportation system and appraised the adequacy of the state's existing highways, future needs, and funding. They also prepared a quantitative analysis on all primary, secondary, and tertiary (local service roads and development roads) road systems in the state.[369] The consultants concluded that Alaska's highways comprised an important transportation system in the state, even if modest when compared to the state's size. The study provided five principal recommendations, paraphrased below:

[365] Wilbur Smith and Associates, *Alaska Highway Study*, prepared for the United States Department of Commerce, Bureau of Public Roads (1965), 140.

[366] State of Alaska, Department of Highways, 1966, 4.

[367] State of Alaska, Department of Highways, 1968, 5.

[368] State of Alaska, Department of Highways, 1971, 8; 1974, 15.

[369] Department of Commerce, Bureau of Public Roads, *Report on the Alaska Highway Study* (Washington, D.C.: U.S. Government Printing Office, 1966), 1-2.

1. Reconstruct selective primary and secondary highway systems to AASHO standards.

2. Limit construction of access roads into undeveloped areas unless needs, benefits, and real costs are defined.

3. Define all roads not already classified as primary or secondary under a tertiary roads classification. Responsibility for construction and maintenance of tertiary roads should rest with the state.

4. Improve roads leading into Canada.

5. Increase efforts toward making road maintenance more effective and efficient.[370]

The *Alaska Highway Study* provided substantial evidence to support the proposed use of federal-aid highway funding for maintenance. In the 1966 FAHA, Congress included a special allocation of $70 million over five years, in addition to the regular federal-aid highway funds the state received, for construction of access roads and maintenance of highways.[371] Additionally, the *Alaska Highway Study* influenced the state's long-range transportation plans. In the 1966 long-range plan, the state made road reconstruction and maintenance a top priority.[372]

3.7.1.1 Highway reconstruction, safety, and beautification

Beginning in 1965, road reconstruction and rehabilitation were the state's top priorities, as indicated in the 1966 long-range transportation plan, "this program places the greatest emphasis on reconstruction of existing highways to minimize the state's maintenance costs and improve traffic service and safety."[373] The priorities resulted from repair needs following the earthquake and general roadway deterioration due the state's unique climate. According to the *Alaska Highway Study,* "Much of the existing designated primary and secondary highway systems have suffered considerable deformation due to frost action and drainage maintenance difficulties. It will be necessary to reconstruct nearly all of the primary system and most of the secondary system to meet projected usage."[374] Improvements by 1967 included construction of 519 miles of roadway, and rehabilitation (leveling and resurfacing) of 310 "badly distorted" miles on the Glenn, Tok, Richardson, and Alaska Highways. Additionally, 406 miles of highways were paved, an effort described as

[370] Wilbur Smith and Associates, 141.

[371] Brown and Jones, 168; "Congress Agrees to $5 Million for Alaska Roads," *Ketchikan Alaska Daily News*, 13 October 1967; State of Alaska, Department of Highways, 1969, 6.

[372] Knox, 10.

[373] Knox, 10.

[374] Wilbur Smith and Associates, *Alaska Highway Study*, prepared for the United States Department of Commerce, Bureau of Public Roads (1965), 140.

"the largest paving program in the history of Alaska."[375] On rural highways, the Department allocated $10 million for repaving portions of deteriorated primary rural highways to "improve ridability *[sic]*."

In 1967 the Department allocated an additional $219 million over five years for continued rehabilitation and construction efforts on Alaska's primary and secondary highways, including the Kodiak, Sterling, Seward, Parks, Glenn, Tudor, Fairbanks-Fox (a portion of the Steese Highway), Alaska, and Richardson Highways, and additions to the coastal network of highways in southeast Alaska. All road improvements and construction were completed using the Department's first standard design plans prepared in 1966, patterned after guidelines prepared by AASHO. Standard design plans better governed procedures and road design and construction features. In the following year, the Department updated survey procedures and standard drawings to make design, construction, and procedures uniform.[376]

The Department considered improving highway safety as another priority. The 1967 annual report stated "…the Department of Highways is responding to continued public demand for better and safer roadways equivalent to those common to the contiguous states. Improved alignment, moderate grades, wider pavement and shoulders and greater emphasis on safety features and aesthetic values are gaining increased importance in the program."[377] Efforts were not limited to primary or secondary roads. The Department upgraded local access roads and state maintenance roads to provide a safer roadway through widening, graveling, improving drainage, and raising grades. Additionally, the Department straightened several dangerous roads and improved sight distances on unspecified roads, as well as installed guardrails and striped all paved roadways.[378] Engineering information on Alaska's standard plans and safety standards is in Section 4.4.5.1.

During road reconstruction and safety improvement efforts, the Department also worked to make the highway corridors more aesthetically pleasing with a focus on tourism. This focus on beautification was tied to the state's upcoming centennial celebration of Alaska's purchase in 1967, where the state anticipated approximately 200,000 tourists, and reflected an aim to provide a pleasant experience to independent road-travelers and tourists. The 1965 National Highway Beautification Act provided needed funds to complete these beautification efforts, which included landscaping; installation of new lighting and medians; construction of scenic overlooks, rest areas, tourist spots, and campgrounds; screening of junkyards; and removal of signs along highways.[379]

The Department estimated in its 1966 long-range transportation plan that it would spend $1.3 million on beautification efforts, including junkyard and sign control, every year over five years. Alaska previously

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[375] State of Alaska, Department of Highways, 1966, 15, 33-34, 39.

[376] Knox, 1, 12-13; "Road Specs' Are Out," *Anchorage Times,* 4 December 1965; State of Alaska, Department of Highways, 1966, 15.

[377] State of Alaska, Department of Highways, 1967, 31.

[378] State of Alaska, Department of Highways, 1967, 45.

[379] State of Alaska, Department of Highways, 1967, 31; "Convenient Combination," *Fairbanks Daily News-Miner*, 18 July 1967.

passed a statute prior to statehood in 1949 banning outdoor commercial advertising along public highways. The state amended the statute over the coming years, substantially expanding and strengthening the ban in 1968 in response to the Highway Beautification Act. The purpose behind expanding the statute included safety and public welfare, but also to "protect scenic beauty and attract tourists." Updates to the statute would continue in the coming decades.[380]

The Department also added a Landscape Engineer to its staff to aid in planning and development of these projects. The first beautification project, completed in 1966 on 21 miles of Anchorage's 5th Avenue, featured new lighting, median islands, seeding, and plantings. By 1967 the state accomplished 17 beautification projects, including landscaping and constructing rest areas and scenic overlooks along highways.[381] The Department also built campgrounds along highways using Highway Beautification funds in anticipation of the 1967 centennial celebration; an example is the Department-constructed campground on Chena Hot Springs Road outside of Fairbanks.[382]

3.7.1.2 Urban road development

Despite ongoing road rehabilitation efforts, the state continued many of its existing programs, including urban road development. The Department's 1966 long-range plan outlined urban and suburban road development as one of the state's top priorities in order to "relieve worsening traffic congestion" in populous areas. The Department focused efforts in Anchorage, Fairbanks, Juneau, and Ketchikan, where population growth dictated the need. Anchorage saw the largest leap in population, growing 293 percent between 1950 and 1960; Fairbanks grew by 130 percent during the same period. Comparatively, Ketchikan and Juneau grew 22 and 14 percent, respectively, between 1950 and 1960.[383]

Most of the projects identified in the long-range plan focused on the Anchorage and Fairbanks urban environs, and included planned reconstruction of various streets and connections to the Seward and Glenn Highways in Anchorage and the Steese Highway in Fairbanks. The importance of urban road development projects is indicated by the amount of money the Department spent on projects in the Anchorage and Fairbanks Districts beginning in 1968. In the Anchorage District, the Department estimated planned highway work at over $23 million, up from $13 million in 1967. In the Fairbanks District, planned work climbed to over $20 million from $11 million in the previous fiscal year.[384] While the state placed emphasis

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[380] Knox, 12. Updates to the statute would continue multiple times throughout each coming decade with the latest revision to the statue occurring in 2002. Alaska Department of Transportation and Public Works, "History of Outdoor Advertising Statutes in Alaska," *Design and Construction Standards, Right-of-Way,* http://www.dot.state.ak.us/stwddes/dcsrow/pop_outdooradvertising.shtml (accessed 27 June 2013).

[381] State of Alaska, Department of Highways, 1965, 12; "Bids Asked For Beautification Project," *Daily Sitka Sentinel*, 26 January 1966; State of Alaska, Department of Highways, 1967, 32, 37; "Bidding To Open on Road Projects," *Anchorage Daily Times*, 3 March 1967.

[382] "Governor and Legislators Must Act on Campgrounds," *Fairbanks Daily News-Miner,* 21 February 1966.

[383] Knox, 11; State of Alaska, Department of Highways, 1968, 4; Richard Cooley, *Alaska's Population and Economy: Regional Growth, Development, and Future Outlook*, "Volume II – Statistical Handbook" (College, Alaska: University of Alaska, 1963), Table P-19.

[384] Knox, 13; "State Road Projects Due in Fairbanks," *Fairbanks Daily News-Miner*, 30 October 1967.

on Anchorage and Fairbanks, other cities also saw improvements. For example, between 1968 and 1969 the Department constructed two belt line routes, one around the Ketchikan business district and another connecting Juneau's downtown to the growing residential areas. According to the 1969 annual report, the "two belt routes will offer greatly increased convenience to drivers" and remove excess traffic downtown. In Nome, the Department began upgrading the Nome to Council Road (currently known as the Nome-Council Highway) to "modern design standards," which included widening and surfacing the roads.[385] For more information on road design standards, see Section 4.4.5.1.

The focus on urban road development was in part due to shifting national attention on improving transportation in and around urban areas. The 1968 FAHA required that each state prepare special planning programs for urban areas to make sure state road development priorities were in keeping with local needs and wishes. In response to the measure, the cities of Anchorage and Fairbanks formed organizations to coordinate future development plans with the Department: the Anchorage Metropolitan Area Transportation Study and the Fairbanks Metropolitan Area Transportation Study.[386] The Anchorage Metropolitan Area Transportation Study ultimately rejected the Department's limited-access highway plans, fearing that Department-proposed freeways would decrease property values and block access across the city. Instead, the community focused on improving the public transportation system. Of the seven proposed urban expressways in the Anchorage urban area in the 1970s, the Department eventually constructed only two—the Minnesota Bypass and the new Seward Highway—and upgraded a section of the Glenn Highway. The Fairbanks Metropolitan Area Transportation Study generally accepted the Department's limited-highway access plans proposed for the Fairbanks metropolitan area. Other work by the Department proposed for the 1968 construction season in the Fairbanks area included reconstruction of College Road and continuation of the Richardson Highway improvements toward the Eielson Air Force Base.[387]

Efforts to reduce traffic congestion and improve traffic flow in the state's major cities continued into the early 1970s. For example, beginning in 1973 the Department planned and contracted a new four-lane highway connecting the Richardson Highway to the Steese Highway in Fairbanks. In 1974 the Department expanded capacity in north Anchorage by adding additional lanes to the Glenn Highway to provide improved traffic flow in the city.[388] This improved traffic flow on the Glenn Highway complemented the state's project, initiated five years earlier, to reconstruct the portion of the Glenn

[385] State of Alaska, Department of Highways, 1968, 15, 19.

[386] Now the Anchorage Metropolitan Area Transportation Solutions and the Fairbanks Metropolitan Area Transportation System, respectively.

[387] "Section Two: Background/Resources Papers," *Vision 2020 Update: Statewide Transportation Policy Plan*, 21; "State Road Projects Due in Fairbanks," *Fairbanks Daily News-Miner,* 30 October 1967, 9.

[388] Fred Pratt, "Council Slates Action on Highway," *Fairbanks Daily News-Miner*, 24 September 1973; "Road Bids Asked," *Fairbanks Daily News-Miner*, 31 January 1974.

Highway just outside of Anchorage to bypass the communities of Eagle River and Chugiak, leaving 9.6 miles of the original highway in vehicular use, which today is known as the Old Glenn Highway.[389]

Combatting urban traffic congestion through expansion and realignment of original highways would remain an important initiative for the state over the coming years. At times when improvements were made in urban areas that led to roadway realignment, the original route alignment was often left as an urban street that became known as the "old" highway. For example, the Old Seward Highway remains in Anchorage, parallel to the current Seward Highway. Other examples of original road alignments exist throughout the road system in both urban and rural areas where road improvements have occurred and the original or old segment remains in use often named as the "old highway."

3.7.1.3 Connecting communities: completion of the Parks Highway

Continued work occurred on the Parks Highway to provide better highway access between Fairbanks and Anchorage. The BPR began construction of the 323-mile road in 1958 to provide a shorter and more direct route between the state's two largest communities. Previously, the only vehicular road between the cities was a circuitous 439-mile drive on the Glenn and Richardson Highways. The Parks Highway also provided more direct access to Denali National Park.

The undertaking proved to be a lengthy process, ultimately resulting in a 13-year construction schedule. Multiple factors contributed to the schedule, including the overall 323-mile length, difficult topography, occasional funding challenges, and damage suffered during the Good Friday Earthquake. For example, the final 14 miles of the Parks Highway took approximately five years to construct, requiring extensive blasting, drainage work, difficult grading, and construction of six bridges, including two major gulch crossings.[390] On October 14, 1971, Governor Egan dedicated the Parks Highway at the Hurricane Gulch Bridge (see Figure 15). Egan remarked that the opening of the Parks Highway was vital in further development of the state and improved commerce between Anchorage and Fairbanks.[391] Newspaper reports indicated that the road was "probably the most important single highway construction project to take place in Alaska."[392] The Department heralded the Parks Highway as its "first major addition to the state highway system."[393]

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[389] Cultural Resource Consultants LLC, *Cultural Resources Investigation for a Proposed Upgrade of the Old Glenn Highway Between Birchwood Loop and Ski Road*, Prepared for CRW Engineering Group, LLC, Anchorage, Alaska, April 2009, 29-30.

[390] Tim Bradner, "Fairbanks to Anchorage Via McKinley Park by Car in '72," *Fairbanks Daily News-Miner*, 15 July 1966; "Costly Stretch," *Fairbanks Daily News-Miner*, 19 October 1971.

[391] Tyler Jones, "Road Called 'Engineering Masterpiece.'"

[392] Pamela Rubenstein, "New Highway Nears McKinley Park," *Fairbanks Daily News-Miner*, 16 April 1968.

[393] State of Alaska, Department of Highways, 1971, 5.

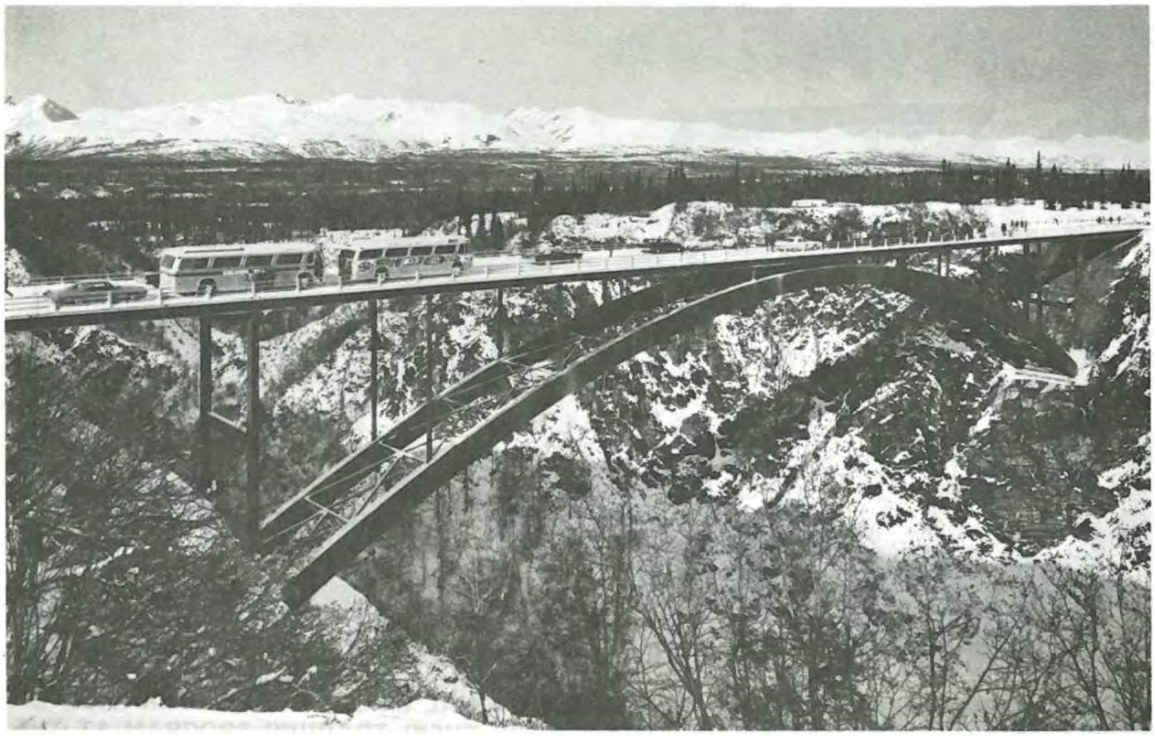

Figure 15. Dedication of the Parks Highway, October 14, 1971.
Photograph from the Department of Highways, Annual Report 1971, 5.

In 1972 the Pacific Northwest Council of the American Society of Civil Engineers (ASCE) nominated a 234-mile portion of the Parks Highway, between Willow and North Nenana, for the ASCE outstanding national engineering achievement of the year. While the road did not ultimately win that year's engineering award, the Pacific Northwest Council ASCE members recognized the road as "a truly bold and imaginative adventure." Pivotal to its nomination were the engineering challenges the Department faced, including mountainous terrain, canyon crossings, remote location, soil conditions, and the techniques employed to build the highway.[394]

3.7.1.4 Local service roads and trails

Beginning in the early 1970s, the state began to focus on improving, expanding, and developing local service roads. Local service roads were those roads not located on the federal-aid highway system, and therefore not eligible for federal funding. The emphasis on constructing local service roads can be attributed largely to the change in governors, from Walter Hickel to William Egan. While the Hickel administration placed a high priority on urban transportation issues, the Egan administration's vision stressed the importance of providing roads to all citizens, including those in more remote or rural locations or to those communities that did not have funds to build their own roads. State Highway Commissioner Bruce Campbell remarked in 1971, "this administration [Egan's] is trying to give some kind of road to more people, rather than a few high-class roads to a few."[395]

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[394] "Missing Link Nominated for Award," *Anchorage Daily Times*, 19 February 1972.

[395] "Alaska Highway Planning Falls Behind," *Anchorage Daily Times*, 13 July 1971.

To achieve the effort, the state proposed a $6 million bond measure to the public in the 1970 general election for construction of local service roads. The proposition stated:

> Throughout the state there has developed a need for improved community and neighborhood access. Projects to meet this need do not qualify for federal assistance, and local governments do not have the resources to undertake a program of this nature without substantial state participation. The $6,000,000 will enable the state to initiate a local service road program in close cooperation with the communities to be served.[396]

With the passage of the bonding measure, the state established the Local Service Roads and Trails (LSR&T) Program.[397] Through the program, funds for projects were allocated through an area-population formula to boroughs, local governments, and villages throughout the state. Under the program, local governments and organized boroughs established their own priorities and received a direct allocation of funds.[398] Comparatively, in the unorganized borough or areas without a local government, the Department determined project priorities based on recommendations from residents or governing bodies. The program funded street, road, trail, boardwalk, sidewalk, and drainage facility construction. Local labor and equipment were used to reduce the cost of projects, benefit the local economy, and provide training to local residents.[399]

Of the $6 million bonded for the program, the Department directly allocated $5 million and the remaining $1 million covered unanticipated program contingencies. The Department's program was an immediate success. Between July, when the Department initiated the program, and December 1971, 21 projects were in the construction phase and another 16 were being designed. The popularity of the program continued to grow. In 1972, 40 projects were completed; the number would double to 80 in 1973.[400] The Department noted the program in the "Major Accomplishments" portion of its 1972 annual report, stating that it "continues to fill a once great void in the State's highway program."[401] While reports were somewhat boastful, the LSR&T Program met the state's goal to improve the state's rural road system.

Projects under the LSR&T Program largely focused on connecting communities, meeting an area's particular transportation needs, or upgrading local streets. Communities used LSR&T Program funds to improve the local economy by reaching a local resource, such as the pipeline road in the Kenai Peninsula

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[396] "Legislature Offers 11 General Obligation Bonds," *Fairbanks Daily News-Miner*, 2 November 1970.

[397] State of Alaska, Department of Highways, 1971, 6.

[398] Alaska is divided into 19 organized boroughs and municipalities, while a single unorganized borough encompasses all of the remaining area.

[399] Alaska Department of Highways, 1974, 19; State of Alaska, Department of Transportation and Public Facilities, *Five Year Local Service Roads and Trails Program 1985-1989* [Juneau, Alaska: Department of Transportation and Public Facilities 1985], forward from Governor Bill Sheffield, ii.

[400] Alaska Department of Highways, 1971, 39; 1972, n.p; Alaska Department of Highways, 1974, 19.

[401] Alaska Department of Highways, 1972, n.p.

Borough.[402] In another example, the community of Pelican applied LSR&T Program funds to construct a road to a sanitary landfill, promoting better sanitation, as well as a boardwalk in town. Many local jurisdictions saw improved safety for roads as important, as evidenced by a LSR&T Program-funded project on the Old Edgerton Highway, where an unspecified portion of the road was straightened, sight distances improved, and the roadbed graveled. Intermodal connectivity was also popular and access roads to airports were constructed in many interior Alaskan villages.[403]

The LSR&T Program was not solely a program to accommodate rural areas of Alaska. More populous areas, such Anchorage, Fairbanks, and Juneau, as well as the organized boroughs in the Kenai Peninsula, Matanuska-Susitna, and Ketchikan Gateway, applied for LSR&T Program funds for street, trail, and pedestrian improvements. However, the largest number of projects planned and completed were located in more rural areas as reported in the 1972 annual report, which stated, "of all of the projects initiative or planned to date, well over half are considered in remote areas of the State."[404] Despite its popularity, the Department eventually phased out the program as Congress made federal funding and congressional earmarks for similar projects available.[405]

3.7.1.5 Roads to resources

Following the completion of reconstruction efforts, the state could once again broaden its road network to areas of industry and natural resources. The Department found that in 1968 recent road improvements to mineral-rich areas brought increased mining and business activity. With this in mind, the Department was determined to "assist orderly development of the awakening resource industries in the land" by extending roads into areas of developing industry.[406]

The discovery of oil in the northern regions of Alaska in 1968 provided an excellent opportunity for the state to pursue the goal to access areas of industry. The discovery prompted the largest road development project in the state since the late 1950s. From 1968 to 1974 two overland routes to the oil field were established. First, the state constructed the Hickel Highway, a winter trail that the state ultimately abandoned. Second, private developers created the North Slope Haul Road (currently the Dalton Highway), which continues in use today.[407] The story of the Hickel and Dalton Highways highlights both state and private efforts to access resources.

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[402] State of Alaska, Department of Transportation and Public Facilities, *Five Year Local Service Roads and Trails Program 1985-1989* [Juneau, Alaska: Department of Transportation and Public Facilities 1985], 3.

[403] State of Alaska, Department of Highways, 1971, 39; Alaska Department of Transportation and Public Facilities, 1978, 43; State of Alaska, 1974, 20.

[404] State of Alaska, 1972, n.p.

[405] 25th Alaska State Legislature Senate Republican Caucus, "Appropriation: Bridges, Service Roads, Trails," Fact Sheet for Senate Bill 189, http://www.aksenateminority.com/pdfs/25/sb0189.pdf (accessed 13 December 2012).

[406] State of Alaska, Department of Highways, 1968, 4, 5; 1969, 5.

[407] Originally called the North Slope Haul Road, this route was renamed the Dalton Highway in 1981 after nineteenth-century arctic engineer James B. Dalton. Throughout this document the road will be referred to as the Dalton Highway.

The Hickel Highway and the Dalton Highway

In the summer of 1968, Humble Oil and Refining Co., along with Atlantic Richfield Co., discovered a large petroleum field at Prudhoe Bay. Initial estimates indicated that approximately 40 billion barrels of oil were contained within the oil field. The valuable natural resource was in the north-central portion of the state in a remote location without overland access known as the North Slope. Facing pressure from the trucking industry and the city of Fairbanks, Governor Hickel requested that the Department develop plans for a winter trail between Livengood and the North Slope that would only be usable when the swampy land was frozen.[408]

The Department commenced construction of the trail in November 1968, including grading and clearing and the construction of ice bridges on 62 miles of the 360-mile route from Stevens Village (north of Livengood) to Sagwon (south of Deadhorse). Initially, the state planned for contractors to construct the remaining portion of the road.[409] However, after consideration of bids and the amount of time contractors needed to prepare, the Department elected to complete the remainder of the road construction itself. Highway Commissioner Cosby Steen concluded that the state could "gain valuable first-hand knowledge of the construction and terrain factors to be dealt with in building such roads in interior Alaska."[410] Department crews typically performed work in weather of -10 to -48 degrees Fahrenheit (°F). Temperatures down to -70°F often stalled the road crews as equipment malfunctioned and rubber tires cracked due to the extreme cold.[411] The Department constructed the winter trail by March 1969 and 12.5 million pounds of freight moved over the road until its closure in April.[412] The public informally named the route the Hickel Highway after the governor who championed its construction. To the Department, construction of the route, as described in the 1969 annual report, was "one of the most dramatic projects" that year. The report further described the learning opportunity presented in construction of the Hickel Highway:

> This pioneering effort in moving freight into the Arctic served the very real and worthwhile purpose. In addition to making possible the transportation of bulky loads which could not have reached the Arctic Coast by any other means before late summer, it provided knowledge and techniques in the construction of permanent roads in the Arctic in the near future.[413]

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[408] "Pipeline Needed by 1971," *Fairbanks Daily News-Miner,* 23 August 1968; "Gov. Hickel Broadens Estimate of Arctic Find," *Anchorage Daily Times,* 23 August 1968; Mike Dalton, "Winter Trail Route Not NORTH Plan, *Fairbanks Daily News-Miner,* 20 November 1968.

[409] "Action on North Trail Job Starts," *Fairbanks Daily News-Miner,* 23 November 1968.

[410] "State to Ignore All Bids, Finish Winter Trail Work," *Fairbanks Daily News-Miner,* 24 December 1968.

[411] "State Continues Road Project to North Slope Oil Fields," *Anchorage Daily Times,* 30 December 1968; "It's Minus 48, Work Resumes on Winter Road," *Anchorage Daily Times,* 8 January 1969; Mike Dalton, "Minus Weather Halts Haul Road," *Fairbanks Daily News-Miner,* 6 January 1969.

[412] "Miller Asks $433,000 for Slope Road Work," *Anchorage Daily Times*, 3 April 1969.

[413] State of Alaska, Department of Highways, 1969, 8.

The Hickel Highway, a Department-constructed winter trail to the North Slope, was ultimately unsuccessful as the state determined it would not fund future maintenance or upgrades to the trail, estimated at $1.5 million. Additionally, the state faced general public outcry at the $766,291 cost to taxpayers to open and maintain the highway in its first year, which was more than double initial estimates.[414] Ultimately, the state abandoned the Hickel Highway.

Private developers had more success in establishing a permanent all-weather road to the North Slope. In the summer of 1969, the Trans-Alaska Pipeline System (TAPS) planned construction of an oil pipeline and parallel 420-mile, gravel, all-weather haul road from Livengood to Prudhoe Bay.[415] However, progress on the road to the North Slope and pipeline stalled due to legal challenges stemming from new federal legislation, including the National Environmental Policy Act and a land-transfer freeze (ultimately leading to the Alaska Native Claims Settlement Act) (see the sidebar titled *Influential federal legislation for the environment and Native American rights* in Section 3.7.1.5*).* For four years, from 1970 to 1974, the fate of the road was unknown as debates and legal battles with conservation groups and Native Alaskans commenced. Additionally, conflicting mining exploration statutes and laws, right-of-way issues, and Congressional debate over private developer construction on federal land further stalled any progress on the road or pipeline. Finally, by January 1974 most legal challenges were solved and Congress approved the pipeline (and road) project.[416]

Shortly after, the Alyeska Pipeline Service Company awarded contracts for the construction of the road.[417] The Department gave the Alyeska Pipeline Service Company use of the abandoned Hickel Highway to move construction supplies and equipment to the North Slope, which allowed the company to forgo building a new winter road to the construction area.[418] In exchange, the pipeline company agreed to construct the road to state secondary road design requirements. For more information on the road design standards used during this period, see Section 4.4.5.1. The Alyeska Oil Pipeline Service Company completed the road in September 1974.[419]

As part of the agreement between the state and the Alyeska Pipeline Service Company, ownership and maintenance of the road reverted to the state after construction in 1977. Almost immediately, the Department was embroiled in controversy over how the road would fit into the state's transportation plans.

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[414] Chris Allen, "The Brief Life and Strange Times of the Hickel Highway: Alaska's First Artic Haul Road," *Alaska History* 24:2 (Fall 2009), 19.

[415] "Interior to Grant Permit for Oil Pipeline Haul Road," *Fairbanks Daily News-Miner,* 29 July 1969.

[416] "Pipeline Work Begins," *Anchorage Daily Times,* 29 April 1974.

[417] "Firms Named to Build Pipeline Road to North," *Fairbanks Daily News-Miner,* 5 April 1974.

[418] In 1970, TAPS reorganized as the Alyeska Oil Pipeline Service Co., though popular publications often still refer to it as the Trans-Alaska pipeline project. "TAPS Sets Reorganization," *Fairbanks Daily News-Miner,* 30 July 1970; "Line to Get Use of Hickel Road," *Anchorage Daily Times,* 24 January 1974.

[419] "Pipeline Work Begins," *Anchorage Daily Times,* 29 April 1974; "Alyeska Nears Windup of Oil Road Construction," *Fairbanks Daily News-Miner*, 28 September 1974.

At the time, the state determined that the road would remain open to industrial and mining traffic only.[420] In 1981, the same year the state renamed the route the Dalton Highway after nineteenth-century arctic engineer James B. Dalton, the southern portion of the route opened to public access to Disaster Creek at Milepost 211.[421] In 1994 the state allowed full public access of the highway a short distance south of Prudhoe Bay.[422]

Additional roads to resources

While construction of a road to the North Slope was a significant private effort, the state participated in other development efforts to provide transportation to natural resources. For example, the state provided vehicular access to a portion of the Edgerton Highway from Chitina to McCarthy (also known as the McCarthy Road) in order to access to the abandoned Kennecott mines in 1973. The McCarthy Road, a former rail line abandoned in 1938 when the mine closed, was redeveloped as a vehicular road. However, the road was not improved beyond a rough one-lane road until the late 1960s.[423] With new bridge construction across the Kennicott River providing vehicular access to the mine in 1974, the state hoped "the re-establishment of this route into the highly mineralized Kennecott area will undoubtedly spur serious exploration in the mineral field."[424] Vehicular access beyond the Kennicott River remains limited after high water damaged the bridges that cross both channels in 1975.[425]

Beginning in 1973, one of the larger state-led road building efforts included the construction of the Klondike Highway, an all-weather road through the Skagway River valley, from Skagway to the Canadian border to provide access to mineral resources. Public interest in the construction of a road connecting Skagway to Whitehorse (located in Canada's Yukon Province) initially emerged after the Klondike gold rush ended around the turn of the twentieth-century. An overland road route faced a number of challenges, including opposition from the White Pass Railroad, which already connected Skagway to Whitehorse, in Canada; lack of consensus among the public and road engineers on the best route over

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[420] State of Alaska, Department of Highways, 1971, 6; "Gov. Hammond's North Slope Road Statement," *Fairbanks Daily News-Miner,* 16 September 1976.

[421] Naming of the highway after James Dalton was commemorative; Dalton did not participate in the construction of the Dalton Highway.

[422] Bureau of Land Management, "The Dalton Highway Visitor Guide," (Summer 2013), 3, available at http://www.alaskageographic.org/uploads/pdf/dalton-vg2013_web.pdf (accessed 8 April 2013).

[423] Rolfe G. Buzzell and J. David McMahan, "McCarthy Road Cultural Resources Reconnaissance Survey, 1994-1995," prepared for the Office of History and Archaeology (1995), 35.

[424] State of Alaska, Department of Highways, 1974, 20; Buzzell and McMahan, 36. Mineral exploration and extraction from the Kennecott Mines was minimized in 1978 when President Carter designated 11 million acres of federal land in Alaska as National Monuments under the Antiquities Act, including the Wrangell-St. Elias National Park which encompasses the mines. In 1979 and 1980, respectively, the Wrangell-St. Elias was designated as a World Heritage Site and National Park. Today the Kennecott Mine site is owned and operated by the National Park Service and is a popular tourist destination.

[425] Buzzell and McMahan, 36.

and through the mountainous terrain; and Canadian apathy for the route, which required far more construction effort than for the Americans and lacked a specific benefit to the province.[426]

In the late 1960s the Cyprus Anvil Mine in the central Yukon Territory commenced operations and with it came the promise of economic prosperity in the region. The opening of the mine renewed the state's interest in the overland route, likely due to the economic benefits from rail and overland shipment of ore and increased population and business activity in the region. Unlike previous decades, neither Canada, the railroad, the state, nor the public opposed the road proposal. The construction of the Klondike Highway, as it would be known, commenced in 1973, with the Department constructing the 9-mile gravel road (now paved) from Skagway to the Canadian border. At the same time, the Canadians began construction of the 33 miles from the border to Carcross. Construction efforts continued for five years, largely due to the challenging terrain and considerably longer route for the Canadians. The Klondike Highway opened to travelers in 1978.[427] Ultimately, the construction of the Klondike Highway represented the state's interest in opening routes to regional industry and international road development efforts.

Influential federal legislation for the environment and Native American rights

From the 1960s through the 1980s the federal government established key pieces of legislation addressing national and state issues of protection of the environment and Alaska Native land claims that impacted road development. Congress passed major environmental legislation addressing concern over quality of air, water, and wildlife beginning in 1899. However, it was not until the late 1960s, and through the 1980s, that key national and state environmental and native land claim legislation were addressed. These pieces of legislation had a particular impact on road development in Alaska. Influential federal policies included the National Environmental Policy Act, Alaska Native Claims Settlement Act, and the Alaska National Interests Lands Conservation Act. These acts impacted Alaska's road development history as the state reshaped road policies and actions and some projects were postponed or cancelled.

National Environmental Policy Act (NEPA)

Public concern for the environment led the federal government to pass legislation to protect natural resources. One of the most influential acts coming out of the environmental legislation in the mid-twentieth century was the NEPA of 1969, which required review of federally-funded projects to determine the impact of the project on the environment.[428] NEPA specifically changed road development in Alaska as environmental awareness and the impact of construction activities became an important element of Department planning. To help guide road construction activities, the Environmental Protection Agency (EPA) published "Environmental Guidelines for Road Construction in Alaska" in 1971. These guidelines were more akin to "best practices," to assist in

[426] Frank Norris, "Skagway, the White Pass Railroad, and the Struggle to Build the Klondike Highway," *Alaska History* 15:1 (Spring 2000), 34, 37, 38, 40.

[427] Norris, 41.

[428] EPA, "Summary of the National Environmental Policy Act," *Laws and Regulations*, http://www.epa.gov/lawsregs/laws/nepa.html (accessed 4 January 2013).

route selection, engineering design, construction activities, and maintenance.[429] For further details on how the guidelines influenced road construction in the state, see Section 4.4.5.1.

The act added complexity to road planning and development as additional study, planning, and coordination with environmental regulators were now necessary. Projects became more intricate and time consuming, as summarized in the Department's 1971 annual report:

> Environment became a key word in our operations and we have attempted to cope successfully with the proliferation of new rules and regulations promulgated as a result of the National Environmental Protection *[sic]* Act. Procedures for implementing the new federal requirements occupied a large part of the time of the Division Director and his immediate staff. The department has been operating on interim instructions which were issued in January 1971. The environmental situation now appears to be stabilizing and we tentatively plan to formalize our requirements in a new operating procedure to be issued this summer.[430]

Projects undergoing planning required review for environmental impacts. In some cases, this resulted in abandoning a project due to a negative environmental impact finding or inadequate environmental study. For example, in 1973 planned reconstruction work and extension of the Copper River Highway was halted after the FHWA pulled federal funding for the project due to an inadequate environmental study.[431] Ultimately, the Department never realized the connection from the Cordova to Chitina. Instead, the road is only maintained for 50 miles from Cordova north to the Million Dollar Bridge.[432]

Alaska Native Claims Settlement Act (ANCSA)

At the same time NEPA was in the national spotlight, a statewide debate regarding Native Alaskan land claims brewed. Threats to Native land rights emerged in the mid-twentieth century as state, federal, and private entities explored areas for natural mineral extraction, hydroelectric power generation, and scientific study.[433] In 1963 the Alaska Task Force on Native Affairs recommended that Congress find a resolution to Native land claim issues. Over the coming seven years, the task force, Congress, and state administration proposed various solutions to the issue, all of which were unsuccessful.[434]

In 1967, following protest against the state's planned sale of gas and oil leases, Secretary of the Interior Stewart Udall imposed a land freeze, restricting the transfer of federal lands until the

[429] "Environment Guidelines on Road Construction," *Fairbanks Daily News-Miner*, 14 December 1971; Frederick Lotspeich, "Environmental Guidelines for Road Construction in Alaska," prepared by the Environmental Protection Agency, Alaska Water Laboratory [1971].

[430] State of Alaska, Department of Highways, 1971, 15.

[431] "Sierra Club, Alaska conservation Society Sue to Stop Road Job," *Ketchikan Daily News,* 8 March 1973; Larry Markley, "Federal Funds Pulled for Copper River Road," *Anchorage Daily News*, 16 March 1973.

[432] "Suit Kills Copper River Highway," *Fairbanks Daily News-Miner,* 17 March 1973.

[433] For additional information on these programs, see Naske and Slotnick, *Alaska: A History,* 284-289.

[434] For more information on the various proposals, see Naske and Slotnick, *Alaska: A History,* 289-296.

Native Alaskan land claim issues were resolved. The land freeze directly impacted development of the road to the North Slope (Dalton Highway), which also impacted any land or oil royalties owed to the state. Ultimately, after years of debate over how to resolve long-standing issues over Native Alaskan land claims, Congress passed the ANCSA in 1971. The provisions in the act conveyed millions of acres to native groups, specifically regional and village corporations created in the legislation, many of which are located in timber- and mineral-rich regions of the state.[435] Passage of ANCSA also cleared the way for pipeline approvals and gas and oil leases.

The act had a huge impact on land planning in the state and inspired fierce debate among legislators, pro-development industries, and conservation groups. Under ANCSA provision 17(d)(2), the Secretary of the Interior could withdraw 80 million acres of vacant, unreserved, and unappropriated federal public lands in Alaska for possible addition into national conservation land holdings. As a result of the d-2 provision, as it is generally known, conservation and development interests and the state and federal government clashed over use and classification of Alaska's uncommitted lands.[436] Congress, through provisions afforded in the ANCSA and other federal land policies and acts, set aside about 120 million acres of Alaska's lands from development and designated them as national monuments, parks, forests, wildlife refuges, and wild and scenic river systems.[437] The debate ensued until the passage of the Alaska National Interest Lands Conservation Act in 1980 (see below).

In terms of Alaska road development, the newly outlined Native Alaskan land holdings added a level of complexity and uncertainty to future road development projects. As a result, the Department needed additional time to prepare plans and assess impacts. An ambitious strategic plan for road corridors was under discussion in the early 1970s but tabled indefinitely due to the complex new land ownership patterns, right-of-way, funding, and access concerns.

Alaska National Interest Lands Conservation Act (ANILCA)
Since the passage of NEPA in 1969 and ANCSA in 1971, no new environmental law had as significant of an impact as the 1980 ANILCA. Congressional leaders introduced early versions of the ANILCA act in 1977, in order to address Section 17(d)(2) of the ANCSA. Under d-2 many millions of acres of public domain land not yet designated or claimed by federal, state, tribal, or private groups were open for potential inclusion as conservation areas. Debate nationally and in Congress ensued between development and conservation groups over the lands. After three years of debate, in December 1980 lawmakers came to an agreement.[438]

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[435] Naske and Slotnick, *Alaska: A History,* 290, 298.

[436] Naske and Slotnick, *Alaska: A History,* 310-311.

[437] Lawrence Rakestraw, "Forest History in Alaska: Four Approaches to Two Forest Ecosystems," *Journal of Forest History* 23, no.2 (April 1979), 70; Naske *Alaska* 310, 312-313.

[438] National Parks Conservation Association, "Alaska National Interest Lands Conservation Act," (2011), http://www.npca.org/news/media-center/fact-sheets/anilca.html (accessed 28 December 2012).

ANILCA established 104 million acres of Alaska land as conservation areas, of which 43.6 million were in national parks and preserves. By 1984 Alaska contained much of the nation's conservation areas, including 41 percent of the land the federal government owned.[439] ANILCA had a direct impact on the Department as newly designated conservation areas posed challenges for the extension of or construction of a new highway. Further complicating the matter, the act divided lands among four federal land management agencies, including the NPS, U.S. Fish and Wildlife Service, U.S. Forest Service, and Bureau of Land Management. These multiple jurisdictions required significant cooperation and planning for any roadwork in designated conservation areas.[440]

In order to aid the planning process, Congress included procedures for the state to establish transportation and utility access on federal land.[441] Transportation systems included any roads, highways, railroads, tramways, airports, landing strips, docks, and other systems of general transportation in addition to any utility, pipeline, or water transportation systems. As described in *Title XI – Transportation and Utility Systems in and Across, and Access Into, Conservation System Units*, the procedure to establish road access on federal land required an application to all federal agencies involved and preparation of an environmental impact statement, following provision of NEPA and the Federal Land Policy and Management Act of 1976.[442] Additionally, Title XI included special provisions for the Dalton Highway.[443]

3.7.2 Federal road-building initiatives

The federal government continued to develop roads in the state with a focus by the U.S. Forest Service on roads in the Tongass National Forest. Increased timber harvesting and growing demand for recreational access in southeast Alaskan forests resulted in additional efforts to develop access roads and forest roads by the agency. In addition to road development in the Tongass, a smaller number of recreational roads to amenities were added to the Chugach National Forest during this period.[444]

In the mid-1960s the U.S. Forest Service proposed development of nine new routes, for a total of 479 additional miles of forest roads in the Tongass National Forest. Within the proposal, estimated at a cost of over $66 million, a series of inter-island ferries would connect the roads from one island to the next.[445] According to U.S. Forest Service historian Lawrence Rakestraw, the final plan for the road system

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[439] Richard Cooley, "Evolution of Alaska Land Policy," in *Alaska Resources Development Issues of the 1980s,* Thomas Morehouse, ed. (Boulder, Colo.: Westview Press, 1984), 29, 31.

[440] Cooley, "Evolution of Alaska Land Policy," 29.

[441] "Section Two: Background/Resources Papers," *Vision 2020 Update, Statewide Transportation Policy Plan*, 23.

[442] Naske and Slotnick, *Alaska: A History*, 316-317.

[443] See "Title XI – Transportation and Utility Systems in and Across, and Access Into, Conservation System Units," of Public Law 96-487-Dec. 2, 1980, 94 Stat. 2371 the "Alaska National Interests Land Conservation Act," at http://alaska.fws.gov/asm/anilca/title11.html#1101 (accessed 28 December 2012).

[444] Rakestraw, *A History of the United States Forest Service in Alaska*, 150, 152.

[445] Wilbur Smith and Associates, 139.

included "planned timber harvest, roadside protection, connection with towns and Native villages, and docks from which ferries could carry tourists from island to island."[446] While these plans were not fully realized, they represent the U.S. Forest Service's overall vision of how best to make the Tongass National Forest more accessible to residents and visitors and the importance of road development in southeastern Alaska during this period.

3.7.3 Conclusion

State road-building efforts, following the Good Friday Earthquake, focused on reconstruction, rehabilitation, and repair of Alaska's roads to address modernization and safety improvements. Roadway beautification efforts were also undertaken. While in the process of completing reconstruction efforts, the state began again to focus on expanding the road system with an emphasis on connecting communities, growing urban area road systems, and providing additional financial support to rural community road development. As a result, the state's road system grew from approximately 4,500 miles to just over 5,000 miles.[447] Another dominant event during the period that impacted road building was renewed interest in accessing Alaskan natural resources with the discovery of oil in the North Slope. However, increasing federal regulations over land use and growing concern for environmental stewardship emerged in this period as private, public, and federal entities grappled with the new regulations.

3.8 Recent road development (1978 – present)

Alaska experienced a period of great wealth beginning in the late 1970s and continuing into the mid-1980s, largely based on revenues generated from the 4 billion barrels of oil extracted from the North Slope.[448] This allowed for increased state spending in many areas, including infrastructure improvements. High oil revenues, increased state spending, private sector optimism, and population growth aided prosperity. Oil prices, propelled higher by the Iraq-Iran War (1979-1988) and national demand, reached a peak of $33 per barrel in June 1981.[449] By 1982 oil revenues supplied 86 percent of the state's general fund, or the money the state sets aside to support general state needs and state and

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[446] Lawrence Rakestraw, *A History of the United States Forest Service in Alaska* ([Washington, D.C.], U.S. Department of Agriculture, Alaska Region [2002]), 152.

[447] United States Department of the Interior, 1956, 24, 30; DOT&PF Annual report 1977, 49.

[448] Note: Informational chapters on Alaska's oil boom and bust are different between the 2nd and 3rd edition of Naske and Slotnick's *Alaska: A History*. Much of the information presented in the second edition (titled *Alaska: A History of the 49th State)* was not included in the third edition (titled *Alaska: A History*), for unknown reasons. Therefore, both editions are used as reference material in this chapter. Claus-M. Naske and Herman E. Slotnick, *Alaska: A History of the 49th State*, 2nd ed. (Norman, Okla.: University of Oklahoma Press, 1987), 269.

[449] Greg Williams, "Population Growth and Migration in Alaska," *Alaska Economic Trends* (October 1985), 1; Scott Goldsmith, "High Oil Prices Give Alaskans a Second Change: How Will We Use this Opportunity?" *Institute of Social and Economic Research, University of Alaska Anchorage* (September 2011), http://www.iser.uaa.alaska.edu/Publications/secondchance09192011.pdf (accessed 20 December 2012); U.S. Energy Information Administration, "U.S. less Alaskan North Slope Crude Oil First Purchase Price," *Petroleum and Other Liquids*, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=f009960__3&f=m (accessed 20 December 2012).

federal programs. As a result of a large general fund, state spending grew by a factor of 16 times from 1967 to 1987 as the state expanded existing services and increased public employee wages.[450]

In 1986, however, the national price of oil dropped substantially from $24 per barrel in January to approximately $11 per barrel by July.[451] As a result, state oil revenues dropped from the peak of $4.4 billion in 1982 to $1.4 billion in 1987. The loss of oil revenue resulted in budget shortfalls and, according to historian Claus-M. Naske, "Alaska's economy plunged, bankruptcies abounded, and many panicked and left the state."[452] While the state's economy stabilized by the late 1990s, oil continued to be cheap and revenues from the oil tax, royalties, and land leases diminished, further squeezing the state's general fund.[453] The loss of oil revenue was particularly hard on the Department, which attempted to convert state-financed projects to federal funding as state general funds lessened. [454]

During this same period, the passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980 was another major event. Through the act, Congress established 104 million acres of conservation systems, creating numerous new national parks, monuments, wildlife areas, and wild and scenic rivers in the state. At the time, it was recognized that Alaska's transportation network was largely undeveloped and there would be a need for roads in some of the designated areas. Therefore, the act provides for use of motorized vehicles and outlines a decision making process that considers minimizing the adverse impacts of transportation corridors (see the sidebar titled *Influential federal legislation for the environment and Native American rights* in Section 3.7.1.5).[455]

This section discusses road-building initiatives in the state beginning in the late 1970s, a period marked by great economic prosperity, which brought a population boom, expansion of urban centers, and increased industrial activities. At this same time, new changes in state's public works and highway organizations created a more streamlined and cost-effective approach to road development. For additional information on the new Department organization, see the sidebar titled *Highway department administrative history* in Section 3.6.2. Notable achievements in state road development during this period include the establishment of the Interstate Highway System; upgrade of rural, urban, and National Highway roads; development of additional roads to resources; and creation or upgrade of significant roads to tourist destinations. The U.S. government also continued to work with Canadian officials to fund road paving efforts on portions of the Alaska Highway in the Yukon Territory to the Alaskan border. Despite ratification of a proposed financing agreement between the two countries in the late 1970s, the Canadian sections remained largely unpaved into the 1980s.[456]

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[450] Naske and Slotnick, *Alaska: A History,* 351-353.

[451] U.S. Energy Information Administration, "U.S. less Alaskan North Slope Crude Oil First Purchase Price."

[452] Naske and Slotnick, *Alaska: A History of the 49th State,* 282.

[453] Naske and Slotnick, *Alaska: A History,* 365.

[454] Jeff Ottesen, DOT&PF Program Development Director, telephone interview with Mead & Hunt, Inc., 12 December 2012.

[455] Naske and Slotnick, *Alaska: A History*, 315.

[456] Coates, "The Civilian Highway: Public Works Canada and the Alaska Highway, 1964-83," 142-146.

3.8.1 State road development initiatives

Beginning in the late 1970s and continuing through the present, the state largely led road development efforts while the federal government focused on land management. Funding for projects continued to primarily be provided through federal allocations, which made road development and maintenance a challenge for the Department during times of national recession. Notably during this period, Alaska's Interstate System was established, bringing with it additional funding sources.

The state continued many of the priorities established in earlier decades, including reconstruction and upgrade of highways, expansion of roads in urban areas to alleviate traffic congestion, and new road construction in rural areas to provide better access to basic needs. Access to Alaska's resources also remained a top priority, with road construction best achieved through public and private partnerships. One new initiative the state undertook during this period was to provide better road connections to the growing tourism industry in the state. Many of the state's efforts focused on connecting roads to seaports, where tourists primarily entered the state via cruise ships and the Alaska Marine Highway ferry.

Throughout the 1980s, as it had beginning in the 1960s, the federal government continued to restrict federal allocations in order to curb national inflation. Additionally, federal grants to the state's highway trust funds dropped in the late 1980s, from $140 million in 1987 to $114 million in 1988.[457] In comparison with other states during this same period, Alaska was one of a handful that saw its federal allocation drop between 1987 and 1988. Grants would recover by the early 1990s to over $211 million and continue to climb.[458] For Alaska, the loss of federal funding was especially damaging, as the state received more federal highway trust funds per capita than any other state. In 1989 alone the federal government financed 89 percent of highway construction funding and the state supplied 11 percent.[459] In order to address federal funding losses, the Department delayed or discontinued projects entirely and assessed which programs would receive funding.[460] Additionally, the Department eliminated some positions, especially in sectors that relied heavily on federal-aid funding, such as the Research Section.[461]

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[457] The highway trust fund is transportation funds distributed to states from a federal fuel tax. See U.S. Census Bureau, *Statistical Abstract of the United States 1990* (Washington, D.C.: U.S. Government Printing Office, 1990), Table 1024 and U.S. Census Bureau, *Statistical Abstract of the United States 1989*, (Washington, D.C.: U.S. Government Printing Office, 1989), Table 1008.

[458] Comparison of Federal Grants per state was undertaken from the U.S. Census Bureau's *Statistical Abstracts of the United States* from 1987 through the present. Statistical abstracts from 1878 to the present can be found at the United States Census Bureau website under "The 2012 Statistical Abstract: Earlier Editions" at http://www.census.gov/compendia/statab/past_years.html (accessed 15 November 2012).

[459] Lois N. Epstein, *Easy to Start, Impossible to Finish II*, prepared for the Wilderness Society (March 2012), 4, http://akvoice.org/files/easy-to-start-impossible-to-finish-ii (accessed 8 January 2013); Claus-M. Naske, "Alaska and the Federal-Aid Highway Acts," *The Pacific Northwest Quarterly* 80, no. 4 (October 1989), 138.

[460] "Funds for Alaska's Highways Chopped," 1, 4.

[461] Impacts on specific projects are unknown for this period as annual reports in the 1980s through the 1990s were generally not available. Alaska Department of Transportation and Public Facilities, 1986, ii.

3.8.1.1 Alaska's Interstate System

In the late 1970s and through the early 1980s the state reexamined inclusion of highly traveled highways in the Interstate Highway System in order to increase funding sources for road improvement efforts on the state's primary highways. At statehood, Alaska had unsuccessfully lobbied Congress to designate Interstates. By the 1980s Alaska was the only state in the union that did not have any designated Interstates, much to the chagrin of Department Commissioner Ward who stated at a 1981 Congressional hearing:

> Why aren't we on it [the Interstate System]? That's a question we have been asking for 20 years and it may seem obvious if it weren't because of the fact that we are not one of the contiguous States, even though we are joined by land masses and transportation arterials that are continuous in our State, we are not one of them. Hawaii is on the Interstate program, so it makes us wonder why we are the only State out of 50 not so treated.[462]

Department interest in designating Alaska highways as Interstates was primarily driven by the special federal funding available for resurfacing, restoration, and rehabilitation of non-toll Interstates. Congress removed federal funding restrictions to allow for the "3-Rs" (resurfacing, restoration, and rehabilitation) on Interstate highways in 1976 after reviewing a report that indicated that rehabilitation of the aging Interstate system should be a top priority for the nation. In 1981 Congress expanded the provision with an additional "R" for repair, making the 4R program even more attractive to Alaska. Ultimately, inclusion of certain Alaska highway routes as Interstates would free federal funds to be used on other highway system improvements.[463]

In the summer of 1981 Commissioner Ward presented a proposal to include 1,100 miles of Alaska's primary highways as part of the Interstate System to the Congressional Subcommittee on Transportation. Under the proposal, the state agreed to improve 1,000 miles of candidate routes to nationally accepted, two-lane design standards and the remaining 100 miles to four-lane, expressway standards. The cost of improving the candidate routes to accepted standards was $1.4 billion, funded by state general funds and existing federal-aid money.[464] Ward did not indicate which routes the state proposed as candidate routes during the subcommittee hearing, though they were likely the same routes that were eventually designated and listed in Table 9.

Congress consented to the proposal and accepted the candidate routes as Alaska Interstates in December 1981. Because the highways were not subject to geometric design standards associated with the Interstate System, and because the roads were not physical extensions of the Interstate System within the lower 48, Alaska's Interstate routes received a different route designation, beginning with "A."

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[462] "Statement of Robert Ward, Commissioner, Alaska Department of Transportation and Public Facilities," in *Federal Aid Highway Act of 1981*, 610, 704.

[463] Federal Highway Administration, "The Dwight D. Eisenhower System of Interstate and Defense Highways, Part VIII – Other Interstate Programs," *Highway History*, http://www.fhwa.dot.gov/highwayhistory/data/page08.cfm (accessed 28 December 2012).

[464] "Testimony by Robert Ward Commissioner, Alaska Department of Transportation and Public Facilitates," in *Federal Aid Highway Act of 1981*, 702-705.

Generally, Alaskans still refer to these routes by their original highway names and they are not signed with an Interstate designation. Figure 16 shows the general layout of Alaska's Interstates. With the passage of the act, Alaska received additional funding for the sole purpose of construction and improvement of its Interstates.

Table 9. Designated Interstates in Alaska[465]

Interstate Designation	Approximate Length	Connects	Located on
A-1	408 miles	Anchorage to the Canadian border	Portions of the Glenn, Richardson, Tok Cutoff, and Alaska Highways
A-2	325 miles	Tok to Fairbanks	Portions of the Alaska and Richardson Highways
A-3	238 miles	Anchorage to Soldotna	Portions of the Seward and Sterling Highways
A-4	520 miles	Glenn Highway (near Palmer) to Fairbanks	Parks Highway

[465] State of Alaska, Department of Transportation and Public Facilities, *State Transportation Policy Plan*, prepared by Department of Transportation and Public Facilities (November 1982), 6-14; U.S. Department of Transportation, Federal Highway Administration, *National Highway System: Alaska* (October 1, 2012), available at http://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/alaska/ak_alaska.pdf (accessed 27 March 2012).

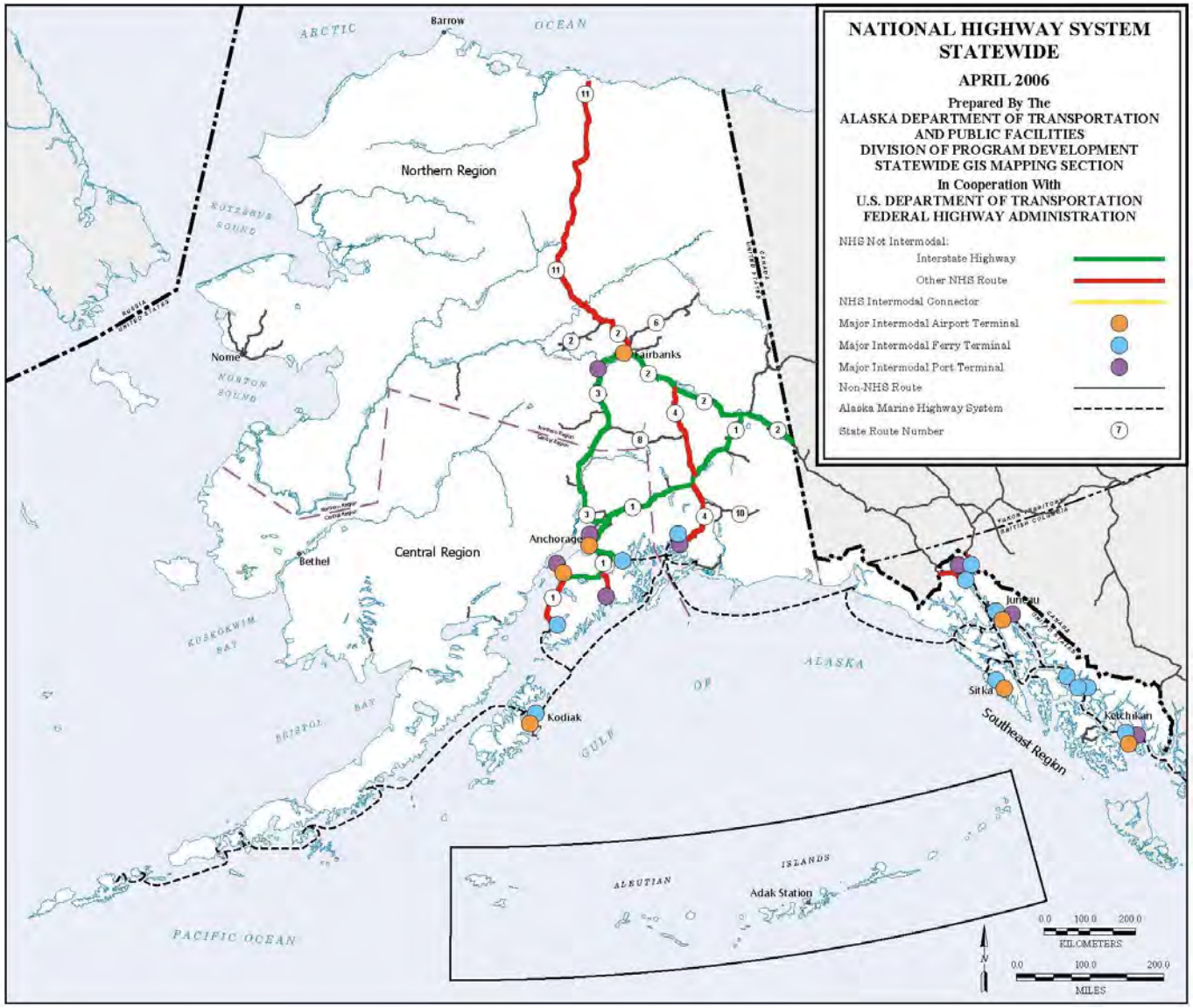

Figure 16. General layout of Alaska's Interstate highways and National Highway System Routes. Source: U.S. Department of Transportation, Federal Highway Administration, 2006.

3.8.1.2 Upgrade of primary highways and Alaska's National Highway System

Throughout the1980s and 1990s the state focused on upgrading older portions of primary highways to new federal and state design standards, improving unsafe areas, and maintaining routes. Major projects reflecting these efforts on primary highways include the widening and resurfacing of the Parks Highway from Nenana to Rex, and straightening portions of the Glenn Highway.[466]

The Department upgraded a number of its two-lane highways designated under the National Highway System (NHS) beginning in the 1990s. In 1995 Congress established the NHS as a way to provide federal funding for improvement and enhancement of important two-lane roads in the nation.[467] In 1996 alone $5.4 billion was distributed for NHS-specific projects.[468] The Department, in coordination with the FHWA, identified 2,210 miles of NHS roads. FHWA-approved projects in Alaska primarily consisted of upgrading NHS-designated two-lane highways across the state to modern design standards. This required reconstruction of roads to have a better geometric alignment, wider roadway width and shoulders, and more safety features to contemporary AASHTO (formerly AASHO) design standards (see Section 4.4.6 for road design standards for the period). According to Department Program Development Director Jeff Ottesen, these efforts are still ongoing.[469]

3.8.1.3 Urban and rural roads improvement

From the 1990s on, upgrading urban and rural roads, rural transportation planning, and supporting tourism and natural resource industries were top priorities for the state. While the state focused most of its attention on maintenance and improvement of its primary highways, expanding roads in urban areas served as a specific priority for state and local agencies. The driving force behind the initiative was the great population growth the state experienced between 1960 and 1980 as a result of the oil boom. In those 20 years, the population grew approximately 78 percent, from 226,167 to 401,851.[470] As a result of the growing metropolitan areas, the Department indicated in the 1982 *Statewide Transportation Plan,* "the need to focus much of our transportation investment in these areas."[471] Population growth was centered

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[466] Rex is likely referring to the Rex Trail, a primarily unimproved access route (former sled road) used since the 1920s for mining, hunting, private property access, recreation, and trapping in central Alaska, near Healy. Alaska Department of Transportation and Public Facilities, 1977, 26-28; Alaska Department of Transportation and Public Facilities, 1978, 34.

[467] Rodney Slater, "The National Highway System: A Commitment to America's Future," *Public Roads* 59, no. 4 (Spring 1996), http://www.fhwa.dot.gov/publications/publicroads/96spring/p96sp2.cfm (accessed 21 December 2012).

[468] Nancy Bennett, "The National Highway System Designation Act of 1995," *Public Roads* 59, no. 4 (Spring 1996), http://www.fhwa.dot.gov/publications/publicroads/96spring/p96sp10.cfm (accessed 21 December 2012).

[469] Ottesen, interview with Mead & Hunt, Inc., 12 December 2012.

[470] Social Science Data Analysis Network, "Alaska's Population Growth," *CensusScope*, http://www.censusscope.org/us/s2/chart_popl.html (accessed 13 December 2012).

[471] State of Alaska, Department of Transportation and Public Facilities, *State Transportation Policy Plan* (November 1982), 8-3.

around Anchorage and Fairbanks, with the Matanuska-Susitna (Mat-Su) Borough, located north of Anchorage, identified as the fastest growing borough.[472]

To accommodate the growing communities, state-led efforts concentrated on alleviating traffic, providing additional interchanges, and improving safety through and between metropolitan areas. Road development efforts in and around municipalities required coordination with city and metropolitan area transportation planning organizations to ensure that local transit, land use, and long-range plans were respected.[473] Research did not reveal the level or amount of funding the state put into its urban road initiatives. However, improvements were many. For example, the state added a third lane to the Seward Highway, between Tudor and Dowling Avenues, in Anchorage and four new highway underpasses to provide additional direct trips through the community in 2006.[474] Other efforts, such as road reconstruction, upgrades, expansion of the street grid, and landscaping improvements, were undertaken by the local government or metropolitan transportation organization.[475]

In addition to urban road improvements and expansion, the state focused efforts on improving rural roads. As early as 1982 the Department estimated that more than 60 percent of its rural paved arterial and collector routes were in "fair to very poor condition."[476] However, improvements and upgrades were stymied for all but the worst roads during the mid-to-late 1980s due to the lack of funds caused by the economic downturn. Efforts were renewed in the 1990s, when Congress made federal available for rural projects through the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. As part of ISTEA, rural communities in Alaska and Puerto Rico competed for federal highway funds (administered by the Department), which exceeded $200 million per year. By 1995 the Department committed approximately $19 million in federal funds to rural Alaska transportation projects, primarily to improve access to water and sewer facilities or landfills.[477]

3.8.1.4 Rural transportation planning

With primary, urban, and rural road improvements underway, the state began focusing more attention on rural transportation planning. The initiative was largely in response to the Rural Transportation Initiative, developed by the federal government in 1999 to "guarantee rural areas and small communities gain in the mobility, economic, social, environmental, and community benefits that the U.S. Department of Transportation programs provide." The ultimate aim of the program was to involve rural community

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[472] Williams, "Population Growth and Migration in Alaska," 2.

[473] Social Science Data Analysis Network, "Alaska's Population Growth," *CensusScope*, http://www.censusscope.org/us/s2/chart_popl.html (accessed 13 December 2012).

[474] Rosemary Shinohara, "Big Plans – Busy Highway," *Anchorage Daily News,* 1 October 2006.

[475] As evidenced in "2035 Metropolitan Transportation Plan" 4-2.

[476] DOT&PF, *State Transportation Policy Plan* (November 1982), 1-4.

[477] *Vision: 2020 Alaska Statewide Transportation Plan*, 2; Ottesen, interview with Mead & Hunt, Inc., 12 December 2012.

leaders in the state's transportation system planning and decision making.[478] By 2003 the Department, in conjunction with local and tribal leaders and residents, prepared 20-year transportation plans for the Southwest and Eastern Interior, Prince William Sound, the Yukon-Kuskokwim Delta, and Northwest Alaska regions.[479]

The Rural Transportation Initiative provided for better insight into the transportation needs of the individual geographic regions. According to Department planner Mike McKinnon, who worked on the comprehensive plans, "people were not as interested in (inter-village) roads as we expected." The planning process highlighted the different transportation needs between various regions. For example, the comprehensive plans indicated that while road development in the Delta region was not a priority for residents, citizens in the Arctic region ranked new road development to nearby mining or oil industries as important.[480]

3.8.1.5 Renewed efforts to access resources

Accessing the state's natural resources continued to be an important priority through the twentieth century, though funding challenges, environmental considerations, and public opinion made state-led efforts increasingly challenging. For example, state-led opportunities, such as joining mining, logging, and oil-field service roads to the larger road system; improving the Dalton Highway; and constructing new highways to mines in the Fairbanks and Nome Mining Districts, were never realized.[481]

One successful state-led project was the construction of the DeLong Mountain Transportation System (DMTS) to facilitate transport of minerals to shipping ports in the late 1980s. The DMTS, which consisted of a road, port, and airstrip, provided transportation of minerals from the Red Dog Mine, located in northwest Alaska, to a port on the Chukchi Sea. As part of the transportation system, the 52-mile Red Dog Mine Road connecting the mines and the port was planned to pass through the Cape Krusenstern National Monument. The Department worked with the mine landowners, Cominco Mining Corporation, the Northwest Alaska Native Association (NANA), the NPS, and Congress to establish a road on federal land. The Department, coordinating with the Alaska Industrial Development and Export Authority, constructed the road from 1987 to 1990.[482]

Renewed efforts to connect roads to resources occurred under the direction of Governors Murkowski (2002-2006), Palin (2006-2009), and Parnell (2009-present). Over the last 10 years, the Department started an approach to development of transportation modes to resources called the "public-private

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[478] U.S. Department of Transportation, Federal Highway Administration, *Serving Rural America,* Publication No.: FHWA-EP-01-33 (2001; updated 2004), 1, http://www.fhwa.dot.gov/planning/publications/serving_rural_america/ruralfinal-nu2.pdf (accessed 8 November 2012).

[479] Joel Gay, "Improving Transportation in the Bush Begins, but Doesn't End, with Roads," *Anchorage Daily News,* 22 December 2002.

[480] Gay, "Improving Transportation in the Bush Begins, but Doesn't End, with Roads."

[481] Steve Rinehart, "Roads to Everywhere Alaska's Transportation Chief Eager to Get Projects Moving," *Anchorage Daily News*, 19 July 1993.

[482] "Section Two: Background/Resources Papers," *Vision 2020 Update, Statewide Transportation Policy Plan*, 23.

partnership." Use of federal funds often slowed the development process and state funds were not always reliable, making state-led efforts difficult. However, under the "public-private partnership," road projects are funded by private entities that may then place a toll on the road to recover expenses. Even though state funding is not used, the project meets state programming, design standards, and environmental policies. The "public-private partnership" approach highlights the state's priority to provide new road corridors to natural resources.

3.8.2 Tourism in Alaska

Renewed interest in connecting roads to tourist and recreational destinations occurred in the 1990s due to the growing tourism industry in the state. In the 1960s and 1970s the state encouraged tourism and recreation by creating rest areas, scenic overlooks, campgrounds, and viewsheds along highways.[483] These improvements aimed at improving the tourist experience for smaller groups of independent travelers. In comparison, the initiatives of the 1990s focused on providing road, rail, and ferry connections to a high volume of travelers arriving in the state via cruise ship and by rail, which were quickly growing sectors of tourism in the state.

The growth of the cruise ship industry drove tourism in Alaska in the 1990s, with the number of passengers steadily rising from 265,000 in 1991 to 958,900 by 2006. According to the state's Division of Community and Economic Development, increased tourism brought an estimated at $1.4 billion into the state in 2001.[484] As a result of the growing importance of tourism, especially by cruise ship, the Department made improving infrastructure to seaport areas an important priority. According to Naske, tourism was the "state's second largest industry, after oil, and the largest private employer in Alaska."[485] The total number of Alaskan visitors exploded from 898,891 in 1991 to 1.4 million in 1999.[486] The industry reached its peak of 1.71 million visitors in 2007, but has since declined due to the recession that developed in the wake of the financial crisis of 2007-2008.[487]

The construction of the Portage Glacier Road is an excellent example of the state's efforts to accommodate the growing cruise ship tourism industry. Prior to construction of the road, visitors reached Whittier via the Alaska Railroad or by ferry. To provide vehicular access, the Department constructed the Portage Glacier Road, which is collocated through the Whittier Access Tunnel with the Alaska Railroad

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[483] Lee Cerveny, "Tourism and Its Effects on Southeast Alaska Communities and Resources: Case Studies from Haines, Craig, and Hoonah, Alaska," Research Paper PNW-RP-566 prepared for the USDA, Forest Service, Pacific Northwest Research Station (July 2005), 19-20.

[484] State of Alaska Division of Community and Economic Development "Alaska Community Tourism Handbook: How to Develop Tourism in Your Community," 1, 2.

[485] Naske and Slotnick, *Alaska: A History*, 376-377.

[486] Ginny Fay, *Prince William Sound Tourism Economic Indicators*, prepared for the National Wildlife Federation Alaska Office (April 2008), 12, available at http://www.nwf.org/~/media/PDFs/Regional/Alaska/PRCA_PrinceWilliamSound_Tourism.pdf?dmc=1&ts=20130108T1626537414 (accessed 8 January 2013).

[487] McDowell Group, "Alaska's Visitor Statistics Program VI: Summer 2011," prepared for State of Alaska Department of Commerce and Economic Development (Summer 2011), 1-2.

line, between 1996 and 2000 (see Section 4.4.6 for more discussion on construction of the road through the existing Whittier Access Tunnel). It extends from the Seward Highway at Portage to Whittier on the Prince William Sound. The highway provided tourists with vehicular access to Whittier, a popular cruise ship transfer point and Alaska Marine Highway ferry terminal.[488] The highway was immediately successful as it provided quicker access to the Sound for tourists and Alaska residents, who used the harbor for recreational purposes.

3.8.2.1 Scenic Byways

In the early 1990s the state established the Alaska Scenic Byway program, which focused enhancements on roads that served tourism and recreation and recognized routes that provide access to the state's scenic, cultural, and recreational areas.[489] The state program grew out of the 1991 National Scenic Byway and All-American Roads Programs, which were federal programs recognizing significant American transportation routes. The state's Scenic Byway program, like the overarching federal program, recognized state highway systems as possessing "distinctive cultural, historic, natural, or other qualities that are unique among neighboring states."[490] Designation as an All-American Road indicated both regional and national significance. All 50 states have designated byways, either under individual state programs or as National Scenic Byway or All-American Road routes.

Since the program's inception, the state has designated 14 road corridors as Alaska Scenic Byways, three of which are also designated as National Scenic Byways (see Table 10). The state program benefited from federal funding, and between 1993 and 2000 received $4.25 million from the scenic byways grant program.[491] Funding allowed for marketing, corridor studies, preservation plans, and byway amenities, such as interpretive signs and construction of visitor centers.[492] In 2012 Congress eliminated the National Scenic Byways Program with the Moving Ahead for Progress in the 21st Century (MAP-21) transportation bill. It is anticipated that existing state designations will continue to be promoted within the state; however, no new road corridors are expected to be established and no federal or state funds are currently available for enhancements.[493]

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[488] Tom Kizzia, "Tourism Industry Split over Whittier Highway," *Anchorage Daily News* 8 December 1996.

[489] Alaska Department of Transportation & Public Facilities, "About the Scenic Byways Program," *Alaska's Scenic Byways*, http://dot.alaska.gov/stwdplng/scenic/org-themes.shtml (accessed 7 November 2012).

[490] Alaska Department of Transportation & Public Facilities, "About the Scenic Byways Program."

[491] State of Alaska, Department of Transportation & Public Facilities, *DOT&PF Report to Alaskans* [Juneau, Alaska: Department of Transportation & Public Facilities, 2000], 9.

[492] Examples of projects funded under federal Scenic Byway grants can be found in the DOT&PF's quarterly publication the *Alaska Scenic Byways Newsletter*. Alaska Department of Transportation & Public Facilities, *Alaska Scenic Byways Newsletter* (Fall 2008), http://www.dot.state.ak.us/stwdplng/scenic/newsletter/fall08.htm (accessed 5 October 2012).

[493] Ottesen, interview with Mead & Hunt, Inc., 12 December 2012.

Table 10. Alaska's National and State Scenic Byways[494]

Name	Description	Length	National Designation Date	State Designation Date
Alaska roads with National and State Scenic Byway Designation				
Glenn Highway	Begins in Anchorage and ends at the Little Nelchina River (north of Eureka Summit)	135 miles	2002	2000
George Parks Highway	Connects Fairbanks to the Glenn Highway (MP 35)	230 miles	2009	2008
Seward Highway[495]	Extends from Seward to Anchorage	127 miles	1998	1993
Alaska roads with State Scenic Byway Designation only				
Copper River Highway	Begins in Cordova and ends at the Million Dollar Bridge, runs through the Copper River Delta	52 miles	--	2001
Dalton Highway	Connects Elliott Highway north of Fairbanks to Deadhorse (near Prudhoe Bay)	470 miles	--	1998
Haines Highway	Connects the Alaska Marine Highway at Haines to the U.S./Canadian border	44 miles	--	1998
Richardson Highway – northern segment	Northern segments connects Fort Greely to Fairbanks	101 miles	--	1998
Richardson Highway – southern segment	Southern segment connects Valdez to Glennallen	128 miles	--	1998
Steese Highway	Extends from Fox (north of Fairbanks) to the Yukon River at Circle	151 miles	--	1998
Sterling Highway – northern segment	Connects Sterling Wye to Skilak Lake	38 miles	--	1998
Sterling Highway – southern segment	Begins 82 miles southwest of Skilak Lake	29 miles	--	1998
Taylor & Top of the World Highways	Connects Tetlin Junction on Alaska Highway to the U.S./Canadian border	105 miles	--	1998
Prince of Wales Island Road System	Located within Prince of Wales Island	260 miles	--	2010
Walden Point Road	Located in the Annette Island Reserve	14 miles	--	2011

[494] Alaska also has three non-road-related transportation networks designated as scenic byways: the Marine Highway and Kachemak Bay Route are both ferry routes, and the Alaska Railroad is an operating railroad line. Information for this table and the scenic byways in the state is available at http://dot.alaska.gov/stwdplang/scenic/indeck.shtml (accessed 7 November 2012).

[495] The Seward Highway is also designated as an All-American Road (2000) and as a USDA Forest Service Scenic Byway (1989).

3.8.3 Federally owned and maintained roads in National Forests

Federal involvement in road building and maintenance continues to the present. The 2011 U.S. Forest Service Alaska Region Long Range Transportation Plan reported a combination of 3,777 total miles of public forest roads in Alaska's Chugach and Tongass Forests. Of this, the Tongass National Forest has the vast majority of the National Forest System roads, totaling 3,693 miles (2,359 open roads and 1,334 closed roads) compared to just 84 miles in the Chugach.[496] The National Forests also contain roads not maintained by the Forest Service. For example, there are 100 additional miles of state highways within the Chugach National Forest. Of the total 184 miles of State and Forest roads in the Chugach National Forest, 135 miles are designated as Forest Highways. [497]

3.8.4 Conclusion

Generally, the state's road history from the late 1970s to the present parallels earlier periods, and included urban and rural road construction and accessing natural resources. Many of the road construction efforts focused on reconstruction, rehabilitation, and improved safety of existing routes. However, new initiatives such as connecting highways to the state's growing cruise ship tourism industry and rural transportation planning programs brought new and future road construction endeavors. The state continued to construct its roads primarily using federal funding, but more recent public-private partnerships have provided a new way to fund road development.

[496] U.S. Forest Service, "Alaska Region Long Range Transportation Plan," prepared November 2011 (draft) by U.S. Forest Service, 19.

[497] There are no known privately owned roads in the Tongass National Forest. Mark McCallum, Tongass National Forest, phone interview with Chad Moffett, Mead & Hunt, Inc., 18 June 2013, U.S. Forest Service, "Alaska Region Long Range Transportation Plan," 17-18.

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4. Road Engineering

4.1 Introduction

Alaska's distinct climate, geography, and remoteness pose unusual difficulties to road engineering. From an early trail and sled road network, an integrated road network connecting multiple modes of transportation evolved. This section focuses on the geographic and climatic conditions influencing the design and construction of Alaska's road system from 1900 to the present and discusses the materials and methods utilized, as well as the location, design, and construction criteria developed and applied over time. Early road design and construction techniques utilized in Alaska were basic and relied on methods familiar to the Army engineers who came to Alaska in the late nineteenth and early twentieth centuries. However, the practice of permafrost construction is confined to Alaska, northern Canada, Siberia, and parts of northern Scandinavia, and was not part of an established body of professional engineering knowledge in the early decades of the twentieth century. Road builders were forced to adapt their methods to address conditions unique to Alaska; due to Alaska's remoteness, these techniques continued to evolve in relative isolation. With the onset of World War II, the needs of the U.S. military placed substantial demands on the road system, requiring that new methods and materials be employed. In the postwar period, this led to experimentation in order to bring roads up to geometric and condition standards comparable to those in the lower 48 states. From the 1960s through the 1980s scientific research yielded advances in cold weather construction, and efforts continue to identify new ways of dealing with age-old problems created by thawing permafrost.

4.2 Geography and climate

With a total land area of 586,412 square miles, Alaska is approximately one-fifth the size of the lower 48 states.[498] Spanning 20 degrees of latitude, with coastlines on the Arctic and Pacific Oceans to the north and south and the Bering Sea to the west, the climate and geography of Alaska present a range of challenges to the road builder, particularly when balancing the need to adapt to local conditions with the desire to achieve standardization. Writing in 1906, geographer Cleveland Abbe, Jr. noted that "ignorance of Alaska's varied climates has been widespread and has led to not a few blunders."[499] Within Alaska, the drainage ditches necessary in one climate can lead to disastrous thawing of the roadbed elsewhere, and a material such as gravel or timber might be abundant in one area but scarce in another. Creating connectivity between different areas required adaptability, and the great distances to be spanned meant that economy of construction was always a concern.

4.2.1 Regional overview

Surrounded on three sides by water, the whole of Alaska forms the largest peninsula in North America and can be divided into three physiographic regions: the Pacific Mountains, the Central Plateau, and the North Slope. The Pacific Mountain region is essentially a continuation of the Pacific Mountain system of British Columbia. Following the coastline of the Gulf of Alaska, it includes the Chugach and Kenai Mountains, the crescent of the Alaska Range, and the Alaska Peninsula, forming fjords along the

[498] Edman, Hudson, and Johnson, 1,

[499] Cleveland Abbe, Jr., "Climate," in *The Geography and Geology of Alaska: A Summary of Existing Knowledge*, Alfred Hulse Brooks, ed. (Washington, D.C.: United States Geological Survey, 1906), 133.

coastline and valleys further inland. Its southeastern portion, known as the "Panhandle," is separated from Canada by mountains, and a substantial percentage of the area is made up of islands. In the spruce and hemlock forests of the Pacific Mountains and coastal areas, temperatures are relatively mild, but the dense vegetation and high annual precipitation meant that early road builders had to clear thick timber by hand, and muddy conditions limited the construction season.

Inland, the Central Plateau spans the width of the state from the Bering Sea to the Canadian border, and is bounded on the south by the Alaska Range and on the north by the Brooks Range. It contains major gold-producing regions in the Fairbanks vicinity and the Seward Peninsula. The landscape of the Central Plateau is less densely forested than the coastal region, with a mix of tundra and wooded areas. The Yukon River runs from the Canadian border across the entire plateau before emptying into the Bering Sea.

North of the Central Plateau, the North Slope stretches from the northern slope of the Brooks Range through foothills and across a coastal tundra plain to the Arctic Ocean.[500] This region contains petroleum reserves but is otherwise minimally populated.

Because much of Alaska's early development was spurred by resource extraction, the early intent of the road network was to connect resource-rich areas with seaports, river access points, or rail lines. In order to link the mining areas along the Yukon River in the Central Plateau with the Gulf of Alaska coast, overland transportation had to contend with several mountain ranges. While trails and wagon roads were built in many areas, only the more important routes were developed into the forerunners of the present vehicular road system. As a result, throughout the twentieth century, most road building activity was concentrated in areas between the eastern half of the Central Plateau and the Gulf of Alaska, where corridors link Fairbanks and the towns along the Yukon River with Valdez, Anchorage, and the Kenai Peninsula. The Panhandle region, due to the large number of islands, is primarily served by waterways, and the western half of the state is minimally populated with the exception of the Seward Peninsula. Western Alaska is not connected by road to the rest of the state; inhabited areas tend to be located on rivers or the coast, allowing access by watercraft. Today these areas have local roads and dogsleds have been replaced by small bush planes as a common means of travel over large distances. Only the southern Seward Peninsula has a road network of any substantial mileage that connects Teller, Council, and Taylor with the port city of Nome.

4.2.2 Climate challenges

Alaska's high latitude and low average annual temperatures create a variety of cold-weather construction and maintenance complications. Road construction in Alaska is plagued by what one engineer termed the "two villains of Alaskan construction, muskeg [bogs] and permafrost."[501] Permafrost, permanently frozen soil or subsoil that is a remnant of the Ice Ages, underlies 80 percent of Alaska's land area.[502] The

[500] Edman, Hudson, and Johnson, 1-3.

[501] "'Missing Link' Highway Nominated For Award," *Anchorage Daily Times*, 19 February 1972.

[502] Arvind Phukan, "Design Consideration for Roadways on Permafrost," prepared for State of Alaska Department of Transportation & Public Facilities, January 1980, 1.

condition occurs in both continuous and discontinuous zones; the continuous zone includes the North Slope and much of the Seward Peninsula, while the discontinuous zone includes all of the Central Plateau (see Figure 17). Where permafrost is found, its depth can reach up to 1,000 feet below the surface. When thawed, it can be an extremely unstable platform for structures, leading to sloughing, subsidence, landslides, and pavement failure. Permafrost is typically protected by a covering of moss, lichen, grasses, sedges, and trees, known as tundra, though at lower latitudes, discontinuous permafrost is also found beneath boreal forests. As little as three inches of moss in tundra areas can insulate the soil beneath and prevent thawing, but as soon as vegetation is stripped (as was the practice in most early road building), the soil begins to thaw. With permafrost below, water cannot drain downward as the lower soils are frozen and impermeable, so it remains at the surface where it accelerates thawing. This releases even more water, and the thaw depth becomes progressively deeper over time (see Figure 18).

Figure 17. Map of permafrost zones. Source: U.S. Geological Survey, Ground Water Atlas of the United States: Alaska, Hawaii, Puerto Rico and the U.S. Virgin Islands (1999).

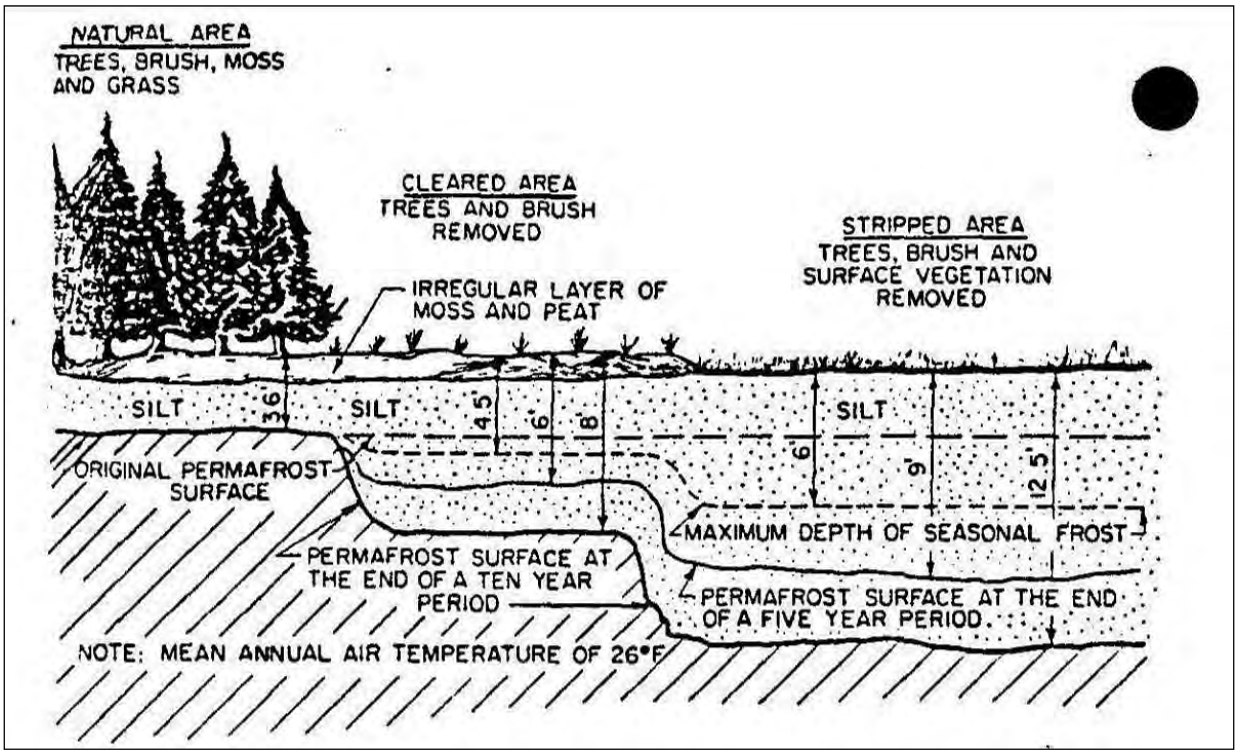

Figure 18. Cleaning and stripping effects on permafrost. Source: A. Phukan, "Design Considerations for Roadways on Permafrost," 1980.

Thawed permafrost made construction impossible, as the sudden release of previously frozen water immediately turns firm surfaces into a muddy quagmire that bogs down heavy equipment and vehicles. Different soil types affect the level of difficulty posed by this thawing; those composed of fine particles such as silt or kaolin (clay) were most susceptible, as they retained more moisture, while more porous, granular or gravelly soil drained relatively easily.[503] Engineers quickly discovered that permafrost soils containing finer particles were totally incapable of supporting construction equipment when thawed, and that there was no way to construct a stable road embankment until the excess water could be drained away with ditches or allowed to evaporate.[504] Initially, stripping and draining was standard practice, but by the middle of the twentieth century Alaskan road engineers' approach to permafrost construction shifted as the scientific community's understanding of its behavior increased. Today, design and construction criteria emphasize the preservation of the frozen state of the permafrost wherever possible.

In the discontinuous permafrost zone, roads traverse both tundra and muskeg, the latter of which poses difficulties similar to permafrost.[505] Muskeg swamps include lichen, grass, sedge, moss, trees, and shrubs atop a bog of partially decomposed organic material at depths ranging from 2 to 3 inches to 80

[503] Alaska Road Commission, *Alaska Road Construction and Maintenance Techniques*, 1952, 4.

[504] A.C. Clark, "Alaska Highway – Problems in Roadway Design," *Western Construction News*, March 1943, 108.

[505] M.D. Williams, "Road Construction in Alaska," *Roads and Streets* (February 1928), 75.

feet.[506] Low ground temperatures and saturation slow the bacterial action that causes this material to break down in more temperate climates so that dead vegetation accumulates rather than decaying fully. Muskeg has a high water content and a low bearing capacity, making it extremely compressible and an undesirable base for road construction. Beginning in the 1940s construction crews used dragline excavators to remove muskeg, but this practice was only economical when muskeg occurred in shallow deposits less than 5 feet deep. The construction of the George Parks Highway in the early 1970s led to the development of a new technique to compress muskeg gradually and remove some of the moisture content in order to provide a more stable embankment (see discussion in Section 4.4.5.3).[507]

In the colder areas away from the Pacific coast, ice formations occur both above and below ground and complicate road construction. Underground pockets of ice, referred to as "ice lenses," form 3 feet or more below the surface and grow horizontally, expanding parallel to the surface as moisture accumulates. Ice lenses range in thickness from 1 to 2 feet to over 100 feet. Nearly as difficult to remove as solid rock, the frozen layers melt as soon as the surface is exposed and the resulting material is described as "soupy," containing too much water to be used safely in embankments. Where practical, engineers preferred to change location or raise the grade line so as to avoid these ice formations entirely; where that was not possible, it was necessary to excavate at least 1 foot below grade and backfill with sandy material before the surface could thaw.[508]

Above the surface, seepage from springs, rivers, or the ground adjacent to a road can form a mass of surface ice as sheets of water freeze in successive layers. Icing, also known as *aufeis* (German) or *taryn* (Russian), can cover a road and even survive the summer in some areas.[509] While ground icing is not common under natural conditions, clearing and construction associated with road building can cause disruptions to thermal and hydrologic conditions. Icing on roadways, found in localized areas throughout the Central Plateau, indicates the presence of a steady water source in the vicinity and tends to recur in the same locations each year. The Denali Park Road is one notable example, with a number of notorious areas of recurring icing. While mechanical removal is often necessary, several preventative options also exist. Ice fences were erected as early as the 1960s using canvas (and later geotextiles) stretched between wooden stakes; used either singly or arranged in terraces, these can impound a sufficient quantity of ice to protect the road. In some cases the road grade can be raised, creating a larger area for ice to collect without spilling across the travel lane, but this method is costly and only effective if the exact limit of the icing is known.[510] A "freezing belt" sometimes provides temporary relief; by removing the vegetative mat and insulating blanket of snow from a strip of ground above the road, the icing process can be instigated closer to the source of the seepage and prevent it from reaching the roadway.

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[506] Frederick B. Lotspeich and Austin E. Helmers, *Environmental Guidelines for Development Roads in the Subarctic* (Washington, D.C.: Environmental Protection Agency, 1974), 52.

[507] John C. Becker, "Alaska Builds Highway over Muskeg and Permafrost," *Civil Engineering (*July 1972), 75.

[508] Clark, 108.

[509] Ted S. Vinson, "Mitigation Options to Reduce Icing and Thaw Instability Problems on the Denali Park Access Road," *Journal of Glaciology and Geocryology* 27, no. 1 (February 2005), 18.

[510] Vinson, 19-21.

High snowfalls in the inland areas and coastal mountains limited visibility on the roads, created the danger of avalanches, and increased the frequency of plowing required due to the drifting snow. As a result, many roads were closed seasonally until the 1950s, when increasing freight traffic led to a demand for year-round access. Wind-borne snow and drifting formations continued to pose a hazard to visibility and traction, but it was not until several decades later that operations on the North Slope led to the first experimental uses of snow fencing in Alaska.

Collector snow fences had first been used in the Rocky Mountain states in the nineteenth century to protect railroad tracks from drifting snow. Set back from the road, snow fencing is designed to reduce the wind speed and allow particles to come to rest on the downwind side. The distance from the road depends on the anticipated quantity of snow received over a season.[511] Two wooden types were developed: the high "Swedish" fence, using horizontal boards, and the lower "Canadian" version, using vertical slats strung on wires. By the 1930s snow fences had fallen out of favor and their use was discontinued. Beginning in the 1970s the Wyoming Highway Department began a program to install porous snow fences using up-to-date knowledge of snow transport and aerodynamics to improve the design and placement for maximum effectiveness. Snow fences based on Wyoming's innovations were utilized in Alaska beginning in the 1980s in Arctic villages, along mountain highways, and near North Slope petroleum facilities.[512] When properly installed, they represented a substantial savings over mechanical snow removal.[513]

Porous snow fences proved to be the most useful, as they were found to have three times the collecting capacity of a solid fence. Typical designs of this period include the Canadian fence, with nominal 2-inch by 3/8-inch slats and a height of 4 to 6 feet; the Swedish fence, constructed using nine 6-inch boards with 2.5-inch gaps, built in 16-foot sections with a height of 6.5 feet; and the Wyoming fence type. The latter is a newer variation on the Swedish fence, constructed using the same section lengths and board widths, with 6-inch gaps, an increased height of 8 to 14 feet, a 12- to 18-inch bottom gap, and a 10-15 degree leeward incline. In the 1980s snow fences were also developed using plastic fabric with 40 to 60 percent porosity, including Tensar and Signode Sno-strap, stretched between vertical posts 12 to 16 feet high.[514]

While the onset of spring brings relief from some cold-weather difficulties, the annual thaw, known as "spring breakup," causes roadbeds throughout the state to become unstable and susceptible to damage by vehicular traffic. When thaws occur at the top of the subgrade, melted water is unable to drain through the still-frozen soil below; the saturation diminishes the bearing capacity of the base, resulting in damage to the road surface.[515] Spring breakup is generally a greater concern with hard-surfaced roads than with gravel, as surface deformations that would destroy an asphalt surface are easily re-graded on a gravel road. In order to alleviate damage, load restrictions were placed on asphalt roads beginning with the

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[511] Ronald Tabler, *Snow Fence Guide* (Strategic Highway Research Program, National Research Council Report SHRP-W/FR-91-106, Washington, D.C. 1991), 9.

[512] Per Wangstrom, "Collector Snow Fences in the Arctic," *The Northern Engineer* 21, nos. 1 & 2 (1989), 13.

[513] Tabler, 3.

[514] Wangstrom, 14.

[515] Phukan, 10.

thaw of 1950. This practice proved successful and continues today, with seasonal weight and speed restrictions imposed where necessary on roadways throughout the state.[516]

4.3 Methods and materials

Alaskan roads are constructed under a variety of conditions, but most utilize one or more of the same basic materials: earth, gravel, wood, and asphalt. Depending on the time period and nature of the road required, these materials might be used as a surface or base course (or both, in the case of gravel). The earliest, most basic roads in Alaska were built simply by clearing timber, grubbing out tree stumps, and shaping and grading earth into a finished surface. These "pioneer roads" provided initial access into previously roadless areas, although in some cases they were created by widening a trail used by foot traffic or pack animals (see Section 3.2 for a discussion of these early non-vehicular routes). Wood and gravel were sometimes used to provide more stable surfaces over wet areas, permafrost, and muskeg; as these early roads were reconstructed and widened over time, gravel surfaces were added to improve durability and create a smoother riding surface. Later, asphalt was applied as a surfacing material to roads that were constructed with a gravel base. Snow and ice were sometimes used to construct temporary, seasonal roads as well, though these are not permanent structures.[517] This section discusses the various ways and time periods in which gravel, wood, or asphalt were used to construct road bases and surfaces.

4.3.1 Gravel

Gravel was widely used from the earliest period of construction as both a fill and surface material. Heavy traffic or wet conditions can destroy an earth road rapidly, and an "all-weather" road requires that the surface remain passable in wet conditions, rather than turning to mud. Gravel was the preferred material for all-weather roads in Alaska until after World War II.[518] These roads were typically constructed by shaping an embankment out of earth or gravel, flattening the surface as much as possible by cutting and filling. When this embankment was compacted, a gravel layer was spread on top and graded. By mid-century, increased understanding of permafrost led engineers to construct some roads without cutting, using fill brought in from another source, known as "borrow," to construct an embankment without disturbing the tundra surface. The roads constructed across the permanently frozen North Slope in the early 1970s were created by depositing gravel directly on the tundra with no earth shaping at all. Gravel roads are still constructed for low-traffic use in Alaska, and modern paved roads continue to use gravel as an embankment material.

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[516] United States Department of the Interior, 1949-1951, 21; BPR Juneau Region (Region 10) Condition of Alaskan Highways Quarterly Report, April 1-July 1, 1957, Bartlett 19R, Box 5; Dave Bush and Philip Tohme, "Assessing Parks Highway Load Restrictions," prepared for Alaska Department of Transportation & Public Facilities, Research and Technology Transfer, Fairbanks, Alaska (December 2003), 1.

[517] Snow and ice roads should not be confused with sled roads. The former are temporary structures, often over water bodies or muskeg bogs, and are made of ice and/or snow without any shaping of the soil beneath. Sled roads, by contrast, involve the construction of an earthen roadbed (graded without a crown) upon which snow accumulates to provide the riding surface in winter. These structures exist year-round, though they are not utilized by dogsleds in the warmest months.

[518] Board of Road Commissioners for Alaska (ARC), 1913, 11.

Natural gravel deposits exist throughout Alaska, and usable gravel was plentiful along most of Alaska's highways; nearby streambeds often provided an adequate supply during the construction process.[519] When extracted directly from such a deposit, the unprocessed gravel is known as "pit run," and its composition can vary considerably with regard to particle size distribution, sometimes making it a less desirable surfacing material. When oversized stones are removed, it is referred to as "screened gravel." A third type, "crushed gravel," is obtained by breaking larger stones into a uniform gradation. Where gravel is not available, quarried rock can also be crushed to produce a similar material.

Low-standard gravel roads were typically surfaced with pit run, while those that saw heavier traffic were surfaced with crushed gravel or crushed rock. In order to create a smooth riding surface, the uppermost layer of a gravel road needs to contain the correct ratio of the different-sized particles that make up the aggregate. These are categorized as gravels (1/4-inch-diameter or larger), sands (0.074mm to 1/4-inch in diameter), and fines (clay and silt, 0.074mm and smaller). When properly mixed and graded, the fines and sands fill the voids between the gravels and form a hard surface crust that can support traffic loads and shed water.[520] Pit run gravel tends to lack the requisite percentage of fines, making crushed gravel superior to uncrushed gravel for road surfaces.[521]

The grading process itself is an important factor in gravel road construction, and unlike pavement the uppermost layer is continually changed and renewed as part of the maintenance process. To eliminate rutting, washboards, potholes, and other surface deformities, a grader breaks up the surface crust and remixes the aggregates of the upper layer before smoothing the surface and shaping the crown, a slight slope (typically 2 percent) away from the centerline that drains surface water to each side.[522] Gravel is less susceptible to frost damage, as it drains more freely and does not tend to wick water upward. When damage does occur the surface can simply be re-graded rather than requiring repaving. For this reason, in some cases gravel provides a surface superior to asphalt and is still widely used on all or parts of rural or low-volume roads traversing more northerly routes in Alaska, including the Dalton, Elliott, and Steese Highways.[523]

4.3.2 Wood

4.3.2.1 Corduroy roads

Corduroy road construction dates back millennia; 3,000-year-old examples still exist in England and continental Europe.[524] The British military built corduroy roads in colonial America in the eighteenth century, and the technique was well known to Army engineers who came to Alaska in the early twentieth

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[519] Alaska Road Commission, *Alaska Road Construction and Maintenance Techniques*, 1952, 3.

[520] "Gravel Roads," *Wisconsin Transportation Bulletin No. 5*, Transportation Information Center, UW-Madison Department of Engineering Professional Development, n.d.

[521] Matthew Reckard, "High Speed Gravel Roads," *The Northern Engineer* 14, no. 3 (1983), 39.

[522] "Reshaping Aggregate Roads," *Technology for Alaskan Transportation* 19, no. 1 (Spring 1994).

[523] D.C. Esch, "Roadway Embankments on Warm Permafrost: Problems and Remedial Treatments," Proceedings, Fifth International Conference on Permafrost, Trondheim, Norway, vol. 2 (1988), 1225.

[524] Lay, 51, 94.

century. Corduroy road construction creates a road bed using small logs laid perpendicular to the direction of travel, which can in turn support an earth or gravel finished surface if desired. The technique makes use of locally available materials, is relatively quick to construct, and allows for travel over wet areas. Corduroy construction is still utilized in remote areas, such as northwest Canada and Alaska.[525]

In Alaska this method was commonly used beginning with the earliest wagon roads in the 1900s. Using logs felled nearby, crews could create a roadway over swamp and tundra or when excessive rainfall created impossibly muddy conditions on portions of an earth road. Once the alignment had been cleared, a layer of roughly trimmed trees, placed at least 12 inches apart, was laid longitudinally in the roadway. A second layer of the straightest and most uniform trees available was laid perpendicular to the roadway, set close together, to form the corduroy.[526] The corduroy was then covered with at least 6 inches of earth, and a gravel surface could be applied if necessary.[527]

The corduroy was generally laid on the stripped earth of the roadway, but when the upper layer of soil was not well suited for either the foundation or surface of a roadway, corduroy was installed directly on top of the moss covering. Over level terrain, the first layer of longitudinal trees was sometimes omitted. The corduroy road was sufficient for ordinary traffic in most weather, but in wet weather the wheels of vehicles could cut through the earth surface down to the trees. In this case, deep side ditches were dug and the lower soil was used as a surface on top of the corduroy.[528] Ditches provided the cheapest source of soil to use as surface on a corduroy road, but if improperly graded they could easily undercut the corduroy. Ditches too close to the road could also pose a danger to wagons. In order to prevent damage to the roadway, ARC literature advised the use of a berm between the corduroy and the ditch, culverts and outlet ditches constructed at intervals of no more than 300 feet to carry off the water and reduce scouring, and revetting with moss or sod in areas showing signs of undercutting.[529]

In the 1970s pioneer roads built to open new areas to development used similar corduroy techniques to cross wet areas, though by that time construction criteria recommended against stripping the ground surface. Ditching and draining were also avoided unless absolutely necessary. Longitudinal timber stringers were placed in the roadbed and perpendicular decking logs were then spiked to them, with branches and smaller trees laid on top. An alternate method was to simply lay larger trees perpendicular to the roadway, followed by a second layer of smaller trees and brush, and sand or gravel fill placed on top as a surface.[530]

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[525] Lay, 207; Lotspeich and Helmers, 53.

[526] Board of Road Commissioners for Alaska (ARC), 1906, 13.

[527] M.D. Williams, 75.

[528] Capt. Glen E. Edgerton, "Alaska's Road and Bridge Builders Face Snow, Frozen Ground and Glacial Floods," *Engineering Record* 71, no. 25 (June 1915), 765.

[529] Board of Road Commissioners for Alaska (ARC), 1913, 11.

[530] Lotspeich and Helmers, 53.

4.3.2.2 Plank roads

Similar in its nature to corduroy construction, the plank road first appeared in North America in 1835, when a road surface was constructed in Toronto, Ontario, using planks laid crosswise on longitudinal timbers.[531] Plank road construction was briefly popular in the 1840s and 1850s, particularly in upstate New York, but the roads lacked durability under sustained traffic and tended to wear out within 10 years.[532] In Alaska the technique was used in the first half of the twentieth century; some boardwalks are still in use in the southeastern part of the state and in western villages, though these omit the covering of sand or gravel used on some early plank roads. Heavy stringers, made of squared timbers or large split logs with the flat side facing up, were embedded lengthwise in the roadway with their top surface roughly level with the ground. Planks up to 3 inches thick were then laid perpendicular to the roadway and covered with sand or gravel. While perpendicular planking was considered the standard, as early as the 1850s some road builders advocated diagonal planking instead. Diagonal planking was believed to last longer, and also allowed the use of longer boards; sawmills typically handled logs greater than 8 feet in length, thus an 8-foot traveled lane width required that boards be shortened.[533] Perpendicular and diagonal planking both appeared in Alaska, and some examples also utilized squared stringers laid perpendicular to the roadway, supporting two lines of planks running longitudinally, spaced an axle-width apart. The technique was also used in the Juneau vicinity where resource extraction companies constructed plank-surfaced access roads to mines, built on timber trestles along steep canyon walls. Plank roads in towns were also common; images of downtown areas in Juneau and Nome depict main streets covered entirely in plank surfaces, and the boardwalks of downtown Nome remained in place until 1970.[534]

4.3.3 Asphalt

Asphalt pavement was introduced in the U.S. in the 1920s, but was not considered necessary in Alaska for several decades afterward.[535] In the years immediately following World War II, asphalt-surfaced roads became an area of focus, particularly for the ARC.[536] Spurred by the onset of the war in the Pacific Theater and fueled by the Cold War, military operations expanded in Alaska, requiring that the road corridors used to transport troops, equipment, and supplies be resurfaced to improve efficiency and durability. Engineers selected asphalt rather than concrete for a number of reasons, both economic and engineering-related. Less expensive than Portland-cement concrete, asphalt is more flexible and forgiving of weak subgrades and is less prone to frost damage, both of which are important concerns in Alaska.

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[531] William Kingsford, F.G. Skinner, and Charles Ezra Clark, *History, Structure, and Statistics of Plank Roads*, (Philadelphia: A. Hart, 1851), 5.

[532] Lay, 207.

[533] Kingsford, Skinner, and Clark, 22-27, 38.

[534] Front Street, Juneau ASL-Juneau-Views-Front Street-17 ASL-P01-2240; First Ave, Nome, Alaska ASL-P307-0986, http://vilda.alaska.edu/cdm/index (accessed 6 January 2013).

[535] Alaska Road Commission, 1940, 6.

[536] The ARC was Alaska's road agency until being absorbed by the BPR in 1956; an official state road agency was created with Alaska's inclusion into the U.S. in 1959, and is referred to as "the Department" throughout this report. Table 1 near the beginning of this report presents a summary of the Alaska road agencies' names through the years.

While Portland-cement concrete pavement is known as rigid pavement, any surface, such as asphalt, which is flexible and allows deflection to be transferred to the base, is considered a "non-rigid" pavement. Prior to World War II, design of non-rigid pavements throughout the U.S. had been based on the experience and judgment of the engineer in the field, who would determine the profile of the road's subgrade.[537] By the time Alaska began its paving program in the late 1940s, U.S. wartime airport construction had provided engineers with ample opportunity to study pavement design, and new empirical thickness design procedures had been developed for asphalt pavements that used soil character and/or wheel load to determine the appropriate section.[538]

Asphalt pavements are applied over an aggregate base (crushed rock or crushed gravel), which in turn rests on a sub-base, usually of granular fill. When the asphalt layer or "wearing course" has sufficient thickness to distribute a portion of the weight of a vehicle (1 inch or greater), it is referred to as an asphalt mat. A thinner layer of asphalt is sometimes applied to the crushed gravel surface. When this wearing course is less than an inch in thickness, it is referred to as a bituminous surface treatment or asphalt surface treatment (AST); this method provides little structural strength compared with asphalt mat pavements and is more commonly found on lower-traffic roads.[539] Both methods were utilized in Alaska beginning with the paving of portions of the Alaska Highway in 1949, which was expected to see low traffic volumes by the standards of the lower 48 states. Several types of AST have been used in Alaska since the mid-twentieth century, and in 2001 the Department developed an AST guide that covers the three main types used on Alaskan roadways; seal coat, double-layer, and high float. All three consist of a thin layer of asphalt emulsion covered with aggregate material, which bonds to the emulsion to form the surface. Seal coat and double-layer pavements utilize a nearly single-sized aggregate (often referred to as "chips"), while high float pavements use a graded aggregate with a wider range of particle size. Seal coats are placed over an existing pavement, while the double-layer and high float types are used over a gravel or crushed rock base.[540]

4.4 Road design and construction

4.4.1 Introduction

From the outset, Alaskan weather and soil conditions were recognized as particular influences on road construction. Road building efforts began with the application of existing principles, but evolved through trial and error to cope with the specific challenges presented by the territory. Permafrost, tundra, and muskeg presented scenarios for which engineers in the lower 48 states never had reason to develop design or construction criteria, and as late as 1940 the ARC acknowledged that while "standard construction and maintenance methods are employed in Alaska so far as practicable, it is necessary to

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[537] Public Roads Administration, *Highway Practice in the United States of America,* 156; Curtis C. Lattimer, "Building and Maintaining Bituminous Macadam Roads in Franklin County, Ohio," *Municipal & County Engineering* (March1922), 88. In his opening paragraphs, Lattimer refers to standard road building practices nationwide.

[538] Public Roads Administration, 156-157.

[539] Public Roads Administration, 212.

[540] State of Alaska, Department of Transportation & Public Facilities, *Asphalt Surface Treatment Guide* (Fairbanks, Alaska: Department of Transportation & Public Facilities, 2001), 3.

vary therefrom in some instances because of special physical and climatic conditions."[541] The development of overland transportation infrastructure also occurred later than elsewhere in the U.S. and remained comparatively unsophisticated until after World War II. As a consequence, rather than a gradual technological evolution seen elsewhere, the war's end saw a rapid move to modernize the Alaskan road system and the construction methods employed. Scientific advances, particularly in the understanding of permafrost behavior, characterize the evolution of road construction and design in the postwar period, and with the exception of large projects, such as the Parks and Dalton Highways, the emphasis shifted from pioneer construction (though this did continue) to the improvement and modernization of the existing system from the late 1960s to the present day. At the present time, federal legislation exempts Interstate highways in Alaska from conforming to the official Interstate Highway Standards, stating that they simply be "designed in accordance with such geometric and construction standards as are adequate for current and probable future traffic demands and the needs of the locality of the highway."[542] Although portions of a number of highways, including the Glenn, Seward, Parks, and Richardson Highways, are incorporated in the Interstate system, most of the road mileage outside of larger population centers still consists of rural, two-lane, undivided highways.

4.4.2 Early roads: 1905-1940

From its beginning, the ARC constructed earth, gravel, corduroy, and plank roads for travel by wagons, and later, automobiles.[543] These pioneer roads were built by hand and were necessarily fairly primitive. In the lower 48 states, the first few decades of the twentieth century saw increased usage of a variety of road building and paving techniques, including brick, wood block, macadam, and concrete, but these were not employed in Alaska. As the 1921 ARC annual report explained, "in the roads built here, the cruising, clearing, grubbing and construction of the road includes all work done upon the roads in the settled parts of the United States from pioneer days."[544] Unlike the lower 48 states, where more sophisticated methods of construction and surfacing were gradually applied to an existing transportation network during this period, the territory of Alaska lacked even a rudimentary road system, and efforts focused on providing basic access to developing areas.

[541] Alaska Road Commission, 1940, 5.

[542] Title 23, United States Code, Section 103 (c)(1)(B)(ii)

[543] Note: The ARC and the BPR are referred to herein as separate organizations until 1956, at which time the former was absorbed by the latter.

[544] Alaska Road Commission, 1921, 7.

The national stage: early influence of national organizations and standard guidance

The Progressive Era, a period of social activism and political reform in the U.S. spanning from the 1890s to the 1920s, was accompanied by a shift towards centralized government control and a new rational approach to design. In the lower 48 states, two national organizations emerged to play a role in setting and disseminating design standards for bridge construction: the BPR and the AASHO.[545] The BPR set the tone for state highway and bridge development by serving as a model of professional planning. In particular, BPR engineers portrayed themselves as unbiased, apolitical, and guided by a scientific approach to bridge design. AASHO also promoted professional planning and national standards which were designed to be adopted by state highway departments. An overview of the general activities of the BPR and AASHO is presented to provide a national context for road-building activities during this period.

Office of Road Inquiry/Bureau of Public Roads

The ORI, established in 1895 as the predecessor to the BPR, believed that research and a scientific approach to highway construction would provide guidance to improve the often miserable road conditions of the early twentieth century, including inadequate bridges. In keeping with the philosophy of the then flourishing Good Roads Movement, ORI advocated technical expertise and provided information on road construction through the circulation of bulletins, technical testing of materials, and the construction of demonstration roads.

Over time, the agency's influence broadened and it began to set national standards for bridge and highway design used by newly formed state highway departments. With the passage of the Federal-Aid Road Act of 1916, the BPR was responsible for administering matching grants to the states and requiring states to follow federal standards and guidelines. To disseminate research, the BPR began the monthly publication *Public Roads—A Journal of Highway Research* in 1918, which continues to be published today by the FHWA.[546] Provisions of the Federal-Aid Act of 1921 kept BPR in control of national highway and bridge design. The BPR's activities put research at the forefront, which was viewed as fundamental to good highway and bridge design.

American Association of State Highway Officials (later American Association of State Transportation Officials)[547]

AASHO, a professional organization of state highway officials, was instrumental in defining and disseminating standard practices for road and bridge engineering. State highway officials from Maryland, Virginia, and North Carolina established this national professional organization in 1914 to facilitate discussion of issues related to road construction, including legislation, economics, and design. Discouraged with the rural road focus of OPR, AASHO leaders identified the federal road network and a federal roads bill as their first priority. During the inaugural AASHO convention in 1915, members ratified a revised federal roads bill which was then introduced to Congress by Senator J.H. Bankhead and passed as the FAHA of 1916.[548]

[545] The PRA was renamed the BPR in 1949.

[546] Cooper, 97, 114.

[547] AASHO was renamed the American Association of State Transportation Officials (AASHTO) in 1973.

[548] Seely, 41-43.

State highway specifications disseminated by AASHO committees, such as the committee on bridges and structures, often reflected BPR design philosophies and policies. During the 1920s to 1940s, AASHO committees were generally headed by BPR officials, and bridge and road specifications were frequently prepared by federal engineers. AASHO published roadway and bridge standards to address varying traffic needs, loads, and speeds. AASHO also recommended grade separations at intersections in rural areas where higher traffic counts warranted this safety measure.[549] Together, the BPR and AASHO established and implemented consensus design standards while seeking to standardize the road and bridge-building practice itself.[550]

4.4.2.1 Alaska Wagon roads

In the early 1900s the first roads built by the ARC for wheeled traffic were classified as wagon roads. The precursors to the wagon road were pack trails and sled roads; while the ARC continued to build and maintain these two types for several decades, they required simpler construction consisting mainly of clearing and flattening. Wagon roads were wide and smooth enough to allow the passage of wheeled vehicles and intended to be crowned to allow drainage (crowning was not necessary or advisable for sled roads). Constructed by hand of earth and sometimes surfaced with gravel, wagon roads were ideally, "good country highways intended to meet an all-year-round traffic of considerable tonnage. They are located with suitable grades, crowned, ditched and drained, and corduroyed or planked where necessary."[551] The early wagon roads connected mining areas with navigable waterways, railroad lines, and ports, such as Valdez and Nome, and were intended primarily to move larger quantities of goods overland to mining camps, thus reducing freight expenses.

Cost was often the deciding factor in the final design, and road width could be reduced to a minimum to save the expense of materials and labor. In 1905, the ARC's first year of activity, heavily travelled roads were cleared to a width of 30 feet with a 16-foot traveled lane, while those expected to see lighter traffic were cleared to a width of 20 feet with a 10-foot traveled lane.[552] The following year the ARC's annual report stated that in most cases the cleared roadway width was reduced to 24 feet with a 12-foot traveled lane.[553] Most pre-World War I examples discussed in ARC literature or contemporary articles, particularly those located in the interior, describe a total cleared width of 24 feet, though the actual traveled lane was typically 12 to 13 feet wide. On lighter-traffic or steep side-hill sections this could be reduced to 10 or even 8 feet (see Figures 19 and 20).[554]

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[549] American Association of State Highway Officials, *Policies on Geometric Highway Design* (Washington, D.C.: American Association of State Highway Officials, 1945), 4; George L. Carver, "The Interstate System Survey," in *Proceedings of the Twenty-Third Annual Short Course in Highway Engineering*, Fred J. Benson, ed. (College Station, Texas: Texas Engineering Experiment Station, A&M College of Texas, 1949), 54-55.

[550] Seely, 121-126.

[551] Board of Road Commissioners for Alaska (ARC), 1913, 10.

[552] Board of Road Commissioners for Alaska (ARC), 1905, 308.

[553] Board of Road Commissioners for Alaska (ARC), 1906, 14-15.

[554] Board of Road Commissioners for Alaska (ARC), 1913, 11; Maj. F.A. Pope, "Road and Trail Construction in Alaska," *Professional Memoirs*, Washington, D.C.: Corps of Engineers, United States Army and Engineer Department at Large, Vol. VI, no. 25-3 (1914), 292.

Figure 19. Excavating by hand on the Richardson Highway, 1914. Source: Archives, University of Alaska, Fairbanks.

Figure 20. Wagon Road in the Matanuska Valley. Example of a wagon road with an earth surface, 1918. Source: H.G. Kaiser, Alaska Railroad Collection; Anchorage Museum, B1979.002.G959.

Where conditions were less extreme, such as the southeastern region, more substantial roads were sometimes constructed. An example of one of these southeastern wagon roads from the 1900s is the Haines-Pleasant Camp Road (the present Haines Highway that was incorporated into the overall Haines Cutoff/Highway). The roadway was graded to a width of 24 feet and the surface was primarily earth, with

gravel on more heavily trafficked areas. At the time of its initial construction in 1908, it was described as comparing favorably to contemporary roads in the lower 48 states.[555]

In addition to side ditches, wagon roads required culverts over small streams or where necessary to carry runoff away from the roadbed. A typical log culvert of the 1910s was built 12 feet wide with walls of logs at least 6 inches in diameter and flooring of poles or split logs at least 4 inches thick, hewn or adzed to a level surface. The minimum waterway dimensions were 6 feet wide by 3 feet high. Log cribbing abutments were notched together with tie logs running at least 5 feet into the embankment and the sills were sunk into the ground to prevent undermining.[556] Though stone was occasionally used, most early culverts were constructed in this fashion, using rough logs and poles, except in treeless areas of the Seward Peninsula, or near the coast, where sawn lumber was cheaper.

The relative cost of materials also dictated whether corduroy or planking was used as a surface for wagon roads in particularly wet areas. Where timber was plentiful, corduroy was less expensive, but if timber of a suitable size was not readily available nearby, it was more cost effective to have sawn lumber shipped from Seattle for the construction of a plank road.[557] Seattle was an important port through which many materials were transported to Alaska, but the cost grew as the distance increased. In timber-scarce locations further from the Alaskan Gulf, such as the Seward Peninsula, road builders were forced to experiment with alternatives to corduroy and plank construction.

The reconstruction of the Nome-Bessie Road illustrates the challenging conditions the ARC faced in this early period, coping with both the climate and the difficulty of obtaining appropriate materials. The original Nome-Bessie Road, built in the early 1900s, was constructed of earth and plagued by chronically wet conditions. Because the Seward Peninsula is largely unforested, little local timber was available for corduroy, meaning materials would have to be brought in at great expense. When the ARC reconstructed the road in 1906, it created a 22-foot-wide roadway. Ditches were plowed on either side and the excavated material was thrown into the center of the roadway. When the ditches thawed, the road was crowned 1 to 2 feet above the height of the adjacent land.[558] Initially, a 12-inch layer of gravel was used as a surface material, but it tended to sink into the muck below under the weight of traffic.[559] Seeking a method to keep the gravel from sinking into the soft ground beneath, the ARC tried several materials as a base. Corrugated iron was employed, but ultimately failed, as it worked its way out from beneath the gravel and posed a danger to traffic. Stunted willow trees grew in the area, but they did not provide a useful base. The most successful material proved to be the gunny sacks in which Nome's coal was imported; these were both cheaper and more effective than willows.

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[555] Pope, 292.

[556] Pope, 293.

[557] Pope, 292.

[558] Pope, 302, 306.

[559] Board of Road Commissioners for Alaska (ARC), 1913, 11.

The gunny sack base remained in service until 1912, when construction began on a gravel road with a Telford base.[560] This method, first developed in Scotland in the late eighteenth century, uses several graduated courses of stones to form the base; large stone blocks with a slight taper are placed on the subgrade and wedged with broken stone, then overlaid by a layer of smaller stones and finally by a layer of gravel.[561] The Nome-Bessie Road example is noteworthy as it is the only occasion on which research yielded mention of one of the more sophisticated types of non-rigid road construction that had been in use in Europe and the lower 48 states for nearly a century.

For the most part, however, Alaskan roads in the early twentieth century were minimally designed, and crushed gravel was the highest type of surface employed until after World War II. While the ARC advised certain general design standards, conditions unique to the territory (and varying widely within it) meant that much was left to the discretion of the supervisor in the field. The ARC did not maintain a large staff of professional engineers, and a later annual report's statement on the subject emphasizes its reliance on institutional knowledge of longtime employees, a practice that continued until after World War II:

> Very little engineering is done on roads after the final survey is made. A resident engineering force is never maintained. To take the place of a permanent engineering force on a new job, foremen of long experience are employed and advised frequently by superintendents who are either engineers or men of wide experience on engineering work of this nature in Alaska. Dispensing with relatively large engineering forces has reduced costs materially and, due to the low type of construction undertaken, has not adversely affected the work to any extent.[562]

4.4.2.2 Early permafrost construction

Included in this body of institutional knowledge were the strategies the ARC developed to minimize wasted effort caused by the climate. A distinctive feature of Alaskan road construction that persisted for decades was the use of what was known as "stage construction." Throughout the first half of the twentieth century, nearly all interior roads were built using some form of stage construction requiring as much as 2 to 4 years to achieve a finished result. When the term was used in the lower 48 states, it typically referred to the construction of low-standard roads with the expectation that they would be improved over the span of several years as necessary. In Alaska, the term referred to the protracted period necessary to obtain a finished grade of even a low-standard earth or gravel road. Tundra and permafrost conditions often required that roads be built in several successive campaigns, as the thawing that resulted from initial clearing efforts led to dramatic settling of the roadbed. Whenever possible, efforts were made to ensure that no final grading or surfacing was done until the roadbed had thawed and drained completely, and the subgrade was usually allowed at least one full season to settle before surfacing. Working only in the summer seasons, crews removed tundra one year, digging ditches to facilitate drainage, and then returned to grade the roadway the following year; it was understood that further reshaping of the subgrade would probably be necessary (see Figure 21).[563]

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[560] Pope, 306.

[561] Lay, 74-76.

[562] Alaska Road Commission, 1940, 5-10.

[563] M.D. Williams, 75.

Figure 21. Initial road construction prior to regrading. Photo c.1910. Source: Archives, University of Alaska, Fairbanks.

Although stripping, ditching, and draining were the accepted practices for dealing with permafrost, within the first 10 years of the ARC's activity, its engineers recognized that, depending on the location, the underlying soil conditions could sometimes make it impractical to strip the tundra. While the soils in the vicinity of Fairbanks and Rampart were amenable to the standard practice, the mica schist soil and "peaty muck" in the Tanana Valley and the Seward Peninsula turned into an unworkable quagmire if the permafrost was allowed to thaw.[564] In such regions, it was recommended that drainage ditches be dug and corduroy laid on top of undisturbed tundra, but this does not appear to have been a widespread practice. Comparatively little was known of permafrost behavior at the time, but the natural insulating properties of tundra moss were also already recognized. In 1915 Captain Glen Edgerton recommended allowing the shoulder to settle out naturally, describing how "the moss on each shoulder of the ditch drops, as the material beneath thaws and sloughs away, until the sides of the ditch acquire a gentle slope and are protected from further thawing by the moss left in the berm."[565] But by 1913 the ARC had already observed the effects of "seven seasons of sun" on the first wagon roads they had constructed, noting that enough thawing and draining action could create an acceptable earth road where not previously thought possible.[566]

4.4.2.3 Improving to automobile standards

One important feature of road building in Alaska that set it apart from that of the rest of the U.S. was the fact that the ARC did not consider hard-surfaced roads necessary until the late 1940s. In the lower 48 states, the 1910s and 1920s saw a rise in the number of rural roads paved with concrete or asphalt surfaces as traffic increased.[567] This was not the case in Alaska; even after World War I, when the

[564] Board of Road Commissioners for Alaska (ARC), 1913, 11.

[565] Edgerton, 765.

[566] Board of Road Commissioners for Alaska (ARC), 1913, 12.

[567] Public Roads Administration, 6.

number of automobiles rose substantially, vehicular traffic still did not approach the levels seen in the lower 48.

In 1920 the ARC was still constructing earthen wagon roads that were typically one-lane wide, though despite what they described as the "crudeness of the construction performed," standards limited grades to a maximum of 10 percent and curvatures to a 100-foot radius.[568] By this time, however, they recognized that automobile traffic required higher-quality roads, and throughout the following decade the ARC began to upgrade roads accordingly by widening and gravelling. The Richardson Highway, an important conduit for both freight and passenger travel, was widened and reconstructed gradually throughout this period (see Figure 22). As the ARC framed the issue in 1921:

> …the roads constructed by this Commission are in general good wagon roads. However, a more substantial type of road has now been built in many places, upon which automobiles and light trucks can be used economically. The demand for roads of this type is increasing, and effort is made in each case to provide a gravel surface for the road.[569]

Figure 22. Richardson Highway, 1931. Source: Archives, University of Alaska, Fairbanks.

Throughout the 1920s, improvement efforts included upgrading to "automobile standard" roads, most of which were surfaced with pit-run gravel taken directly from glacial deposits.[570] This was made possible, in part, by the recent advances in mechanized equipment that made road building more efficient.[571] Where previous work had been done by hand or using horse-drawn machinery, the ARC began to acquire military surplus vehicles and machinery for dragging and grading after World War I. Hand-built log

[568] Alaska Road Commission, 1921, 25.

[569] Alaska Road Commission, 1921, 6.

[570] M.D. Williams, 75; Board of Road Commissioners for Alaska (ARC), 1918; Spindler, 126.

[571] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 83.

culverts were replaced by the prefabricated nesting corrugated metal type manufactured by Armco, and portable compressors and jackhammers were available to cut through rock and widen the roadway.[572]

By 1925 approximately 90 percent of all travel over wagon roads was done in motor vehicles, meaning the ARC had to expend more funds and energy to keep the roads in passable condition.[573] In some instances, increased vehicular traffic meant that new materials had to be found in order to maintain an acceptable surface. Wire mesh surfacing was used experimentally on the Seward Peninsula in the 1930s when the ARC searched for alternatives to the usual corduroy, plank, or earth/gravel road for use in coastal areas where roads were built close to the shoreline over fine dry sand and subjected to traffic by heavy trucks. Surfacing materials, including rock, were more difficult to obtain locally, and corduroy and planking were vulnerable to ice action and prone to washouts at high tide. An attempt to use chicken wire failed, as it was not durable enough to withstand the volume of traffic, but heavier wire mesh was used successfully in 1931.[574] Research yielded no further mention of wire mesh until the late 1960s and early 1970s, when it was recommended as a possible base for pioneer roads over muskeg in newly developing areas.[575]

By 1932 the Alaskan road system consisted of approximately 2,200 miles; less than one-quarter of that total were graveled, and none were paved.[576] As late as 1940 the ARC maintained that while an improved gravel surface was "necessary for practically all roads which are used by automobiles," the use of concrete or asphalt-surfaced roads was "nowhere warranted in the present stage of development of the territory." Improvement efforts in the 1930s typically consisted of widening and upgrading to a crushed gravel surface, which was the highest standard then in use, and the ARC continued its practice of relying on institutional knowledge and experienced crews rather than maintaining a large professional engineering staff to oversee construction and final design. [577]

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[572] Spindler, 125; Alaska Road Commission, 1921, 29.

[573] Board of Road Commissioners for Alaska (ARC), 1925, 1992.

[574] J.G. Christiansen, "The Use of Wire Mesh for Road Surfacing," *The Military Engineer* (May-June 1931), 237. At Safety Sound (east of Nome), 8-foot-wide rolls of netting, made of No. 9 gauge wire with 2-inch mesh, were wrapped around a 2-inch diameter iron pipe at each end, buried at a depth of 2 feet. The sides of the mesh were similarly attached to pipes, which were anchored with a wire 15 feet to each side at 10-foot intervals. The resulting surface was sufficient to carry a five-ton truck and was recommended as a cost-effective alternative to crushed rock surfacing in regions where such materials were scarce. In contrast to the usual expense involved in shipping construction materials to remote areas, wire mesh was compact and a single roll could surface up to 250 feet of roadway.

[575] Lotspeich and Helmer, 53.

[576] United States Army, *Building Alaska With the United States Army, 1867-1965,* Pamphlet no. 360-5, Prepared by the Information Office, Headquarters, US Army, Alaska (1 October 1965), 75. Note: this figure differs substantially from the 1930 figure provided in Section 3.4.1 as the latter only includes ARC mileage and does not account for nearly 300 miles of BPR roads or approximately 200 miles added by the ARC between 1930 and 1932.

[577] Alaska Road Commission, 1940, 6.

4.4.3 World War II and the Alaska Highway: 1941-1944

The rapid construction of the Alaska Highway during World War II represented an extraordinary feat of logistics and construction, and the project led to an expanded knowledge of permafrost and muskeg construction. Because of its perceived strategic urgency during wartime, the planned construction of the Alaska Highway did not follow the typical pattern of other roads in Alaska, where a rudimentary earth road was gradually improved over a period of many years.

Most roads built in Alaska began as "pioneer roads," built through previously undisturbed areas to formerly inaccessible areas, or widening a trail in order to accommodate wheeled traffic; these were gradually improved, and later modifications might be made to the alignment as necessary. By contrast, the final location of the Alaska Highway, built by the BPR and private contractors, was not intended to correspond exactly to the pioneer road constructed by U.S. troops. The pioneer road was completed in a single season in 1942, cut quickly by U.S. Army construction crews who sometimes overtook the locating parties in their haste. It followed the path of least resistance, and did not necessarily utilize a line well suited for a permanent road. The pioneer road was initially constructed with a width that varied from 13 to 18 feet.[578] The BPR's hired contractors then widened this one-lane earth road into a 20- to 24-foot wide, two-way road and added a 4- to 12-inch gravel surface layer.[579]

The construction of the all-weather highway commenced the following year. The typical section was initially designed to match the standards of the two-lane country roads that the BPR had built throughout the U.S. during the 1930s, with a 24-foot-wide surface and 6-foot shoulders, except in areas of rock or where cuts were required to remove large quantities of earth. While the final highway, completed in 1943, sometimes used the same approximate alignment, it diverged in instances where BPR engineers attempted to follow a line more appropriate for a permanent road.[580] The constructed road bed was designed to be at a higher level relative to the surrounding ground than the pioneer road that preceded it. Where possible, the grade line was to be rolled with the contour of the land and thousand-foot sight distances were the ruling minimum in flattening vertical curves. A 2:1 horizontal-to-vertical slope was used on fills less than 2 feet, and a 4:1 slope was used on frozen ground. In instances where it was deemed desirable to deviate from the pioneer road, the ruling grades were 5 percent or lower, with a maximum of 7 percent; the maximum curvature was "3 degrees in mountainous sections, 19 degrees on open sight distance, and 16 degrees where sight distance is obscured or blind." All curves were to have standard spirals and widened road beds for curvatures above 3 degrees.[581]

According to A.C. Clark, principal highway engineer for the BPR in 1943, the subgrade design of the final Alaska Highway "follows standard practice. Three layers of material above the natural soil are provided – selected borrow, base course, and surface course."[582] Borrow and base courses used locally available

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[578] Clark, 109.

[579] Thomas H. MacDonald, L.I. Hewes, and J.S. Bright, "The Alaska Highway – Construction Activities of the Public Roads Administration," *Civil Engineering* 13, no.4 (April 1943), 173.

[580] Coates, *North to Alaska*, 145-146; Clark, 109.

[581] Clark, 109.

[582] Clark, 106.

deposits of sand or sandy gravel; where these were unavailable, sandstone ledges were blasted out to provide material and crushing plants were set up along the route. Base course material was crushed to a 2-inch maximum size, and the surface course utilized sandy gravel containing durable aggregates, crushed to a 1-inch maximum. The surface and base courses were each 4 inches thick, and the selected borrow depths varied between 6 and 16 inches, depending on the AASHO classification of subgrade soil. Where subgrades contained less favorable clayey soils, a total of 24 inches for borrow, base, and surface was typical, while for fine sand or silty/clayey gravel and sand, a total thickness of 14 inches was sufficient. Where present, silty soils were "entirely removed or mixed with heavier clays and treated as A-7 [clayey] soils."[583]

Where stage construction was required to cope with permafrost soils on the Alaska Highway, it was impossible to wait a full season before completing a newly cleared road bed, due to the speed with which the road-building operations were expected to proceed. Permafrost sections were allowed two months to settle, after which time they had thawed to a depth of at least 7 feet and were "relatively dry and stable."[584] As a result of the lessons learned on the Alaska Highway, engineers realized that, in some instances, the most prudent course of action was to leave the permafrost intact and build on top of it.[585] In low or flat areas where it was impossible to completely drain the excess water, vegetation was not stripped unless the underlying material was stable when saturated, such as gravel or coarse sand. Over unstripped tundra, the recommended practice required at least 3 feet of fill on top of the vegetation, with porous granular material at the bottom of the fill. This helped to insulate the ground below and prevent thaw, but also allowed any thawed water to run off.

The pioneer road used temporary bridges and wooden stave pipe culverts, but the final highway was built with Armco nesting corrugated metal culverts and steel bridges designed using AASHO specifications.[586] These steel bridges were designed with a 24-foot roadway, 18-inch safety curbs, and a clear height of 16 feet, with either timber or concrete decks.[587]

BPR engineers had determined that hard surfacing should be deferred until after the grading was stabilized. A bituminous surface treatment was recommended, though hard-surfacing efforts would not occur until several years after the war's end. Until that time, the crushed stone or crushed gravel surface remained. Decades of previous road construction in Alaska had shown the desirability of deferring any high-type surfacing until a season's traffic had passed and any corrections to the sub-base were made.[588]

In April 1943 the Army downgraded construction standards for the permanent road, lowering the quality of the finished surface and halting any further major relocations of the alignment in favor of following the pioneer road as closely as possible. Though still an improvement over the rough earth of the pioneer road,

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[583] Clark, 106, 107.

[584] Clark, 108.

[585] "Alaskan Army Engineers Battle With Permafrost," *Fairbanks Daily News-Miner,* 12 November 1963.

[586] MacDonald, Hewes, and Bright, 172; Spindler, 124-129; Raymond Archibald, William Greene, and John W. Guppy, "Problems in the Design of Alaska Highway Bridges," *Engineering and Contract Record*, 19 July 1944, 54.

[587] Archibald, Greene, and Guppy, 54.

[588] Clark, 109.

the all-weather Alaska Highway completed in the fall of 1943 (see Figure 23) was not up to formal civilian standards for its full length, and portions did not match A.C. Clark's 1943 description of the subgrade design. The first 100 miles of the Richardson Highway south from Fairbanks linked to the Alaska Highway and was also reconstructed to a 26-foot-wide roadway, with a pit run gravel base and surfacing for full width. Armco nesting type corrugated pipe culverts were used, as on the Alaska Highway.[589]

Figure 23. Alaska Highway, 1943. Source: Fred B. Dodge Photograph Collection, Alaska State Library, P42-017.

4.4.4 Postwar construction: 1945-1958

In the years immediately following World War II, new roads were constructed, such as the Sterling, Denali, Seward and Taylor Highways. These highways were gravel surfaced, but by 1948 the ARC recognized that military operations in the territory required the stabilization of the gravel surface on the main highways.[590] For the first time in the history of Alaskan road construction, hard surfacing of major transportation corridors became a priority, requiring new approaches and technologies. National guidance from the BPR (formerly the PRA, renamed in 1949) and AASHO helped disseminate information to state transportation organizations and kept them up to date with rapid developments in new materials and technology.

[589] Spindler, 124-129.

[590] Alaska Road Commission, 1948, 6.

The national stage: effects of standard guidance

Plans and guidance developed by the BPR and professional transportation organizations like AASHO (later AASHTO) were instrumental in setting federal transportation policy and disseminating information regarding new materials and technology, standard bridge designs, and best practices to state departments of transportation. National design standards, plans, and specifications were frequently adopted by state departments of transportation, and they assisted the state in efficiently and economically implementing bridge planning and construction. In the post-World War II period, the technical approach of the BPR and AASHO culminated in the 1956 Interstate System, which put in place a new and different set of highway design criteria and standards that seemed appropriate for unprecedented growth in highway travel in the 10 years following World War II.

Changes in standard plans and specifications were reviewed annually by AASHO and revised periodically, often in cooperation with the BPR. Both organizations were seen as a cooperative partner to the states. Updated AASHO specifications were published in 1949, 1953, 1957, 1961, and 1963, with such regular updates reflecting rapid developments in new materials and technologies. Bridge design standards developed by federal engineers and BPR officials were frequently disseminated under AASHO's name.[591] The BPR published its first edition of standard bridge plans in 1953 and periodically updated these plans to reflect new technologies and materials. In 1956 AASHO adopted *A Policy on Design Standards, Interstate System*, which included standards to address the new Interstate System.[592] For rural roads, updated standards were provided by AASHO in its 1965 publication *A Policy on Geometric Design of Rural Highways*.[593] The national standards developed by AASHO were applied in Alaska based on expected road use and traffic volume.

4.4.4.1 The six-year program

The six-year road-building program initiated in 1949 by the ARC resulted in the reconstruction, widening, and paving of existing primary roads, including the Richardson, Glenn, and Alaska Highways (see Figure 24). The Seward Highway was also constructed as part of the program, using portions of the former grade of the Alaska Railroad's Anchorage to Seward track after the railway was relocated.[594]

[591] Seely, 121-126.

[592] American Association of State Highway Officials, *Standard Specifications for Highway Bridges*, (Washington, D.C.: American Association of State Highway Officials, 1956), xxiii.

[593] American Association of State Highway Officials, *Standard Specifications for Highway Bridges*, 9th ed. (Washington, D.C.: American Association of State Highway Officials, 1965), 502.

[594] United States Army, *Building Alaska With the United States Army, 1867-1965,* 78.

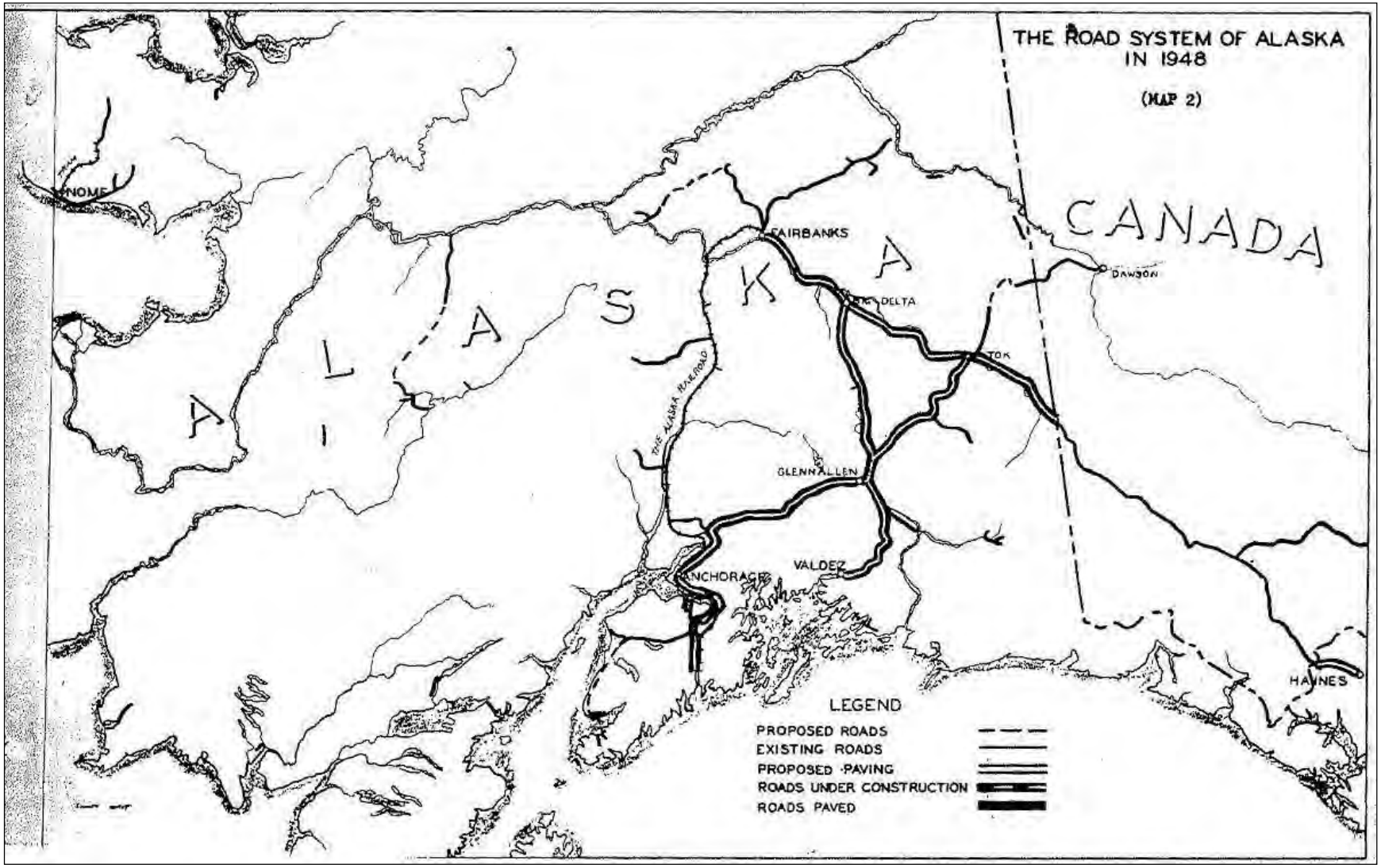

Figure 24. Map showing proposed paving under the six-year program.
Source: Alaska Road Commission, 1949-1951.

Paving efforts began with the Alaska Highway, and the decision was made to utilize plant mix (semi-continuous) asphalt with a very thin section, only 1.5 inches thick. The ARC expected light traffic (by U.S. standards of the time), and decided that most funds would be put into "careful preparation of the base, and that a thin surface upon a good base would probably be adequate." The use of plant mix asphalt led to the construction of bulk asphalt handling facilities at Valdez and Anchorage, in order to ensure that a supply of asphalt was available within reasonable hauling distance of work areas. Previously, the only available material was asphaltic cement supplied in non-refillable sheet metal drums that had to be opened by hand using an axe. A section of the Alaska Highway south of Delta Junction was also used for an ultimately unsuccessful experiment with a surface treatment type of bituminous pavement, which the ARC hoped would save money over plant mix.[595] This surface, which is more vulnerable to damage during thaws, fared poorly in the spring breakup of 1950 and had to be replaced. As a result, seasonal load restrictions were put in place throughout the highway system, and bituminous surface treatments were later used successfully on the Haines Highway and elsewhere. By the end of the six-year period, the Seward Highway had been constructed and paved, and the Richardson, Glenn, Alaska, and Haines Highways had been reconstructed and were approximately 80 percent paved.[596]

4.4.4.2 New standards

In general, construction standards used during the six-year program were "designed to provide soundly-engineered [roads] without the costly refinements of alignment, grade, and roadside development common to stateside highway standards."[597] As the result of limited budget, design standards "in most cases, were compromised unmercifully in order to construct the desired mileage of roads within the appropriation."[598] The highways were built to AASHO secondary standards, which dictate the minimum sight distance, maximum grade and curvature, and minimum roadway and surfacing dimensions for roads by category based on anticipated traffic volume (see Table 11). The large number of military vehicles present in Alaska as a result of the Cold War put tremendous strain on these road systems, and the level of traffic to which the roads were subjected, both in weight and number of vehicles, was unexpected. These highways, often with shoulder widths of 2 feet or less, had already begun to show signs of breaking down within five years of their completion.[599]

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[595] United States Department of the Interior, 1949-1951, 6, 8.

[596] United States Department of the Interior, 1955, 3.

[597] United States Army, *Building Alaska With the United States Army, 1867-1965,* 78.

[598] D.A. McKinnon, Commissioner of Highways for the State of Alaska, Testimony before Senate Public Works Committee on S.B. 3155, given 26 May 1966.

[599] Territory Of Alaska, Office of Highway Engineer, *Brief Report on Reasons for Placing the Territory of Alaska Under the President's Ten Year Road Program*, prepared for the Senate Committee On Public Works March 1955.

Table 11. AASHO standards for secondary highways, 1949

Design Control	Annual average daily traffic volume					
	Under 100		100 to 400		400 to 1000	
	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable
Width of surfacing or pavement	12, if any	-	16	20	18	20
Width of roadbed	20	-	24	28	26	30
Design Speed (mph)						
Flat topography	40	-	45	55	50	60
Rolling topography	30	-	35	45	40	50
Mountainous topography	20	-	25	35	30	40
Sharpest Curve (degrees)						
Flat topography	14	-	11	7	9	6
Rolling topography	25	-	18	11	14	9
Mountainous topography	56	-	36	18	25	14
Maximum gradient (percent)						
Flat topography	8	5	8	5	7	5
Rolling topography	12	7	10	7	8	6
Mountainous topography	15	10	12	9	10	7
Non-passing sight distance (feet)						
Flat topography	-	-	315	415	350	475
Rolling topography	-	-	240	315	275	350
Mountainous topography	-	-	165	240	200	275

Source: Design Standards, American Association of State Highway Officials (Washington, D.C.: The Association, 1949), 11.

During this period, the ARC developed standards for curve and grade maximums and right-of-way, roadbed, and paving widths for three categories of roads, classified by levels of connectivity: through, feeder, and local roads (see Table 12).[600] As shown by comparing with Table 11, the standards the ARC used for through and feeder roads fall within the parameters for AASHO's standards for secondary roads carrying an average of 100-400 vehicles per day. This highlights an important characteristic of the Alaskan road system: even the most heavily utilized primary roads were considered secondary roads by the standards of the lower 48 states. Higher-standard local and feeder roads were surfaced with crushed gravel, and low-standard roads were surfaced with an all-weather pit-run gravel layer.[601] Feeder and local roads were left unpaved, but the ARC desired to eventually pave all through roads to a width of 20 feet.[602] The standard section used on these roads called for 2 inches of hot plant-mix, rapid-curing,

[600] United States Dept. of the Interior, Alaska Roads Commission, *The Bulletin* 1, no 2 (July 1950), 5.

[601] Alaska Road Commission, *Alaska Road Construction and Maintenance Techniques*, 3.

[602] United States Dept. of the Interior, Alaska Roads Commission, *The Bulletin* 1, no 2 (July 1950), 5.

cutback asphalt over a 4-inch crushed rock base primed with medium-curing cutback asphalt and a minimum 15-inch granular sub-base.[603]

Table 12. Road standards, Alaska Road Commission Memorandum No. 2, January 1, 1949

	Through Roads		Feeder Roads		Local Roads	
Right of Way Width	300’		200’		100’	
Roadbed Width	28’		24’		20’	
Paving Width	20’		none		none	
	Min.	**Desirable**	**Min.**	**Desirable**	**Min.**	**Desirable**
Sharpest curve, deg.						
Flat Topography	11	7	14	7	14	-
Rolling Topography	18	11	25	11	25	-
Mountainous Topography	36	18	56	18	56	-
Maximum Grade, %						
Flat Topography	5	-	5	-	8	-
Rolling Topography	7	-	7	-	10	-
Mountainous Topography	9	-	9	-	12	-
Non-Passing Sight Distance						
Flat Topography	315	415	315	415	-	-
Rolling Topography	240	315	240	315	-	-
Mountainous Topography	165	240	165	240	-	-

Source: Alaska Road Commission, 1949-1951, Appendix 8.

While the ARC was responsible for the vast bulk of Alaskan road construction, the BPR had been responsible for building roads in Chugach and Tongass National Forests since 1922. The BPR also began hard surfacing during the 1950s, and by 1954 had paved the entire Seward Highway with a bituminous surface treatment and had constructed a portion of the Tongass Highway with the same.[604] The early 1950s highlighted the significantly different approaches of the ARC and BPR when the latter organization constructed the Seward, Sterling, and Copper River Highways within Chugach National Forest. In theory, both organizations’ design standards were based on the AASHO’s secondary road standards.[605] In practice, however, the ARC and BPR interpretations varied; the ARC’s design standards were lower and its

[603] Alaska Road Commission, *Alaska Road Construction and Maintenance Techniques*, 3; United States Army, *Building Alaska With the United States Army, 1867-1965,* 78.

[604] Annual Report of the Bureau of Public Roads to the Governor for the Fiscal Year 1954, State Archives, Juneau, Alaska.

[605] *Statement of the Department of Commerce Regarding Performance of Road Construction and Maintenance Activities in Alaska*, 1952, 8.

postwar commissioner, Col. John Noyes, felt the BPR's "interpretation," based on the AASHO standards for the 400 to 1,000 vehicle per day category for secondary roads, incurred excessive costs.[606]

The BPR's construction operations were essentially confined to the Pacific coastal area, where the majority of settlements were separated by water and roads were not the primary mode of transportation. Within its jurisdiction, the BPR had applied methods and standards of road construction in keeping with its efforts in the lower 48 states. Using a much higher construction standard and more careful surveying, it had built only a small number of roads, though they were intended to have a long service life.[607] In contrast, the ARC tended to build roads quickly using day labor and low-standard construction; it served an exponentially larger area of the territory and could not afford the expenditure of time or money required to build to BPR standards.

While the BPR's practices had long been accepted and commonly used in the lower 48 states, they were considered by several politicians, residents, and the ARC to be unsuitable for Alaska. The BPR devoted most of its resources to improving its existing system of earth and gravel roads, which accounted for relatively little total mileage. These improvement efforts included widening and straightening of alignments, substantial blasting of rock, and attention to roadside aesthetics such as stump removal and the obliteration of older roads following an alignment change. Many Alaskans, including Governor Gruening, considered these practices to be wasteful and not in line with the needs of residents, who were more concerned with connectivity and basic maintenance.[608] The problem was eventually solved by the BPR's absorption of the ARC in 1956 and the subsequent transfer of responsibilities to the newly formed Department in 1959.

4.4.4.3 Right-of-way

As standardization of road design became an area of emphasis in the postwar era, new guidelines attempted to include the standardization of right-of-way (ROW). Clarification of existing ROW also started to receive attention, as legislation enacted prior to this time did not specify the widths of ROW in most cases.[609] ROW issues continue to the present as titles and plans for major highways and the nature and width of ROW remain unclear in some instances.

Examples of historic legislation in which ROW is delineated are few; in 1917 territorial legislation established a 60-foot minimum ROW for all public territorial roads, but in 1938 a district court found that the 60-foot ROW only applied to roads built or maintained by the Territorial Board (see Table 1 in Section 3.3 for discussion of Territorial Board) and did not apply to roads built by the federal ARC, which

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[606] Col. J.R. Noyes, letter to James P. Davis, 7 May 1951.

[607] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 178.

[608] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 244.

[609] The Act of June 1932 transferred administration of roads to the Secretary of the Interior. United States Department of the Interior, Alaska Road Commission, "Manual No. 8 Real Estate Procedure and Practice" November 1952, available in the JF Bennett Collection, Alaska DOT&PF Northern Region files, PDF Archive Folder 11.

constituted the vast majority of road mileage.[610] The BPR and Forest Service were also not subject to this 60-foot ROW, and no clear evidence can be found to demonstrate that ROW was ever formalized for forest roads.[611]

RS 2477, applied to Alaska in 1923, granted ROW on unreserved public land for the construction of highways but did not specify the width. It did allow the use of federal section line easements, which could occur when a road was built following a section line, and established a total ROW of 66 feet.[612] These do not appear to have been widely used by any agency and are not applicable to the majority of Alaska's roads, which were often prevented by topography from following a straight line such as a section line for their full length. The Act of June 30, 1932, which authorized the construction of roads and highways over unappropriated public lands, also did not specify the width of the ROW.[613]

The first road-specific ROWs were established in 1942 with Executive Order 9145. This provided the ARC with a 200-foot ROW (100 feet on each side of center line) for the construction, operation and maintenance of the Palmer-Richardson Highway (Glenn Highway) from terminal point to connection with the Richardson Highway.[614]

Five years later, the Act of July 24, 1947, established a reservation of ROW for existing and future roads constructed by the U.S. or any state created out of the territory. The U.S. Senate Committee on Public Lands' report on the act stated:

> the bill is designed to facilitate the work of the Alaska Road Commission. As the population of Alaska increases and the Territory develops, the Road Commission will find it increasingly difficult to obtain desirable highway lands unless legislative provision is made for rights-of-way. The committee believes the passage of this legislation will help to eliminate unnecessary negotiations and litigations in obtaining proper rights-of-way in Alaska.[615]

However, the Act of 1947 did not specify ROW widths.[616]

That same year, Public Land Order (PLO) 386 of July 1947 was enacted to specifically address the ROW of two major highways under the jurisdiction of the Secretary of the Interior. Under the order, a strip of land 600 feet wide was withdrawn for highway purposes along the Alaska Highway from the Canadian

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[610] John F. Bennett, Alaska Department of Transportation & Public Facilities, Northern Region, *Highway Rights-of-Way in Alaska*, 9 March 1993 (Revised 1 January 2013), 60.

[611] John F. Bennett, *Highway Rights-of-Way in Alaska*, 65.

[612] John F. Bennett, *Highway Rights-of-Way in Alaska*, 49-52.

[613] The Act of June 1932 transferred administration of roads to the Secretary of the Interior. United States Department of the Interior, Alaska Road Commission, "Manual No. 8 Real Estate Procedure and Practice" November 1952, available in the JF Bennett Collection, Alaska DOT&PF Northern Region files, PDF Archive Folder 11.

[614] Executive Order 9145 - Reserving Public Lands for the Use of the Alaska Road Commission in Connection with the Construction, Operation and Maintenance of the Palmer-Richardson Highway, available in the JF Bennett Collection, Alaska DOT&PF Northern Region files, PDF archives, folder 10.

[615] John F. Bennett, *Highway Rights-of-Way in Alaska*, 62.

[616] John F. Bennett, *Highway Rights of Way in Alaska*, 62.

border to the junction with the Richardson Highway and along the Gulkana-Slana-Tok Road from Tok Junction to its connection with the Richardson Highway.[617]

To address future ROW needs, the Department of the Interior's Field Committee and Alaska representatives of the BPR made recommendations for uniform ROW by road classifications that would be the first legislation to classify and define ROW widths for public lands.[618] The recommendations were enacted in Public Land Order 601 of August 1949 (revoking EO 9145 and PLO 386) reserving for highway purposes and withdrawing from all forms of appropriations under public land law the following:

- Public lands in Alaska within 300 feet on each side of the center line of the Alaska Highway
- 150 feet on each side of the center line of all other through roads (Richardson, Glenn, Haines, and Seward Highways, exclusive of land within the Chugach National Forest)
- 100 feet on each side of the center line of feeder roads
    - Steese, Elliott, Denali (formerly McKinley) Park Road, Anchorage-Potter-Indian Road, Edgerton Cutoff, Tok Eagle Road, Ruby-Long-Poorman Road, Nome-Solomon Road, Kenai Lake-Homer Road, and Circle Hot Springs Road
- 50 feet on each side of the center line for local roads[619]

Correspondence at the time between Governor Gruening and Representative Bartlett demonstrates their opposition to the proposed ROW widths. Draft correspondence prepared by Governor Gruening for Representative Bartlett to send to the Secretary of the Interior proposed a revised ROW of 200 feet for the Alaska Highway and primary and secondary roads and 100 feet for branch and feeder roads. The draft letter cites that the ROWs as proposed would "in many cases push him [would be-settler] up a mountain, over a cliff or into a stream or lake," and it would cause issues for construction and maintenance of driveways. "I find it impossible to believe that anyone acquainted with actual conditions in Alaska would recommend a 600-foot right-of-way or anything approaching that dimension."[620] It is not known if this letter was ever sent to the Secretary of the Interior, but it does show the sentiment that

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[617] John F. Bennett, *Highway Rights of Way in Alaska*, 16.

[618] The Department of the Interior's Field Committee was a new agency of the Department of the Interior established in 1948 with heads of all of the agencies of the Department of the Interior in Alaska. United States Department of the Interior, 1949-1951; J.A. Krug, Secretary of the Interior to Mr. E.L. Bartlett, House of Representatives, 10 February 1949, available in Series 1, subseries A, Subseries 2, Box 28 Folder 188, Gruening Collection, Elmer E. Rasmussen Library, University of Anchorage at Fairbanks, Fairbanks, Alaska.

[619] Public Land Order 601 and 757; John F. Bennett, *Highway Rights of Way in Alaska*, 16.

[620] Draft correspondence for E.L. Bartlett prepared by Governor Gruening to be sent to J.A. Krug Secretary of the Interior, E.L. Bartlett to Governor Gruening, 22 February 1949, and Letter from Bartlett to Gruening states the draft letter is excellent and it will go out immediately. No additional correspondence is in the file so it is unknown if the letter was actually sent. Available in Series 1, subseries A, Subseries 2, Box 28 Folder 188, Gruening Collection, Elmer E. Rasmussen Library, University of Anchorage at Fairbanks, Fairbanks, Alaska.

Governor Gruening and Representative Bartlett had for the recommendation. This was an area where they felt that the Department of the Interior was out of touch with the unique situations in Alaska.

Just two years later, PLO 757 and Secretary Order 2665, both enacted in 1951, fixed the width of public highways established or maintained under the jurisdiction of the Secretary of the Interior and outlined a uniform procedure for the establishment of ROW (or easements) over or across public lands. ROW widths by road classification did not change from those previously established. Two additional through highways were identified, Anchorage-Lake Spenard and Fairbanks-College Highway, and the ROW for feeder and local roads were transferred to easements. An amendment to SO 2665 in 1956 added through roads with a 300-foot width, including Fairbanks-International Airport Road, Anchorage-Fourth Avenue-Post Road, Anchorage International Airport Road, Copper River Highway, Fairbanks-Nenana Highway, Denali Highway, Sterling Highway, a portion of Kenai spur, Palmer-Wasilla-Willow Road, and a portion of the Steese Highway. Adjustments were also made to feeder and local roads.[621]

Further legal changes occurred to ROWs in 1958, when through roads were converted to easements from withdrawals in PLO 1613. This did not affect the physical dimensions, as the existing ROW for through roads remained at 300 feet.[622]

4.4.4.4 Permafrost construction

By the mid-1950s construction criteria discouraged stripping or any disturbance of the tundra. Wherever possible, roads were constructed atop the tundra covering using fill, and locating parties and equipment were kept off final alignment where possible using temporary tote roads to haul material to the construction site.[623] Location criteria during this period, based on decades of previous experience, were designed to avoid the worst of the construction difficulties posed by Alaskan climate and soil conditions. In areas of discontinuous permafrost, locations were developed on the southern exposure of hillsides wherever possible, as they tended to be free of permafrost. The increased sun also reduced snowfall, freeze-up, and icing, and thawed earlier, thus reducing maintenance as well. Wet slopes, typically more prone to slides and icing from seepage, were avoided.[624]

In 1954 the ARC partnered with the Geophysics and Military Geology Branches of the USGS to create a program of thermal studies examining road and structural foundations in permafrost areas. Through a combination of field observation and laboratory analysis, they confirmed what the ARC's location criteria had long reflected, recommending three basic approaches. The first, that roads and other structures must be built so heavily as to withstand any shifting due to differential settling caused by unequal thawing of the permafrost, was extremely costly. The second, that permafrost be deliberately thawed and eliminated prior to construction, was impractical except in small areas or where permafrost conditions

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[621] John F. Bennett. *Highway Rights of Way in Alaska*, 17; Department of Interior Order 2665, Amendment no.2 "Rights-of-way in Alaska, 9/15/56," available in the JF Bennett Collection, Alaska DOT&PF Northern Region files, PDF archives, folder 10.

[622] John F. Bennett, *Highway Rights of Way in Alaska*, 18.

[623] Alaska Road Commission, *Alaska Road Construction and Maintenance Techniques*, 4.

[624] United States Army, *Building Alaska With the United States Army, 1867-1965,* 77.

were less severe with respect to depth, temperature, and soil composition. The third approach, utilization of the unthawed permafrost as part of the foundation, was the most widely followed practice and had been the ARC's policy for some years already.[625]

4.4.4.5 Winter road maintenance

Before World War II, winter conditions regularly rendered certain stretches of road impassable. As highway standards improved and freight traffic increased, the ARC began to examine the possibility of keeping more through roads open year-round. Snow and ice removal methods and equipment were a central part of these efforts, enabling mountain passes to remain open. The first example of year-round mountain pass maintenance occurred in 1949 on the Richardson Highway where seasonal closing of the Thompson Pass cut off the only automobile route from Valdez to Fairbanks, making it a top priority. One of the most notorious Alaskan mountain passes, the Thompson Pass is located where the Richardson Highway crosses the Chugach Mountains northeast of Valdez. At over 2,800 feet in elevation, the pass has received up to 80 feet of annual snowfall, combined with wind gusts up to 100 miles per hour.[626]

Beginning in the winter of 1949-1950, tractors and heavy trucks removed snow from the pass to keep it open throughout the season. Two 20-yard dump trucks were equipped with rotary plow heads, the dump bodies removed to accommodate the twin diesel motors that powered the heads, and two additional 20-yard dump trucks were fitted with specially designed V-blades, fabricated by the Pacific Car and Foundry Company of Renton, Washington. The first season's operation was a success, and similar efforts were applied to other passes, including the Isabel Pass. According to the ARC, the specially designed rotary plows in use by the mid-1950s were believed to be the world's largest.[627] Maintaining a 1- to 2-inch "snow cake" on the road provided a "smooth and pleasant driving surface."[628] Additionally, ice fences were erected to encourage ice to build up vertically rather than spreading across the road surface; heating units were also installed in drainage structures in order to keep water moving freely through.[629]

As a result of these efforts, the ARC also began to address avalanches in areas where highways passed through the mountains. When roads were closed for the winter, an avalanche was nothing more than a "costly nuisance" to be cleared away in the spring; with year-round traffic and thousands of avalanches of varying sizes each season, the risk of fatalities was very real.[630] The most effective method of dealing with the problem proved to be the use of controlled avalanches triggered by 75mm artillery rounds. Snow sheds, diversion walls, and piers were studied as possible structures for roadway protection, but were costly to build and maintain. After experiments in the 1950s, it was found that simple earth and stone mounds "strategically placed in a slide path" could provide enough interference to slow and spread an avalanche.[631]

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[625] United States Department of the Interior, 1956, 14.

[626] United States Department of the Interior, 1953, 11.

[627] United States Department of the Interior, 1954, 14.

[628] United States Department of the Interior, 1953, 12.

[629] Alaska Road Commission, 1955, 27.

[630] Alaska Road Commission, 1955, 10.

[631] United States Department of the Interior, 1956, 10.

4.4.5 Focus on improvement: 1959-1977

With the advent of statehood in 1959, responsibility for the road system shifted to the newly created Department. As major highways were improved, motorists became accustomed to better roads and demanded improvements elsewhere. The Department had previously placed the greatest emphasis on "providing rudimentary access to the populated areas" and linking formerly isolated communities, but by the mid-1960s its focus shifted away from pioneer construction to reconstruction.[632] Following the 1964 Good Friday Earthquake, road design and improvements continued to reflect the public's desire for features such as improved sight distance, gentle curves, and wider lanes. This came in response to both continued public demand for roads on par with those of the lower 48 states and with the desire to lower the state's maintenance costs.[633]

4.4.5.1 Standards and safety

By 1963 the Department had classified roads into several categories based on connectivity and eligibility for federal funding. Primary highways included the Seward, Glenn, Sterling, Richardson, Alaska, Glacier, Tongass, and Haines Highways. Secondary highways were divided into two subcategories: Secondary A highways, which received federal funds, such as the Elliott, Steese, Taylor, and Edgerton Highways; and Secondary B highways, which were typically short feeder roads that provided access to mines, farms, and residential and recreational areas, and were not eligible for federal funds.[634] Outside of urban areas, the width and surfacing standards for both primary and secondary roads were essentially the same, and design was dictated by traffic volume (see Table 13).

Table 13. Primary and secondary highway standards for two-lane rural roads in 1965

Average Daily Traffic Volume	Roadway width	Surfacing*
15-300	24'	24'
300-900	30'	24'
900-1,500	30'	24'
1,500-3,000	36'	24'
3,000-4,500	40'	24'
4.500-9,000	40'	24'

** With the exception of the 15-300 vehicles per day category, which was assumed to have a gravel surface for the full roadway width, other surfacing consisted of either asphalt mat or bituminous surface treatment.*

Source: Alaska Highway Study, 1965.

Nationwide trends in improving highway safety were reflected in Alaska as well. Where necessary, guardrail was included in the designs for improvement projects, and a 1967 sight-distance improvement near Juneau was the first project in the state to be undertaken solely for safety purposes, rather than

[632] State of Alaska, Department of Highways, 1967, 31.

[633] "Highways '66: Reconstruction," *Alaska Construction* (May-June 1966), 10.

[634] State of Alaska, Department of Highways, 1963, 13.

maintenance or new construction.[635] A centerline striping program was initiated in 1961 and shoulder striping was added beginning in 1966. The latter practice was relatively new in western states but had shown safety benefits, particularly for night driving when oncoming headlights made it difficult for drivers to follow a centerline, and by 1968 all paved roads had both center and edge stripes.[636]

After the completion of repairs necessitated by the Good Friday Earthquake damage, state-maintained and local roads continued to be upgraded throughout the 1960s and into the 1970s. Rock was blasted where it impaired sight distance, roadways and shoulders were widened, surfaces were graveled or paved, and grades were raised and adjusted to improve drainage.[637] Hazardous portions of major highways that still followed pioneer alignments were straightened, as was the case for a nine-mile section of the Richardson Highway, south of Fairbanks between Nine Mile and Moose Creek Bluff, where a "two-lane curvy old road" was replaced with a divided four-lane road.[638] Initial paving continued on previously gravel-surfaced roads, and asphalt surfacing of the Sterling Highway was completed in 1967.[639] Pre-construction activities also evolved to utilize new scientific approaches. Extensive subsurface investigation was conducted prior to highway design and construction, a departure from the practices of the 1940s and 1950s. Highway design over frost-susceptible materials was done using methods developed by the USACE, which classified soils according to frost susceptibility, basing road section design on the characteristics of the underlying soils.[640]

The late 1960s and early 1970s also saw the development of statewide environmental guidelines for road building; location, design, and construction criteria were adapted in response to federal environmental legislation to reduce the impact of road construction on the local ecosystems. Extra care was taken to prevent silt released by permafrost thaw from clogging streams.[641] Recommendations included the extraction of local gravels without damaging wildlife habitat, and specially designed fish passage culverts where roads crossed streams used by migrating fish.[642] The EPA published environmental guidelines in 1971 that also addressed aesthetics, recommending that material borrow sites and haul roads from borrow areas be screened from the right-of-way by a strip of vegetation, and the boundaries of these sites be shaped so as to "blend with surrounding natural land patterns."[643] The Forest Service had implemented similar aesthetic guidelines on forest highways throughout their jurisdiction as early as the

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[635] State of Alaska, Department of Highways, 1967, 32.

[636] State of Alaska, Department of Public Works, Division of Highways, 1961, 99; "Alaska's Roads Get Shoulder Stripes," *Anchorage Daily Times*, 25 July 1966; State of Alaska, Department of Highways, 1968, 21.

[637] State of Alaska, Department of Highways, 1968, 21.

[638] State of Alaska, Department of Highways, 1970, 52.

[639] State of Alaska, Department of Highways, 1967, 31.

[640] D.A. McKinnon, letter to William J. Niemi, 21 January 1965, available in Bartlett 31A, Box 1; Phukan, 11.

[641] Frederick B. Lotspeich, *Environmental Guidelines for Road Construction in Alaska* (College, Alaska: Environmental Protection Agency, Alaska Water Laboratory, 1971), 22.

[642] Lotspeich, 28-29.

[643] Lotspeich, 59.

1910s and 1920s, but these were not practices shared by the Department until later in the twentieth century.[644]

4.4.5.2 1964 earthquake damage

The 1964 Good Friday Earthquake severely damaged the road system in south-central Alaska and Kodiak Island. At the time of the quake, over half of the total paved mileage in Alaska was located within the damage radius.[645] Underlying soil types tended to dictate the level of damage sustained, as roads built over bedrock or frozen gravel remained most intact, while those built over silty soils fared poorly.[646] The Richardson, Seward, and Copper River Highways were particularly affected. The Seward Highway sustained some of the worst damage, where general subsidence lowered the portion of the highway along Turnagain Arm below tide levels. Cracks and fissures appeared in numerous locations, and the earthquake also triggered slides, slumps, and side-hill failures on the Glenn Highway between Anchorage and Glennallen. Longitudinal fissures up to 6 feet wide and 12 feet deep appeared, some up to 1,000 feet in length, rendering the road unusable. Other coastal highway areas were similarly affected by subsidence, such as the Homer Spit, where the road settled below the high tide level.[647]

To the east, the Richardson Highway sustained heavy damage in the area near Valdez, resulting in transverse and longitudinal roadway cracks and vertical displacements up to 1 foot. The first five miles of the highway north from Valdez actually moved 5 feet seaward as a whole.[648] Overall, earthquake repairs to the entire highway system took more than three years to complete.[649] While seismic resistance became a concern in road building and bridge design, it was not feasible to redesign the existing roads to resist future earthquake damage; the highway network crossed numerous areas of very soft soils, which are particularly vulnerable to seismic activity, and it was not economically justifiable to rebuild the highways using earthquake-resistant design.[650]

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[644] Rakestraw, 150.

[645] Gary G. Sturman, "The Alaska Highway System," in *The Great Alaska Earthquake of 1964,* (Washington, D.C.: National Academy of Sciences, 1973), 987.

[646] Ralph R. Migliaccio, "Earthquake Damage to Highways in the Valdez District, Alaska," *Highway Research Record*, No. 91 (1965), 64-69.

[647] Sturman, 989-992.

[648] Sturman, 999.

[649] State of Alaska, Department of Highways, 1967, 32.

[650] Sturman, 1,009.

ADH technological advancements: use of computers to aid in road design

Throughout the early-to-mid-1960s, the Department pursued improved engineering practices with technology, including the use of photogrammetric techniques and computers for design work. First, it rolled-out photogrammetry techniques for locating potential highway routes. The technique, which used aerial photography to obtain reliable information about the terrain and environment, helped the Department's pre-construction engineers better plan highway routes. The Department first tested the technique on unspecified consulting engineering projects in 1962. The success of the technique prompted the Department to perform the work in-house.[651]

In addition to photogrammetric techniques, the Department began using computers in design work. While state facilities did not initially have computers, the Department contracted with the Washington Highway Department, located in Olympia, Washington, for use of computer design facilities. In 1963 the Department sent approximately 40 percent of design work to the Washington Highway Department for processing.[652] The following year, the Washington Highway Department computed over 60 percent of Alaska's design work. The tool proved invaluable in 1964 for emergency reconstruction work following the earthquake. In fact, the first project completely designed with the aid of computer by the Department was the emergency reconstruction work on miles 5 to 13 of the Copper River Highway.[653]

After the earthquake, the benefits of computers were clear, and in 1965 the Department added a Data Processing Section to oversee computer work. Computers not only made calculations easier, they also reduced the amount of manpower needed. According to the Department's 1965 annual report, "In the first 10 months of 1965 approximately 600 hours of data processing service was utilized for design earthwork and geometric calculations which represents nearly 28,500 man days of manual calculations."[654] The importance of the computer to the Department is best indicated by a full-page photograph of the new computer room in the 1966 annual report, with the caption: "The Department's electronic computer results in great savings in calculating earthwork quantities for the Department's engineering staff."[655]

4.4.5.3 Permafrost and muskeg construction on new roads

While the Department had spent the previous decade focused on improvements to the existing road network, the late 1960s and early 1970s saw the construction of two entirely new highways. Both the George A. Parks (Anchorage-Fairbanks) Highway and the North Slope Haul Road (later named the Dalton Highway) challenged engineers and construction crews to work under extremely difficult circumstances, and wherever possible, construction made use of new methods for dealing with permafrost and muskeg.

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[651] State of Alaska, Department of Highways, 1963, 29.

[652] State of Alaska, Department of Highways, 1963, 29.

[653] State of Alaska, Department of Highways, 1964, 7.

[654] State of Alaska, Department of Highways, 1965, 10.

[655] State of Alaska, Department of Highways, 1966, n.p.

Following the 1968 discovery of oil fields at Prudhoe Bay, attention turned to the construction of roads on Alaska's North Slope. Located in the continuous permafrost zone, this region has a typical thaw depth of 12 to 18 inches beneath tundra sod that covers the majority of the ground. Initially, drilling operations were confined to the winter months and temporary roads were constructed of snow, but in 1971 Trans Alaska Pipeline Systems (TAPS) began work on an all-weather road from the Yukon River to Prudhoe Bay in accordance with AASHTO secondary highway standards.[656]

Gravel roads were already being constructed at Prudhoe Bay by this time, and construction criteria developed specifically for this area by engineers working with TAPS reflect the growing understanding of permafrost among the global scientific community during this period. These criteria strongly recommended against stripping the vegetation, stating that "destruction or removal of the tundra cover will promote rapid and disastrous melting of the permafrost in the summer months."[657] Conventional methods of surface grading and side ditching were discouraged in favor of building gravel roads directly on top of intact tundra cover, which would preserve the stability of the roadbed by insulating the permafrost from thaw. Winter construction was preferred, since the tundra was less vulnerable to disturbance when completely frozen. This also required less gravel, as the roads were not as prone to settling as during summer construction.

Gravel was widely available from nearby riverbeds, and typical North Slope roads were constructed entirely of that material. To avoid frost susceptibility, gravel was to contain less than 3 percent of material finer than 0.02mm. Roads were constructed with a 30-foot crown width and 1:3 slopes at each side. After snow was removed from the ROW, the gravel fill was compacted in layers to an embankment thickness of 5 to 6 feet. Investigations of existing airstrips and other facilities already in the area had indicated that this depth of fill would be satisfactory to prevent thawing into the permafrost. To facilitate drainage, corrugated metal culverts were laid through the roadbed above the tundra surface, since ditching was inadvisable.[658]

In order to protect the existing vegetative mat or restore it as quickly as possible, the construction area was limited to the roadway and opened or eroded areas were reseeded.[659] Department construction guidelines developed at this time continued to emphasize the importance of keeping heavy machinery off the tundra surface to avoid damage and subsequent thawing. To accomplish this, all borrow was dumped at the end of the fill and pushed forward onto the undisturbed tundra by bulldozers.[660] The new construction criteria also called for vertical cuts in permafrost rather than sloping cuts; this technique reduced the volume of material removed and was stable as long as it remained frozen. Over time, the exposed material would thaw and slough, undercutting the vegetal mat above; this in turn settled over the

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[656] State of Alaska, Department of Highways, 1969, 13.

[657] William P. Stokes, "North Slope – Construction Criteria for Roads and Facilities," *Journal of Petroleum Technology* (October 1971), 1,209.

[658] Stokes, 1,210-1,211.

[659] Alaska Department of Highways*, Permafrost Construction, TAPPS Road, Livengood to Yukon, 1972-1973* (Juneau, Alaska: Alaska Department of Highways, 1973).

[660] Phukan, 69.

cut (see Figure 25). Interestingly, these guidelines bear a striking resemblance to the technique described by Captain Glen Edgerton more than 60 years earlier (see Section 4.4).[661]

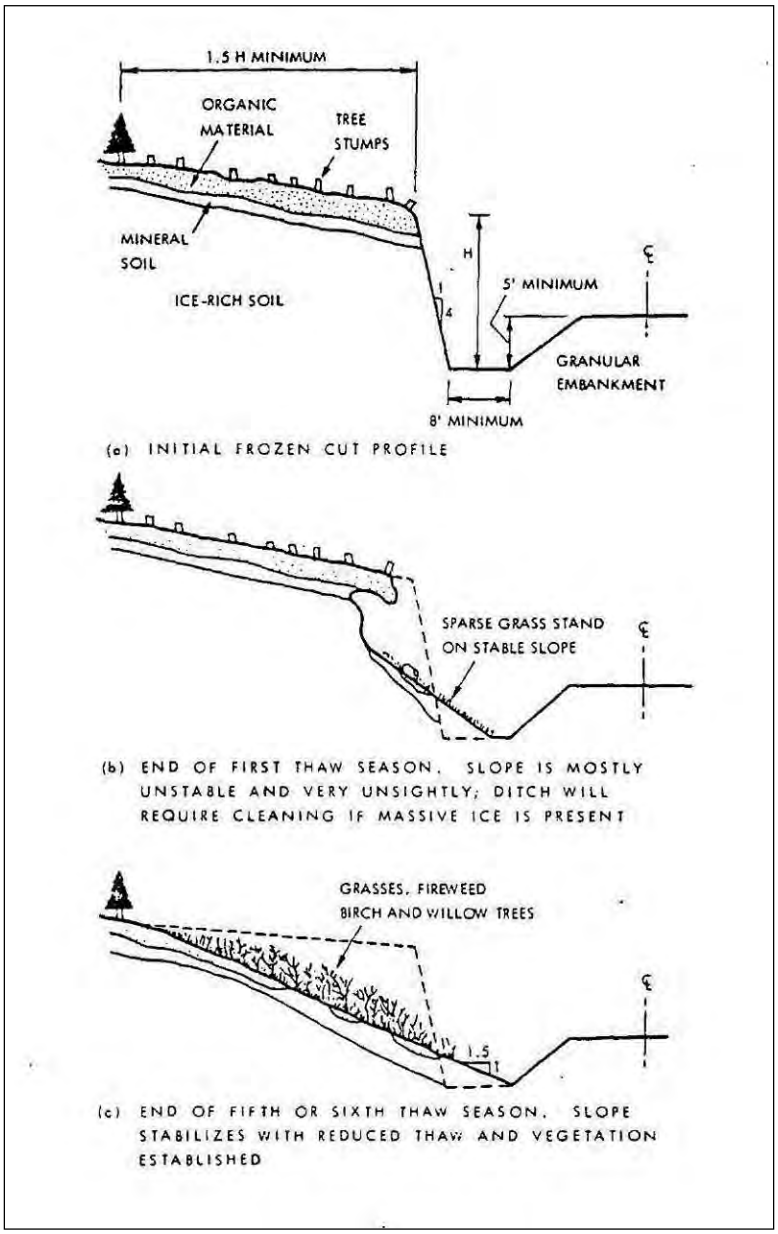

Figure 25. Stabilizing using vertical cuts in ice-rich permafrost. Source: A. Phukan, "Design Consideration for Roadways on Permafrost," 1980.

The George A. Parks (Anchorage-Fairbanks) Highway was also constructed during this period. Dedicated in 1971, this ambitious project provided the opportunity to integrate the various technical advances in permafrost and muskeg construction into a completely modern highway designed to meet

[661] Lotspeich, 31; Edgerton, 765.

AASHO primary standards for 60- to 70-mph traffic.[662] Where the roadway passed through areas of muskeg, a technique known as a "rolling surcharge" was used. In this technique, subgrade material is advanced from behind, with a large quantity of excess gravel (up to 20 feet above the design embankment height) maintained at the leading edge of the embankment at all times. The weight of the surcharge compressed the muskeg into a relatively stable platform capable of supporting the roadway. Over 25 percent of the highway's total mileage was constructed through permafrost. In those areas, the tundra cover was left undisturbed and a substantial embankment was built to insulate and protect the ground below. The initial lift of embankment was dumped off the leading edge of the advancing subgrade in order to keep equipment off the organic mat, a practice known as "end dumping." Where ice-rich soils were encountered, they were over-excavated from 3 to 5 feet deep and quickly backfilled with granular material before they could thaw.[663] By this time it was understood that it was impossible to completely prevent degradation of the permafrost, and the Department design criteria simply limited the allowable thaw rate and settlement.

4.4.5.4 Roadway insulation

The late 1960s marked the beginning of a period of innovative approaches to solve permafrost and cold-weather construction problems, particularly in the area of roadway insulation. While gravel fill was used for roadway insulation in this period, the Department sought more effective solutions to maintaining permafrost beneath roads. The Department spent several years conducting studies, assisted by scientists from Dow Chemical, who had recently developed Styrofoam HI brand extruded polystyrene plastic foam as a result of extensive research into earth insulating problems.[664] Foam planks were laid in a 3-inch layer in the subgrade with additional fill placed on top (see Figure 26). The first tests using polystyrene road insulation in Alaska were done in 1968-1969 on a section of the Edgerton Highway near Chitina and a section of the Seward Highway near Potter.[665] Initial observations reported that "all objectionable frost heaving [had been] eliminated," and long-term performance monitoring of the test section continued until at least the mid-1990s.[666] Styrofoam installation proved successful, and continued to be used to insulate roadbeds built over thaw-unstable terrain. In 1970 it was installed along a 1,200-foot segment of the Parks Highway between Sunshine and Chulitna that had shown itself especially vulnerable to frost heave damage.[667] Private companies operating in the North Slope around this time had also experimented with using polyurethane foam to insulate the tundra and reduce the amount of gravel fill required, but the high cost of transporting these products to such a remote region outweighed any savings in materials.[668]

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[662] State of Alaska, Department of Highways, 1968, 12; Becker, 75.

[663] Becker, 75, 77.

[664] "Insulation Goes Into Highway," *Fairbanks Daily News-Miner*, 20 November 1970.

[665] Esch, 1,223; State of Alaska, Department of Highways, 1969, 13.

[666] State of Alaska, Department of Highways, 1969, 13.

[667] "Insulation Goes Into Highway," *Fairbanks Daily News-Miner*, 20 November 1970.

[668] Stokes, 1,210.

AN INSULATION PROJECT, researching the performance of a three-inch layer of styrofoam built into the subgrade of the road in the Anchorage District. Object of the project was to determine effectiveness of protecting the permafrost from degradation and control of frost heave.

BACKFILLING OVER STYRO PLANKS. Note depth of the initial lift after installation of the insulating layer.

WOODEN SKEWERS are used to hold the styrofoam planks in place prior to covering with grade material.

CARE MUST BE TAKEN to remove any large rocks from direct contact with the insulating layer which might damage it. Initial indications of the effects of the insulating effort are highly encouraging.

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Figure 26. Styrofoam subgrade insulation installation. Source: ADH Annual Report, 1969.

Insulation of the subgrade, either with gravel or other materials, did not solve all the long-term problems created by permafrost construction; the slopes of the road embankments on each side were still vulnerable to thawing, eventually undermining the travelled area of the roadway. Even when the roadway was insulated, the sideslope surfaces became warmer than either the travelled roadway surface or adjacent undisturbed ground. Progressively deeper thawing each year led to the formation of "taliks," areas of year-round unfrozen ground in permafrost areas. These developed beneath slope and ditch areas and led to settlement and loss of roadway support.[669] During the construction of the Dalton Highway between Livengood and the Yukon River in 1972, experimental insulation used on slopes and embankments included fiberglass, excelsior ("wood wool"), and a wood pulp product called "Silva-Fibre." Peat underlays had been used for roadway insulation in Norway since the early 1900s, though those efforts were aimed at preserving a thawed rather than frozen state.[670] Peat was first tested on a section of the Richardson Highway approximately 70 miles southeast of Fairbanks during a reconstruction project in 1973 and monitored for the next nine years. While the peat had a positive effect on the area directly

[669] Esch, 1,223, 1,226.

[670] David C. Esch and Robert L. McHattie, "Benefits of a Peat Underlay Used in Road Construction on Permafrost," presented to the Fourth International Permafrost Conference, Fairbanks, Alaska (July 18-22, 1983), 1.

under the road surface, it was found to have no impact on preventing side slope and ditch thawing.[671] Berms on either side of the embankment sometimes had a beneficial insulating effect; the Parks Highway was constructed with 6-foot embankment berms in hopes of providing insulation, but this effort was ultimately unsuccessful as well.[672]

4.4.6 Recent construction, methods, and materials: 1978-present

The most recent decades of road construction and engineering in Alaska are characterized by advances in materials technology and innovative uses of these new materials. Experimental techniques developed and installed in test sites by the Department in the late 1970s and early 1980s were observed over the next two decades, culminating in the publication of several design manuals in the 2000s. During this period, a number of well-traveled older highway segments were also improved to modern standards. Other projects focused on improving connectivity, such as the improvements to the Skagway-Carcross road, which was incorporated into the Klondike Highway, and the Whittier Access Tunnel, which converted a rail tunnel to combined rail and automobile use, linking the town of Whittier to the rest of the state's highway system for the first time.

Issues surrounding climate change also prompted further advances in technology. As the scientific community first became aware of the effect of greenhouse gases and global warming, it became clear that most of Alaska's roads over permafrost would suffer major problems if the climate warmed even slightly.[673] Amid growing concerns over climate change in the early 1980s, particular attention was given to the problem of permafrost thawing beneath roads and buildings, and researchers continued to seek improved solutions. In order to share these and other new approaches to Alaskan transportation technology, the Department created the Transportation Technology Transfer Program, now the Research, Development, and Technology Transfer Program (RD&T2), in the 1980s. The program, focused on technology related to roads, bridges, airports, seaports, railroads, and public transportation, continues to provide training and information to help Alaskans meet local transportation needs.[674]

4.4.6.1 Permafrost preservation

Concerns about the long-term stability of structures built over warm permafrost led to more investigations to reduce the temperatures of roadways and sideslopes. In addition to the roadway sites near Glennallen that were instrumented in 1954 as part of the USGS thermal study, Department researchers had been continuously monitoring the Chitina Styrofoam test site and five other sites, all located in "warm" permafrost (areas of permafrost where the ground temperature is above 28 degrees Fahrenheit). Berms, insulation using peat and Styrofoam, and the erection of wooden solar sheds continued to be evaluated as methods to maintain the integrity of the permafrost in road embankments. Other tests included painting sections of road surface white in order to reduce the absorption of solar heat, though this compromised winter traction and wore down quickly.[675]

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[671] Esch and McHattie, 6.

[672] Esch, 1,228.

[673] Alaska Department of Transportation & Public Facilities, 1987, 12.

[674] "Let's Get Acquainted," *Technology for Alaskan Transportation* 1, no, 1 (Fall 1986).

[675] Alaska Department of Transportation & Public Facilities, 1985, 9-10.

Additional sub-surface methods were developed to actively cool the permafrost. Thermosyphons, devices used to draw heat from permafrost below structures, are comprised of a buried evaporator connected to an above-ground condenser, typically a narrow vertical tube with small fins. Heat below ground turns fluid in the buried portion to vapor. The vapor then rises into the upper portion where it releases heat into the air as it condenses, allowing the fluid to fall and repeat the cycle. Thermosyphons had been used since the 1960s beneath airfields and building foundations, and in 1998, researchers successfully tested thermosyphons on a section of Chena Hot Springs Road.[676] Thermosyphons are currently in place and being monitored along Thompson Drive at the entrance to the University of Alaska Fairbanks.

A second sub-surface device, an air duct permafrost stabilization system, was initially tested in 1975 on experimental installations near Fairbanks. Corrugated metal pipes were installed under the roadway and attached to vertical vent pipes, allowing airflow to cool the embankment. The system was first implemented on the Alaska Highway near Northway in 1983.[677] Subsequent construction of Air-Cooled Embankments (ACE) used highly permeable, poorly graded fill (rock sizes ranging from 1 to 6 inches) in the subgrade to allow for air circulation. ACE technology has since been incorporated into a number of road projects, such as the Parks/Chena Ridge project and the entrance to the University of Alaska Fairbanks at Thompson Drive both in Fairbanks, and monitored through embankment temperature probes to quantify the beneficial effects of ACE.[678] In 2009 RD&T2 developed an ACE design guide based on the experience gained from these and other projects.[679]

4.4.6.2 Pavement design methods

In addition to ongoing permafrost research, the Department also conducted pavement performance research from 1978 to 1981, and by 1983 had adopted a new method of pavement design based on their results.[680] Previously, paved roads in Alaska were designed using the USACE's Frost Classification System to predict pavement performance based on the underlying soil type. The researchers found that the Frost Classification System did not provide an accurate basis for predicting performance; rather, the percentage of fines (in this case defined as particles that will pass a #200 sieve, less than 0.075mm in diameter) found in the base and sub-base was the strongest predictor of the deflection caused by spring breakup and a pavement's ability to withstand fatigue. Based on these results, the researchers

[676] Anna Forsstrom, "Thermosyphon Cooling of Chena Hot Springs Road," prepared for the Alaska Department of Transportation, February 2003, 2-3.

[677] Alaska Department of Transportation & Public Facilities, 1983, 60.

[678] Steve Saboundjian and Douglas J. Goering, "Air Convection Embankment for Roadways: Field Experimental Study in Alaska," *Transportation Research Record* 1821 (N.p.: Transportation Research Board, 2003), 22 (full text 20-28).

[679] Robert L. McHattie and Douglas J. Goering, *Air Convecting Embankment (ACE) Design Guide*, (Fairbanks, Alaska: State Department of Transportation & Public Facilities, Research & Technology Transfer, 2009).

[680] Alaska Department of Transportation & Public Facilities, 1982, 41.

developed an equation that allowed them to predict pavement cracking and fatigue life based on the maximum seasonal deflection, influenced by soil and climatic factors.[681]

The outgrowth of this research was the development of the "excess fines" concept, which determined that at any given depth up to 3.5 feet below the surface of the pavement, there was a maximum allowable percentage of fines that, if exceeded, would leave the road structure vulnerable to frost and thaw damage.[682] Consequently, Alaska's design policy placed restrictions on the percentage of fines up to 3.5 feet below the paved surface in order to reduce heaves.[683] The end result of the study enabled pavement design to be more efficient and economical; pavement could be designed based on the average deflection rather than the maximum probable deflection when the critical fines content was not exceeded, meaning that a thinner pavement section could be used in some cases.

Beginning at roughly the same time in the early 1980s, the Department also began developing what is now known as the mechanistic-based design method. Mechanistic design, which analyzes the pavement as a mechanical system of elastic layers, proved over time to be the more comprehensive tool to meet the needs of designing Alaskan roads. In 2004 the Department published a design manual for mechanistic-based pavement design, now the preferred method in Alaska.[684]

4.4.6.3 Updating the Seward Highway

The Seward Highway is the sole link between Anchorage and the Kenai Peninsula, and as the population of the region grew in the later decades of the twentieth century, demands on the road increased. The road hugs the northern coast of Turnagain Arm, a shallow fjord where construction and improvement efforts have been plagued by geologic issues. The "last skinny section" of highway between Anchorage and Girdwood was updated in 1994.[685] This particularly narrow, winding, 7.5-mile stretch between Girdwood and Bird Point was relocated and the old alignment was abandoned. In order to move the road out of the reach of avalanches, the new roadway was constructed atop 3.5 million cubic yards of fill placed along the shoreline.[686] This required extensive drilling and blasting of the adjacent cliffs to provide fill material, and the project encountered a serious setback when a massive rockslide occurred, the result of unforeseen defects in the rock. To stabilize the cliff, enormous stair-steps were cut into the rock, holes were drilled to drain water from within, and a system of motion detectors was installed as an added precaution against future rockslides. An additional geologic difficulty was encountered when it was discovered that another short section of the highway was built over an ancient talus slope (essentially the remains of a prehistoric rockslide). When the contractor began to cut from below, the roadbed threatened to collapse. As a result, the roadway was moved 35 feet to a new alignment cut into the cliff.[687]

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[681] Esch and McHattie, 2.

[682] Esch and McHattie, 9.

[683] Reckard, 39; Phukan, 44-45.

[684] Alaska Department of Transportation & Public Facilities, *Alaska Flexible Pavement Design Manual* (Fairbanks, Alaska: State Department of Transportation & Public Facilities, 2004), 1-2.

[685] Steve Rinehart, "No Easy Road for the Arm Crew," *Anchorage Daily News,* 7 September 1994.

[686] Hugh Curran, "Nasty Stretch of Road to be Moved, Tamed," *Anchorage Daily News*, 28 March 1993.

[687] Rinehart, "No Easy Road for the Arm Crew."

Portions of the Seward Highway had been reconstructed after the 1964 earthquake, but reconstruction of the last segment to be upgraded, a 6.3-mile portion near the Hope Wye, did not begin until 1996. This 24-foot-wide, two-lane, shoulderless road segment had not been altered since the early 1950s. The alignment was improved and the road widened to meet modern standards for rural Interstate highways. The existing bridge at Canyon Creek did not meet earthquake standards, and a new bridge on a realignment of the road was constructed. Seismic concerns and poor footing complicated the construction of the new bridge. Despite these challenges, the work was completed in 1998, nearly 50 years after the highway was first constructed.[688]

4.4.6.4 Whittier Access Tunnel conversion

The Anton Anderson Memorial Tunnel, also commonly referred to as the Whittier Access Tunnel, links the town of Whittier with Portage and is the only land route to or from Whittier, a strategic port on Prince William Sound developed during World War II. Between 1941 and 1943, the U.S. Army constructed a railroad spur that included a 1-mile tunnel through Begich Peak and a 2.5-mile tunnel through Maynard Mountain. After the war, this rail line remained the town's only link to the highway system and the rest of the Kenai Peninsula; any automobile traffic in or out of Whittier had to be transported on flat rail cars provided by the Alaska Railroad's shuttle service. As demand for highway access increased, the Department determined in 1995 that the best solution was to construct a highway from Portage to Maynard Mountain and convert the existing 2.5-mile tunnel into a combination highway and railway tunnel.[689]

With a typical width of 16 feet, the tunnel could only accommodate a single lane of traffic; the converted tunnel had to be redesigned to allow rail and auto traffic to alternate, utilizing the same roadway. The concept of a road overlaying a railroad track is not uncommon on city streets in the lower 48 states, but the Anderson Memorial Tunnel is the first time that this type of roadway was installed in a tunnel. Construction began in 1998, and the existing railroad track and crushed rock bed were removed. In their place, a roadway was made using 7.5-by-8-foot pre-formed concrete panels; these panels have a textured surface for vehicular traction and the railroad tracks are set into grooves so they are flush with the adjacent surface. Additional poured concrete on either side created an 11.5-foot wide roadway with a 3-foot sidewalk on one side.[690]

4.5 Conclusion

Throughout the twentieth century, Alaska's road builders have striven to create, expand, improve, and maintain a road system that connects communities, recreation areas, and natural resources across substantial distances and in extreme climates. Construction methods use innovative materials, but also experiment with new ways of using basic materials. A product as primitive as screened gravel or as

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[688] Rooney, 65-67.

[689] Alaska Department of Transportation and Public Facilities, "Tunnel History," State of Alaska, http://www.dot.state.ak.us/creg/whittiertunnel/history.shtml (accessed 7 March 2013).

[690] Alaska Department of Transportation and Public Facilities, "Tunnel Design," State of Alaska, http://www.dot.state.ak.us/creg/whittiertunnel/tundesign.shtml (accessed 7 March 2013).

modern as extruded polystyrene foam can be used to the same effect, as in the case of roadway insulation. At the same time, construction methods also evolved to make the best use of the natural conditions where possible, rather than to overcome them, particularly the emphasis on the preservation of permafrost wherever possible. While early road builders attempted to thaw, drain, and tame the permafrost, by mid-century it was recognized that the frozen soil actually provided a good subgrade if it could be kept frozen, and construction methods now preserve it wherever possible.

The Department continues to conduct research to improve the quality and longevity of Alaska's road system. Since 2000 the research section has produced numerous studies, including those examining different asphalt mixes to reduce rutting, the prevention of longitudinal cracking, air-cooled embankments, and culvert design to enable fish passage. Permafrost construction is a perennial area of focus, and other studies developed best management practices for permafrost sites and investigated the effects of freeze/thaw cycles on pavement performance.

5. The Present Alaska Road System

This section provides a summary of the present Alaska road system, illustrating the chronological development of the state's major roads, geographic distribution, and road ownership.

5.1 Chronological development recap

After the 1867 Alaska purchase, a number of U.S. government and private expeditions conducted geographic explorations prior to the development of a road system. Fur traders and mining prospectors used Native trails and built trails, sled roads, and wagon roads into the interior of Alaska to reach trading posts and mining camps. With the onset of gold rushes in the late nineteenth and early twentieth centuries, increased mining activity and population growth focused more attention on developing road transportation, leading to the establishment of the federal Alaska Road Commission in 1905.

In the first three decades of the twentieth century, the ARC built roads to support mineral extraction and fish processing, provide access to timber, connect farmers to markets, and link communities and connect them with railroads and local airfields. In the 1920s, the federal Bureau of Public Roads took over construction and maintenance of roads in Alaska's national forests. During the Depression, limited funding for road and bridge projects in Alaska led to continued, but constrained, construction efforts. In the period between the U.S. entry into World War II and Alaska statehood, Alaska's strategic military importance and increasing population led to a great expansion and update of the road system. New areas could be reached by roads, and principal cities and military installations had better connections. Major highways were improved in design and paved, and there was connection to the lower 48 states via the Alaska Highway.

Following statehood, a newly established state highway department focused on expansion of the highway system. However, the Department faced great challenges following the Good Friday Earthquake and, as a result needed to temporarily shift its priorities to rehabilitation, reconstruction, and repair. Another dominant event that impacted road building in the early statehood period was renewed interest in accessing Alaskan natural resources with the discovery of oil in the North Slope. Increasing federal regulations over land use and growing concern for environmental stewardship also emerged at that time and private, public, and federal entities grappled with the new regulations.

The state's road history from the late 1970s to the present parallels earlier periods, and includes urban and rural road construction and accessing natural resources. Many road construction efforts focused on reconstruction, rehabilitation, and improved safety of existing routes. However, initiatives such as rural transportation planning programs and support of the tourism industry brought new road construction endeavors. The state continued to construct its roads primarily using federal funding, but public-private partnerships have recently provided a new way to fund road development.

From an engineering perspective, road construction in Alaska must address challenging conditions based on topography and climate. In particular, the state's large expanse, mountainous terrain, and areas of permafrost, tundra, and muskeg pose challenges for road design and construction practices. Overall, the Territory's road building legacy in the early twentieth century began with minimally designed roads that served as one component of a larger transportation network. The majority of these early roads were built

of earth, and crushed gravel was the highest type of surface employed until after World War II. Asphalt surfacing was not used until the late 1940s. After World War II, the road system was upgraded, at which time the use of state or federal standards became widespread, along with reliance on engineering and scientific advances. Permafrost posed one of the greatest challenges, resulting in the development of various techniques to address areas with these conditions.

Table 14 summarizes engineering developments and selected highway construction dates.

Table 14. Alaska road development and construction

Timeframe	General engineering developments	Selected highways, or segments, constructed during this period *Parentheses indicate locations connected. Year given is year completed for through use. See Appendix B for previous names.*
Beginning of study-1940: Early roads	• Trails developed into wagon roads • Earthen wagon road construction • Early automobile roads • Early ARC standards (1905-6) • Stage construction used for permafrost areas • In later years, construction to all-weather standards typically with gravel surface	Richardson Highway, 1910 (wagon road) (Valdez-Fairbanks)[691] Nome-Council Highway, 1906 Edgerton Highway, 1911 (Chitina-Richardson Highway)[692] Steese Highway, 1927 (Fairbanks-Circle) Elliott Highway, 1934 (Steese Highway-Livengood) Glenn Highway (western, formerly Palmer Highway), 1937 (Anchorage-Palmer)
1941-1945: World War II roads	• Accommodate war needs including increased traffic and vehicle weight • Increased standardization • Paving (hard surfacing) of highways begins	Glenn Highway, eastern, 1943 (Palmer-Richardson Hwy) Alaska Highway, 1943 Tok Cutoff, 1943 (Slana-Tok) Haines Highway, 1943 (Haines-British Columbia border)[693]

[691] Originally known as the Valdez-Fairbanks Trail, this route was completed as a pack trail in the early 1900s and later upgraded to a wagon road in 1910.

[692] Does not include the McCarthy Road segment (McCarthy to Chitina), which was converted from a portion of the abandoned CR&NW railbed at the same time as the Copper River Highway.

[693] The Haines Highway travels through British Columbia to Haines Junction in Yukon Territory, Canada.

Table 14. Alaska road development and construction

Timeframe	General engineering developments	Selected highways, or segments, constructed during this period *Parentheses indicate locations connected. Year given is year completed for through use. See Appendix B for previous names.*
1945-1958: Post-World War II road construction	• Reconstruction and improvement of roads (widening and paving) • ARC and AASHO 1949 road standards • Roads constructed on top of the tundra covering using fill to insulate the permafrost from thaw	Sterling Highway, 1950 (Homer-Seward Highway) Seward Highway, 1951 (Seward-Anchorage) Taylor Highway, 1953 (Alaska Highway-Eagle) Denali Highway, 1957 (Paxson-Cantwell)
1959-1977: Road expansion following statehood	• Shoulder striping and center stripes for paved roads • 1965 Department standards • Roadway insulation experiments to address permafrost • Department design criteria outlines allowable thaw rate and settlement for permafrost areas since impossible to prevent degradation	Elliott Highway, 1959 (Livengood-Manley) Copper River Highway, 1964 (Cordova-Million Dollar Bridge)[694] Parks Highway, 1971 (Anchorage-Fairbanks) Dalton Highway, 1974 (Livengood-Deadhorse)
1978-present: Recent road construction	• Expansion and improvement of the system • Continued utilization of national standards • Technological research through the Transportation Technology Transfer Program[695]	Klondike Highway, 1978 (Skagway-BC Border)

[694] Unlike other highways listed in the table, the Copper River Highway was never completed for through use as originally intended. The planned northern terminus was at Chitina, and the highway was gradually converted from the abandoned CR&NW railbed beginning with a short portion outside of Cordova in the early 1950s. Most work occurred in the early 1960s and proceeded north from Cordova, although a small amount of mileage was built south from Chitina. Construction was halted by the 1964 earthquake and subsequent efforts did not proceed further north. The 1964 completion date represents the point at which the highway reached its current northern terminus at the Million Dollar Bridge.

[695] This was renamed the Research, Development and Technology Transfer Program.

5.2 Geographic distribution and road ownership

Alaska is a vast state with over 586,412 square miles of land. The extent of the state's current road network varies regionally in part due to constraints presented by the state's size, topography, and climate.

The physical pattern of the state's roads includes large areas with little or limited roads, areas with roads but no "system" providing links to the rest of the state, and areas with greater concentrations of roads constituting an interconnected system. Areas without a road system that connects to the rest of the state rely on marine and air as primary transportation modes.

The geographic distribution of the state's major road network is summarized below by region.

- The central and interior section of Alaska has the most concentration of roads that provide an interconnected system. Roads, including the state's main highways, connect from the Kenai Peninsula to the interior traveling north to the Yukon River and Prudhoe Bay. However, outside of this corridor on the eastern side of the interior, much of northern Alaska and the remaining interior is characterized by areas with few or limited roads primarily consisting of roads that do not connect to other parts of the state.

- Southeastern Alaska has many islands and includes the Tongass National Forest and a number of communities. This area has regional road networks that are connected to the rest of the state by the Haines Highway/Cutoff and the Klondike Highway into Canada to reach the Alaska Highway.

- The Seward Peninsula includes a regional network of roads in the Nome/Council/Teller area which developed to support the early mining industry. This network does not have a road connection to other parts of the state.

- The Alaska Peninsula and southwest islands only have small local road networks and are not connected via road to the rest of the state.

A total of 16,240 miles of vehicular roads were developed under the jurisdiction of various federal and state agencies, tribes, boroughs, and municipal governments (see Table 15).[696]

[696] Of these roads, the Methodology portion of the study will address the 35 percent owned by the Department and the 35 percent locally owned that are eligible for assistance from the Federal-Aid Highway Program and covered under the Alaska Road PA.

Table 15. Alaska's public road ownership mileage by owner[697]

Agency	Road mileage
Alaska DOT&PF	5,609
Boroughs	3,697
Native Alaskans[698]	2,241
Municipal	1,854
Department of Defense (including the Army Corps of Engineers)	883
Bureau of Indian Affairs	476
U.S. Forest Service	548
National Park Service	159
Other federal agencies (Coast Guard, Fish and Wildlife Service, and Bureau of Land Management)	109
Alaska DNR and other state agencies	459
Other local agencies	205
Total	**16,240**

[697] Data from *Certified Public Road Miles* (CPRM) 2012 report available at http://www.dot.alaska.gov/stwdplng/transdata/public-road-data.shtml (accessed 17 June 2013).

[698] The source uses the term "Indian Nations."

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Appendix A. Full Versions of Cropped Maps

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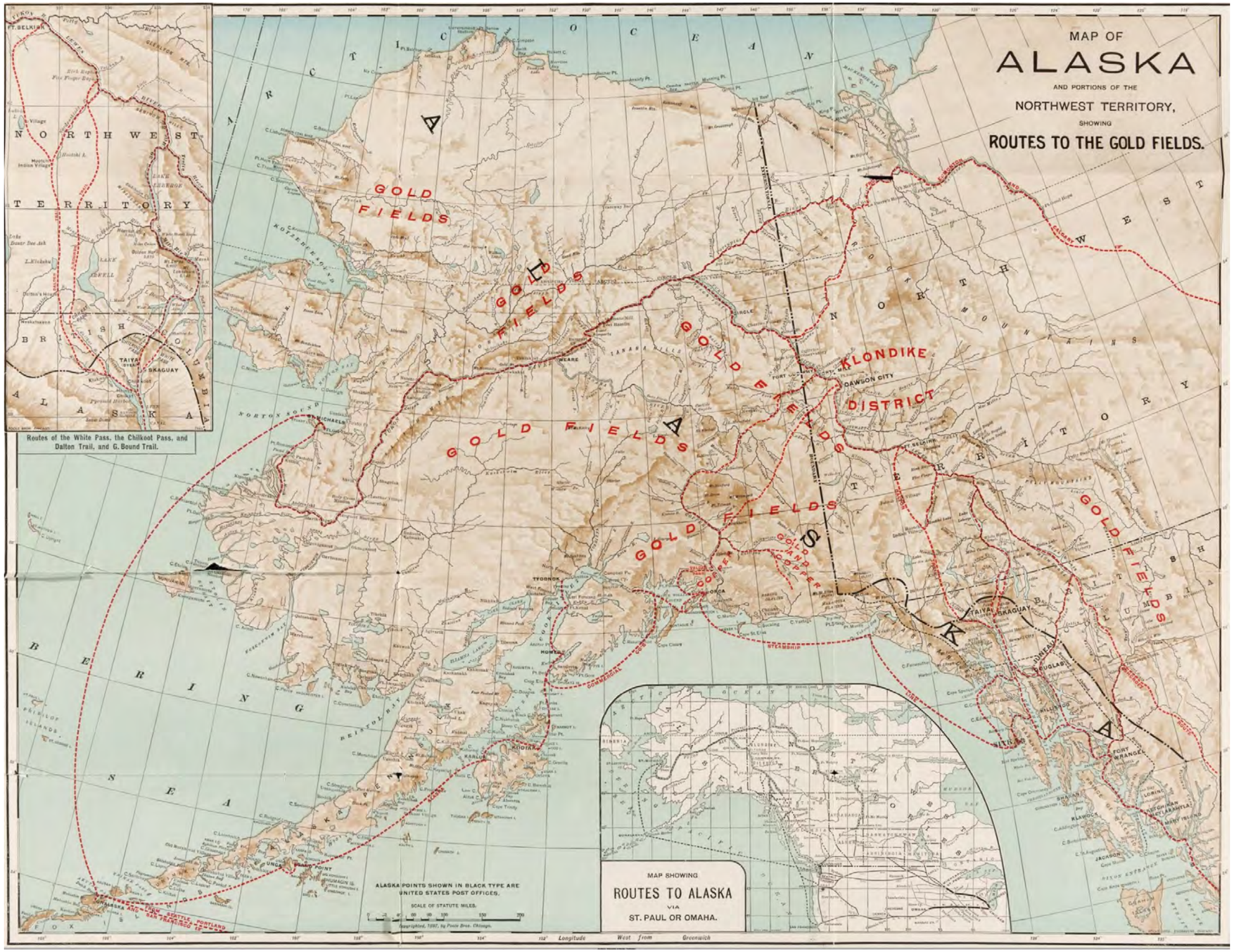

"Map Showing Routes to Alaska via St. Paul or Omaha," 1897. Red dashed lines indicate overland trails and steamship routes; black dashed and dotted line indicates Canada-Alaska boundary. Source: University of Alaska Fairbanks. Rare Maps Collection, Alaska & Polar Regions Collections, UAF-M0482.

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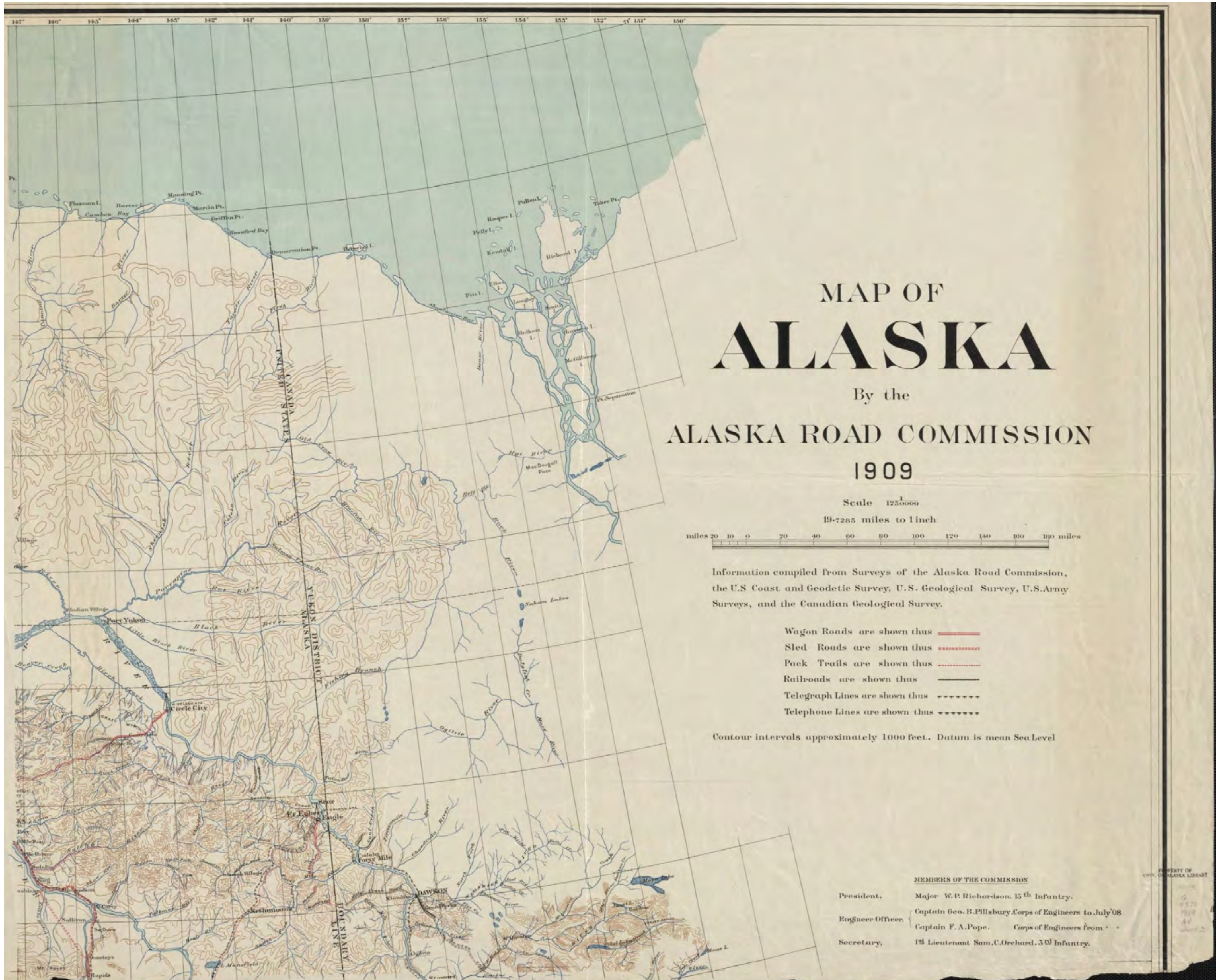

1909 Map of Alaska by the Alaska Road Commission, 1 of 4. Source: University of Alaska Fairbanks. Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255.

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1909 Map of Alaska by the Alaska Road Commission, 2 of 4. Source: University of Alaska Fairbanks. Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255.

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1909 Map of Alaska by the Alaska Road Commission, 3 of 4. Source: University of Alaska Fairbanks. Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255.

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1909 Map of Alaska by the Alaska Road Commission, 4 of 4. Source: University of Alaska Fairbanks. Map of Alaska by the Alaska Road Commission, 1909. Rare Maps Collection, Alaska & Polar Regions Collections. UAF-M255.

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Appendix B. Major Roads in Alaska and Significant Highway Name Origins

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Former Names for Selected Major Roads in Alaska[699]

Current name	Previous name or segment name
Richardson Highway	Valdez-Fairbanks Road Richardson Trail Valdez-Fairbanks Trail Old Valdez Trail
Sterling Highway	Cooper Landing Truck Trail Quartz Creek-Russian River
Glenn Highway	Palmer-Richardson Highway Road Anchorage to Matanuska Road Eagle River to Anchorage Palmer-Matanuska
Denali Park Road	Paxson-Cantwell Road Mt. McKinley National Park Highway Roosevelt-Glacier-Riley Creek
Taylor Highway	Tok-Eagle Road Eagle- Fortymile, Boundary
Dalton Highway	North Slope Haul Road TAPS Road
Seward Highway	Seward-Anchorage Highway Turnagain Arm Road Seward-Kenai Lake Highway Moose Pass Sled Road
Steese Highway	Chatanika-Circle Road Chatanika-Miller
Edgerton Highway	Willow Creek-Chitina Road
Elliott Highway	Fox to Olnes Olnes to Livengood
Alaska Highway	Alcan Highway
Tok-Cutoff	Gulkana-Chistochina Gulkana to Nabesna Road
Haines Highway	Haines Cutoff Haines to Porcupine
Parks Highway	Anchorage – Fairbanks Highway
Klondike Highway	Skagway-Carcross Road
Copper River Highway	Cordova-Chitina
Nome-Council Highway	Nome-Council Road Nome-Davis Road Cunningham-Cape Nome Road

[699] Selected roads; not intended to be a comprehensive list. Additionally, the list of previous names or segment names may not be comprehensive.

Significant Highway Name Origins

Elliott Highway: The Elliott Highway is named for Major Malcolm Elliott, president of the ARC from 1927 to 1932. In 1931, under Elliott's leadership, the segment of this highway originally known as the Fox to Olnes road was extended from Olnes to Livengood. In 1929 Major Elliott proposed the construction of the Alaska-Yukon-Pacific Highway that would run from the western part of the U.S. to Alaska. He was appointed to the committee to study a feasible route for this highway in 1930 by President Hoover.[700]

Glenn Highway: Opened in 1943, the Glenn Highway, which includes the former Palmer Highway built in the 1930s, is named for Captain (later Major General) Edwin F. Glenn, leader of the 1898 U.S. Army expedition sent to locate a route to the Copper and Susitna rivers from Prince William Sound and from Cook Inlet to the Yukon across the Tanana River. He also oversaw the 1899 exploration from Cook Inlet across the Tanana River to the army posts at Fort Gibbon and Rampart.[701]

Richardson Highway: The Richardson Highway is named for U.S. Army General Wilds P. Richardson who oversaw the construction of the original route from Valdez to Fairbanks, which was considered Alaska's most important road. He was the first president of the ARC from 1905 to 1917, when he left to serve in World War I. Alaska's Federal District Court Judge James Wickersham called Richardson "the first great road builder in Alaska."[702]

Steese Highway: The Steese Highway is named for U.S. Army General James G. Steese, president of the ARC from 1920 to 1927 and who oversaw its planning and most of its construction, making it possible to drive from Valdez to Circle on the Richardson and Steese highways. During Steese's leadership in the post-World War I years, the ARC reopened roads and trails that had been abandoned during the war, built new roads despite an initial lack of funding in the early post-war years, and bought road building equipment that replaced the use of horses. Steese served briefly as chairman of the Alaskan Engineering Commission in 1923 when management of the ARC and the Alaska Railroad were combined in order to coordinate the efforts of both agencies. However, this merger was dissolved only a few months after it began.[703]

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[700] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 154; Board of Road Commissioners Alaska (ARC) 1932, 31; International Route to Tie Up United States and Alaska Now Approved by Leading Interests, (*The Evening Independent ,* St. Petersburg, Florida, 1931), 5A; President Names Commission For A-Y-P Road Study (*Seattle Daily Times,* 1930), 2.

[701] Brooks, 284; Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 7.

[702] Naske, *Alaska Road Commission Historical Narrative*, 30, 75; Board of Road Commissioners for Alaska (ARC), 1922, Part I, 2,234.

[703] Board of Road Commissioners for Alaska (ARC), 1929, 8; Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission,* 94, 98, 100.

Parks Highway: The Parks Highway, dedicated in 1971, is named for George A. Parks, a cadastral and mining engineer who served as the Governor of Alaska for two consecutive terms from 1925-1933.[704] Nominated unexpectedly by Calvin Coolidge, Parks was the first Alaskan resident to be appointed to the office.[705]

Taylor Highway: The Taylor Highway is named for Ike P. Taylor, the president of the ARC from 1932 to 1948. Taylor came to Alaska in 1916 and worked as an engineer on the construction of the Alaska Railroad before joining the forces of the Alaska Road Commission.[706] Construction of a road from the Alaska Highway into the Fortymile mining district (near Eagle) began in 1947 under Taylor's administration, although the route was not completed until 1953 when the road linked up with existing local roads south of Eagle.[707]

Edgerton Highway: The Edgerton Highway was named for Glen E. Edgerton who served as the ARC chief engineer from 1910 to 1915.[708] The Edgerton Highway developed from an existing pack trail to Chitina from the Richardson Highway that was upgraded to a wagon road by the ARC in 1910.[709] Following his work with the ARC, Edgerton held a succession of government posts in the lower 48 states and was eventually appointed Governor of the Panama Canal Zone in 1940.[710]

Sterling Highway: The Sterling Highway is named for Hawley Sterling, an ARC engineer who served from 1920 to 1948. He first arrived in Alaska in 1911 to work on the Yukon-Alaska boundary survey before taking a position with the Alaskan Engineering Commission from 1914 to 1919.[711] Sterling had supervised the construction of the Steese Highway, laid out and supervised the Glenn Highway, and in 1946 laid out and begun work on a road linking the towns on the western side of the Kenai Peninsula with Seward.[712] Sterling died in 1948, and Governor Gruening named the highway in his honor in 1950.[713]

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[704] "Parks Highway," *Anchorage Daily News,* 16 July 1975. p. 4.

[705] "Parks is Nominated Governor of Alaska," *New York Times*, 15 February 1925. p. 2.

[706] "Ike Taylor." *Alaska Sportsman*, Obituaries, September 1963.

[707] ARC 1947, 7;.ARC 1954, 24

[708] Board of Road Commissioners for Alaska 1911, 3.

[709] Board of Road Commissioners for Alaska 1910, 8.

[710] Panama Canal Authority, "Glen E. Edgerton," Canal De Panama, http://www.pancanal.com/eng/history/biographies/edgerton.html (accessed 23 April 2013).

[711] "Hawley Sterling, Former ARC Man, Is Dead At 59," *Anchorage Daily Times*, 9 September 1948

[712] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 239.

[713] "Governor to Dedicate New Sterling Highway," *Anchorage Daily Times*, 1 September 1950.

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Appendix C. Alaska Road Commission Available Funding, 1940-1956

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ARC Available Funding, 1940-1956

Fiscal Year	Federal government appropriation to the Department of the Interior	Alaska Fund	Funds from the Territorial Legislature	Funds from National Park Service	Contributions by individuals, companies, corporations, etc.	Additional sources of funding
1940	$560,000	$140,000	$213,085	$50,300	$12,341	
1941	$570,000	$150,000	$214,798	$50,000	$7,407	$1,000,000 First deficiency bill, April 1, 1941 (for construction of the Palmer to Richardson Highway)
1942	$684,500	$151,000	$127,336	$31,327	$7,285	$500,000 Allotment under the Third Supplemental National Defense Appropriation Act, 1942 $2,200,000 (original allocation) First Deficiency Appropriation Act, 1942
1943	$999,900	$152,000	$106,301	$6,000	$6,710	$1,450,000 (remaining balance) First Deficiency Appropriation Act, 1942 $500,000 Second Supplemental National Defense Appropriation Act (for Glenn Highway) $93,500 Defense Highway Act of 1941(for access road construction)

ARC Available Funding, 1940-1956

Fiscal Year	Federal government appropriation to the Department of the Interior	Alaska Fund	Funds from the Territorial Legislature	Funds from National Park Service	Contributions by individuals, companies, corporations, etc.	Additional sources of funding
1944	$880,000	$152,500	$105,150	$10,000	$2,108	$132,545 (remaining balance) First Deficiency Appropriation Act, 1942 $71,500 (balance as of July 1, 1943 with $26,295 unexpended and unobligated) Defense Highway Act of 1941(for access road construction) $800,000 ($500,000 for reconstruction of Richardson Highway and $300,000 for extraordinary maintenance) First supplemental National Defense Appropriation Act of 1944 (part for the Richardson Highway)
1945	$2,250,000	$152,500	$81,892	$15,000	$6,434	
1946	$2,288,900	$152,500	$147,672	$35,000	$6,703	
1947	$3,350,000	$140,000	$165,324	$84,249	$4,989	
1948	$4,000,000	$130,000	$173,928	$55,850	$5,881	
1949	$24,346,400	$29,462	$316,876	$48,520	$9,952	
1950	$26,762,000	$100,000	$250,000	$353,022	$46,891	
1951	$30,500,000	$0	$250,000	$446,200	$10,807	
1952	$22,940,000	$0	$250,000	$119,800	$19,100	
1953	$20,318,000	$0	$250,000	$441,859	$9,853	

ARC Available Funding, 1940-1956

Fiscal Year	Federal government appropriation to the Department of the Interior	Alaska Fund	Funds from the Territorial Legislature	Funds from National Park Service	Contributions by individuals, companies, corporations, etc.	Additional sources of funding
1954	$17,600,000	$0	$211,500	$301,623	$31,214	$409,460 Reimbursements from funds appropriated to other federal and territorial agencies for services performed by ARC
1955	$13,289,316	$0	$684,691	*	$15,442	
1956	$13,515,843	$0	$703,129	*	Not available	

Sources: ARC annual reports 1940 – 1956

** Although still showing as National Park Service appropriation in ARC 1954 annual report beginning in fiscal year 1953 the National Park Service fund was discontinued and the reimbursements were made as part of the general appropriation. (ARC 1956, 39).*

Note: These figures do not reflect the funding for the construction of the Alaska Highway or forest roads constructed and maintained by the BPR.