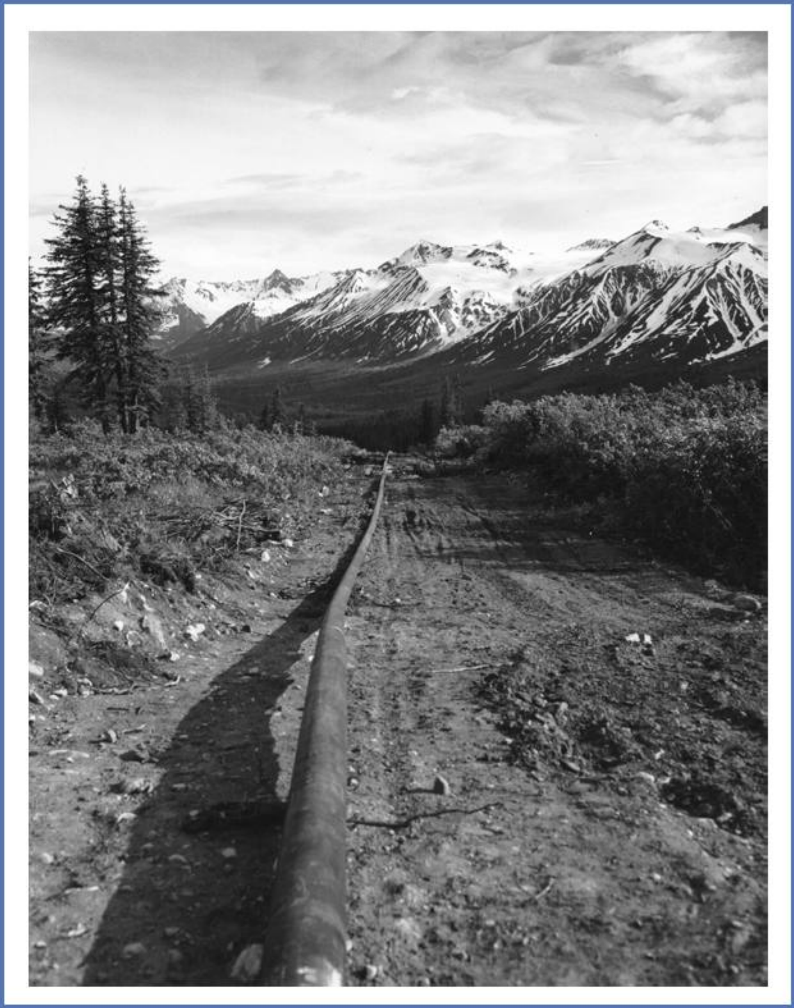
The Haines-Fairbanks Pipeline



April 2003

CEMML TPS 03-04

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Pipeline

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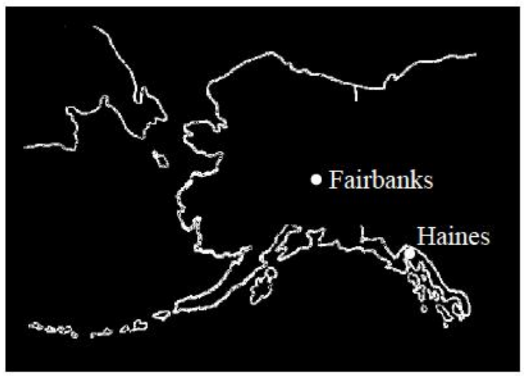

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CHAPTER 1.0 Introduction

When people think of pipelines in Alaska the first thing that usually comes to mind is the Trans-Alaska Pipeline. But the state has actually been host to several large pipeline systems over the past 60 years. The Haines-Fairbanks Pipeline was a lesser-known Cold War era project owned and operated by the U.S. Army from 1955 to 1973. The eight-inch diameter pipeline transported refined fuel from a deep-water port at Haines to Fort Greely, Eielson Air Force Base, and Ladd Air Force Base (Ladd AFB was transferred to the Army and became Fort Wainwright in 1961).

The U.S. Army Corps of Engineers was responsible for pipeline design and construction. The Corps contracted most of this work to private companies, maintaining a supervisory role over the project. The pipeline was designed from 1950 to 1952 and construction occurred over 22 months, from 1953 to 1955. Civilian, federal wage-grade personnel operated the pipeline in conjunction with orders received via teletype from the Petroleum Division headquarters at Fort Richardson.[1]

Four types of fuel were conveyed over the 626-mile route including diesel, automotive gas, jet fuel and aviation gas. The vast majority of fuel transported was JP4: jet fuel. Originally, five strategically located pump stations pressured fuel through the pipeline. In 1961, six booster stations were added to the system to increase the fuel output. When operating at maximum capacity, the pipeline could deliver 27,500 barrels of fuel a day, most of which was for Air Force use.

Fuel was an essential commodity that powered Cold War missions of defense and deterrence. The Haines-Fairbanks Pipeline was considered a logistical asset and the most reliable, efficient means of transporting the vast quantities of fuel needed in interior Alaska. In 1970 investigations revealed the pipeline metal was deteriorating, particularly on the southern half of the system. Repair costs were prohibitive, and plans to shut the Haines to Tok section of the line were implemented. The Tok to Fairbanks section continued operating until 1973 when it too was closed. Routine operations, normal for the period, resulted in environmental contamination, particularly at the main pipeline pump stations in Haines, Tok and Fairbanks. Environmental investigations and restoration work have been ongoing at these sites since the early 1990s.

The purpose of this report is to document the history of the pipeline from its inception to the conclusion of operations. The document was written to fulfill the requirements of a Memorandum of Agreement (MOA) between the U.S. Army Alaska and the State Historic Preservation Officer (SHPO). The report was written in consultation with the Fort Wainwright Cultural Resources Working Group, the U.S. Army Corps of Engineers and the Alaska State Historic Preservation Office (SHPO). The MOA sets stipulations for the demolition and cleanup of the Tok Terminal. Stipulation 3C required historic documentation of the pipeline.

[1] The Army's petroleum operations underwent several name and organizational changes over the years that the Haines-Fairbanks Pipeline operated. Petroleum Division was the last designation used.

As a significant Cold War property, preservation of the pipeline's history is important and a requirement under federal regulations, as stipulated in Section 110 of the National Historic Preservation Act of 1966 (as amended).

1.1 Acknowledgments

Many former employees and their family members generously shared memories of the Haines-Fairbanks Pipeline for this study. Special thanks to: Randy Acord, Layton Bennett, Johnny Burnham, Ray Carder, Vern McConnell, Richard Duke, June Haas, Dwight Hanson, Earnest and Laura Kelly, Edward and Elizabeth Karmen, John Koehler, George Lyle, Genie Menaker, David Menaker, Clarence Sparks, Joyce Thomas and Thomas Webster. Without them, this project would not have been possible.

Also, thanks to the following for assisting in various stages of the project: Fort Wainwright Cultural Resources Working Group; Lee Clayton, President of the Chilkat Indian Association; Sarah Epps, Cold Regions Research and Engineering Laboratory; Diane Hanson, U.S. Army Corps of Engineers; Kathy Price, USARAK Cultural Resources Specialist; and Russ Sackett, USARAK Cultural Resources Manager.

1.2 Methods

This project was initiated with background research in files at the U.S. Army Alaska's, Department of Public Works, Environmental, Fort Richardson. Three studies served as basic reference sources on the pipeline facilities and operations:

> Garfield, D.E., Ashline, C.E., Haines, F.D. and Ueda, H.T. *Haines-Fairbanks Pipeline: Design, Construction and Operation.* SR 77-4 CRREL. February 1977.
>
> Pamphlet 360-1, *Description of Alaskan Military Petroleum Facilities.* 172 Infantry Brigade (Alaska) 15 January 1982.
>
> Rickard, W.E. and Deneke, F. *Preliminary Investigations of Petroleum Spillage, Haines-Fairbanks Military Pipeline, Alaska.* April 1972.

Haines-Fairbanks Pipeline: Design, Construction and Operation provided a historical narrative of the pipeline. *Description of Alaskan Military Petroleum Facilities* described facilities and equipment at each pump station. And *Preliminary Investigations of Petroleum Spillage* discussed the effects of documented oil spills along the pipeline corridor before 1972.

Background research was also conducted at the Loussac Library and the Alaska Resources Library & Information Services (ARLIS). There were only brief references to the pipeline in historical literature. ARLIS provided magazine articles recording the pipeline's construction. These articles were valuable in reconstructing the early pipeline history. Also important to documenting construction was a special "Pipeline Edition" of the *Anchorage Daily News* published October 11, 1955.

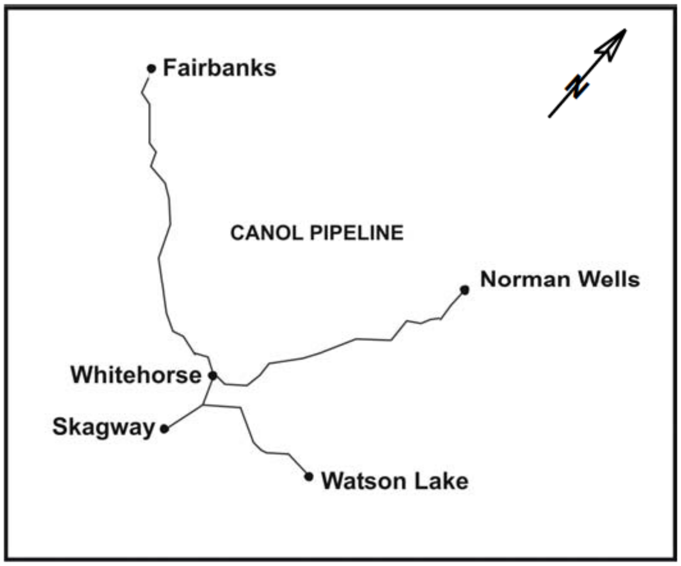
Initial archival research was conducted at the University of Alaska Anchorage (UAA) Archives and Manuscripts Department, the National Archives and Records Administration, Alaska Pacific Region, the University of Alaska Fairbanks Archives (UAF), the Alaska State Archives, Yukon Archives, and the Sheldon Museum and Cultural Center Archives.

Primary sources documenting the pipeline's history were difficult to find. Original records may have been disposed or transferred out of state when the pipeline was shut down. Alaskan archival resources produced limited information.

Oral history interviews were a key information source for this study. Former Haines-Fairbanks Pipeline employees and their family members filled gaps in the written sources and added a personal dimension to the pipeline story. Fifteen people were interviewed in Haines, Haines-Junction, Tok, Fairbanks, and Anchorage. One interview was conducted over the phone. Two interviews conducted for the Sheldon Museum oral history program also proved useful.

The author contacted the companies that built and designed the pipeline. Neither Willbros, now known as Willbros USA Inc, nor Fluor Corporation had original documentation regarding the pipeline's history in their archives.

Chapter 2.0 Context



Map 1. CANOL Pipeline. Based on map in *Invention & Technology*, "Pipe Dream" by Raoul Drapeau.

As the defense infrastructure expanded in Alaska during World War II, fuel supplies became a growing concern, particularly at Interior bases. The Lend-Lease program and Alaska-Canada Highway (ALCAN) construction required steady fuel supplies.[2] The Alaska Railroad transported fuel to the Interior and coastal points were supplied by oil tankers. However, the railroad was plagued with scheduling difficulties and burdened with shipping war supplies. It was also unreliable and slow to move the amount of fuel required. Oil tankers were in short supply due to the war effort and were vulnerable to attack.[3]

These fuel supply issues received attention at the highest levels of government, and construction of a pipeline was quickly authorized. The CANOL Pipeline (Canadian American Gas Oil pipeline) would move crude oil from Canadian oil fields at Norman Wells to a refinery at Whitehorse. From Whitehorse, supplementary lines would deliver refined fuel to Fairbanks, Skagway and Watson Lake. The combined length of the pipelines was 1,600 miles. The project's appeal lay in the protected inland fuel source that would allow the Army to decrease its dependence on Navy tankers.[4]

CANOL construction was a massive effort in terms of money and labor consumed. The project was authorized quickly without feasibility studies or a full understanding of the conditions and costs that would be encountered.[5] The final price tag for construction was about $130,000,000.00. At the peak of construction, over 10,600 civilians and 4,000 engineer troops worked on the project.[6] The work started in 1943 and the pipeline was operating by April of 1944. The CANOL ran at full capacity for only 12 months before sections were shut down in April, 1945. The system was plagued with leaks and spills during its short service and maintenance costs were prohibitive. Major development of the Norman Wells oil fields ceased in 1945. The Whitehorse refinery was sold and dismantled in 1947. The pipeline from Skagway to Fairbanks continued to be used in a limited capacity until 1958, delivering fuel to Whitehorse, Fairbanks and other points along the Alaska Highway. Skagway was receiving fuel by oil tankers.[7]

[2] The Lend-Lease program ferried U.S. equipment to the Soviet Union during W.W.II.
[3] Drapeau, Raoul. "Pipe Dream." *Invention & Technology* (Winter) 2002.
[4] Woodman, Lyman L. *Duty Station Northwest: The U.S. Army in Alaska and Western Canada, 1867-1987,* Volume Two 1918-1945. Anchorage: Alaska Historical Society, 1997.
[5] Fradkin, Philip. "The First and Forgotten Pipeline." Source unknown.
[6] Ibid.
[7] Menders, Paul. *First Draft Report: An Evaluation of the Economics of Utilizing the Haines-Fairbanks Pipeline for Civilian Purposes*. Economic Staff Group, Northern Development Branch, D.I.A.N.D. 29 April 1970.

Alaska's proximity to the Soviet Union propelled the territory's development to a strategic Cold War theater beginning in 1947. The U.S. Army Corps of Engineers embarked on large-scale construction efforts across the territory to bolster the defense infrastructure. Fuel supply again became a key logistical issue for the military's widely scattered bases. As stated in an annual report, "Logistic operations in the Alaskan Command (were) unique, not because of the forces or missions assigned, but because of complexities created by vast distances, limited surface transportation, difficult terrain, and the extreme variations of weather encountered within the territory."[8]

The CANOL was in poor condition and too small to meet the military's anticipated fuel demand. The Army needed a system that would reliably and quickly get fuel to Ladd Air Force Base, Eielson Air Force Base and Fort Greely. The bases played a key role in the Cold War as Alaska served as "a giant listening post" and the first line of defense against Soviet attack. Cold region training and research, aerial reconnaissance, and aerial defense were crucial Army and Air Force missions occurring at Interior bases. [9]

As during World War II, a pipeline was once again identified as the best fuel transportation solution. It was thought to be cheaper than using the railroad, which was shipping the most fuel at the time. Railroad delivery cost ten cents a gallon, while it was estimated that pipeline delivery would cost two cents a gallon.[10] Also, fuel delivery had to compete with other railroad shipping demands. The pipeline would be devoted solely to petroleum transportation. Finally, Cold War strategy called for a reliable and safe delivery route. A pipeline was a smaller, less vulnerable target than the highly visible railroad.[11] This was an important consideration during the tense Cold War years.

[8] "History of the Alaskan Command, 1969." Prepared by the Historian, Office of the Secretary, Joint Staff Headquarters ALCOM.
[9] Price, Kathy. Northern Defenders: *Cold War Context of Ladd Air Force Base Fairbanks, Alaska 1947-1961*. CEMML TPS 01-2 January 2001.
[10] "History of the Alaskan Command. 1 July 1956." Prepared by Office of Information Services, Alaskan Commnd.
[11] Haas, Frank M. "The Haines / Fairbanks Pipeline." February 1992. On file at Sheldon Museum & Cultural Center, Haines, AK.

Chapter 3.0 Project Planning, 1947–1953

Though most defense fuel was consumed by the Air Force, petroleum distribution (along with supply logistics) was an Army function. An Army pipeline to replace the CANOL was considered as early as 1945.[12] After congressional authorization, the design phase was implemented in 1950, just as the Korean War started. The Haines-Fairbanks Pipeline was also known as the Alaska Canada Gas Oil Pipeline or ALCANGO.

3.1 Design Contract

The U.S. Army Corps of Engineers was in charge of the pipeline construction. In 1950, the Corps issued invitations to bid on the project's design. Fluor Corporation, of Los Angeles, California, won the bid. It designed the line from 1950 to 1952. Fluor subcontracted some of the research work to Ryall Engineering, a Little Rock, Arkansas company.

Issues of cold climate construction necessitated careful planning and design. Preliminary route studies were conducted by air, automobile and foot.[13] Ryall Engineering explored the pipeline corridor and researched the CANOL operating records. Engineers hoped to learn from past mistakes and avoid the problems experienced with the CANOL.[14]

3.2 Pipeline Route

The first step in designing the pipeline was choosing the route. Haines to Fairbanks was a logical choice because of the proximity to existing infrastructure. Haines was located on a deep-water, ice-free inlet with year-round access. The inlet was large enough to handle the heavy tanker traffic pipeline fuel deliveries would generate. There was already a dry cargo dock present, which could accommodate massive supply deliveries and allow construction to begin immediately. And Haines was a strategic location that let tankers use a protected coastal route on the journey to Alaska, avoiding the rough, open seas of the Gulf of Alaska. From Haines the pipeline could follow the Haines Highway and the ALCAN Highway north to Fairbanks. Roads were essential for transporting equipment during construction, and later for maintenance access. Eliminating the need to build both a road and a pipeline corridor was another way to speed construction.

The Haines-Fairbanks route traversed two countries and a diverse landscape of variable climates. Recorded temperatures ranged from a low of -82° F in Snag, Yukon Territory to a high of 92° F in Fairbanks, Alaska.[15] The line snaked through mountain, tundra, swamp and plateau. Designers had to carefully consider extreme elevation changes, which affected the location and number of pump stations needed.

[12] Pamphlet 360-5. *The U.S. Army in Alaska*. 172nd Infantry Brigade (Alaska) May 1976. p.104.

[13] George, W. "The Alaska Pipe Line." *The Military Engineer*. Nov-Dec 1955. p.460.

[14] "The Alcango Pipeline: Part 1 of 2." *Western Construction*. Feb. 1955. p.37, 38.

[15] Garfield, D.E., Ashline, C.E., Haynes, F.D., & Ueda, H.T. *Haines-Fairbanks Pipeline: Design, Construction and Operation*. CRREL, Special Report 77-4. February 1977. p.1.

Table 1: Pipeline crossings.

HAINES-FAIRBANKS PIPELINE	
Major River Crossings	25
Minor Stream Crossings	82
Major Highway Crossings	49
Secondary Road Crossings	39
Major Swamp Tundra Crossings	11

They also tried to keep the pipeline as straight as possible to shorten the route and avoid excessive use of pipe.[16]

The 50-foot-wide pipeline right-of-way was located after aerial and ground investigations. To narrow down the final corridor selection, aerial surveys and photography were used to plot a four-mile-wide band to known landmarks and elevations. Then rough maps were drawn and a ground survey located the line to survey points and private property boundaries.[17]

The pipeline was planned to be predominantly surface laid except for two major underground sections. Originally designers also planned to bury the pipeline under large streams and rivers. After research exposed the dangers of variable water flows and deepening river channels, it was decided to attach the pipeline to ALCAN and Haines Highway bridges wherever possible. Where bridge crossing were not available, the pipeline was buried or raised over the water on trestles or catenary cables.[18]

3.3 Canada Route

Approximately 292 miles of the Haines-Fairbanks Pipeline crossed Canada in the Yukon Territory and British Columbia. Cooperation of the Canadian government was absolutely essential in constructing, operating and maintaining the project. There was precedence for the issue with previous projects such as the CANOL Pipeline and the ALCAN Highway. In the exchange of notes to work out details for the right-of-way authorization, the pipeline project was described as “a mutual defense interest of both countries.”[19]

The United States first approached the Canadian government with a request to survey the proposed pipeline route on July 25, 1950. Canada gave its approval several weeks later. In July of 1952, the U.S. Department of External Affairs sent a memo seeking permission to build the line. The United States and Canada signed Treaty No. 20, “Haines-Fairbanks Pipeline,” on June 30, 1953.

The treaty authorized operation of the Haines-Fairbanks Pipeline for 20 years. The government of Canada arranged “for the remission of duties and Federal taxes, on construction equipment, materials and supplies imported into or purchased in Canada, when consigned to the project and used in its construction.”[20] If either government wished to terminate the agreement after 20 years, they were free to do so. The Permanent Joint Board of Defense was tasked with resolving disputes if either the United States or Canada disagreed about the need for continuing use of the pipeline.

Canada required that certain conditions be met in the construction and operation of the pipeline. The government was primarily interested in protecting its lands from environmental degradation and ensuring that Canadian labor and supplies were used in the construction, operation and maintenance of the pipeline in its country. The Canadian pump stations were operated entirely by Canadians.

[16] U.S. Army Corps of Engineers, *Products Pipeline, Haines to Fairbanks Alaska, Operating Manual*. Prepared by Fluor Corporation. May 1955.

[17] George, W. “The Alaska Pipe Line.” *The Military Engineer*. Nov-Dec 1955. p 460.

[18] Ibid. p.461.

[19] Secretary of State for External Affairs, Canada to the Embassy of the United States of America. 30 June 1953.

[20] Note No. 227, Embassy of the United States of America, Ottawa, April 19, 1962 to Embassy of The Honorable, The Secretary of State for External Affairs, Ottawa.

3.4 Construction Contract

Invitations to bid on the pipeline construction contract were advertised September 15, 1953. Potential contractors were given one month to submit proposals. The government estimate for the job was $28,622,684. Only three bids were received – $29,001,287, $31,812,739.25 and $38,7784597.35. Williams Brothers (Tulsa, Oklahoma), McLaughlin Inc. (Great Falls, Montana) and Marwell Construction (Vancouver, British Columbia, Canada) won the contract as a joint venture with their low bid of $29,001,287.00.[21] Williams Brothers was the primary contractor.

3.5 Land Acquisition

The Army needed to acquire land for the pipeline right-of-way and pump stations. A 50-foot corridor was required for the 626-mile route. The pump stations varied in size from five acres at Junction and Donjek to 203 acres for the Haines Terminal. Overall, the pipeline occupied 2,404.34 acres.[22] Private property was acquired by a Declaration of Taking. Public lands were withdrawn by Public Land Orders.[23]

In contrast to the Trans-Alaska Pipeline built some 20 years later, there was no consultation with native groups for use of the land. The laws and regulations governing tribal consultation today were not yet in place. According to a report by Northern Land Use Research Inc., there were mixed reactions to pipeline construction among Tlingits in the Haines region. Interviews indicated that some thought the pipeline was important to national defense. Others appreciated the job opportunities created by the construction and operations. These reactions can in part be attributed to the perceived understanding that the Haines Terminal would be returned to the native people when the pipeline was closed.[24] However, some residents were decidedly against the project. As one elder stated:

> I do know that there were people fairly upset with what was taking place. And the major issue dealt with boundaries. The boundary issue just regarding the federal government coming in and doing whatever they pleased without even checking with the community. On how the land was used, who used it, who owned it…The only comments that I heard when I was a kid was the lack of respect regarding boundaries and the lack of being able to express one's opinion. Not knowing who you could go and express your concern [to].[25]

The pipeline land in British Columbia and the Yukon Territory was "acquired by and remain[ed] in the title of Canada."[26] The expense of obtaining the land was to be incurred by Canada. It is not known what price the Canadian government may

[21] "Joint Venture Built Largest Single Project." *Anchorage Daily News: Pipeline Edition*. 11 Oct. 1955.

[22] This figure includes the acreage added in 1961 when six additional pump stations were constructed.

[23] Defense Environmental Restoration Program, Formerly Used Defense Sites, Findings and Determination of Eligibility. Alaskan Petroleum Pipeline System, Haines-Fairbanks Division, Alaska. Property No. F10AK1016.

[24] McIntosh, S. J., Bowers, P. M., Higgs, A. S., & Williams, C. M. *Tanani Subsistence*. Report prepared for: Central Council Tlinget and Haida Indian Tribes of Alaska. Northern Land Use Research, Inc. March 2000.

[25] McIntosh, S. J., Bowers, P. M., Higgs, A. S., & Williams, C. M. *Tanani Subsistence*. Report prepared for: Central Council Tlinget and Haida Indian Tribes of Alaska. Northern Land Use Research, Inc. March 2000. p.33.

[26] Annex to Note No. 288, from the Embassy of the United States of America, June 30, 1953.

have paid to acquire the land for the pipeline corridor and pump stations, or if private property owners were affected.

The only known, documented discussion of native land right issues in Canada took place in the Yukon Territory, with regard to the Klukshu Indian Village. The village, located near Klukshu Lake, was used as a summer fish camp by the Champagne Indians. There were 118 residents in 1951. The fish camp was near the Haines cut-off road that connected Haines to the ALCAN Highway.

In 1951 the Klukshu expressed their desire for the creation of an Indian reserve. A letter by R.J. Meek, who worked in the Indian Affairs Branch of the Department of Citizenship and Immigration, stated that the Haines cut-off road had disrupted life at Klukshu Village. "Since the opening of the Haines-Cut-Off Road, access to the fishing station is easy…many visitors, tourists, and others drop in at the village to watch the fishing and drying."[27] The reserve was intended to protect the village from further disruption.

A survey was scheduled to take place in 1951, but due to a controversy over the exclusion of a church mission from the proposed reservation boundaries, the survey was not completed and the reserve was not created. In 1954 the request was renewed. The reserve was created in January of 1955. The Haines-Fairbanks Pipeline right-of-way was exempted from the boundaries. A 1954 letter to the Indian Affairs Director stated: "With regard to the oil pipe line now being constructed which will cross this land, I note with satisfaction that this line will not interfere with the use of the land by the Indians."[28] This is the only known discussion regarding possible impacts to native land use caused by the Haines-Fairbanks Pipeline. This consultation was taking place through Canadian administrators of the Indian Agency, Department of Citizenship and Immigration. Tribal consultation on a government-to-government basis was not yet practiced. [29]

3.6 Army Petroleum Distribution and the Air Force

Ninety to ninety-five percent of fuel transported via the Haines-Fairbanks Pipeline was consumed by the Air Force. Initially the only Army fuel deliveries were to Fort Greely. Fort Greely's combined fuel storage capacity was 74,500 barrels. The Ladd AFB and Eielson AFB storage capacity was 508,950 barrels. Even after Ladd AFB was transferred to the Army in 1961, the Fairbanks Terminal served more as surplus holding for the Air Force rather than for Army use.

The discrepancy in fuel consumption was a result of differing Army and Air Force missions and technology. Ladd AFB's Cold War missions centered on border patrol, strategic aerial reconnaissance, photo and electronic reconnaissance, and long range detection. Eielson AFB was a Strategic Air Command (SAC) headquarters. Air Force missions involved flights over Alaska, Canada and the Soviet Union

[27] R.J. Meet, Superintendent Indian Agency, Department of Citizenship and Immigration, to Indian Commissionor for B.C., Vancouver B.C. 28 May 1951. In Champagne and Aishihik First Nations, "Summary of the Non-native Activities in the Klukshu Reserve Area and Their Impact on Traditional Life: A Response to the Federal Offer Respecting the Klukshu Specific Claim." Appendix 2. 27 September 1994

[28] Champagne and Aishihik First Nations. "Summary of the Non-native Activities in the Klukshu Reserve Area and Their Impact on Traditional Life: A Response to the Federal Offer Respecting the Klukshu Specific Claim." Appendix 2, 27 September 1994.

[29] The Champagne and Aishihik First Nations believe the pipeline affected and disrupted traditional lifestyles and impacted Indian health. Their 1994 investigations concluded that environmental contamination from fuel spills and the aerial spraying of chemical defoliants exposed people, wildlife and vegetation to dangerous levels of chemical toxins. See "Summary of the Non-Native Activities in the Klukshu Reserve Area and Their Impact On Traditional Life: A Response to the Federal Offer Respecting the Klukshu Specific Claim." By Champagne and Aishihik First Nations. 27 September 1994.

using aircraft such as B-47s, B-52s, KC-97s and KC-135s, which consumed large amounts of fuel. On the other hand, Army Cold War missions, such as Air Force protection and cold weather training, did not require nearly as much fuel. Because the Air Force was the primary consumer, it provided most of the money for the pipeline operating budget through Operations and Maintenance Money Air Force. Remaining funds were procured through Operations and Maintenance Money Army.[30]

The Army reorganized and renamed its petroleum distribution system a number of times between 1955 and 1971. Initially pipeline operations were under the supervision of the Quartermaster Corps and were known as the Alaskan Petroleum Pipeline System.[31] Over the years the system was also known as The Alaska Petroleum Pipeline System, the Petroleum Distribution Office, Petroleum Distribution Division and the Petroleum Distribution Unit.[32] On July 1, 1974, the Petroleum Division was established as an element of the Director of Industrial Operations.[33] Headquarters were at Fort Richardson's Petroleum Distribution Office (PDO), Building 724. It was subordinate to the Director of Logistics of the Defense Supply Agency.

The pipeline was operated by federal, wage-grade personnel under the direction of the U.S. Army. Though most pipeline employees were civilians, some Army personnel were assigned at the pump stations for training and assistance when civilian labor was limited. Many early employees were recruited from the CANOL Pipeline. In fact, most of the station foremen were former CANOL workers. Their knowledge and experience was valuable to the newly operating Haines-Fairbanks Pipeline.

[30] Thomas Webster, interviewed by Kristy Hollinger. 29 October 2002. p. 2.

[31] "QM Corps to Supervise Big Pipeline." *Pipeline Edition: Anchorage Daily News*. 11 October 1955.

[32] *Alaskan Command Natural Resource Information Exchange* 11 Jan. 1971. On file at UAA Archives and Manuscripts Dept. U.S. Army Haines Fairbanks Pipeline.

[33] Pamphlet 360-1, *Description of Alaskan Military Petroleum Facilities*. 15 January 1982.

Chapter 4.0 Construction, 1953-1955

Construction of the Haines-Fairbanks Pipeline was a major undertaking that required detailed planning and organization. Supplies and equipment were procured outside Alaska and then distributed along the 626-mile route. Construction crews were strung along the right-of-way in two countries for nearly two years. The work was accomplished in extreme weather and terrain under a strict 22-month deadline.[34]

Figure 1. 10 Aug. 1954. Haines-Fairbanks POL pipeline area #3 (Harding Lake Area). Resident Engineer vehicle M-37 stuck in the mud – looking south. NARA.

4.1 Right-of-Way

The first step in building the pipeline was clearing a right-of-way. A 50-foot-wide corridor was needed along the 626-mile route. The center 30 feet were graded for pipeline placement. Williams Brothers subcontracted the Alaskan section of the job to Oaks Construction Co. of Anchorage and the Canadian section to Omack Company of Canada. Clearing work started in December of 1953 at Ladd Air Force Base in Fairbanks. Crews only had three hours of daylight at that time of year, so most work was initially done in the dark. Two additional crews were added January 1, 1954 — at Tok Junction and the Alaska-Yukon border. Crews cleared an average of one mile a day during the winter months. Severe weather stopped all but one team in February when temperatures dropped to 30 below zero. The single team continued working by covering its vehicles with tarps to trap engine heat. At night, kerosene lanterns were placed under the tarps to keep equipment from freezing.[35]

Figure 2. Ball used in clearing way for pipeline. NARA.

In summer the mud and floods were major problems for the clearing crews. Spring thaws combined with permafrost exposed from digging up the tundra turned the right-of-way into "an alleyway of gumbo."[36] The common practice of pushing all debris to the edges of the right-of-way worsened problems by blocking water drainage. An *Anchorage Daily News* article described the conditions:

> In muskeg and thawed permafrost areas, the track vehicle sometimes sank up to the hoods to become immobile as tracks failed to gain toe-holds on the icy bottom. On occasion a cat would drop out of sight and a thoroughly drenched skinner would scramble to high ground. Extra tractors were kept busy towing floundering equipment.[37]

[34] Huttlinger, J. "Contract Awarded for Strategic Alaskan Line." *World Petroleum*. Vol.24 No. 13. Dec. 1953.
[35] "50-Foot Right-of-Way Hacked Out of 626 Wilderness Miles." *Pipeline Edition: Anchorage Daily News*. 11 Oct 1955.
[36] "Mud a Major Problem for Line Builders." *Pipeline Edition: Anchorage Daily News*. 11 October 1955.
[37] Ibid.

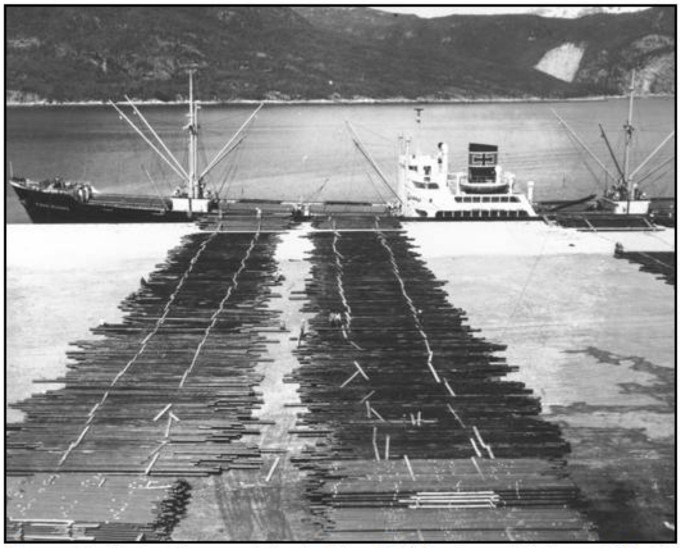


Figure 3. Unloading and stockpiling British pipe at Haines. NARA.

Figure 4. Push and Pull assistance was necessary to bring piping to the places needed in tundra swamp crossing. NARA.

"Corduroy and temporary bridges were utilized to keep the pipe stringing moving forward. At one location in Canada, Koidern No 1 and South Fork, a temporary bridge was built to reach the Island between the two streams. Dick Woodring, stringing superintendent, tried out the trestle with a Cat. The west side of the structure gave way, dunking the super and the skinner into 9 ft. of icy water. Luckily no one was injured, and the drowned Cat was rescued by cables run from several pull Cats on the shore."

—Excerpt from: "The ALCANGO Pipeline: Part 2 of 2" *Western Construction*. March 1955

A seven-foot-diameter steel ball was attached between two tractors to help clear trees and brush. The ball was filled with water and weighed ten to twelve tons.[38] The right-of-way clearing was finished in October of 1954.

4.2 The Pipe

The pipeline pipe was eight-inch-diameter, Grade A, seamless steel with a standard .277-inch wall thickness. Pipe slated for burial was slightly thicker at 0.322 inches. Alaska's section of pipe was from Jones and Laughlin at Aliquippa, Pennsylvania. The 8,300 tons of pipe made a 9,500-mile journey before arriving in ports at Haines and Valdez. Barges carrying 500 tons each made their way down the Ohio and Mississippi rivers to New Orleans where the load was put on freighters for the next leg of the journey. From Louisiana, it was a 7,500-mile voyage across the Gulf of Mexico, the Caribbean Sea, through the Panama Canal and then up the Pacific Coast. The journey took two weeks. Pipe on the Canadian section was from Scottish mills. It was shipped from England across the Atlantic and through the Panama Canal.

The pipe was unloaded on the Haines docks and rolled into stacks eight or nine pipes deep. From the docks, pipe was loaded onto logging trucks by Caterpillar D-6s for distribution along the route. The D-6s had Trackson Pipe Layer side booms rigged to them. Pipe was placed every five miles with trucks and skids. Trucks were unloaded with D-6s configured the same as those used for loading.[39] In rough areas tractors pulled and pushed the trucks through the right-of-way muck. Spacer gangs followed pipe distribution to line up and clamp pipe together for the welding crews. A 1/16-inch gap was left between the pipe segments.[40]

It was impossible to make the pipeline follow an exactly straight line. The pipe had to be bent in many locations to accommodate curves and turns in the route. Bending the pipe was accomplished on site using Caterpillar D-6 tractors with side booms.

[38] CRREL (1977) *Haines-Fairbanks Pipeline: Design, Construction and Operation*. Special Report 77-4. p. 6, 7.
[39] Ibid. p. 6
[40] "The ALCANGO Pipeline: Part 2 of 2." Western Construction. March 1955. p.35.

Figure 5. Laying pipe for underwater crossing. NARA, A4-3826.

Figure 6. Pipeline construction. NARA.

Figure 7. Pipe welding. NARA, DA 573 #373.

Most of the pipeline was laid directly on the ground except for two major sections that were placed underground. These were a 40-mile segment north of Haines and a 100-mile segment south of Fairbanks. The Haines section was buried to protect the line from rockslides and avalanches in the mountainous terrain. The Fairbanks section was buried through military maneuver areas.[41]

Though the Haines ditching operations required drilling through solid rock, burying the line near Fairbanks was more difficult because of the permafrost. Ditch digging for pipe placement required a minimum burial depth of at least seven feet. Most pipe was buried at nine feet, and some as deep as fifteen feet. Cleveland 320 trenching machines were altered to accommodate the permanently frozen ground. A smaller wheel with more buckets was used so that the ditcher operated continuously with less jarring action on the equipment. The permafrost wore out the specially treated steel teeth on the buckets. The teeth had to be replaced twice a day.[42] It took an average of 12 hours to dig one mile of pipeline trench. In the summer, ditchers ran 24-hours a day, six days a week, with Sundays devoted to routine repairs.[43]

As the pipe was spaced along the right-of-way, welding crews followed to fuse the pipe lengths together. The work started April 19, 1954. Welding was carefully monitored throughout construction. The pipe metal was constructed softer than normal because of the cold temperatures the line would be exposed to. Soft pipe is more difficult to weld and many applicants failed qualifying employment tests. Finding enough welders for the job and keeping men on the job after they started were challenges.

In many places the right-of-way was flooded by up to three feet of water. Work continued with men working in icy, waist-high water. Hip boots were standard equipment. Where the right-of- way was flooded, laborers welded sections of pipe together and floated them into position. The pipe was anchored to the ground with 480-pound concrete weights – made as needed. The route also required many stream and bridge crossings. The regular welding crews bypassed these tricky areas in order to maintain a rapid pace. Tie-in crews finished the work later. Pipe for underground burial was welded and

[41] "Ingenious Method Used for Burial of One-Fourth of Line." *Pipeline Addition: Anchorage Daily News*. 11 Oct 1955.

[42] "The ALCANGO Pipeline: Part 2 of 2." *Western Construction*. March 1955. p.35.

[43] "Ingenious Method Used for Burial of One-Fourth of Line." *Pipeline Addition: Anchorage Daily News*. 11 Oct. 1955.

Figure 8. Area 2. Mile 1173, Yukon Territory, Corps of Engineers inspection vehicle mired along pipeline right-of-way. NARA.

then placed in the ditch. The soil was backfilled as quickly as possible to prevent exposed permafrost from thawing. Normally in permafrost-free areas outside Alaska, pipe was placed in the ditch and then welded.[44]

Teams of radiographic inspectors followed the welders to check for faults in the weld joints. They checked a random 15% sample visually and with x-ray equipment. The U.S. Army Corps of Engineers contracted the work to Isotope Products of Texas and Edmonton, Alberta. Isotope Products took gamma graphs using the radioactive pill method. The initial inspections revealed many faults, and Lincoln Welding Co. was hired to bring up more qualified welders from Oklahoma and Texas.[45] The work progressed rapidly after that, and in one record-setting day, the Canadian team completed 426 welds in one 12-hour shift.[46]

Figure 9. Tok terminal under construction, 1954. NARA.

4.3 Pump Stations

Marwell Construction Company built the pump stations in Canada and Alaska. The pipeline was initially designed with five stations at Haines, Border, Haines-Junction, Donjek and Tok. Haines and Tok were also equipped with bulk fuel storage facilities known as tank farms. Tank farms were already present at Fairbanks and Eielson Air Force Base. The Fairbanks tank farm was built during W.W.II to store fuel shipped by the CANOL Pipeline.

The pump station construction work was carefully planned and coordinated with supply deliveries. Construction specifications detailed exact locations of machinery and equipment in buildings and around the station. Over 2,100 drawings were prepared. When changes to the plans were required, they were done on site.[47]

All pump stations were designed to be self-supporting communities. They were equipped with their own heating, water, electrical and sewage systems. Living quarters were provided for the operators and their families. These consisted of two or

[44] "Tanker Arrives in Alaska…Delivers First Fuel for Line." *Oil and Gas Journal*. 20 June 1955.
[45] "The ALCANGO Pipeline: Part 2 of 2." *Western Construction*. March 1955. p.35.
[46] Ibid. p.35, 38.
[47] "Joint Defense Plans Served by Alaska Products Pipe Line." *Oil in Canada*. Vo. 7, No. 48. 26 Sept 1955. pp. 62-72.

three bedroom apartments and bachelor quarters at Haines and Tok. Every station also had at least two fuel storage tanks to supply the equipment and vehicles.

Building conditions at the five pump stations varied according to the sub-surface soil. Tok Terminal was the easiest to build due to the presence of two feet of silty topsoil overlaying gravel. Donjek was the most problematic because of unstable soils and the presence of permafrost to varying depths. The pump building foundation had to be excavated 12 feet underground. The bottom four feet were backfilled with compacted gravel.[48]

The pumps at every station were laid on concrete slabs. Vibration pads were placed around the concrete to insulate the building from the jarring action of pumping equipment. The Donjek Station concrete slabs were eight feet thick.[49]

4.4 Construction Working and Living Conditions

There was pressure to complete the pipeline as quickly as possible. The job urgently needed to be completed before the start of another winter. The pressure led to a fast work pace, particularly during the summer when crews were put on 12 hour shifts seven days a week to take advantage of the extended daylight hours. Conditions were too much for some. Though the number of workers brought in from outside is unknown, many men quit and returned to the Lower 48.

Figure 10. 24 Sept 1954. Contractor's Camp at Mosquito Lake 25 miles from Haines. NARA.

Two mobile camps or 'spreads' were used to support construction work – one in Canada and one in Alaska. The Alaskan spread started in Fairbanks and the Canadian spread started on the Alaska/Canada border. Each crew had 140 employees on average.[50] During peak construction in 1954, the workforce swelled to 775 employees, with 500 men working on the pump station construction.[51] Catering services and a fleet of trailers used as bunkhouses, mess hall, kitchens, showers and offices supported employees. Canus Services Inc., the catering company, served three meals a day. Breakfast was at 5:00 am, dinner at 7:30 pm, and packed lunches were provided to eat on the job.[52]

The mobile camps moved with the men as work progressed – generally at 50 to 70 mile intervals. Everything was designed to move in one overnight trip. Smaller camps were arranged as needed when work lagged from difficult conditions. Commercial logging facilities could also be used for small crews staying behind the main spreads. Crews kept in contact with each other and the main offices by two-way radios. Stationary camps were set up at the five pump station sites.

The international agreement between the United States and Canada required that supplies and labor for the Canadian section of the pipeline be obtained from Canadians. This agreement appears to have been strictly adhered to, as everything from

[48] Ibid.

[49] Ibid.

[50] "Two Contractor 'Spreads' Sped Work." *Pipeline Edition: Anchorage Daily News*. Oct 11 1955.

[51] Judah, M. A. "Alaskan Products Line Completed." *Pipe Line Industry*. 4:3 (Oct 1955) p.48.

[52] "Pipeline Construction Crews Had Trailer Living Quarters." *Pipeline Edition, Anchorage Daily News* 11 Oct. 1955.

the pipeline pipe to metal for construction of pump station buildings was purchased from Canadian sources.

Figure 11. Haines-Fairbanks Pipeline construction. NARA.

Figure 12. 1954, Mile 28. Workers assemble on highway.

4.5 Dedication Ceremony

When the Haines-Fairbanks Pipeline was completed in 1955, a dedication ceremony transferred management responsibilities from the contractors to the military. The ceremony took place at the Haines Terminal on October 12. Alaska's top Army and Air Force officers were in attendance, along with Governor Frank Heintzleman and Canadian officials. During the ceremony Brigadeer General D.H. Tulley, Assistant Chief of Engineers for Military Construction stated, "The ALCANGO may well prove to be a deciding factor in some future wartime operation."[53] The project engineers thanked those involved in the construction and praised the U.S. and Canadian governments for cooperating to build the project.

The end cost of construction was $38,249,796.00. This was 32% over the original $28,622,684.00 construction bid.[54]

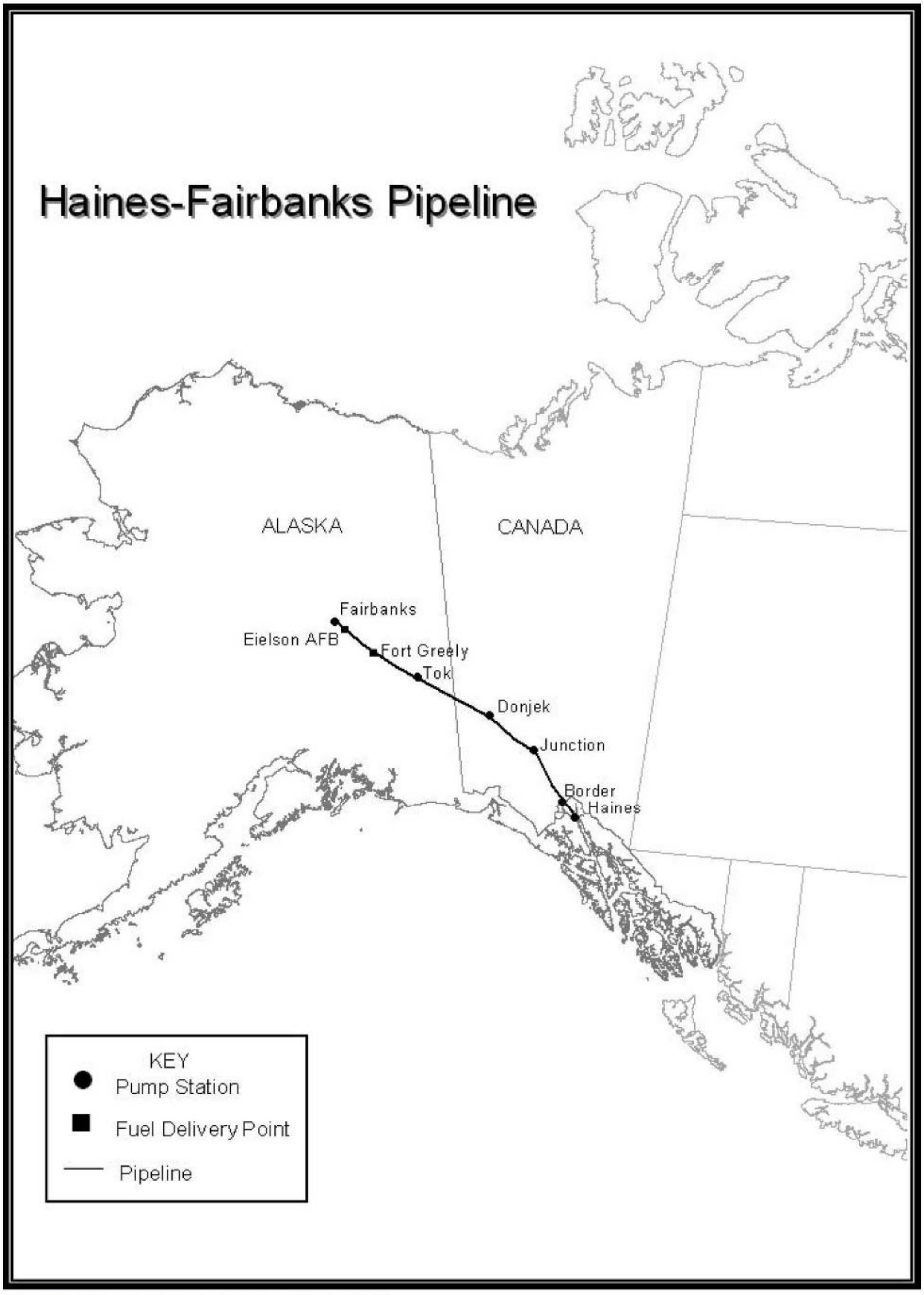
Figure 13. Tom Nelson, superintendant of the Haines-Fairbanks $40,000,000 POL pipeline, explains to distinguished military guests how the great ALCANGO 626-mile pipeline carries the different fuels, jet and aviation, motor and diesel, to military bases in the interior. L to R; Maj. Gen. James F. Collins, Commanding General USARAL; Brigadier H. L. Meuser, Commander, Northwest Highway System, Canada; Brig. Gen. Hugh Mackintosh, Columbus General Depot, Quartermaster Corps; Lt. Gen. J. H. Atkinson, USAF Commander in Chief, Alaska; Commissioner, F. H. Collins, Yukon Territory, Canada. U.S. Army photograph, Sheldon Museum Collection, Haines, Alaska.

"There is the story of three inspectors who were walking along the right-of-way and glancing over their shoulders periodically for bear protection. When a bear showed up on the left, the inspector on that side made for a tree without wasting time to yell. The other two continued walking until the second man in file saw the bear and went up another tree. A few seconds later the third man noticed the bear when he glanced back and went up a third tree. The inspection team carefully maintained their altitude until a side-boom tractor came by and routed the bear."

— Excerpted from "Products Line Completed."

[53] Photo caption; US Army photo. Alaska State Archives. Record Group 101. Office of the Territorial Govenor, Series 130.

[54] D.E. Garfield, C.E. Ashline, F.D. Haynes and H.T. Ueda. *Haines-Fairbanks Pipeline Design, Construction and Operation*. February 1977.



Map 2. Haines-Fairbanks Pipeline: 1955 – 1961.

Chapter 5.0 Facilities and Operations, 1955-1961

From 1955 to 1956, the pipeline was staffed to minimum levels. As stated in the 1957 ALCOM report, "The maintenance of the pipeline by the Army was considered the loneliest job one could be assigned. Many times difficulty was experienced in keeping stations manned."[55] In August of 1956, for example, there were still 18 unfilled positions at the Haines Terminal alone.[56] Tok was operating with just seven employees in 1955. Former employee George Lyle remembered, "I was working 12 hours seven days a week. Yeah pretty near all winter we worked 12 hours seven days a week… it helped out on the paycheck. But it got a little old!"[57] The staff shortage led planners to recruit a number of workers from outside. They also hired people with no former pipeline experience to train on the job.[58] Maintaining a qualified workforce was an issue for the duration of operations.

The pipeline was designed as a multi-product system to transport four fuel products: aviation gas, jet fuel, automotive gas and arctic grade diesel. Five pump stations moved the fuel through the pipeline. They were located strategically to push fuel over higher elevations along the route. Six booster stations were added to the system in 1961 to increase the pumping capacity.

Fuel was pumped through the pipeline in two stages: from Haines to Tok and then Tok to Fairbanks. Bulk fuel storage facilities, known as tank farms, were located at Haines and Tok to hold fuel before pumping it through the pipeline. Tank farms were also present at the fuel delivery points on Ladd AFB (Fairbanks), Eielson AFB and Fort Greely.

The system was designed to operate under four phases: normal, emergency, increased emergency and full capacity. Normal and emergency only called for use of the three main stations: Haines, Border and Tok. Increased emergency and full capacity outputs used all the pumping stations.

The pipeline pumped 9,600 barrels per day under standard operations. Maximum output was as high as 16,500 barrels per day if the booster stations at Haines-Junction and Donjek were put on line.

5.1 Line Freeze-Up

Though pipeline construction was completed in late 1955, it was not until 1956 that full-scale operations commenced. In 1955 the construction engineers tested the pipeline with water instead of fuel to check the integrity of the line. The rationale was to prevent the costs and hazards associated with the loss of fuel if leaks occurred. No major ruptures developed during the test, and the pipeline was transferred from the contractors to military.

[55] "History of the Alaskan Command, 1 July 1956 – 30 June 1957." Prepared by the Office of Information Services Alaskan Command.
[56] Keith H. Ewbank, Colonel, GS, HQ USARAK, Office of the Chief of Staff to B. Frank Heintzleman, Governor of Alaska. Alaska State Archives.
[57] George Lyle, interviewed by Kristy Hollinger. 21 July 2002. p.14.
[58] Johnny Burnham, interviewed by Kristy Hollinger. 7 May 2002. p. 5.

Figure 14. Pipeline break located near MP 498.8. Break was discovered during test period and was repaired. NARA.

The new operators quickly discovered, however, that testing the line with water was a costly and time-consuming mistake. In November 1955, the weather turned very cold. Temperatures reached minus 30 at Border Station and minus 60 at Tok Terminal. Haines was pumping jet fuel at 800 pounds per square inch (psi) when at about 2:00 am all pump stations started losing pressure. Haines responded by increasing the pressure to 1,000 psi, but Tok was still only receiving a dribble of fuel. Ray Carder at the Haines Terminal ordered the shutdown of the line. Batch Elder was the general foreman of the pipeline at that time. Ray remembers, "I went in and woke him and announce(d) the news that the pipeline was in my opinion, froze up – he couldn't believe it…..Batch held his head between his hands for a while and said, 'They told me I couldn't have freeze-up on this line'."[59]

It was discovered that the water used in testing had not been completely purged from the system and had settled in the pipe at lower elevations along the route. The low temperatures froze the water into solid chunks of ice, and the fuel was unable to pass over or push it through the system. It took about six months before pumping operations could resume.

All the ice had to be physically removed from the pipeline. The work began in January of 1956. The first step was locating the ice blocks. The pipeline was put under pressure of 1000 pounds per square inch (psi) and pressure irregularities were noted. A person then walked the line near the low-pressure areas and tapped the pipe with a 10-pound hammer. The absence of a sharp ringing sound indicated an ice blockage. Once the ice was located, brush fires were lit underneath the pipeline to loosen the ice. Then the pipe was cut and the open end was directed towards the right-of-way edges. Pressure was put on the line and, as pipeline employee George Lyle described, "it would shoot out these big icicles: twenty, thirty feet long and eight inches in diameter."[60] The fuel and ice were discharged straight onto the snow-covered ground and left to evaporate. Attempts were made to cut the pipeline away from areas where discharged fuel might leak into the watershed.

The pipeline was cut in 28 locations over a 176-mile section. The amount of fuel lost during the operation varied at each location. Several former employees recall seeing pictures of ice removed from the pipeline stacked up like cordwood along the right-of-way.[61] The last cut was made on March 16, 1956.[62] A valuable lesson was learned; water should not be used to test the pipeline in such a cold climate. After this initial freeze-up, the Haines-Fairbanks Pipeline operated without major interruption for over 15 years.

[59] Ray Carder, interviewed by Kristy Hollinger. 8 April 2002.
[60] George Lyle, interviewed by Kristy Hollinger. 12 July 2002. p. 2.
[61] Ray Carder, interviewed by Kristy Hollinger. 8 April 2002. p. 9.
[62] Rickard, Warren and Deneke, Frederick. *Preliminary Investigations of Petroleum Spillage, Haines-Fairbanks Military Pipeline, Alaska*. Cold Regions Research & Engineering Laboratory. April 1972

5.2 Tankers and Fuel Delivery

The pipeline system essentially began with Military Sea Transportation Service (MSTS) tankers and their delivery of fuel in Lutak Inlet at Haines. The tankers were loaded with refined fuel in California or Washington. The journey to Alaska took about five days. The tankers were often transporting fuel to Whittier and Kodiak as well.

> **MILITARY SEA TRANSPORTATION SERVICE (MSTS)**
> The Military Sea Transportation Service was created on August 2, 1949, to centrally manage all Department of Defense ocean transportation needs. During W.W. II four separate agencies managed ocean transport. A need for centralized control of military shipping was identified and the MSTS was the result. The MSTS was renamed the Military Sealift Command in 1970. It continues to operate today. It is a service of the United States Navy.

Figure 15. Fuel tanker docking at Haines. NARA.

Lutak is a deep-water, ice-free inlet. A T-shaped concrete dock was built for the pipeline system. The dock was capable of mooring a 26,000 dead-weight-tonnage tanker. There were two dolphins, 780 feet apart, to hold the ship against spring fenders. The dock was equipped with a dockmaster's office where an employee monitored the tanker arrivals. There were also two pumps located on the dock in case the tanker's pumps malfunctioned.

Before fuel could be pumped from the ship, it had to be tested for contamination. A lab employee drew samples from the cargo holds and performed tests at the station's lab to make sure the product was clean. The testing process took from three to eight hours. Pure, uncontaminated product was critical for jet fuel and aviation gasoline. Poor fuel quality could cause a plane crash. The lab did a good job of monitoring the fuel quality and, as the lab foreman Frank Haas stated, they "never had an airplane crash because of contaminated fuel."[63]

Fuel was rarely found to be contaminated or impure. On one occasion a new crewmember accidentally opened the wrong valve in the cargo hold and mixed two different types of fuel. The mistake was immediately identified and the fuel was shipped back to the Lower 48 for re-refinement.[64]

No one interviewed for this study recalled any shipwrecks occurring on voyages for the Haines-Fairbanks Pipeline fuel deliveries. This is not to say that it was always smooth sailing. Ships docked in all kinds of conditions: through rain, sleet, snow and wind. Navigation could be complicated further when the cold, damp air iced up the tankers. Ray Carder recalls a cold spell when this occurred:

> Well, the temperature was down to around ten or fifteen below zero with the north wind blowing out there the way it is now, only I guess worse, and...(they) iced up all over the ship. And I mean when

[63] Frank Haas, interviewed by Pam Moore, tape #92.210.01, transcribed by KM, April 1999. On file in the Sheldon Museum Archives, Haines, Alaska. p. 12.

[64] Ibid.

> it ices up, there's ice that big around all over the cables, the catwalk that went across the well deck, you could barely get across it unless you walked sideways. The ice was that thick. But that wasn't the first tanker that had come in in that condition.[65]

Another problem tankers faced was maneuvering in the tricky tidal currents of Lutak Inlet. Sometimes an airplane would be used to guide the ship in. A tanker also occasionally hit the dock when trying to navigate its landing. Frank Haas recalled one incident:

> We were standing waiting for the ship to shear off, as it normally did, and he was coming almost straight at the dock, and you know, we're used to the ships and they would come in, and they would kick it in reverse, and just fall off to the side. And we're standing and we're watching a while, Enterlin's eyes are getting bigger, and finally the Chief Mate, a fellow named Kirkpatrick, was standing right on the bow, didn't raise his voice. He just looked at us and said, "You know, if I was you guys, I'd get the hell out of there." Mass exodus of eight men. I was accused of running over one fellow and spinning my feet a couple of times. They claimed that's why he went bald.[66]

Fortunately there was no fuel in the tanker at that time or sparks could have ignited a serious explosion.

The ships had crews of approximately 30 to 40 men. Many of the tanker captains were W.W.II veterans who ferried fuel across the Atlantic to the European theater. The Haines station foremen were often invited aboard the tankers to dine with the captain. Ray Carder, the Haines foreman, remembers that the meals were excellent.

A tanker arrival meant an increased pace of work for the Haines Terminal workforce. When a ship arrived, the station men helped secure it to the dock with steel cables. Then, during the entire unloading operation, men were kept on fire watch. Preventing the fuel from sparking at this stage was very important. The dock was equipped with a fire foam protection system in case there was an explosion. Once pumping from the ship began, it continued non-stop around the clock until all holds were emptied. The rate of pumping varied according to ship and the experience level of its captain and crew. A skilled crew might have the holds emptied within 12 hours. On average though, the tankers were in Haines for a day and a half. Fuel shipments varied over the years according to military needs. There were probably one or two tankers arriving at Haines every week during peak operations. Normal output called for one tanker shipment every week and a half.

5.3 Ship to Shore—Haines Terminal

The tankers pumped fuel from the ship into pipes leading from the dock to the manifold building at the Haines Terminal (see Figure 16). There were four ten-inch pipes – one for each type of fuel. There was also a six-inch pipe for kerosene. Designers originally planned to use a kerosene buffer between the fuel batches.

[65] Ray Carder, interviewed by Kristy Hollinger. 8 April 2002. p. 12.

[66] Frank Haas, interviewed by Pam Moore, tape #92.210.01, transcribed by KM, April 1999. On file in the Sheldon Museum Archives, Haines, Alaska.

Figure 16. Pipes leading from Haines dock to manifold building. NARA.

Operators quickly determined, however, that the fuel interface could be controlled without the kerosene buffer.

In the manifold building, fuel was routed to specific storage tanks. All fuel was pumped from the ships to the tank farm before going into the pipeline. Fuel storage served multiple functions. First, it allowed tankers to discharge cargo quickly and efficiently, without worrying about batch schedules. Second, storage allowed any water and/or sediment in the fuel to separate and settle on the bottom of the tank. The presence of water in the fuel was harmful because it could corrode the pipeline and contaminate fuel. Finally, fuel storage permitted tank gaugers to take a more accurate inventory of the product delivered.

> The manifold equipment at Haines was originally left outside, with no protection except for a roof. During the first winter of operations snow drifts buried the valves, which were in an open underground pit. It took three days to dig out the valves. The next summer, a more appropriate, fully enclosed building was constructed over the manifold equipment.

Figure 17. Haines Terminal. NARA.

Table 2. Tank farm capacities.

TANK CAPACITY

Station	*Number of Tanks*	*Barrels Per Tank*	*Total Capacity Barrels*	*Total Station Capacity*
Haines Terminal (1,2)	1	110,000	110,000	390,000
	9	30,000	270,000	
	2	5,000	10,000	
Tok Terminal	9	30,000	270,000	285,000
	3	5,000	15,000	
Fort Greely	2	15,000	30,000	74,500
	4	10,000	40,000	
	2	2,250	4,500	
Birch Lake (3)	2	6,600	13,200	13,200
Fairbanks Terminal	2	25,000	50,000	204,950
	14	10,000	140,000	
	4	2,250	9,000	
	3	1,190	3,570	
	4	595	2,380	
Eielson Air Force Base	5	30,000	150,000	304,000

1. The 110,000 barrel tank at Haines was added to the station in 1964.
2. The Haines and Tok tank farms had 5,000 gallon tanks because originally the pipeline design called for use of a kerosene buffer between the fuel tenders. Operators discovered that the fuel interface could just as easily be managed without the kerosene buffer, and the tanks were used for regular fuel storage.
3. The tanks at Birch Lake were added to the pipeline in the late 1950s for strategic emergency diesel and automotive fuel storage.

5.4 Pumping to Tok Pump Station

As dictated by the pumping schedules, fuel went from storage tanks back to the manifold building where it was then routed to the mainline pump building. On the way the fuel passed through Warner Lewis water separators and Moorlane strainers as a final precaution against introducing water into the system. In the mainline pump building, fuel entered the eight-inch pipeline and started the journey north. The building was divided into an engine room, pump room and control room. The control room was isolated from the engine and pumping areas by a firewall. The room was pressurized to protect workers from breathing harmful petroleum fumes. The pump room housed three Wilson Snyder quintuplet pumps which pushed the fuel through the pipeline. Each pump was driven by a 285 horsepower Chicago-Pneumatic diesel engine (6 cylinder, 4 cycle, 720-420 RPS).

The next pump station was 48 miles from Haines, on the U.S.-Canadian border. The station, called 48-mile or Border, had the heaviest pumping load on the pipe-

Figure 18. Donjek Pump Station. NARA.

line. The highest elevation on the route was at mile 57. Border had to push the fuel over that 3,750-foot rise. Border was critical to the pipeline system and for this reason the station was larger than the other booster stations at Junction and Donjek. The 32-acre site included a mainline pump building, utility building, warehouse-garage-shop building, family housing and a cold storage locker. The pump building housed three pumps and three Chicago Pneumatic diesel engines to drive the pumps. There was a 5,000-gallon storage tank to supply the station's fuel needs. Housing consisted of two apartment buildings: one with six two-bedroom units and one with six three-bedroom units. There was also a dormitory building with a ten-man capacity.

From Border, the Junction and Donjek pump stations could be brought on line to increase the fuel output to Tok Terminal. Junction and Donjek had similar facilities. Each five-acre station consisted of a mainline pump building, utility building and family housing. The pump building housed two pumps and two diesel engines. Housing consisted of one apartment building and one single-family residence for the station foreman.

5.5 Tok Terminal

Tok Terminal was a major component of the Haines-Fairbanks Pipeline. At Tok fuel was temporarily diverted from the eight-inch line to the tank farm for storage before progressing to Fairbanks. Storing fuel at Tok it made it easier to send smaller, better-managed batches of fuel north as needed. It was only 194 pipeline miles from Tok to Fairbanks as opposed to the complete pipeline route of 626 miles. Storing the product at Tok provided a last opportunity for water and sediment to settle out of the fuel. The Tok tank farm had a 285,000-barrel capacity.

Operating Tok Terminal involved many of the same functions as at the Haines Terminal, minus the tanker deliveries. The station was receiving, storing and pumping fuel. Foreman Johnny Burnham described a typical day:

> Well, you got your pumping orders from wherever the headquarters was at, either Haines or down at Fort Richardson. And the pumping orders would tell you if you were going to pump fuel or receive fuel or just hold pressure on the line. For instance, if you was going to receive fuel they would tell you at what time the other pump stations south of us would go on the line, and tell us what back pressure to hold on the line, which could be anything from 50 pounds to 600 pounds of back pressure that you would hold. If you was going to pump of course they would tell you, the pumping orders would tell you at what pressure to pump at and what product to move and so on like that.[67]

[67] Johnny Burnham, interviewed by Kristy Hollinger. 7 May 2002. p. 1.

Fuel entered the mainline pump building via the eight-inch pipeline. From the pump building a line led the fuel to the manifold and transfer pump building where the product was transferred back and forth from the tank farm. The manifold building housed the valves and piping leading to each storage tank, three Warner Lewis water separators, three motor-driven centrifugal pumps, a 600-gallon products sump tank and two positive displacement meters.

Once fuel arrived at the manifold building from the mainline pump building, it was routed to the tank farm. Each storage tank was attached to the manifold building by an eight-inch pipe. Opening the appropriate valves in the manifold building allowed fuel to enter the pipe leading to a specific tank. The pumps in the manifold building assisted the flow of fuel up the hill to the tank. The tank volumes were calculated in advance and when filled, the valves leading to the tank were closed and valves leading to another tank were opened.

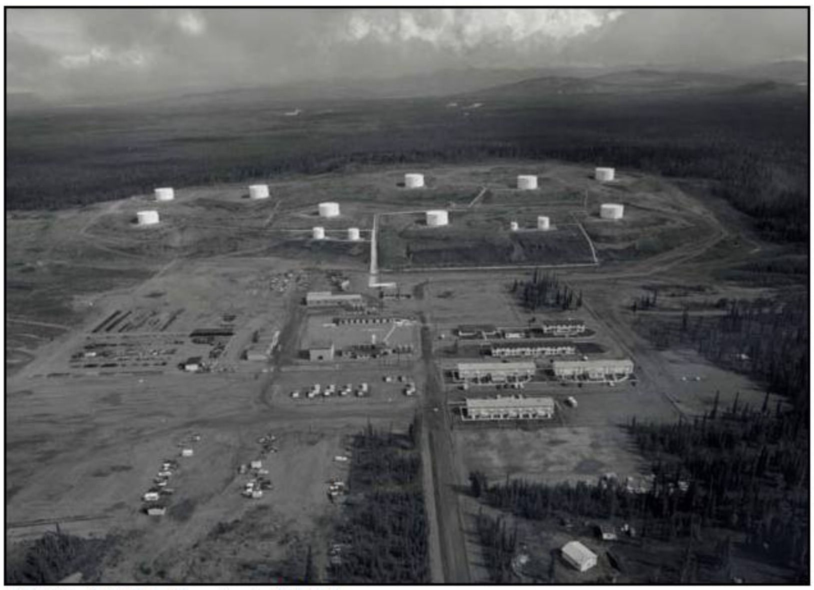


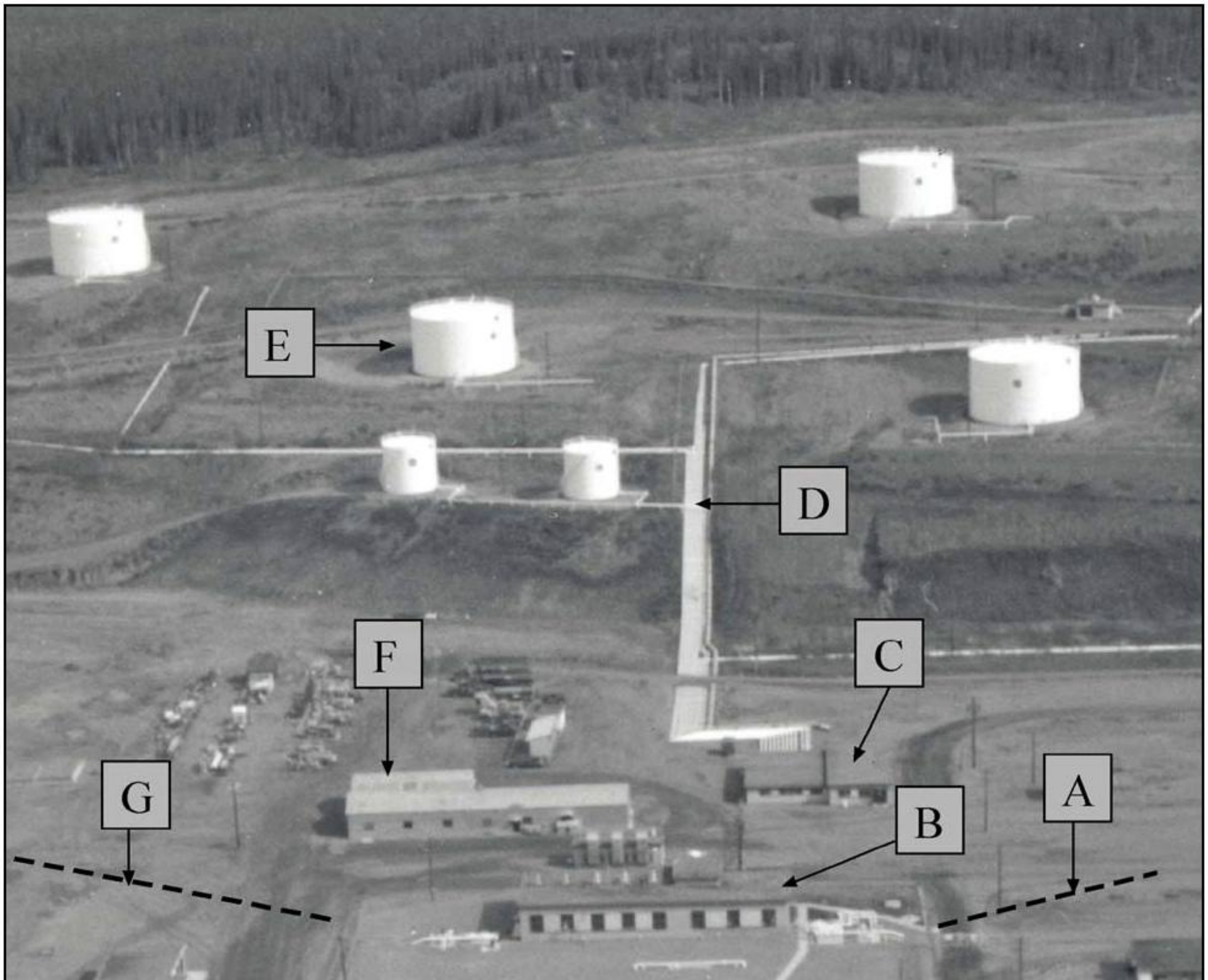
Figure 19. Tok Terminal. NARA.

Each tank was equipped with a 40-foot swing line for filling and withdrawing the product. As fuel flowed up to the tank farm, tank gaugers were on hand at the tank to operate the swing line. Filling the storage tanks required careful and constant monitoring. The swing line was placed just below the product level in the tank and was raised as the tank filled. This prevented static electricity from igniting a spark.

To supply the pipeline from the tank farm, the operation was reversed. The tank gauger positioned the swing line just below the product line and fuel was drained from the tank. It was important that gaugers kept the line as far from the tank bottom as possible to avoid drawing sediment and water out of the tank. Since the tanks were on a hill, gravity assisted the fuel flow back to the manifold building. In the manifold building the product was routed through a Warner Lewis water separator and into a pipe leading back to the pump building.

The Tok pump building was similar to the one at Haines. It was divided into a pump room, engine room and control room. The control and engine rooms were separated from the pump room by a firewall and had a pressurized air system. Three Wilson Snyder quintuplet pumps driven by Chicago-Pneumatic diesel engines propelled the product through the pipeline. The diesel engines were connected to a water cooling system in the adjacent radiator building.

Tok Terminal was also connected to the CANOL Pipeline. The CANOL was still pumping fuel north to Fairbanks. A three-inch line led from the pump building to the manifold building for fuel arriving or exiting via the CANOL. The tie-in was only used for several years before shutting down.



LEGEND

A. Pipeline (underground) feeds fuel into the pump building.
B. Pump Building. In the pump building fuel is routed to the manifold & transfer pump building.
C. Manifold & Transfer Pump Building. Opening the appropriate valves leads fuel to storage tank in tank farm. Every storage tank is connected to the manifold building by a separate pipe.
D. Pipes lead from the manifold building to every storage tank in the tank farm.
E. Fuel fills storage tank. Then, to supply pipeline with fuel for northern delivery, fuel travels back down the pipe to the manifold building where it is routed to the pump building and into the pipeline.
F. Radiator Building. Contains radiators to cool the diesel engines running the pumps. Underground piping feeds cold water to circulate around the engines.
G. 8" pipeline (underground) leads from pump building north to Fairbanks.

Figure 20. Tok Terminal Flow Diagram.

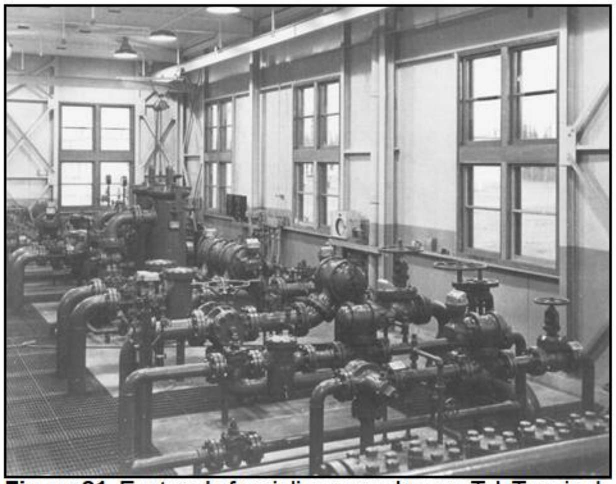


Figure 21. East end of mainline pump house. Tok Terminal. Courtesy George Lyle.

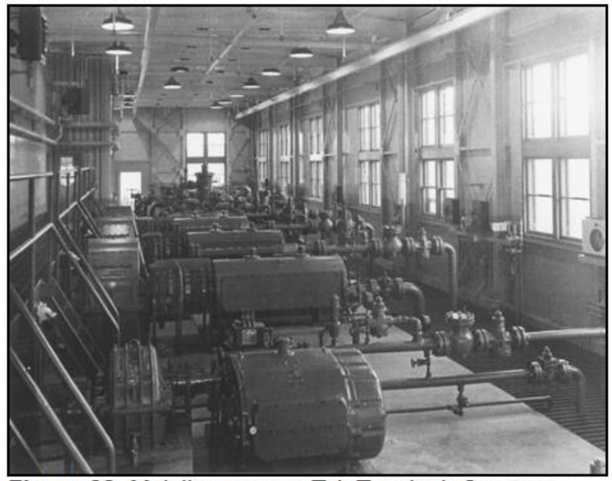


Figure 22. Mainline pumps. Tok Terminal. Courtesy George Lyle.

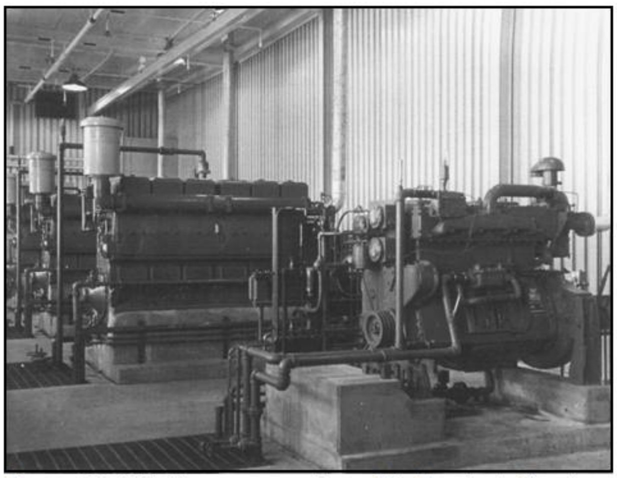


Figure 23. Mainline pump engines. Tok Terminal. Courtesy George Lyle.

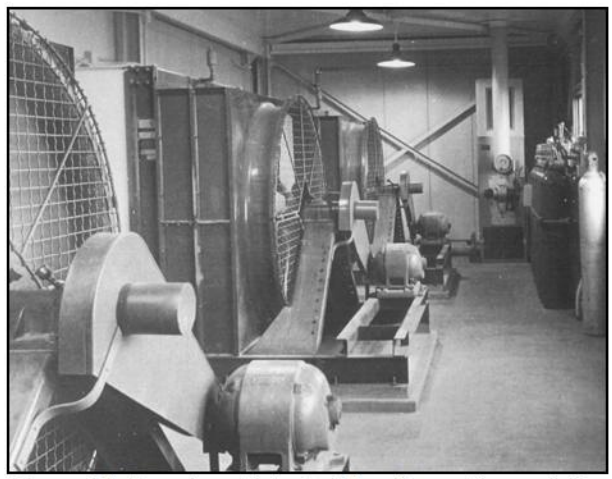


Figure 24. Fans in radiator building for cooling mainline pump engines. Tok Terminal. Courtesy George Lyle.

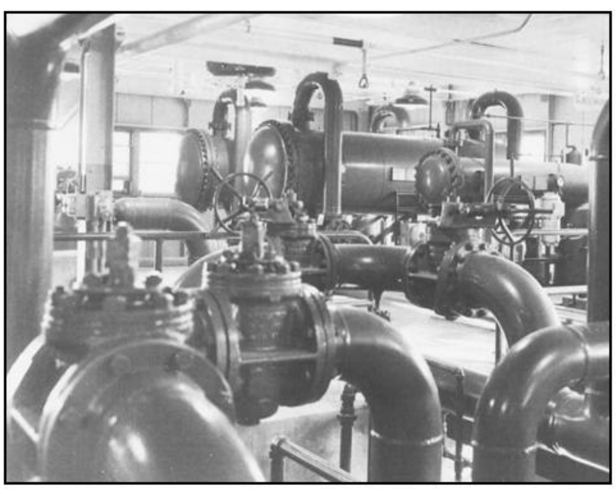


Figure 25. Manifold and transfer pump building interior. Tok Terminal. Courtesy George Lyle.

Figure 26. Pipes leading from manifold building to tank farm. Tok Terminal. NARA.