Winter is Coming

Northern / Remote Site Challenges

October 17, 2019

Overview

Overview

- History of the Alaska Highway
- Work Programs on Alaska Highway
- Northern / Remote Work Conditions & Challenges
- Outcomes and Learnings

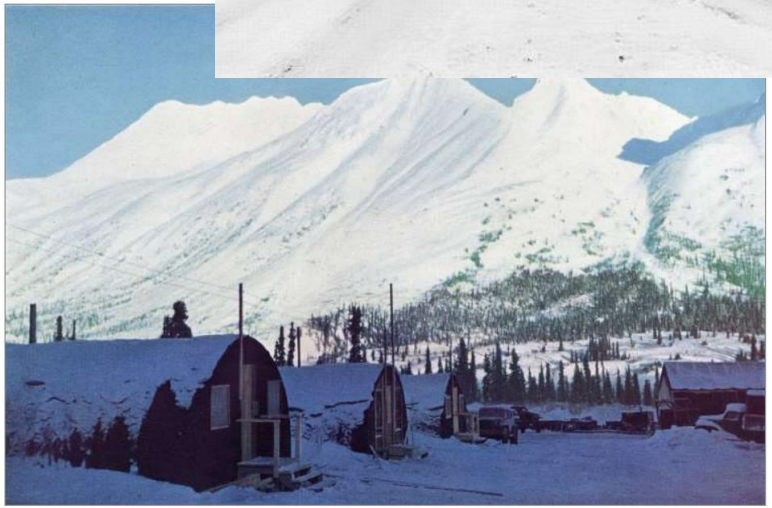
History

Alaska Highway

- Joint effort by the Canadian / American Armed Forces in 1942
- Constructed 2451 km of highway in 8 months
- Built largely on land that had never been surveyed
- Operational stations and later highway maintenance yards established

Alaska Highway

- Weather and remote site issues not new along Alaska Highway
- Construction of the Alaska Highway took place primarily in the spring / summer / fall months.
- Following construction, maintenance and upgrading over winter months was a challenge
- Highway opened to general public in 1948

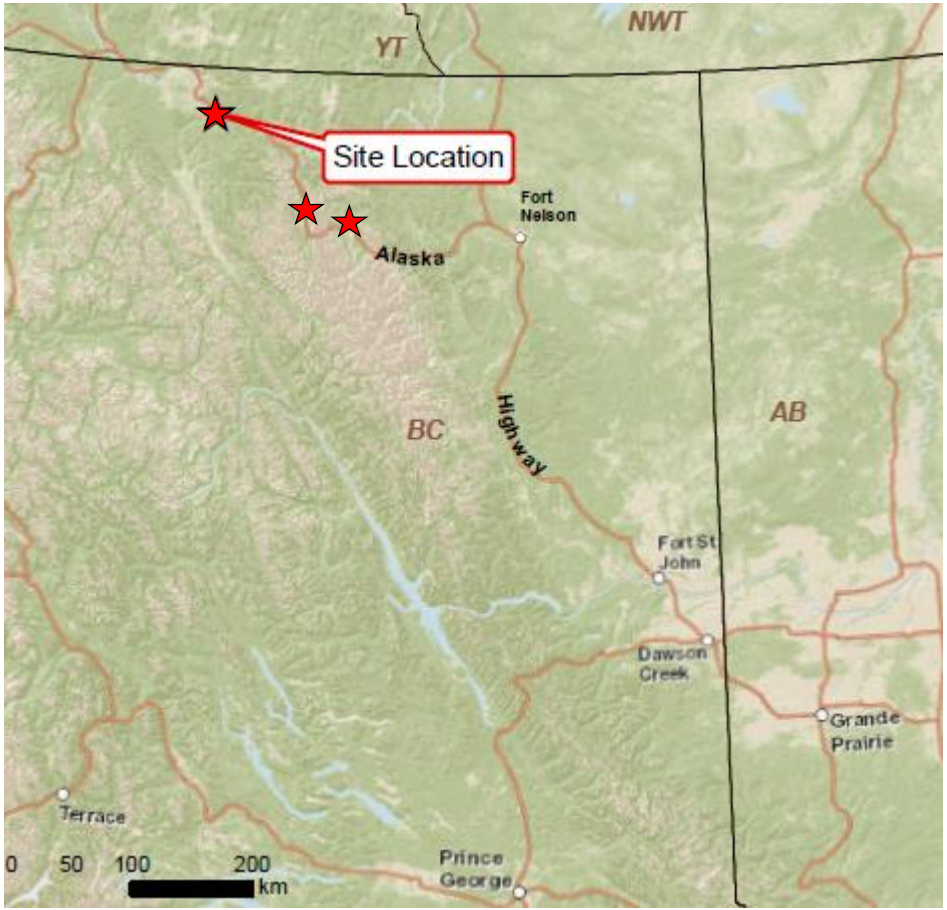


Work Programs on Alaska Hwy

Alaska Highway Work Programs

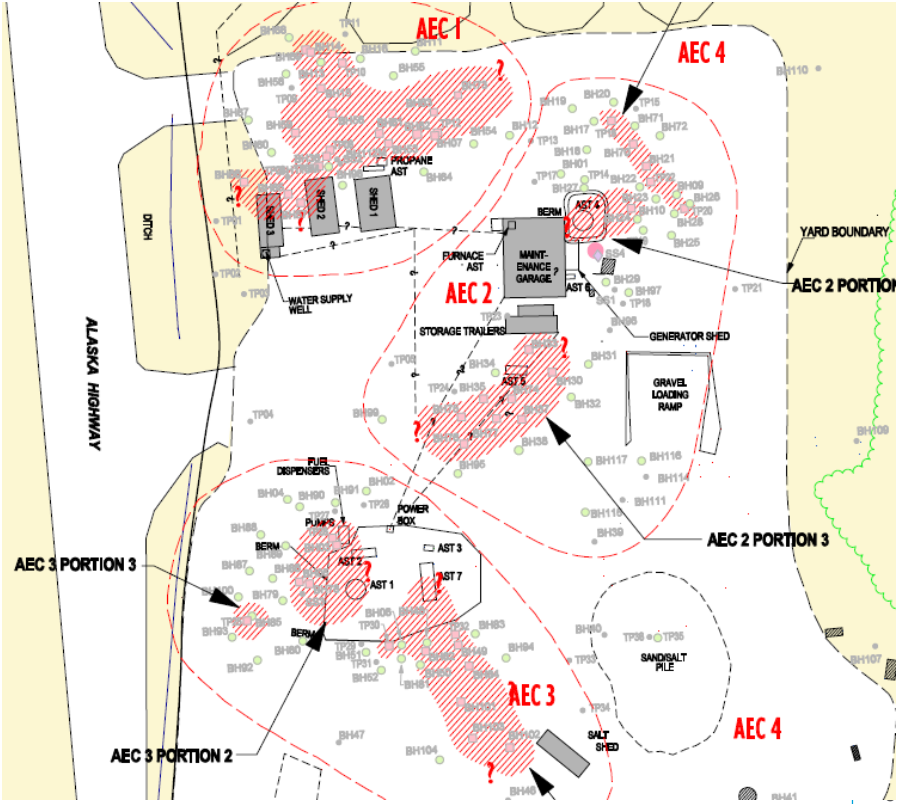
Highway Maintenance Yards Active Sites

- Toad River KM 648.7
- Muncho Lake KM 698
- Fireside KM 839



Alaska Highway Work Programs

- Environmental assessment ongoing by PSPC since 2000
- Sources of contamination - bulk fuel storage, waste practices/dumping, salt storage
- SNC-Lavalin involved in concurrent multi–year work programs at three sites starting in 2016



Alaska Hwy Work Programs

Assessment

- Multiple drilling programs for improved delineation / data gaps
- Use of light induced flourescence (LIF)

Remediation

- Soil excavation (50,000 m^3 from 3 yard sites)
- Soil treatment facility (STF) design, construction, and management
- Soil screening, backfilling and compaction

In-Situ Remediation

- Options evaluation
- Feasibility study, Pilot testing, 1st Stage and Full scale implementation

Risk Assessment

- Anticipated residual impacts

Alaska Highway Work Programs

Timing and Scheduling of Work

- Significant portions of the work undertaken in fall and winter months (Oct – Mar).
- Due to a number of factors (funding availability, procurement, contractor mobilization, stakeholder planning)

Northern / Remote Work Conditions & Challenges

What Did We Expect?

Northern / Remote Work Conditions

Work Conditions/Constraints:

- Extreme Temperatures
  - Average daily temps -10 to -40^{o}C
- Weather Conditions
- Equipment Limitations
- Shortened Daylight Hours
  - Working with reduced light
- Remote Area
  - Limited communications
  - Long daily travel times to site
- Active Site
  - Interaction with on-site residents / staff

Challenges or Goals

Maintain productivity and performance in extreme cold

Minimize stand-by time and maximize efficiencies

Avoid costly delays

What We Expected

Drilling

- Equipment limitations & operation in cold temperatures
- Recurring snow falls – use of total station to position / clear utilities

Soil Excavation

- Use of experienced contractors with well maintained equipment
- Frozen ground – jack hammer / breaker equipment needed

STF

- Construction of STFs vs long haul transport
- Turning events problematic in frozen ground conditions

What We Expected

In-Situ

- Liquid injection limited in cold temperatures

Communications

- Use of on-site satellite internet and text communication via InReach devices

Health and Safety

- Proper Cold Weather PPE, staff training
- On-site emergency support
- Use of on-site camps to minimize daily mobilizations

Additional Challenges

Ground Conditions

- Soil Excavation / Screening
- Backfilling/Compaction – testing not viable (-0^{o}C), crown excavations

Equipment Issues

- Equipment limitation due to freezing conditions
- STF liner limitations

Logistics

- Delays for supplies/repairs and staff rotations
- Sample submission – 5 days to reach labs including transit time

Health and Safety

- Extreme cold – frost bite
- Wildlife
- Vehicle incidents

Outcomes and Learnings

Outcomes / Learnings

Successful execution of all programs

Key Learnings:

- Do work in summer months!
- When work must happen in cold climates & during winter months:
  - Adequate training - staff and contractors need to be prepared for cold weather conditions
  - Use of experienced contractors and equipment suitable for extreme temperatures
  - Establish communication protocols
  - Anticipate unexpected delays and issues with supply chain/equipment/staff resources
  - Planning and contractor engagement is critical
  - Reduce time sensitive decisions – e.g. sample results (define excavation limits in advance, prioritize activities)

Questions?

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