



To commemorate the Founding of the Institution of Civil Engineers in the UK,
200 Years Ago

A Short Presentation, dated April 11th 2018

On

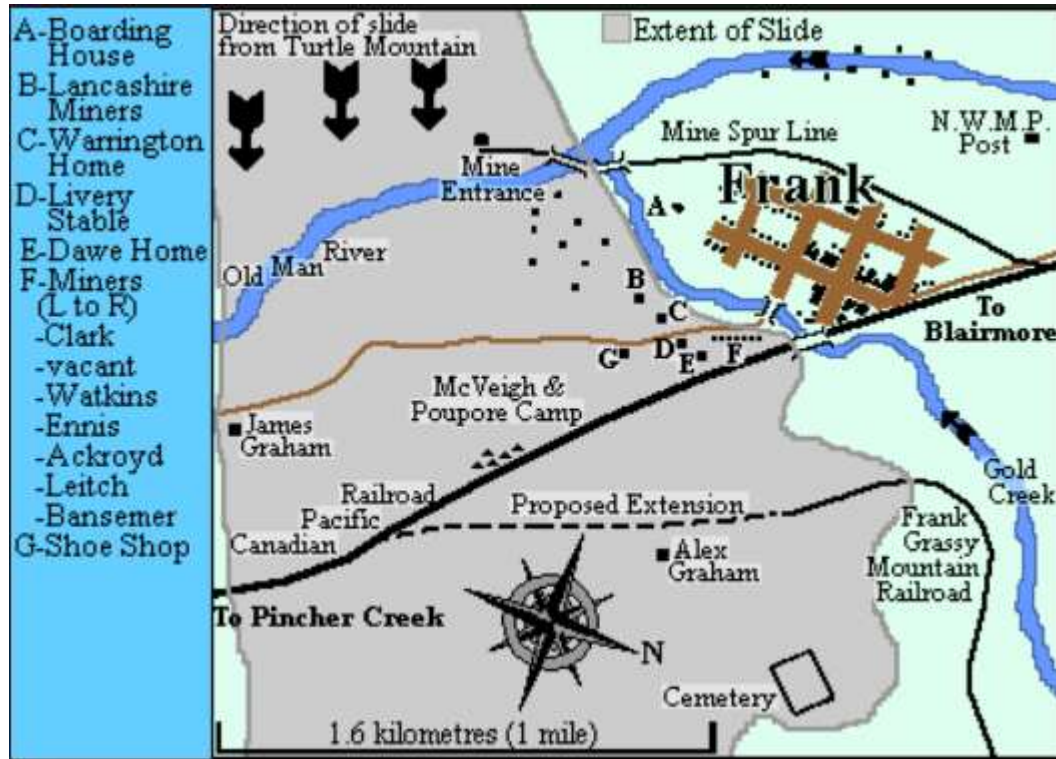
“The Frank Slide”

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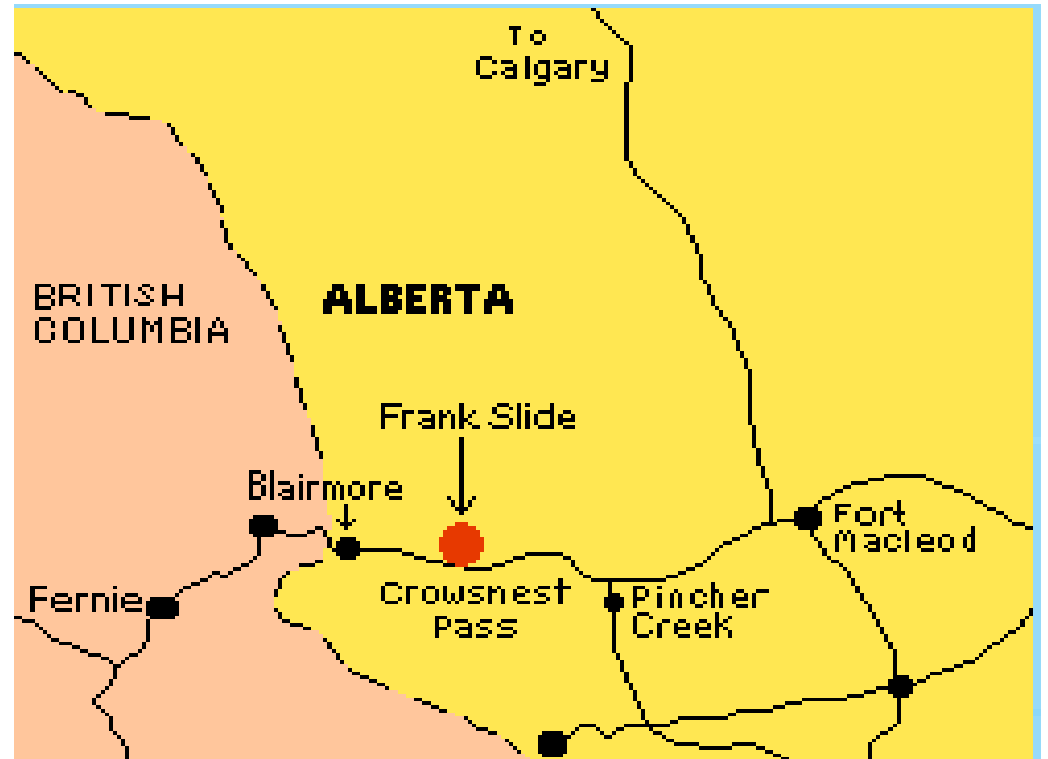
The Frank Slide

- ❑ It is the largest and deadliest landslide in Canada
- ❑ Limestone boulders tumbled from the summit of Turtle Mountain and devastated the south eastern part of town of Frank
- ❑ It travelled along a 3 km path destroying properties and lives across the valley
- ❑ This rockslide was so immense that people, at that time, had difficulty believing an event of such magnitude was possible
- ❑ Even today, we look upon it in awe and wonderment.

Path of the Rockslide & Frank Town



Location of Coal Town called Frank



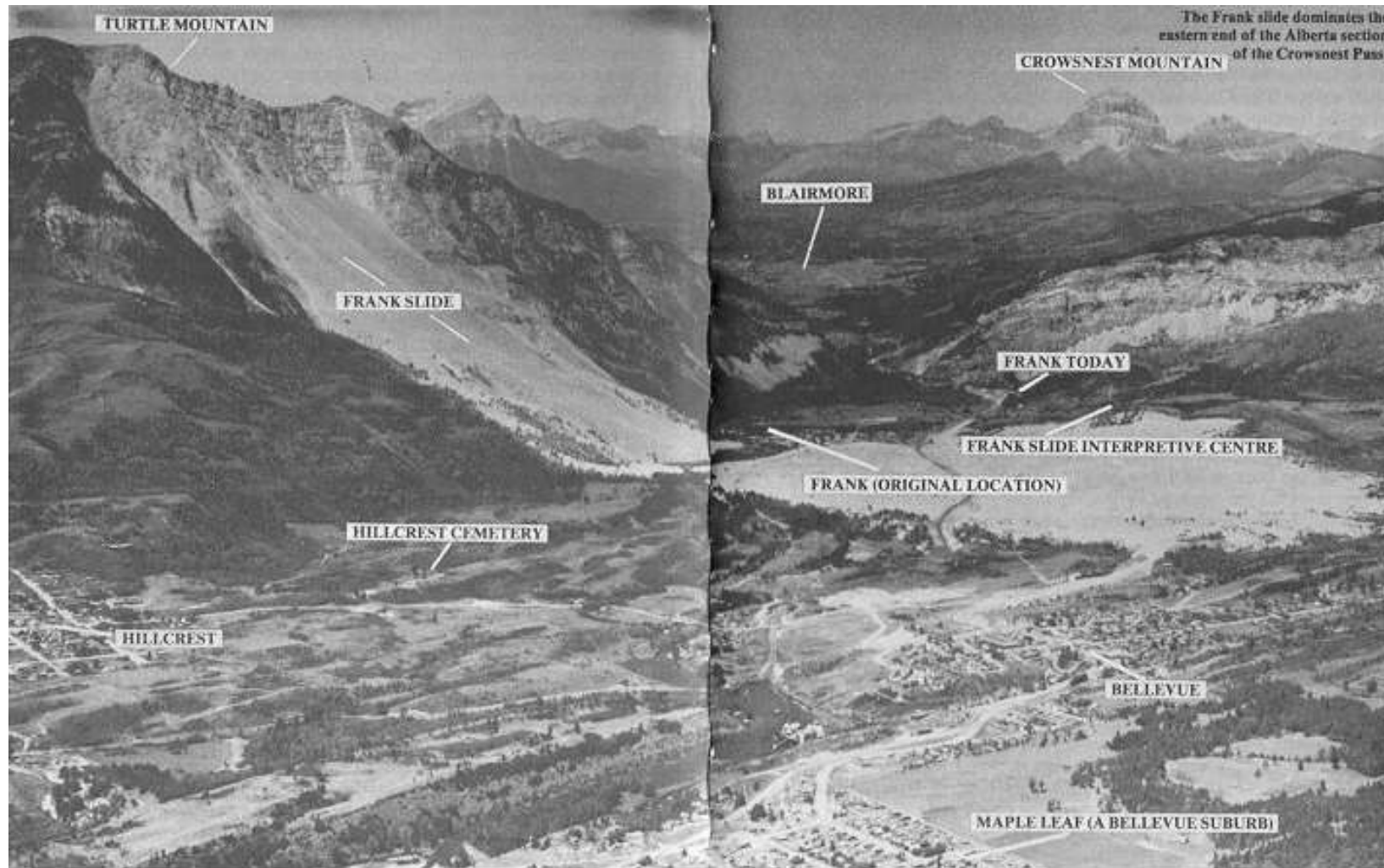
Where is Frank?

- ❑ Frank, a mining town was founded in 1900 at the foothills of **Turtle Mountain**,
- ❑ It is located between Blairmore and Pinscher Creek, along Crowsnest's Pass, in southwest Alberta
- ❑ Natives had oral traditions calling Turtle Mountain “the mountain that walks” and refused to camp below it, long before discovery of coal and the area became populated.

The Rockslide

- ❑ A rockslide occurred early in the morning at 4:10 am, April 29, 1903
- ❑ Some 82,000,000 tonnes of massive limestone boulders tumbled down Turtle Mountain into the River Valley below
- ❑ The speed of the rockflow was estimated at around 120 km/h
- ❑ Rock debris fanned out and covered 3 km² of the valley to an average depth of 14 m; with some spot as deep as 45m.

Side View – east flank of Turtle Mountain



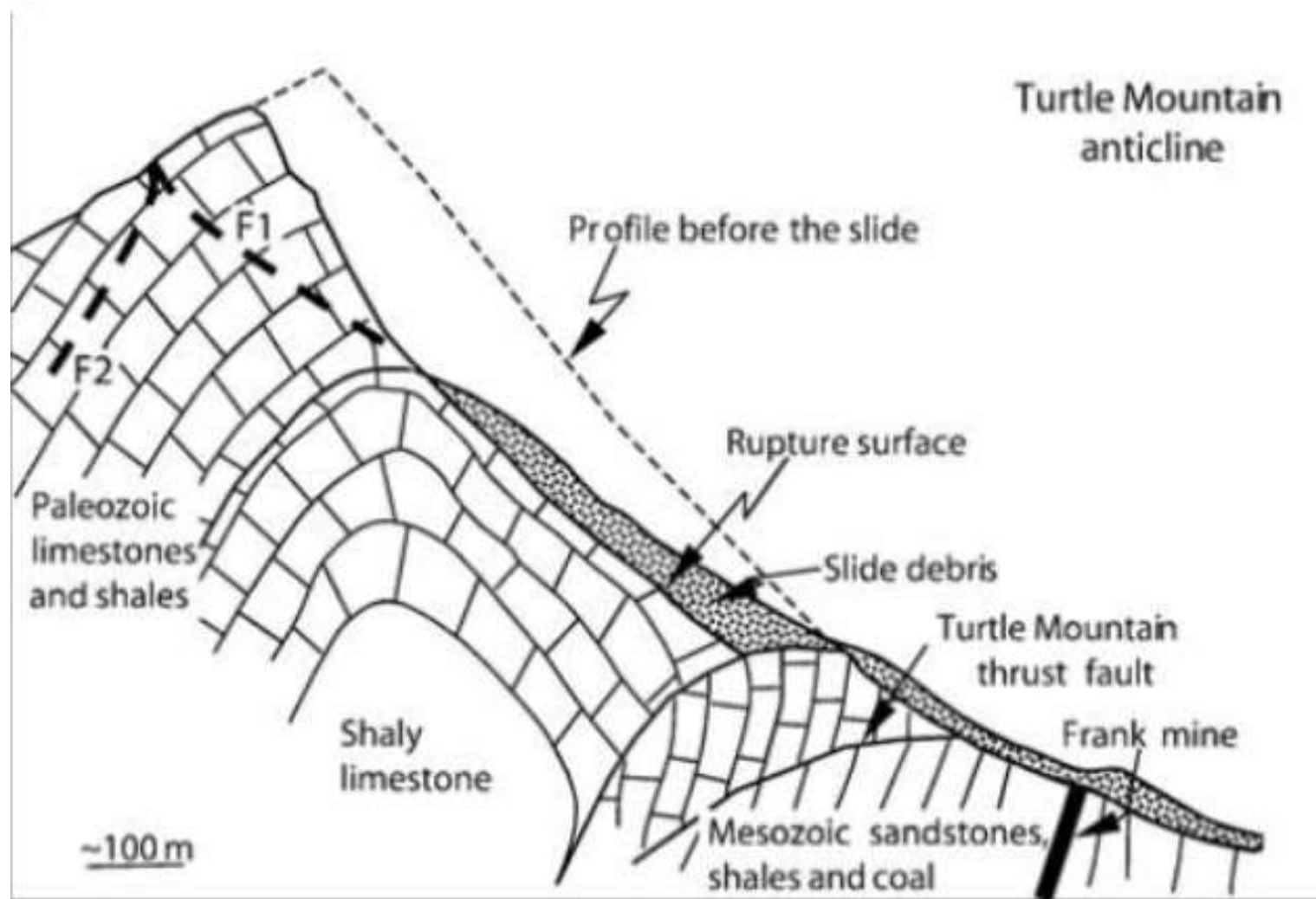
Frontal View of the Frank Slide



Recovery from the Disaster

- ❑ Immediately after the slide stopped, rescuers were already pulling the injured to be treated at the local doctor's house
- ❑ All 17 entombed miners dug their way out in 13 hrs.
- ❑ Fearing another imminent slide the town was evacuated but only brought back after engineers allayed their fears
- ❑ The mine reopened one month later. Rescuers found Charlie the mine horse, alive inside. They welcomed him to a hearty meal of oats and brandy, but poor Charlie, starving, promptly gorged himself to death.

Cross Section of Turtle Mountain Anticline



Causes of Landslide

- ❑ **Geological movements** folded limestone, sandstone, siltstone and shale beds into Turtle Mountain Anticline. Rock openings were formed.
- ❑ **Erosion** dissolved these openings wider to allow more seepage water into the mountain core forming caves, cavities and springs.

Causes of Landslide (continued)

- ❑ **Glaciers** came down the valley and shaved off Turtle Mountain's eastern flank making it even steeper. When glacier retreated the fractures opened wider. Cliffs were left "hanging" unsupported high above the valley.
- ❑ **Miners** reported hearing strange noises inside the mine. Props & timber supports began splintering. Coal fell from roof and walls to the mine floor. These signs indicated the mountain was shifting. Three years into mining, Turtle Mountain collapsed.

Noteworthy Comparisons

- ❑ The rock slid for 100 secs and attained 120 km/h; exceeding some Canadian highway speed limits
- ❑ 82,000,000 tonnes of rock was involved in the rockslide. It is equivalent to 900 of the largest aircraft carriers in the world, (Nimintz class @ 97,000 ton displacement)
- ❑ 250,000 tonnes of coal was extracted from the mine leaving a big hole that could accommodate ~1,000 transit buses.

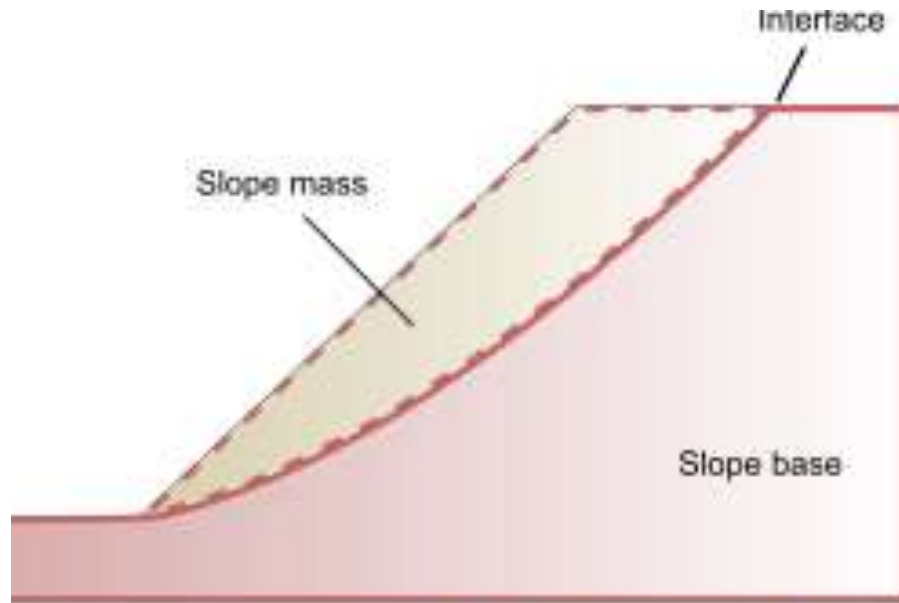
Noteworthy Comparisons (continued)

- ❑ Fatalities were between 70 – 90; 12 - 15% of the population, Lac Megantic was <1%
- ❑ 3 km of CPR railway buried in the slide was rebuilt within 3 weeks. That was lightning speed compared with today's standard!
- ❑ Frank town grew very fast, between 1900 – 1911 when its population grew from near zero to 1,200. By 1917, population dwindled when the mine closed. It is now a tourist attraction
- ❑ The rockslide provided enough stones to build a wall 1 m thick x 6 m high, that stretches from Victoria to Halifax.

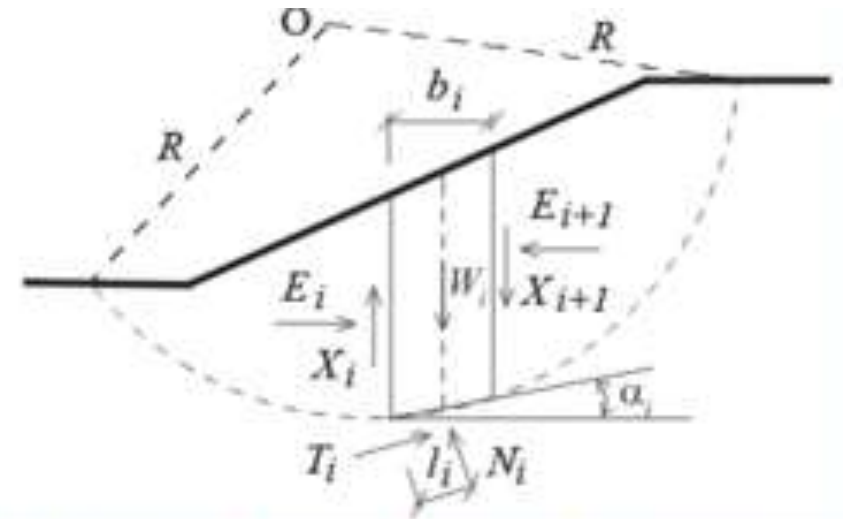
Landslides and Civil Engineering

- ❑ As you can see from the foregoing rockslides and indeed all forms of slides are very destructive
- ❑ Civil Engineers have long been conducting intensive research to mitigate this problem because it has been, and still is, a great social and economic issue
- ❑ Engineers have simulated the failure mechanisms within the slopes and employed mathematical tools to describe these failures
- ❑ Such work continues today
- ❑ The Frank Slide has contributed much towards the studies of the subject of Slope Stability Analysis

Simulation of Landslide in Studies



A typical cross-section of a slope used in two-dimensional analyses.



Schematic of the method of slices showing rotation center.

THANK YOU

The End

By

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