



# Construction of the Alcan Highway 1942

**“ One of the Top 10 Construction  
Achievements of the 20th Century”**

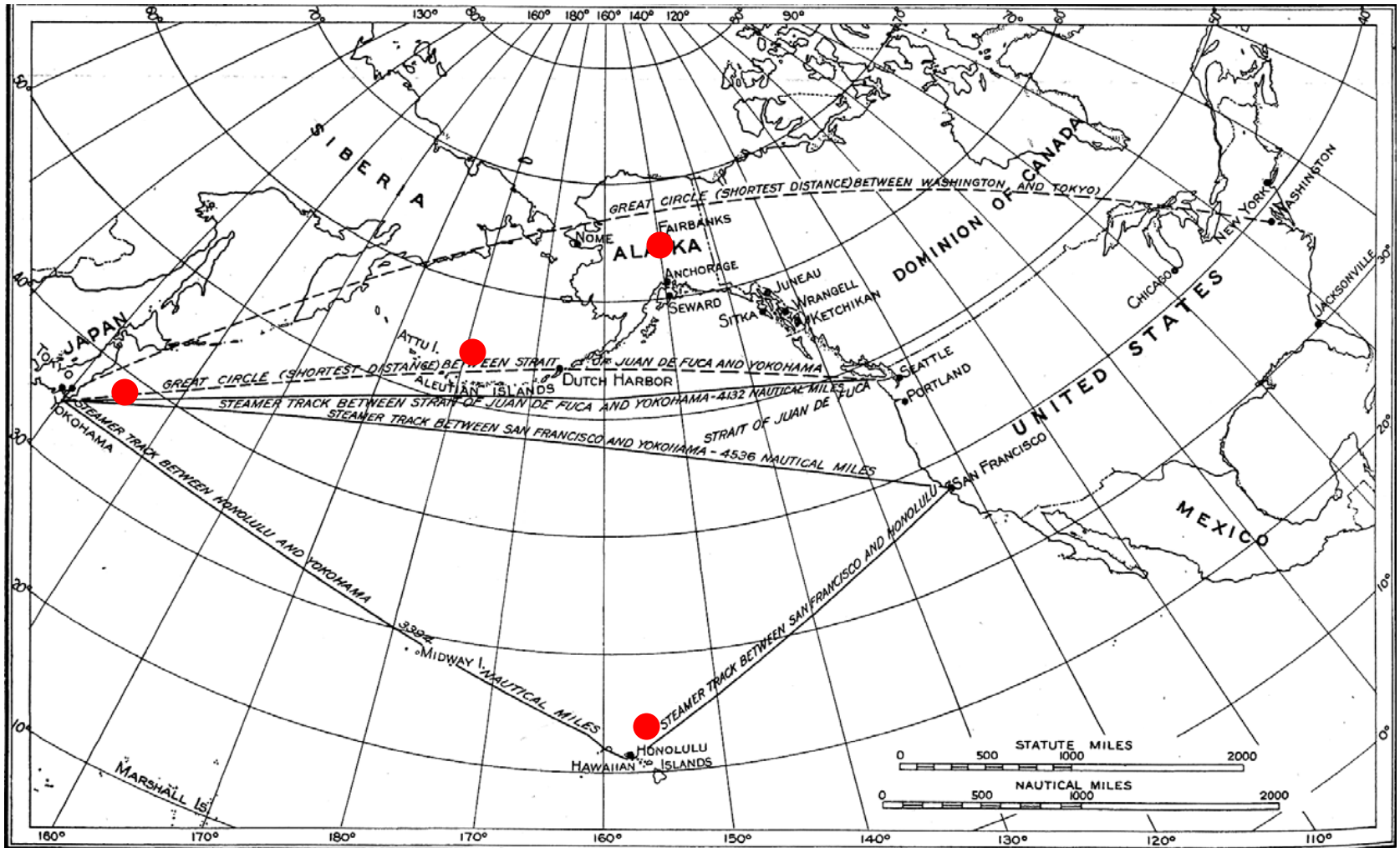
# Outline

- **Purpose of the Alcan Highway**
- **Corps of Engineers Mission**
  - Specifications
  - Plan of attack
- **Surveying the land**
- **Construction of the pioneer road**
  - Plan of Attack
  - Problems
  - Culverts
- **Bridges and pontoons**
  - Use of pontoons
  - Maintenance
- **African Americans involvement**
- **Final Details of the Alcan Highway**
- **Conclusion**

# Purpose of the Alcan Highway

- **Since the 1930's there had been discussions about developing a road that would link the western United States to Alaska. There was not a strong push for the development of the highway until the Japanese attacked Pearl Harbor on December 7, 1941. With the fear of the Japanese possibly invading Alaska, completing the "Ring of Fire" and using it for the war efforts, leaders in Washington realized the need to have a supply road to our small forces in Alaska and for the airfields currently located and planned between Seattle, Washington and Fairbanks, Alaska.**

# Alaska as a Strategic Location



Traverse Polyconic Projection Showing Strategic Location of Alaska

# U.S. Corps of Engineer's Mission

- **The Corps' mission, under the guidance of Brigadier General Clarence L. Studevant, was to build a pioneer road suitable for supply trucks as fast as humanly possible. Civilian contractors working for the U.S. Public Roads Administration (PRA) will then upgrade this road into a permanent highway.**
- **SPECIFICATION**
  - Clearing: 32 feet wide minimum**
  - Grade: 10% maximum**
  - Curves: 50 foot radius minimum**
  - Surfacing: 12 feet minimum**
  - Shoulders: 3 feet minimum**
  - Ditch depth: 2 feet**
  - Crown: 1 inch per foot maximum**
  - Bridges: Single lane with H15 minimum loading**

# Plan of Attack

- **Provide aerial photos to route survey parties to provide general location and bearing**
- **Using bearing, surveyors blaze trail and mark center line by tying red cloths to bushes and trees.**
- **A plane table party would then traverse the alignment and record relative elevations**
- **If this preliminary pass along the proposed alignment proved satisfactory, construction units begin dozing**
- **Civilian contractors followed to improve the pioneer road cut by the Army Engineers**

# Survey Party recording and marking center line



# Surveying the Land

- When the first surveyors of Company D, 29th Engineer Topographic Battalion and Company A of the 648th Engineer Topographic Battalion hit the ground in February of 1942, the base maps were simply aerial photographs.
- Only one map was provided of the area from Dawson Creek to Fort Nelson.
- Paucity of maps and snow up to 18 inches deep posed the biggest problems for the route surveyors. Other problems were the mosquitoes, gnats and yellow jaundice.
- The surveyors also had to comply with orders to make the pioneer road service the airfields in the Yukon Territory and Alaska as well as avoiding steep terrain and muskegs.
- A survey party would consist of approximately 1 Officer and 9 Surveyors. The first group to enter the forest would split up into team and venture out for a mile or two to see which alignments had the greatest potential. The teams would then back track and reunite. This splitting and coming together along with updated aerial photos was the only way for the surveyors to blaze the best path.
- Another survey team would follow behind, running a level survey and tape the centerline. Shortly behind them came the transit team that would record the centerline and elevations of the proposed road.
- The teams would average about 2-4 miles per day. The teams would use local Indians as guides.





- Route surveying was made difficult by the adverse weather and heavy vegetation, which limited sighting distance

A traverse team and recorders do final calculations to verify that the intended road meets specifications.



- These shots show two of the plane table survey teams, who fixed vertical elevations along the path



# DOG SLEDS

- **With no defined road established during surveying, supplies were brought to the parties either by dog sled teams or horses. From the start, the supply team would leave with a months supply carried by dog sleds.**



# Construction of the Pioneer Road

- The first Engineer Construction regiment (341st) arrived on March 10, 1942 at Dawson Creek. They started north to St. John. Their initial goal was to get past Peace River just north of St. John before the spring thaw. Otherwise, they had no means of transporting their equipment any farther.
- By June of 1942, 7 Engineer Regiments were on the ground and constructing the pioneer road. Each Regiment was given a section of land approximately 350 miles long. Their goal was to reach the next regiment's pioneer road before winter set in.

18th Engineer Combat Regiment

35th Engineer Combat Regiment

93rd Engineer General Service Regiment (colored)

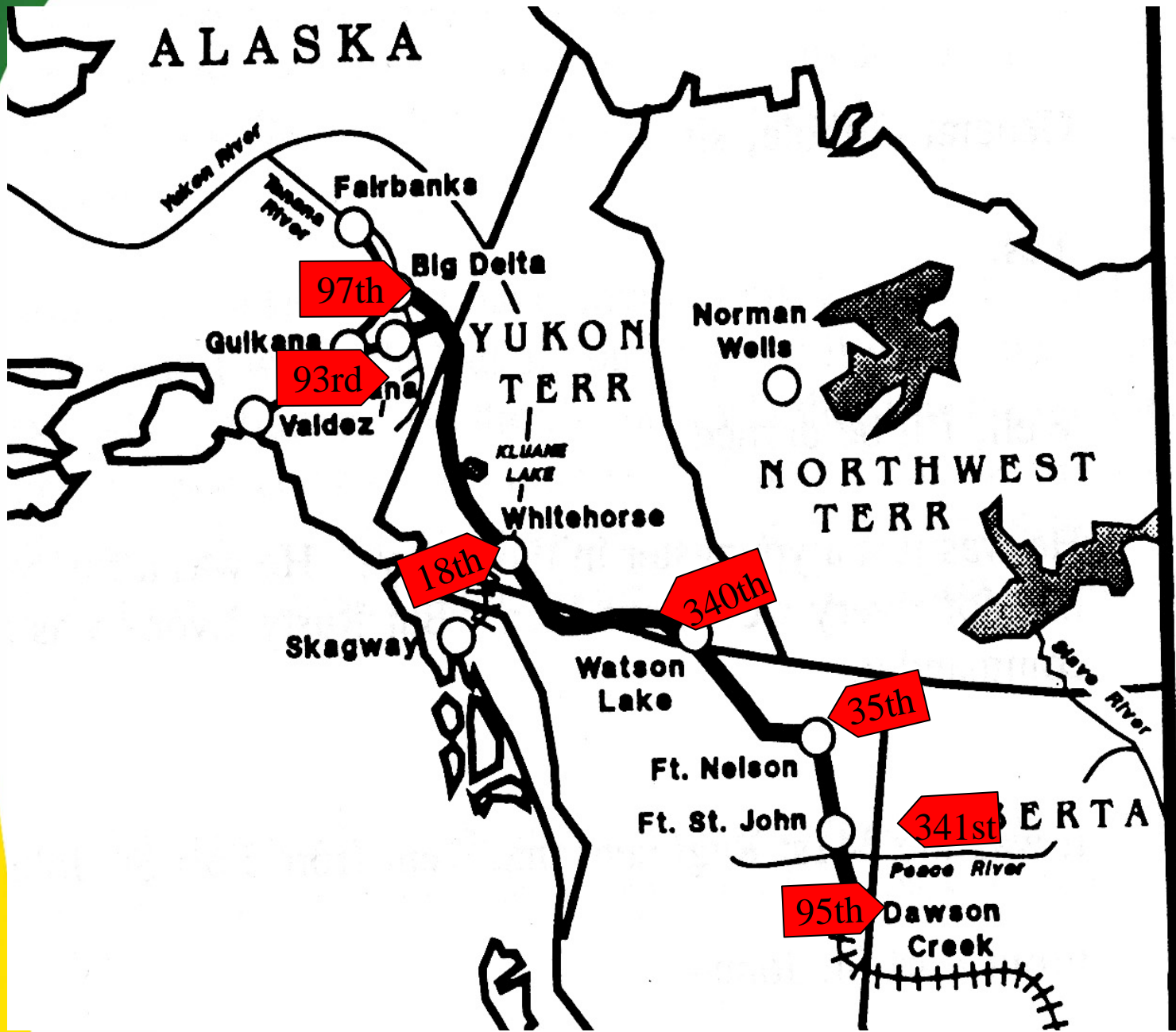
95th Engineer General Service Regiment (colored)

97th Engineer General Service Regiment (colored)

340th Engineer General Service Regiment

341st Engineer General Service Regiment

# ALASKA

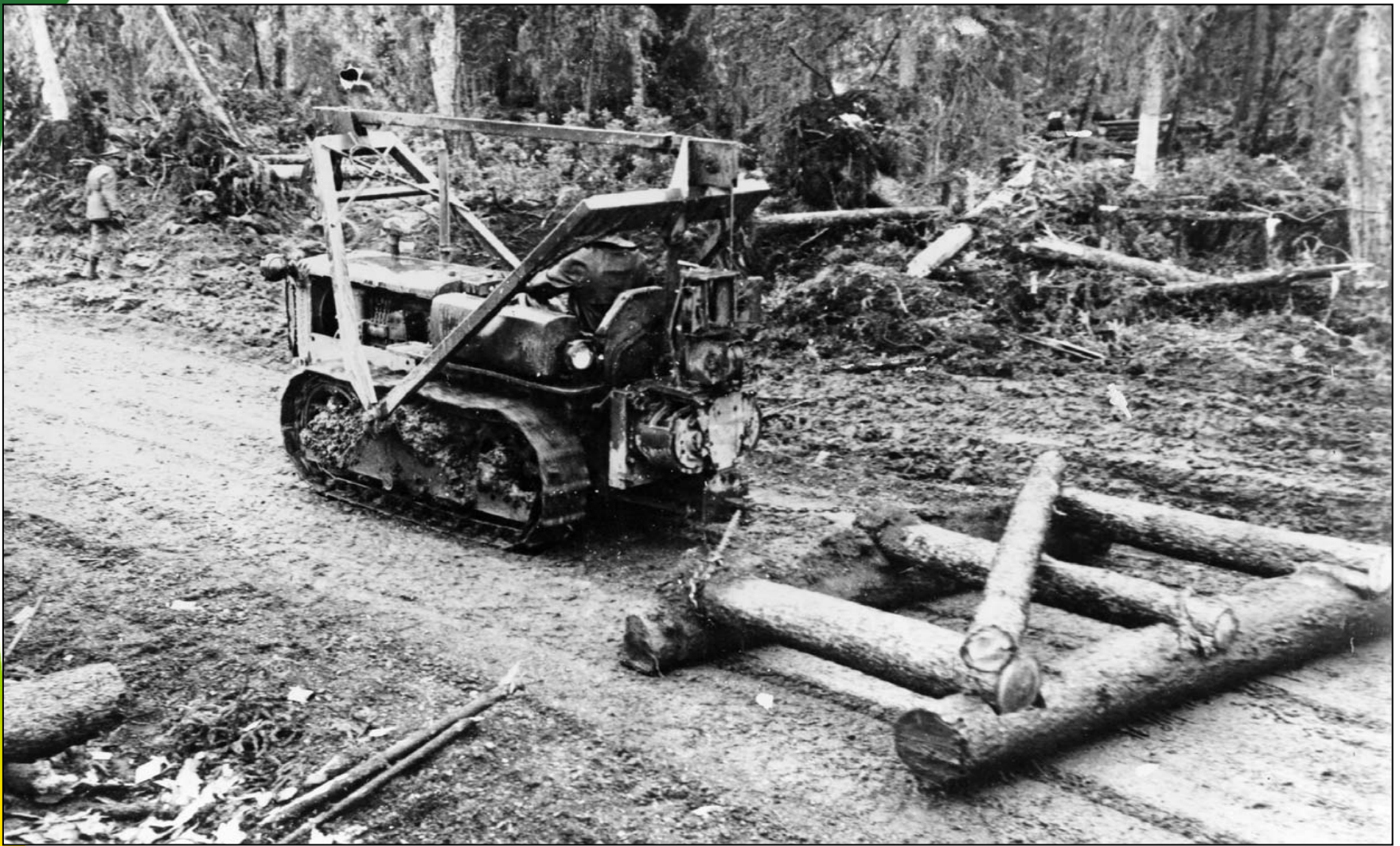


# Leap Frog Grading

- **Within each Regiment, the companies constructed a portion of the road using a leap-frog method. One company would grade their assigned section, another just ahead of them (about 30 miles). When a company worked up to the next company's road, then they would "leap ahead" and start again.**
- **During the spring and summer months, daylight could last up to 20 hours with twilight for the remaining 4 hours. This allowed the construction crews to work 3 shifts of 8 hours each, round the clock.**
- **The units only had a short supply of equipment until the arrival of heavier equipment (CAT D-7's and D-8's). For the most part, they were using hand saws, hand axes and small D-4 bulldozers. Building the road took a lot of brute force and creativity.**



**For the first few months of construction, the Engineers had to use muscle and determination to blaze a road.**



**Until heavier equipment arrived, the Engineers had to be creative, using local supplies to continue construction. Here, a D-4 dozer pulls a makeshift grader made from local timber.**





**Once the heavier equipment arrived, clearing a path became easy. Here a D-8 bulldozer clears a path.**

# Construction Problems

- **PERMAFROST** Permafrost is the permanently frozen subsoil beneath cover of vegetation and top soil. The topsoil insulates the frozen subsoil. When constructing a road, it is common procedure to remove the topsoil. But, when the topsoil was excavated, the permafrost began to melt and turn everything into mud.
- Another problem the Engineers faced were with the Muskegs. A muskeg is like a muddy version of quicksand. A vehicle would pass through a muskeg once, but within a short time, the area would turn into complete mud, losing shear strength. Once caught, a vehicle had to be pulled out.
- On top of these foundation problems, everyone had to deal with the cold (frostbite was very common), gnats, and innumerable mosquitoes.



**A typical inclusion of glacial ice found in permafrost. These were impediments to grading, like large boulders.**



**Stuck in the mud. The Engineers quickly learned about permafrost and the effect it had on equipment when the permafrost cover was removed or disturbed.**



- **Muskegs sometimes appeared to “swallow” the heavier equipment, exhibiting thixotropy .**

# Overcoming Muskegs

- **To overcome the liquid mud created by disturbed Muskegs, the Engineers laid corduroy, just like the Romans.**
- **Corduroy road surface is constructed by first laying piles of brush, then logs, then more brush, and more logs, and finally a layer of gravel.**
- **In one stretch, 2 miles of corduroy was laid. Overall, over 100 miles of muskeg was corduroyed in this manner.**



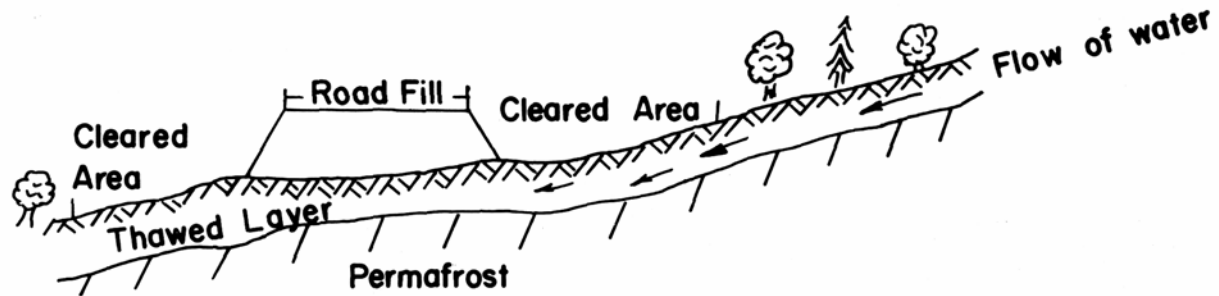
**A road in a muskeg without corduroy.**



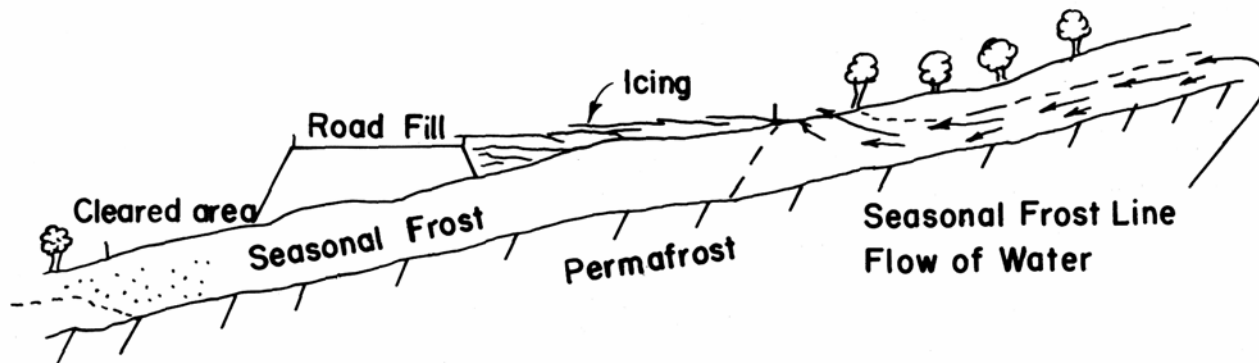
**Corduroy road surface under construction.**



## CONDITION DURING SUMMER



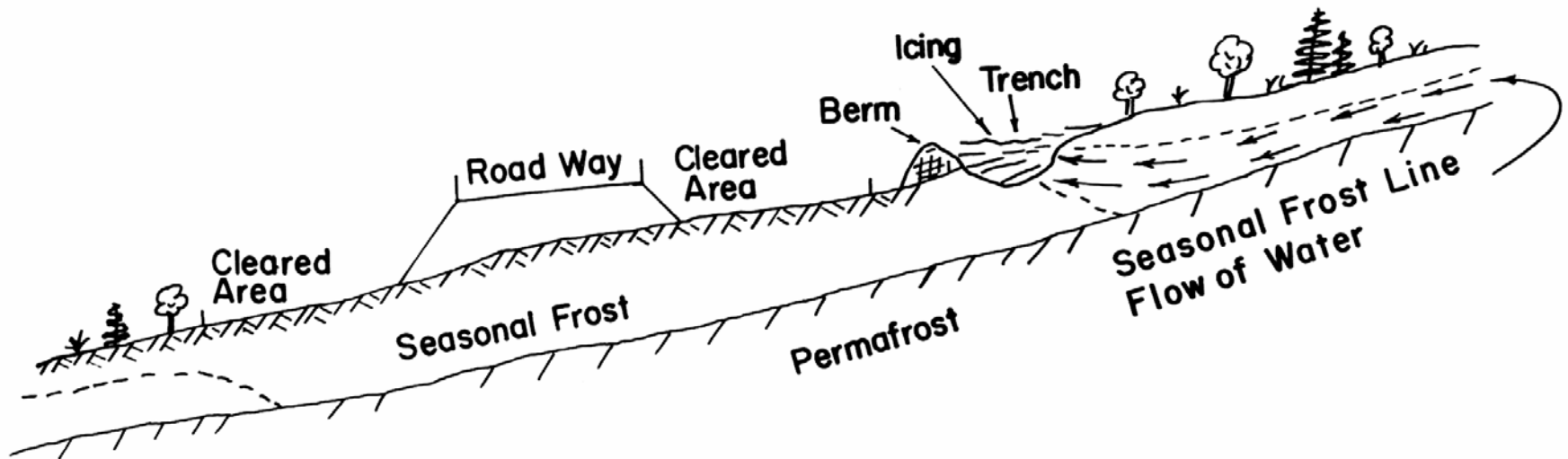
## CONDITION DURING LATE FALL AND WINTER



- Seasonal permafrost problems were the largest engineering problem to overcome in maintaining the Alcan Highway

# SOLVING THE PROBLEM

## METHOD OF PREVENTION



- **Drainage trenches and diversion berms had to be constructed upslope of highway embankments to control seepage during seasonal thaw, as sketched above.**

# DRAINAGE CULVERTS

- Culverts were constructed from the surrounding wood. They were intended to be temporary until the contractors came through to improve the road.
- Here you see construction of these temporary culverts. After the wood frame was erected, a bulldozer would fill and level the fill over the top of the culvert.



# The Alcan Road Today



- The highway serves as an artery for all manner of traffic, even offroad mining rigs like the one shown here.

# Bridges and pontoons

- Throughout the construction of the Alcan Highway, Army Engineers crossed more than 200 rivers. During the colder months, most traffic crossed ice-covered rivers and forded the smaller streams. Once the spring thaw arrived, the 73rd and 74th Engineer Light Pontoon Companies went to work constructing temporary pontoon bridges.
- The first bridges constructed by the Army Engineers were temporary. They failed when the spring thaw increased water levels. Spring freshets also brought flotsam in the form of tree trunks and brush, which slammed into the pilings, damaging them and capturing more and more debris because of the obstructions.
- When the water levels were high during the spring thaw and flood seasons, equipment crossed the swollen rivers by ferry or treadway pontoon bridge.

# Use of pontoons to support construction

- A temporary pontoon bridge used to expedite construction.
- Pontoons ferrying across equipment



# SEASONAL BRIDGES



The pontoon bridges and ferries were only temporary solutions until permanent bridges could be built. Using 3 sawmills, construction crews and members of the PRA constructed bridges along the entire alignment, even during winter.



# Maintaining Bridges

- **Maintaining the bridges posed the biggest problem. During construction, a guard was posted to make sure that large trees brought downstream did not get snagged by the bridge pilings, which could easily damage or destroy the bridge.**





# What a bridge on the Alcan Highway looks like today



# African American Engineer Units

- Prior to the Alcan Highway Initiative, African American units did not work under “white” supervision. When it was foreseen that the highway would not be built in time if more troops were not available, Congress allowed three colored regiments (93rd, 95th, 97th) to work along side the non-colored units. Due in part to the hard work and dedication of these men, African Americans were integrated into all military units in 1947.



# Final Details of the Alcan Highway

- The highest pass is only above 4,000 feet elevation as opposed to the initial predicted elevation of 6000 feet.
- There are over 200 bridges (H20 and H15) and 8000 culverts
- Final specification of the pioneer road:
  - Two lanes
  - 22-22 feet minimum width
  - Maximum grade of 7%
  - Maximum curvature: Prairie routes 3 degrees  
Mountain routes 19 degrees

# CONCLUSIONS

- **All the locals thought that a road through the wilderness would be impossible. Not only did the Corps of Engineers construct a road through the Yukon Territory to Alaska, they did it in a record time of 8 months and 11 days.**
- **Total pioneer road constructed: 1543 miles**
- **10,670 Engineers were used to construct and improve a total of 1685 miles of highway. 41 American and 13 Canadian contractors assisted in the construction and improvement of the highway.**
- **November 20, 1942 marked the official opening of the Alcan Highway. It has been in continuous operation ever since.**

# REFERENCES

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- **Alcan Trail Blazers by the men of Company “A”, 648th Engineer Topographic Battalion**
- **Highway Maintenance 1946-1964 by the Royal Canadian Engineers**
- **Alcan and Canol by Stan Cohen**
- **Alcan America’s Glory Road an Engineering News-Record Report**
- **Corps of Engineers archives**