Statement of Significance

Dalton Highway

Prepared for

Alaska Department of Transportation and Public Facilities

December 2014

DOT&PF Note October 2015:
Rept does not address integrity;
NRHP eligibility status not determined

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Prepared by

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1. Introduction

This statement of significance was prepared as a component of the Applied Historic Context of Alaska Roads Project completed in 2012-2014 for the Alaska Department of Transportation and Public Facilities (DOT&PF). The project began with the development of the *Alaska Roads Historic Overview: Applied Historic Context of Alaska's Roads* (Roads Overview) (February 2014) and the *Methodology for Assessing National Register of Historic Places Eligibility* (Roads Methodology) (December 2014).

For the project a select number of roads with potential for individual National Register of Historic Places (National Register) eligibility were identified for evaluation of significance. This study is limited to the evaluation of the road's significance. If a road meets one or more areas of significance, identification of essential physical features and an assessment of integrity needs to be completed to determine National Register eligibility. These statements of significance apply the Roads Methodology and utilize contextual information from the Roads Overview. The Roads Methodology outlines that the entire length of a road should be considered when evaluating significance. The entire length of the road was considered in the development of this statement of significance.

This report identifies and describes the important historic themes associated with the Dalton Highway. It summarizes these important themes to place the development of the Dalton Highway within an appropriate historic context to evaluate its historical significance.

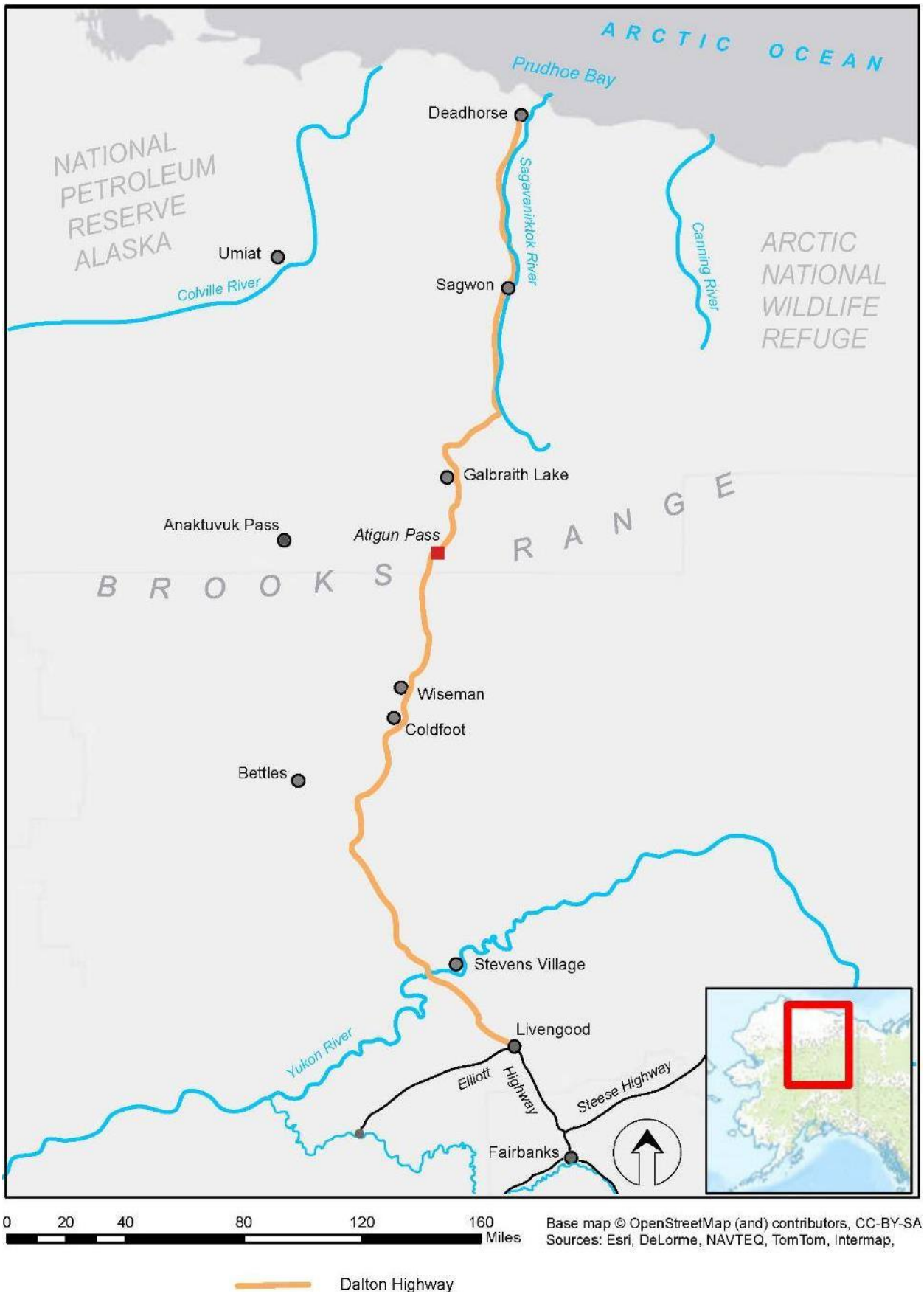
2. Description of the Road

The Dalton Highway (Alaska Heritage Resources Survey [AHRS] numbers LIV-00501, TAN-00118, BET-00200, WIS-00408, CHN-00070, PSM-00570, SAG-00097, and XBP-00114; Coordinated Data System [CDS] number 150000) is approximately 415 miles long and runs from the Elliott Highway at Livengood to Prudhoe Bay. The highway is owned by the Alaska DOT&PF and is located within the North Slope Borough and the Yukon-Koyukuk Census Area of the Alaska Unorganized Borough. From the southern terminus on the Elliott Highway at Livengood, the Dalton Highway runs north across the Yukon River and crosses the Brooks Range through Atigun Pass, providing access to the North Slope of the Brooks Range. The highway follows the Sagavanirktok River to Deadhorse, terminating outside the privately owned petroleum facilities at Lake Colleen Drive.

The segment between Livengood and the Yukon River was constructed in 1969 and 1970, after which the project was temporarily halted due to legal disputes. Construction resumed in spring of 1974 and the highway was completed within six months. Although the highway was constructed by the Alyeska Pipeline Service Company (Alyeska Pipeline), an entity owned by a group of oil companies with interests at Prudhoe Bay, ownership was transferred to the state in 1978.[1] Permafrost conditions necessitated that the bulk of the route be constructed using compacted gravel fill atop the tundra. The majority of the highway is surfaced with gravel. Overall, approximately 133 miles are surfaced with asphalt; with the exception of the 85-mile segment south of Atigun Pass, most are short segments. The entire route is open year-round and is designated as Alaska Route 11.

A map illustrating the location of the Dalton Highway in relation to other major features is provided on the next page.

[1] Alyeska Pipeline was comprised of Amerada Hess, Atlantic Richfield, British Petroleum, Humble (Standard Oil of New Jersey), Mobil, Phillips, Union, and SOHIO (Standard Oil of Ohio). Originally known as the Trans-Alaska Pipeline System (TAPS) and founded by Atlantic Richfield, Humble, and British Petroleum in 1968, the name was changed after expanding to accommodate mergers and additional parties. For clarity, this document refers to the entity throughout as Alyeska Pipeline and the pipeline itself as TAPS.


ARCTIC OCEAN
Prudhoe Bay
Deadhorse
NATIONAL PETROLEUM RESERVE ALASKA
Umiat
Colville River
Sagavanirktok River
Sagwon
Canning River
ARCTIC NATIONAL WILDLIFE REFUGE
Galbraith Lake
Anaktuvuk Pass
Atigun Pass
BROOKS RANGE
Wiseman
Coldfoot
Bettles
Stevens Village
Livengood
Yukon River
Elliott Highway
Steese Highway
Fairbanks
0 20 40 80 120 160 Miles
Base map © OpenStreetMap (and) contributors, CC-BY-SA
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,
Dalton Highway

3. Historic Context

A. Development of the road

Since the turn of the twentieth century, the United States Navy viewed Alaska's abundant mineral resources as an important potential fuel source. Following President Theodore Roosevelt's withdrawal of all federally owned coal lands from public entry in 1906, Alaska's coal lands, including those in the Matanuska Valley and southern Kenai Peninsula, were held as naval reserves. Following World War I, the United States Navy switched from coal to oil as the primary fuel source for its fleet, and in 1923 President Warren G. Harding withdrew 23 million acres in Alaska, designated as Naval Petroleum Reserve No. 4 (PET4, now known as the National Petroleum Reserve - Alaska [NPRA]).[2] At that time, early exploration parties to PET4 realized the impracticality of shipping oil by tanker, as the ice-free window off the entire Arctic coast was barely over a month long and the shallow sea depths did not permit ships to anchor near the shore. Geologists concluded by the 1920s that the only way to transport oil reliably or efficiently would be by constructing a pipeline to an ice-free port or by extending the Alaska Railroad, the latter of which was expected to cause considerable difficulties due to the terrain.[3]

In 1944 the United States Geological Survey (USGS) and the Navy began a systematic exploration of PET4 in order to determine whether oil resources were sufficient to support the nation in the event that World War II continued and disrupted supplies from South America and the Middle East. The Navy concurred with earlier assessments regarding transportation difficulties, expressing a preference of a pipeline leading to Fairbanks, which would provide a link to the territory's existing rail and highway network.[4]

Discussion of a road to link Fairbanks with the North Slope occurred as early as the fall of 1950, when the Alaska Road Commission (ARC) learned that the Navy had discovered oil on the North Slope within PET4. The Navy expected that a pipeline would be constructed to transport oil south, and although it had not planned a vehicular road north from Fairbanks to the coast, the Navy concurred with the ARC that any pipeline would approximate an appropriate location for a highway as well. In discussions with the Navy officer in charge of the project, ARC Chief Engineer Angelo Ghighlione agreed that the most logical route would traverse Anaktuvuk Pass through the Brooks Range, south down the John River Valley to Bettles, to the Yukon River near Stevens Village. The ARC had previously surveyed a route between Livengood and the Yukon River, and the proposed pipeline/highway would tie into this route, thus linking to the Elliott Highway at Livengood.[5]

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[2] Peter A. Coates, *The Trans-Alaska Pipeline Controversy* (Bethlehem, Pa.: Lehigh University Press, 1991), 55.

[3] Philip S. Smith, J.B. Mertie, Jr., and W.T. Foran, "Summary of Recent Surveys in Northern Alaska," from *Mineral Resources of Alaska, Report on Progress of Investigations in 1924*, U.S. Geological Survey Bulletin 783 (Washington, D.C.: US GPO, 1925), 165.

[4] Coates 75.

[5] Claus-M. Naske, *Paving Alaska's Trails* (Lanham, Md.: University Press of America, 1986), 243.

The ARC completed its first study of a proposed road to the North Slope in 1951. The route ran from Livengood north to Umiat by way of Anaktuvuk Pass, an average of 50 miles to the west of the current route of the Dalton Highway. By this time, interest in extraction of arctic petroleum reserves was not limited to the U.S. South of the Arctic Circle, existing drilling operations had already been established in Canada's Mackenzie River Valley, and during World War II the CANOL pipeline carried oil from the drilling site at Norman Wells to Whitehorse and Fairbanks.[6] In the 1950s the Canadian government also recognized the mineral potential of the Arctic coast and initiated a road program to further open the Yukon and Northwest Territories for mineral exploration.[7] Construction of the Dempster Highway from Dawson north to the coast began in 1957, although the project came to a halt in 1961 due to poor prospects in the Eagle Plain oilfields.[8]

Oil discoveries in other parts of Alaska predated the commercial development of the NPRA. Discoveries on the Kenai Peninsula and Cook Inlet occurred a decade earlier, leading to the rise of a lucrative petroleum industry in south-central Alaska in the late 1950s and early 1960s. By the mid-1960s oil and gas production provided more income to Alaskans than the U.S. military or fishing. Commercial interests, rather than those of the Navy, began to drive oil exploration on the North Slope after the State of Alaska gained title to lands there and held lease sales. Between 1964 and 1967 the State of Alaska offered leases on two million acres of State-owned North Slope land not included in either the NPRA or Arctic National Wildlife Refuge (ANWR). In response to mounting protests over Native Alaskan land claims in the region, Secretary of the Interior Stewart Udall imposed a land freeze in 1966, restricting the transfer of federal lands until the Native land claim issues were resolved.

Despite this, newly elected governor Walter Hickel approved the sale of leases on 37,000 acres of federally owned North Slope lands. Inaugurated in December 1966, Hickel had previously served as the director of the Anchorage Pipeline Company, which provided oil and natural gas from the Kenai fields to the Anchorage. He was a fervent supporter of the "opening" of the arctic for commercial mineral exploitation. Hickel believed that overland transportation to Nome and the North Slope would be of crucial importance in Alaska's economic development, and established the Northern Operation of Rail Transportation and Highways (NORTH) Commission to examine the possibility of constructing a road to the Arctic and extending the railroad to Nome. [9]

Although the ARC's study had not resulted in the construction of a North Slope Route, the Alaska Department of Highways (Department), which had assumed the duties of the ARC following statehood, had completed a detailed second study in 1965, and the following year funding was authorized to begin

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[6] Archives Canada, "Chapter 5: CANOL Project," http://www.alaskahighwayarchives.ca./en/chap5/index.php (accessed 11 September 2014).

[7] W. A. Kent, "The Dempster Highway Road to Resources?" *Geography* 67, no. 2 (April 1982), 142-145.

[8] Kent, 142; Coates, 243.

[9] Coates, 162-164.

survey on a number of alternatives.[10] The Department requested USGS aerial photographs be produced for the survey area, and a team travelled by helicopter to investigate multiple routes to Anaktuvuk Pass. Initially, the project focused on providing access to a narrow area between the Colville and Canning Rivers, corresponding to the eastern boundary of the NPRA and the western boundary of the ANWR. Routes surveyed included northern termini in the Umiat vicinity and at the Sagavanirktok River, site of oil explorations near Sagwon. As the investigations developed, the Department decided to expand the target area to the entire arctic coastal plain under the assumption that these reserves might be opened to commercial development at a later date. The Department also evaluated options to tie any proposed routes into the existing highway system at Fairbanks. The Steese and Elliott Highways provided access to the area north of Fairbanks, although both had been built prior to World War II to "low standards with steep grades and very crooked alignment," and by the late 1960s they were being brought up to current secondary standards. The Elliott Highway was the preferred link, and had already been identified as a starting point for a road that would connect Fairbanks to Nome and the Kobuk River area.[11]

Department efforts resulted in a report detailing five through-routes from the Livengood area to the Beaufort Sea coast. It contained a number of points intended to be of use to future planners, particularly the construction of a crossing at the Yukon River north of Livengood that could be used by both North Slope and Fairbanks-Nome routes. The document acknowledged, however, that it was difficult to draw many firm conclusions as there was, as yet, no defined northern terminus other than a target area 400 miles wide. Ironically, the report was nearing completion just as the news arrived that a test well at Prudhoe Bay had shown a substantial flow of oil.[12]

The Atlantic Richfield Oil Company announced the first commercial strike on the state-leased North Slope lands at Prudhoe Bay early in 1968, and subsequent drilling confirmed that the oilfield was the largest ever discovered in North America.[13] At that time, the North Slope oil industry depended primarily on air transport, supplemented by barges in the summer. As a result, Governor Hickel requested that the Department develop plans for a winter trail between Livengood and the North Slope, accelerating efforts from the planning stage to construction.[14] The Department commenced work on the trail in November 1968, including grading and clearing and the construction of ice bridges on 62 miles of the 360-mile route

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[10] After statehood, Alaska's state highway agency changed names three times, from the Department of Public Works, Division of Highways (1959-1961) to the Alaska Department of Highways (1962-1976) and finally to the current Alaska Department of Transportation & Public Facilities (1977-present). For the sake of simplicity, this document refers to the agency as "the Department" throughout the period from 1959 to the present.

[11] Alaska Department of Highways, *North Slope Road Study* (Juneau, Alaska: Alaska Department of Highways, 1970), 1-3.

[12] Alaska Department of Highways, *North Slope Road Study*, 17.

[13] Coates, 164; Arthur C. Banet, Jr., *Oil and Gas Development on Alaska's North Slope: Past Results and Future Prospects*, U.S Department of the Interior, Bureau of Land Management Alaska State Office, March 1991, 6.

[14] "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.

from Stevens Village to Sagwon. Although the state had planned for contractors to construct the remaining portion of the road, the Department elected to complete the remainder of the road construction itself, stating that the organization could "gain valuable first-hand knowledge of the construction and terrain factors to be dealt with in building such roads in interior Alaska."[1516] Despite the fact that such methods were known to cause catastrophic thawing of the underlying soils, the Department bladed a trail directly on the tundra, removing the protective vegetative mat as bulldozers plowed snow from the route. Trucks then drove over the exposed frozen ground, which rapidly deteriorated into a waterlogged ditch as the permafrost thawed.[17]

The winter trail, informally named the Hickel Highway, was not the rousing success its namesake might have hoped for (although Hickel had left Alaska to become President Nixon's Secretary of the Interior by the time the trail was completed in 1969). In the single season it was used, approximately 7,500 tons of freight traveled over the trail.[18] The Hercules air transports that were the main supply method to the North Slope could have moved the same quantity effectively, and research revealed that opening of the winter trail did not reduce the cost of freight.[19] To the Department, however, construction of the route was "one of the most dramatic projects" that year. The 1969 annual 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.[20]

The initial expenditure of $766,291 to open and maintain the route in its first year (more than double initial estimates) prompted an outcry from taxpayers, and the state elected not to fund future maintenance or upgrades to the trail, estimated at $1.5 million.[21] The Hickel Highway was abandoned, and it would be several years before an all-weather road finally opened up the North Slope to vehicular access.

In the summer of 1969 Alyeska Pipeline, an entity owned by eight oil companies with holdings in the Prudhoe Bay oilfield, began planning for the Trans-Alaska Pipeline System (TAPS) oil pipeline. The project also included the construction of a parallel 420-mile, gravel, all-weather haul road from Livengood

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[15] "State to Ignore All Bids, Finish Winter Trail Work," *Fairbanks Daily News-Miner,* 24 December 1968.

[16] "Action on North Trail Job Starts," *Fairbanks Daily News-Miner,* 23 November 1968.

[17] Coates, 165.

[18] "Miller Asks $433,000 for Slope Road Work," *Anchorage Daily Times*, 3 April 1969.

[19] Coates, 165.

[20] State of Alaska, Department of Highways, *Annual Report 1969* [Juneau, Alaska: Department of Highways, 1969], 8.

[21] Chris Allen, "The Brief Life and Strange Times of the Hickel Highway: Alaska's First Arctic Haul Road," *Alaska History* 24:2 (Fall 2009), 19.

to Prudhoe Bay, replacing the abandoned Hickel Highway.[22] Intended to move construction materials along the pipeline route, the first section of the haul road between Livengood and the Yukon River was constructed between August 1969 and July 1970.[23] Progress on the road to the North Slope and pipeline soon stalled due to legal challenges stemming from new federal legislation, including the National Environmental Policy Act and other government action that resulted in a freeze on public land transfers. After years of debate over how to resolve long-standing issues over Native Alaskan land claims, Congress passed the Alaska Native Claims Settlement Act (ANCSA) in 1971. The provisions in the act conveyed millions of acres to Native groups, specifically regional and village corporations created in the legislation, and included lands on either side of the pipeline route.[24] Between 1970 and 1974 the future of the road remained uncertain as debates and legal battles with conservation groups and Native Alaskans continued. Additionally, conflicting mining exploration statutes and laws, right-of-way issues, and Congressional debate over private developer construction on federal land further stymied progress on the road and pipeline. In response to growing discord between the U.S. and the Organization of Petroleum Exporting Companies (OPEC), the Nixon administration announced a new strategy intended to increase domestic oil production in April 1973. Several months later, Arab members of OPEC imposed an oil embargo against the United States as the result of its political involvement in the Arab-Israeli War.[25] Against the backdrop of a nationwide shortage and skyrocketing oil prices, President Nixon signed the Federal Lands Right-of-Way Act in November 1973, enabling the pipeline and other projects needing right-of-way to proceed.[26]

Shortly after, Alyeska Pipeline awarded contracts for the construction of the road.[27] The Department allowed the company use of the abandoned Hickel Highway to move construction supplies and equipment, which removed the need to build a new winter haul road to the construction area.[28] In exchange, Alyeska Pipeline agreed to construct the road to state secondary road design requirements and to turn the highway over to the state when the pipeline was completed.[29]

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[22] "Interior to Grant Permit for Oil Pipeline Haul Road," *Fairbanks Daily News-Miner,* 29 July 1969; Joshua Ashenmiller, "The Alaska Pipeline as an Internal Improvement," *Pacific Historical Review*, August 2006, 469.

[23] Jerry Brown and R.A. Kreig, eds., *Guidebook to Permafrost and Related Features Along the Elliott and Dalton Highways, Fox to Prudhoe Bay, Alaska,* Fourth International Conference on Permafrost, July 18-22, 1983, University of Alaska, Fairbanks, Alaska, 3.

[24] Claus-M. Naske and Herman E. Slotnick, *Alaska: A History of the 49th State*, 2nd ed. (Norman, Okla.: University of Oklahoma Press, 1987), 290, 298.

[25] Office of the Historian, "Oil Embargo, 1973-1974," U.S. Department of State, http://history.state.gov/milestones/1969-1976/oil-embargo (accessed 18 July 2014).

[26] Ashenmiller, 488.

[27] "Firms Named to Build Pipeline Road to North," *Fairbanks Daily News-Miner,* 5 April 1974.

[28] In 1970 TAPS reorganized as Alyeska Pipeline, 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.

[29] "Pipeline Work Begins," *Anchorage Daily Times,* 29 April 1974; "Alyeska Nears Windup of Oil Road Construction," *Fairbanks Daily News-Miner*, 28 September 1974.

Construction of the road began in April 1974 and was completed by the end of September, although the bridge spanning the Yukon River (the first permanent structure to cross the river) was not opened until the following year. In order to protect the permafrost below, the haul road was constructed upon the intact tundra surface. A thick pad of gravel, five feet thick or more, insulated the permafrost beneath much of the route (see Section 3.B for further discussion of permafrost construction). The haul road followed an alignment roughly parallel to the pipeline, beginning at Livengood and crossing the Yukon River before running north to Coldfoot and Wiseman. Rather than the Anuktuvuk Pass route favored by previous Department surveys, the road crossed the Brooks Range through the Atigun Pass, due south of Deadhorse, and continued north up the Sagavanirktok River to Prudhoe Bay. The haul road created North America's first vehicular link to the Arctic coast. While the Prudhoe Bay oil discoveries had reignited Canada's work on the Dempster Highway from the Klondike Highway north to Inuvik, it was not completed until 1979.[30]

Once the haul road was constructed, work on the pipeline, which extended from Deadhorse to Valdez, began in March 1975. North Slope crude oil first flowed to the southern terminal at Valdez in July 1977.[31] North Slope petroleum development's subsequent impact on Alaska can hardly be understated. The social, political, and economic effects of the pipeline were substantial, eclipsing production of the Cook Inlet fields. Over 1.5 million barrels of oil were pumped from Prudhoe Bay each day between 1980 and 1995, cementing oil production as the dominant factor in the Alaskan economy.[32] Since the completion of TAPS, petroleum revenues have generated an average of 85 percent of Alaska's state government revenue.[33] Much economic and social change in Alaska in the 1970s and 1980s can be directly or indirectly attributed to North Slope oil development, which led to an increase in state spending on public services and infrastructure.[34] During the period of pipeline construction between 1973 and 1977, the state's population increased by 25 percent, and a further 30-percent increase occurred between 1980 and 1985, correlating to the economic boom resulting from the state's oil revenues.[35]

As part of the agreement between the State of Alaska and Alyeska Pipeline, ownership and maintenance of the road reverted to the State after construction in 1979. The State opened the highway to the public between Livengood and the Yukon River, while the rest remained closed to the public. Controversy persisted over how the road would fit into the state's transportation plans. As the highway was the only overland route into a previously inaccessible area of great natural beauty, private companies expressed interest in operating tourist buses to Prudhoe Bay. Some conservationist and Native Alaskan groups

[30] Kent, 142.

[31] Coates, 252, 255.

[32] Ted G. Eschenbach, George A. Geistauts and William H. Beardsley, "A Delphi Forecast for Alaska," *Interfaces* 15, no. 6 (Nov.-Dec. 1985), 100-109, 101.

[33] William S. Brown and Clive S. Thomas, "Diversifying the Alaskan Economy: Political, Social, and Economic Constraints," *Journal of Economic Issues*, June 1996, 601.

[34] Linda Leask, Mary Killorin, and Stephanie Martin, *Trends in Alaska's People and Economy* (Anchorage, Alaska: Institute of Social and Economic Research, University of Alaska, Anchorage, October 2001), 2.

[35] Leask, Killorin, and Martin, 2.

advocated keeping the highway closed to all traffic not related to the oil industry to avoid increased development and impacts on wildlife.[36]

In 1981 the State renamed the route the Dalton Highway after arctic engineer James B. Dalton, who was involved in the early years of arctic oil development.[37] The same year, the southern portion of the route opened to the public as far as Disaster Creek at Milepost 211, 33 miles south of Atigun Pass.[38] In 1989 the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service, and the National Park Service jointly established the Arctic Interagency Visitor Center at Coldfoot. The BLM also maintains a contact station at the Yukon Crossing (Milepost 56). In 1993 Alaska established a scenic byways program to designate travel corridors that provide access to significant scenic, cultural, and recreational resources. The following year, the state allowed full public access of the highway to a short distance south of Prudhoe Bay, and the Dalton Highway was designated as a State Scenic Byway in 1998.[39]

B. Permafrost construction

Permanently frozen soil or subsoil underlies 80 percent of Alaska's land area.[40] Known as permafrost, the condition is a remnant of the Ice Ages and 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 between the Brooks and Coast Ranges. Where permafrost is found, its depth can reach up to 1,000 feet below the surface. The implications are significant with regard to construction of roads and buildings; when thawed, permafrost 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 known as taiga. As little as 3 inches of tundra moss can be sufficient to 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 at the surface soon begins to thaw. The resulting water cannot drain downward as the lower soils are frozen and impermeable, so it remains at the surface where it further accelerates thawing. This releases even more water, and the thaw depth becomes progressively deeper over time. In some particularly sensitive areas, thawed areas may not stabilize even 30 years after disturbance.[41]

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[36] Coates, 307.

[37] Coates, 211.

[38] Naming of the highway after James Dalton was commemorative; Dalton did not participate in the construction of the Dalton Highway.

[39] 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); Dalton Highway Scenic Byway Corridor Partnership Plan, 6, http://dnr.alaska.gov/parks/interp/pdf/daltonhwyscenisbywaycorridor.pdf (accessed 17 June 2014).

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

[41] Donald A. Walker and Marilyn D. Walker, "History and Pattern of Disturbance in Alaskan Arctic Terrestrial Ecosystems: A Hierarchical Approach to Analysing Landscape Change," *Journal of Applied Ecology*, April 1991, 246.

This thawing action turns firm surfaces into a muddy quagmire that can easily bog down heavy equipment and vehicles. Although the effect varies by soil type, by the 1940s engineers realized that some permafrost soils 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. 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.[42]

Fifteen years prior to the Prudhoe Bay oil discovery, a prior construction effort along the arctic coast of Alaska had provided valuable insight into arctic permafrost construction. During the Cold War, the U.S. and Canada jointly constructed three strategic defense lines across northern North America. The most northerly, known as the Distant Early Warning (DEW) line, ran from Greenland to Point Barrow, Alaska. Construction of the string of radar and communications stations occurred between 1953 and 1957, and the builders found that a 5- to 6-foot gravel pad effectively insulated the ground beneath roads, airfields, and buildings.[43]

The construction of the Dalton Highway drew upon knowledge gained from DEW line construction and other localized projects such as airfields along the arctic coast. Initially, drilling operations were limited to the winter months and temporary local roads at Prudhoe Bay were constructed of snow. Soon local gravel roads were being constructed at drilling installations, and construction criteria developed specifically for this area by engineers working with Alyeska Pipeline 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."[44] 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.

Investigations of existing arctic coast facilities indicated that 5 feet of gravel fill would be satisfactory to prevent thawing into the permafrost. Gravel was widely available from nearby riverbeds, and typical North Slope roads were constructed entirely of that material. Roads were constructed with a 30-foot crown width and 1:3 slopes at each side. After snow was removed from the right-of-way, the gravel fill

[42] Alaska Road Commission, *Alaska Road Construction and Maintenance Techniques*, 1952, 4; A.C. Clark, "Alaska Highway – Problems in Roadway Design," *Western Construction News*, March 1943, 108.

[43] V. B. Bagnall, "Operation DEW Line*," Journal of the Franklin Institute,* June 1955, 488-490.

[44] William P. Stokes, "North Slope – Construction Criteria for Roads and Facilities," *Journal of Petroleum Technology* (October 1971), 1,209.

was compacted in layers to an embankment thickness of 5 to 6 feet. To facilitate drainage, corrugated metal culverts were laid through the roadbed above the tundra surface, since ditching was inadvisable.[45]

Much of the Dalton Highway is located in the continuous permafrost zone, and construction would follow the best practices utilized previously to ensure that construction caused minimal disturbance to the permafrost. Per their agreement with the state, Alyeska Pipeline was also faced with the task of constructing the road in accordance with American Association of State Highway and Transportation Officials (AASHTO) secondary highway standards that dictated grade, curvature, sight distance, and width.[46] Using the same gravel-pad construction employed locally on earlier projects at Prudhoe Bay, the initial construction of the Dalton Highway required a total of 3 million hours of labor and 23.5 million cubic yards of gravel.[47] Currently, the highway contains 32 million cubic yards of gravel.[48]

Completed in 1974, the 415-mile-long Dalton Highway was the only example of a long-distance highway in North America constructed using this method until Canada completed the Dempster Highway in 1979 from the Klondike Highway north to Inuvik.[49]

[45] Stokes, 1,210-1,211.

[46] State of Alaska, Department of Highways, *Annual Report 1969*, 13.

[47] Jerry Brown and R.A. Kreig, eds., 3. This total includes gravel used for construction of airfields at various pipeline construction camps; Alyeska Pipeline Service Company, *Facts: Trans Alaska Pipeline System* (Anchorage, Alaska: Alyeska Pipeline Service Company, 2013), 28.

[48] Alyeska Pipeline Service Company, 17.

[49] Kent, 142.

4. Significance

The Roads Methodology provides guidance on the application of the National Register Criteria for Evaluation, identifying areas of significance, and evaluating significance under *Criteria A, B, C*, and *D*. The Dalton Highway is less than 50 years in age and must meet *Criteria Consideration G: Properties Less than 50 Years Old* to be eligible for the National Register. Under *Criterion Consideration G*, a road may possess exceptional significance for singularly embodying associative values under *Criterion A* or by exhibiting an extremely rare distinctive feature or property type under *Criterion C*.

A. *Criterion A: Events*

To meet the threshold for significance under *Criterion A,* a road must possess a direct and important association in one or more supplemental areas of significance as identified in the Roads Methodology in addition to *Transportation*. This evaluation of significance under *Criterion A* considered all potential areas of significance identified in the Roads Methodology. Based on research and context development, only the applicable areas of significance for this road are addressed below.

Transportation

The Dalton Highway has an association with *Transportation* because the connection from Livengood to Deadhorse in 1974 provided the first vehicular link to the Arctic Ocean and North Slope from the rest of the Alaskan road system and lower 48 states. The period of significance for *Transportation* will relate to the historical purpose this road had in the conveyance of people and goods as defined in one or more supplemental areas of significance that meet *Criterion A*.

Industry

The Dalton Highway has a direct and important association with the petroleum industry at the state level in the area of *Industry*, by providing the critical link that led to the development of petroleum extraction on the North Slope and resulted in a significant expansion of the oil industry in Alaska. Although it was not the first petroleum region developed in Alaska, North Slope oil production quickly overtook Cook Inlet/Kenai Peninsula oil and gas production, and the rise of North Slope oil industry had a profound impact on the state's economy. The Dalton Highway provides the only vehicular access to the drilling facilities at Deadhorse/Prudhoe Bay and maintenance facilities along the pipeline and was instrumental in the construction of the pipeline. The development of the pipeline represents an event of extraordinary importance, and the Dalton Highway as the only vehicular access to the North Slope meets the requirements under *Criteria Consideration G* for its direct and significant association with this event. The period of significance begins with the completion of the highway in 1974 and continues into the present. This corresponds to the period in which the highway facilitated construction of the pipeline and includes its continuing function as a haul road supporting petroleum extraction in the North Slope.

Entertainment/Recreation and *Conservation*

The Dalton Highway does not meet the requirement for significance in the area of *Entertainment/ Recreation* and *Conservation*. This area of significance focuses on the specific use of roads to provide critical and direct access to important entertainment and recreational facilities or conservation activities. The road was developed to provide direct access to oil companies operating on the North Slope with

restricted, private access to oil extraction operations at Prudhoe Bay, as well as access to the pipeline for construction and maintenance. The full length of the highway did not open to the public until 1994. Following the opening of public access to the Dalton Highway, recreational facilities, tourism, and areas of scenic, natural, and historical importance were developed at locations along the highway. However many regional and state highways in Alaska frequently led to the development of recreational activities and points of interest due to the access a major transportation corridor could provide. Research did not reveal that the road provided critical access to important entertainment or recreational activities or areas deemed critical for the management of natural resources subsequent to its construction that transcends normal recreational activities to meet National Register significance in the area of *Entertainment/Recreation* and *Conservation*.

Community Planning and Development

The Dalton Highway does not meet the requirement for significance in the area of *Community Planning and Development* considering *Criteria Consideration G*. This area of significance focuses on roads that played a crucial role in the development pattern within a community. The Dalton Highway was constructed to provide access to oil operations, and research did not reveal that it was constructed to directly improve the physical structure within specific communities. The town of Deadhorse, at the northern terminus, consists mainly of housing and production facilities for the oil industry and its development relates to the industry itself rather than the construction of the road. Native villages or mining communities that pre-date the road did not see significant growth after construction of the Dalton Highway. Research did not reveal a specific role of the Dalton Highway in improving the physical structure within communities and therefore additional access the highway may have facilitated represents a common function and overall development pattern of roads and is related to *Transportation.*

B. *Criterion B: Persons*

As outlined in the Roads Methodology, a road is not likely to qualify for National Register significance under *Criterion B* for association with a significant person. To qualify under *Criterion B*, the road would need to best exemplify a person's contribution to history. Mere association with a road, such as involvement in design or construction, or roads named for an individual that is commemorative in nature, would not render a road significant under *Criterion B*. The highway is named for James W. Dalton (not to be confused with his father, Jack Dalton, who developed the Dalton Trail to the Yukon), an arctic engineer who supervised the DEW line construction and served as a consultant in early North Slope oil exploration, particularly regarding pioneering winter trails for heavy equipment. This is a commemorative recognition as he had no direct role in the highway's construction; therefore, it would not qualify under *Criterion B* for an association with Dalton. No other individuals were identified through research to have played a significant role in the Dalton Highway that would qualify it under *Criterion B*.

C. *Criterion C: Design/Construction*

The Roads Methodology explains how a road would meet the threshold for significance under *Criterion C*. Roads will generally reflect patterns of features common to a particular road type, and under the Roads Methodology this does not convey significance on its own. In order to possess significance, a road must

also reflect other important or distinctive design features and/or construction practices or be a surviving example of a rare type.

The gravel pad construction method employed in the construction of the Dalton Highway is a distinctive method of construction specific to the Arctic region, and represents an engineering solution to the unique environmental challenge posed by road construction over permafrost soils and reflects ongoing upgrades to accommodate the challenges of the arctic environment. Although not the earliest example of this gravel-pad construction, the Dalton Highway is the first long-distance road in North America to utilize this method and the largest such example in Alaska. The only other such example in North America is the Dempster Highway, located in the Yukon and Northwest Territories of Canada, which was not completed until 1979. As a result, the Dalton Highway is significant at the state level in the area of *Engineering*, applying *Criteria Consideration G*. The period of significance is 1974, which corresponds to the year in which the highway was completed and continues into the present.

D. *Criterion D: Information Potential*

Criterion D is most often applied to archaeological properties. As outlined in the Roads Methodology, roads in vehicular use are not likely to be significant under *Criterion D* for the ability to yield information. The Dalton Highway is in vehicular use and remains an above-ground property type. No evidence was found for potential significance under *Criterion D*.

5. Recommendation

The Dalton Highway possesses significance at the state level under *Criterion A* applying *Criteria Consideration G* for its direct and important association with *Transportation* and under the supplemental area of significance of *Industry.* The Dalton Highway also possesses significance at the state level under *Criterion C* in the area of *Engineering*.

The Dalton Highway has an association with *Transportation* because the connection from Livengood to Deadhorse in 1974 provided the first vehicular link to the Arctic Ocean and North Slope from the rest of the Alaskan road system and lower 48 states.

The Dalton Highway has a direct and important association with the petroleum industry by providing the critical link that led to the development of petroleum extraction on the North Slope and resulted in a significant expansion of the oil industry in Alaska. The Dalton Highway provides the only vehicular access to the drilling facilities at Deadhorse/Prudhoe Bay and maintenance facilities along the pipeline, and was instrumental in the construction of the pipeline. The development of the pipeline represents an event of extraordinary importance in the state, and the Dalton Highway as the only vehicular access to the North Slope meets the requirements under *Criteria Consideration G* for its association with this event. The period of significance begins with the completion of the highway in 1974 and continues into the present. This corresponds to the period in which the highway facilitated construction of the pipeline and includes its continuing function as a haul road supporting petroleum extraction in the North Slope.

The Dalton Highway meets the threshold for significance in the area of *Engineering* as a distinctive method of construction applying *Criteria Consideration G* at the state level. The gravel pad construction method employed in the construction of the Dalton Highway is a distinctive method of construction specific to the Arctic region, and represents an engineering solution to the unique environmental challenge posed by road construction over permafrost soils. Although not the earliest example of this gravel-pad construction, the Dalton Highway is the first long-distance road in North America to utilize this method and the largest such example in Alaska. The period of significance is 1974, which corresponds to the year in which the highway was completed and continues into the present to reflect ongoing upgrades to accommodate the challenges of the arctic environment.

The Dalton Highway does not possess significance under *Criteria B* or *D*.

Since the Dalton Highway possesses significance under *Criterion A* and *Criterion C*, identification of essential physical features and an assessment of integrity is needed to determine National Register eligibility.