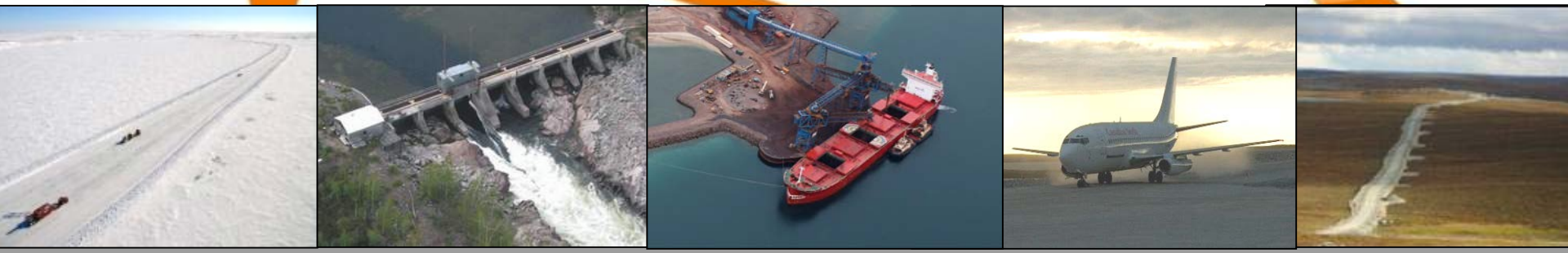
NWT & NUNAVUT CHAMBER OF MINES



Logistics in the Northern Minerals Industry

Presentation to the Arctic Security Working Group

Tom Hoefer – November 28, 2018

Key Messages

- Mining is the North's largest private sector industry
- Logistics are key to its success – examples
- Northern mining industry is under-developed
- Where improving logistics could help
- Time is right for Vision and Action

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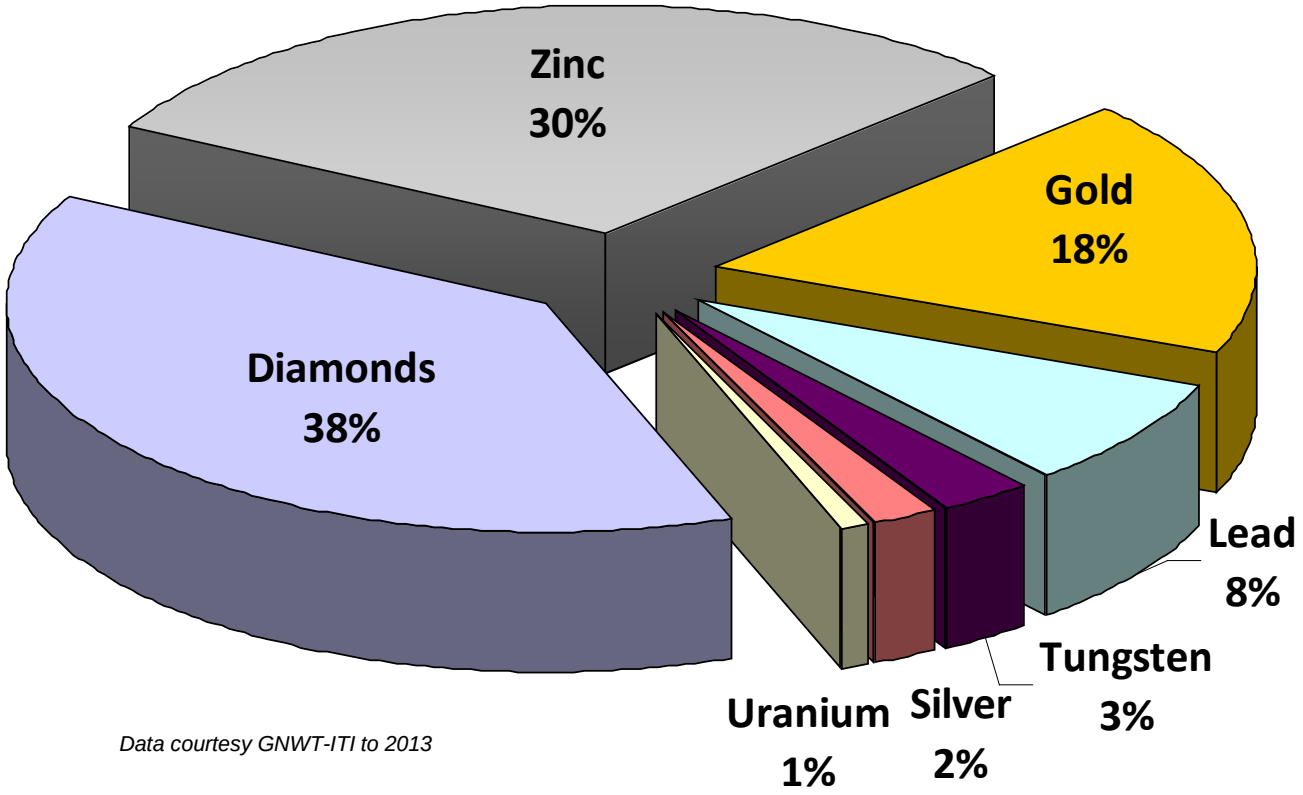
Significant Historical Mineral Production

– Over C$70 billion since 1932 –



Data courtesy GNWT-ITI to 2013

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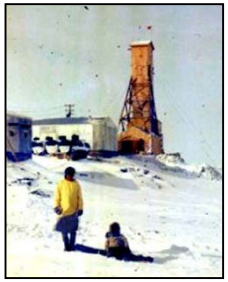
Note: Data is courtesy of the Government of the NWT-ITI as historical data is pre-Nunavut creation. It needs to be updated with new Nunavut data, including iron ore production so is conservative.

Our economic advantage = 80+ years of history

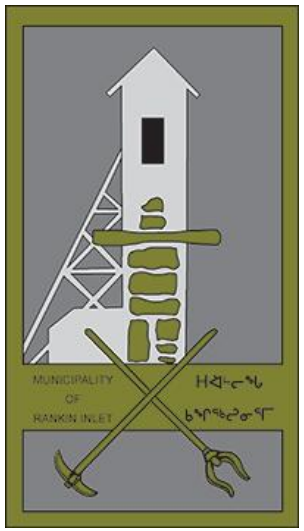
- 1930s – Eldorado (radium, uranium), Con, Negus, Rycon (gold)
- 1940s – Giant, Thompson-Lundmark (gold)
- 1950s – Rankin (nickel), Discovery (gold)
- 1960s – Pine Point (zinc-lead), Cantung (tungsten)
- 1970s – Nanisivik (zinc)
- 1980s – Polaris (zinc-lead), Lupin (gold), Cullaton Lake (gold)
- 1990s – Colomac (gold), Ekati (diamonds)
- 2000s – Diavik, Snap Lake, Jericho (diamonds)
- 2010s – Meadowbank and Hope Bay (gold), Mary River (iron), Gahcho Kué (diamonds)



Mining has contributed to legacy infrastructure

- Communities: Yellowknife, Rankin Inlet
- Roads to Resources, eg: highways to Yellowknife, Pine Point & Ft. Resolution
- Railway (to Hay River & Pine Point)
- All 3 NWT hydro-electric facilities
- Marine shipping & ports
- Microwave communications



And Technical Innovation

- High efficiency diesel power
- Innovative wind energy
- Dikes to allow mining under lakes
- Ice roads
- Arctic shipping

Heat recovery on diesel powerplants

Diavik's wind turbines

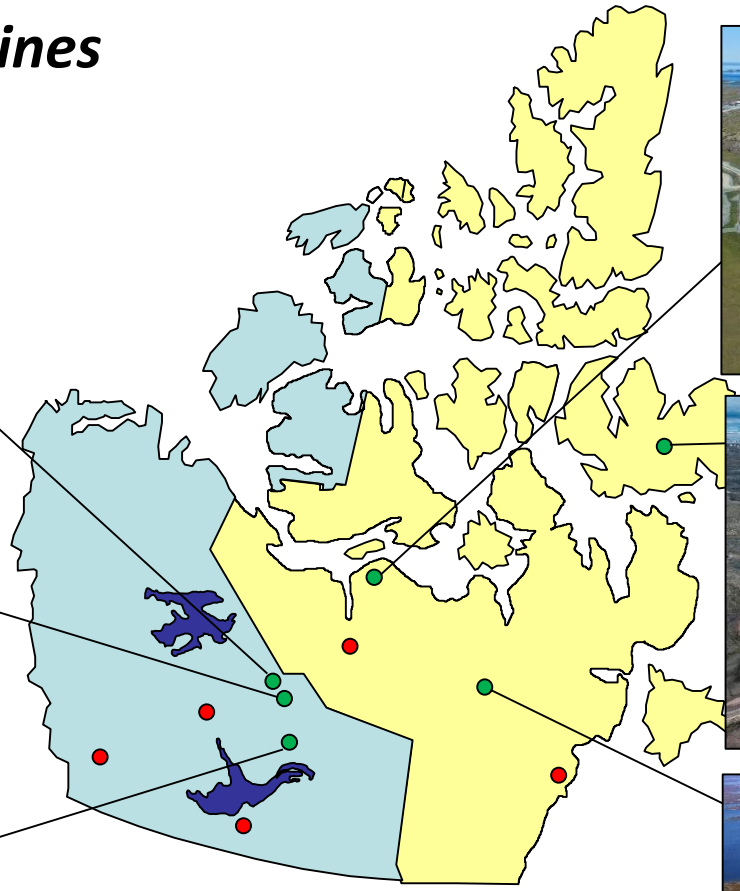
MV Arctic ice breaking technology

National award winning Diavik dikes

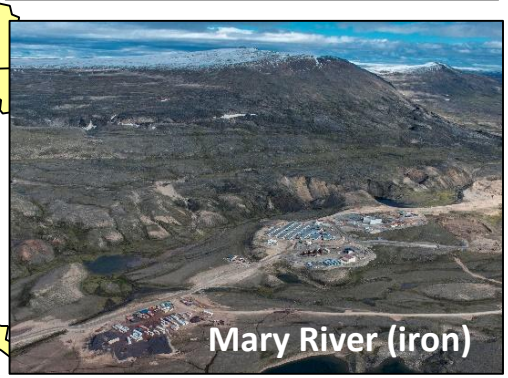
Engineered ice road "highways "

6 Operating mines today

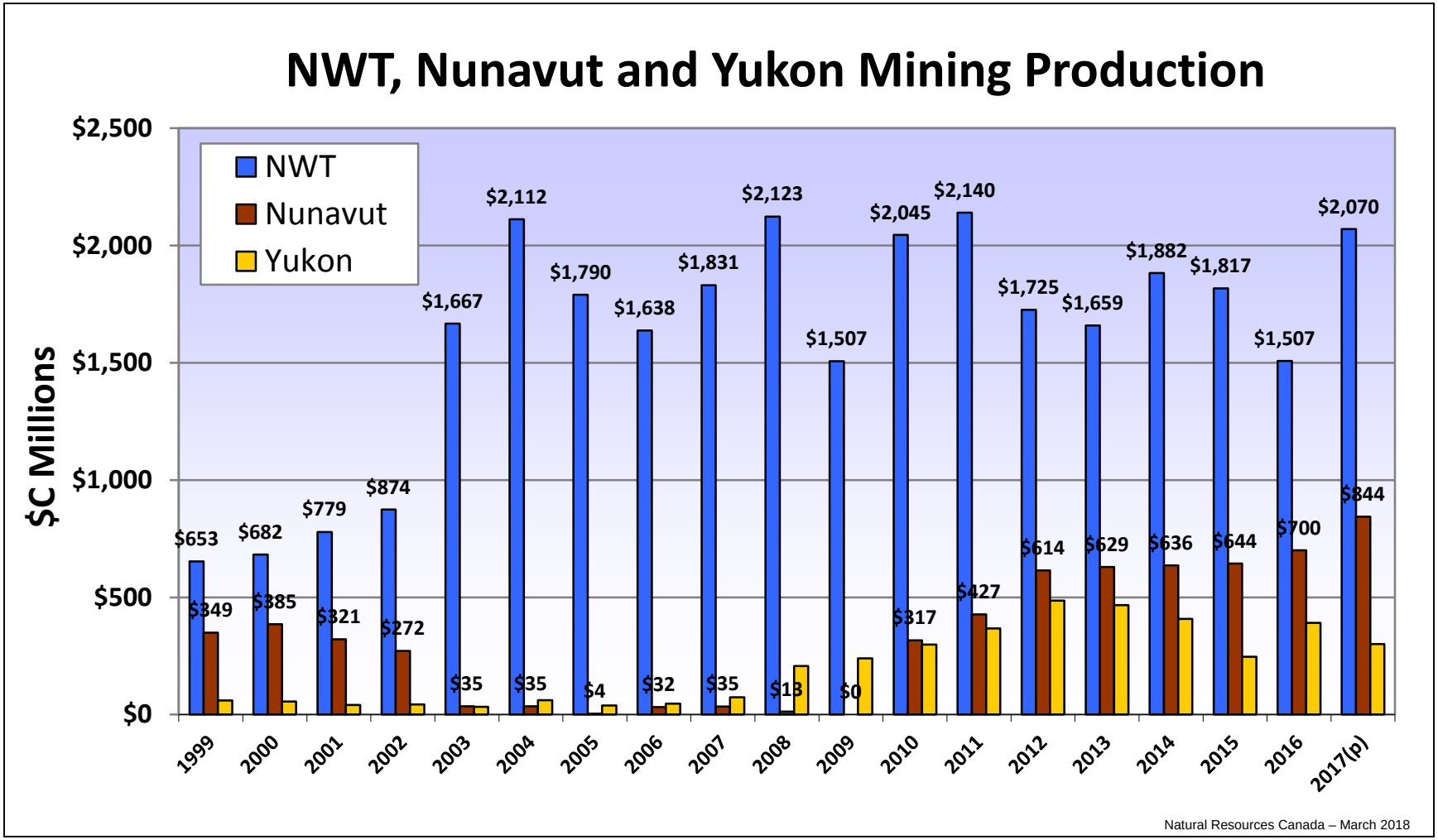
NWT's 3 Operating Mines



Nunavut's 3 Operating Mines



Our mines create significant value



- Maintaining strength through diamonds in NWT
- In Nunavut, with gold and iron, rejuvenating industry from zero production in 2009
- Source: http://sead.nrcan.gc.ca/prod-prod/ann-ann-eng.aspx

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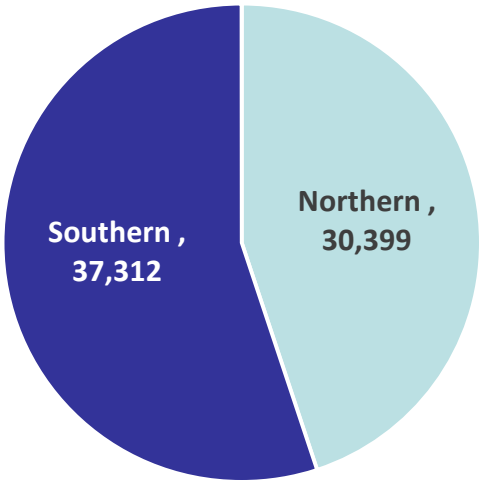
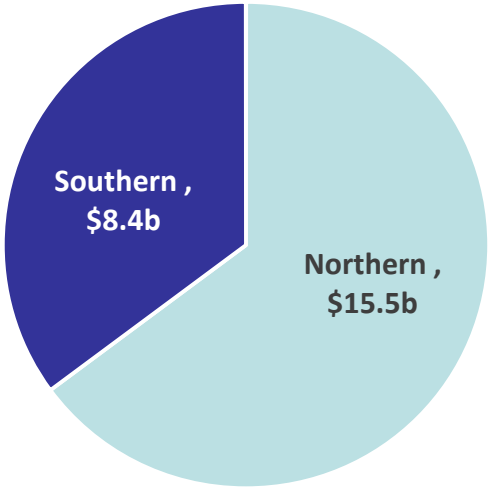
Northern mining creates significant benefits

(NWT plus Nunavut, 1996-2017)

Mining Jobs
(68,000 person-years)



Mine Spending
($24 billion)



- Significant employment and business benefits
- Indigenous benefits too – 14,000 person years, $6 billion business
- Significant taxes & royalties to public & Indigenous governments
- Good for northern and southern Canada

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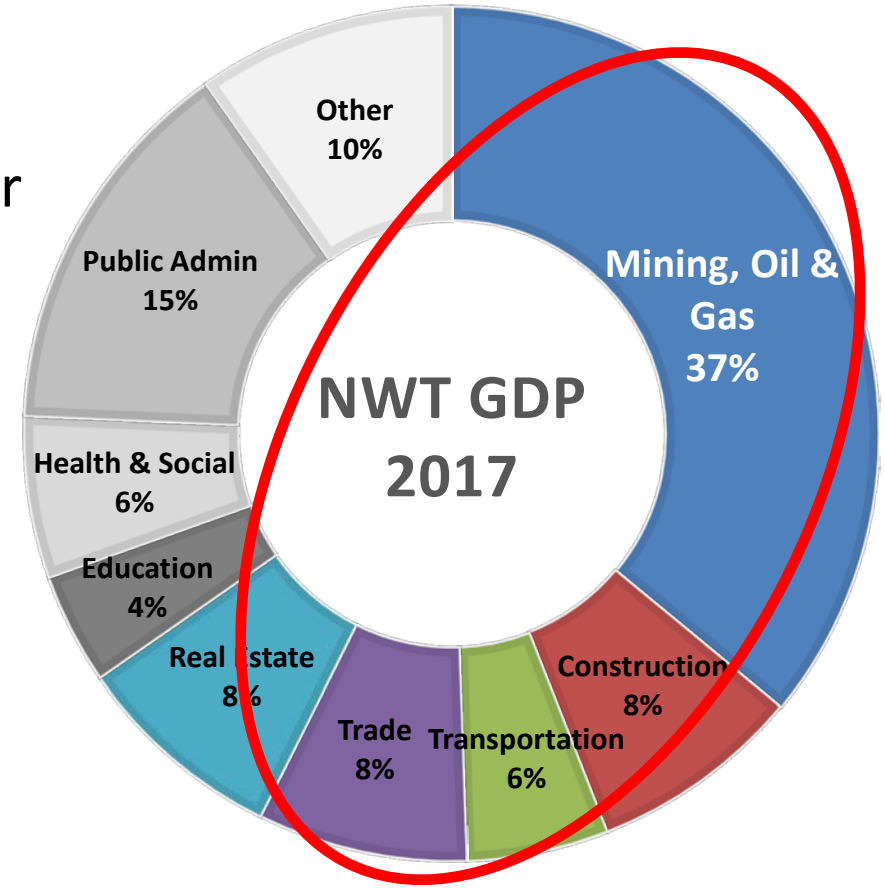
Largest private sector economic contributor

- Mining is the north's economic advantage
- The largest direct private sector contributor to the NWT economy
- And, it contributes more through other sectors of the economy, eg, construction, transportation, trade, real estate
- Nunavut is similar



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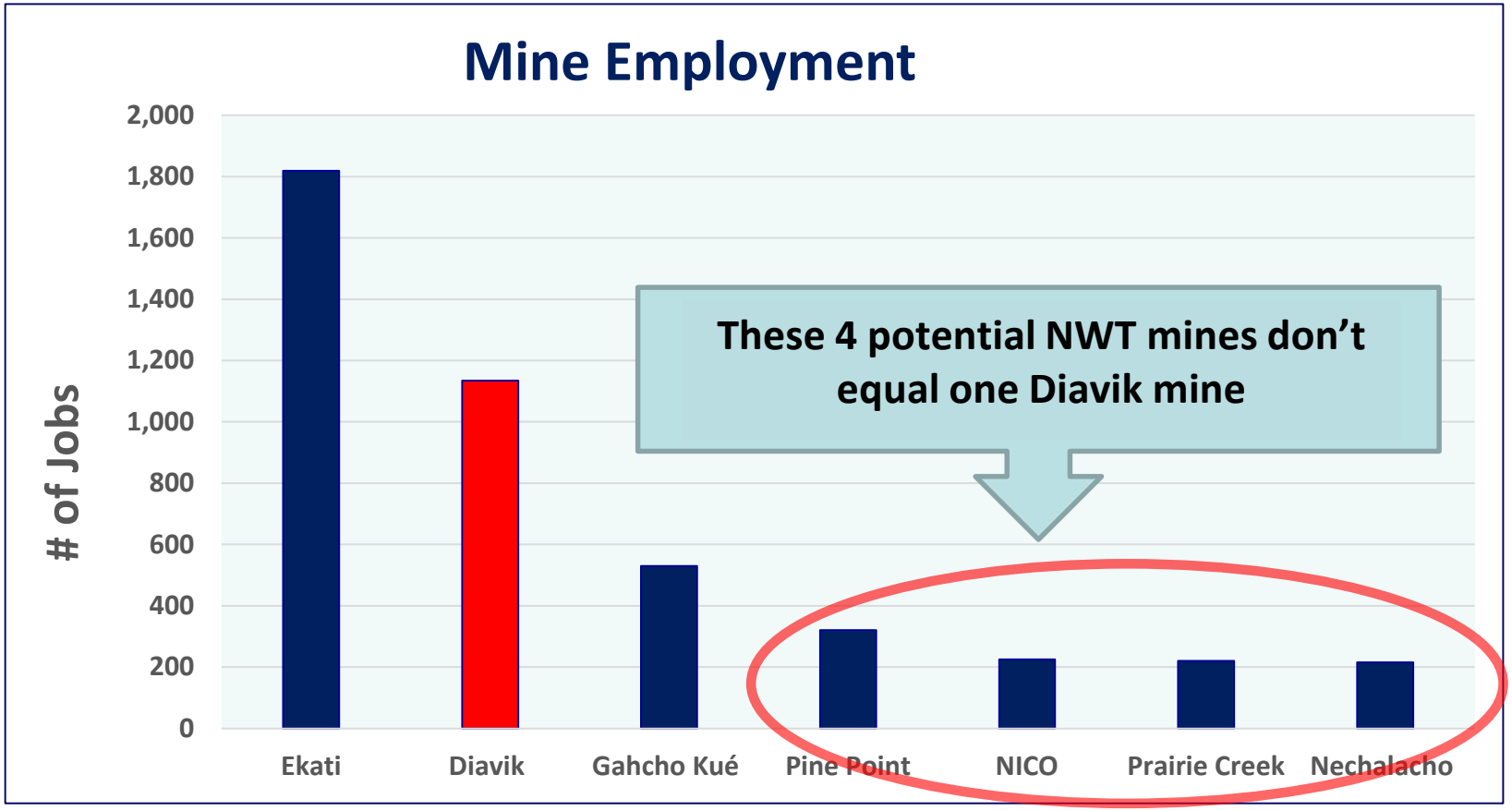
- *"Over the past 3 years, diamond mines contributed 41% of the GNWT's corporate income, fuel, property and payroll tax revenue"* … GNWT Spokesperson

Not all mines are created equal, eg, Jobs



- Future NWT mines like Pine Point, NICO and Prairie Creek are smaller & deliver lower government revenues & community benefits. Jobs and business spending are lower.
- Many small mines needed to replace impact of just 1 diamond mine
- **We need to find more new mines**

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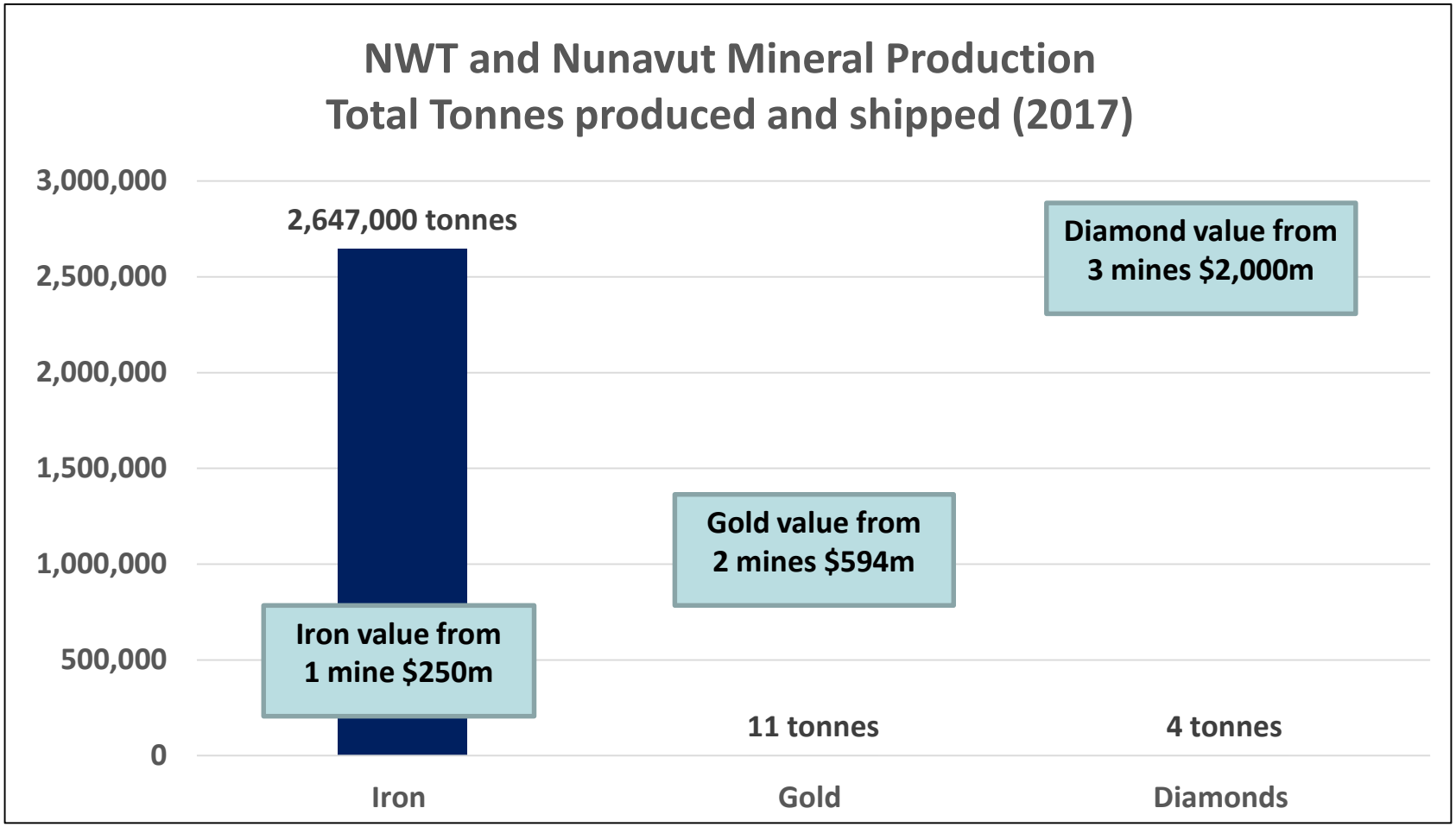
Not all mines are created equal, eg, Exports



- Type of product has implications on transportation requirements and logistics and can be significantly different
- Precious metals create value from very small quantities compared to iron and base metals

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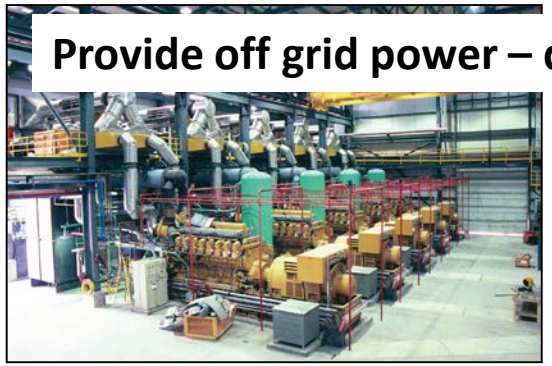
Where all mines are equal – logistics

Provide off grid power – diesel, wind



Buy & store annual inventories

Build Roads – seasonal, all weather

Provide room & board, medical

Build sea ports and air ports

$!

Mining infrastructure – NWT vs Nunavut

- NWT
  - Aircraft
  - Private ice road
  - **All-season public highway and rail transportation**
- Nunavut
  - Aircraft
  - Private all-season tote roads
  - **Marine shipping**



Some Examples of logistics

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NWT Diamond mines

- Heavily ice road supported
  (But will leave for Ron Near to explain)

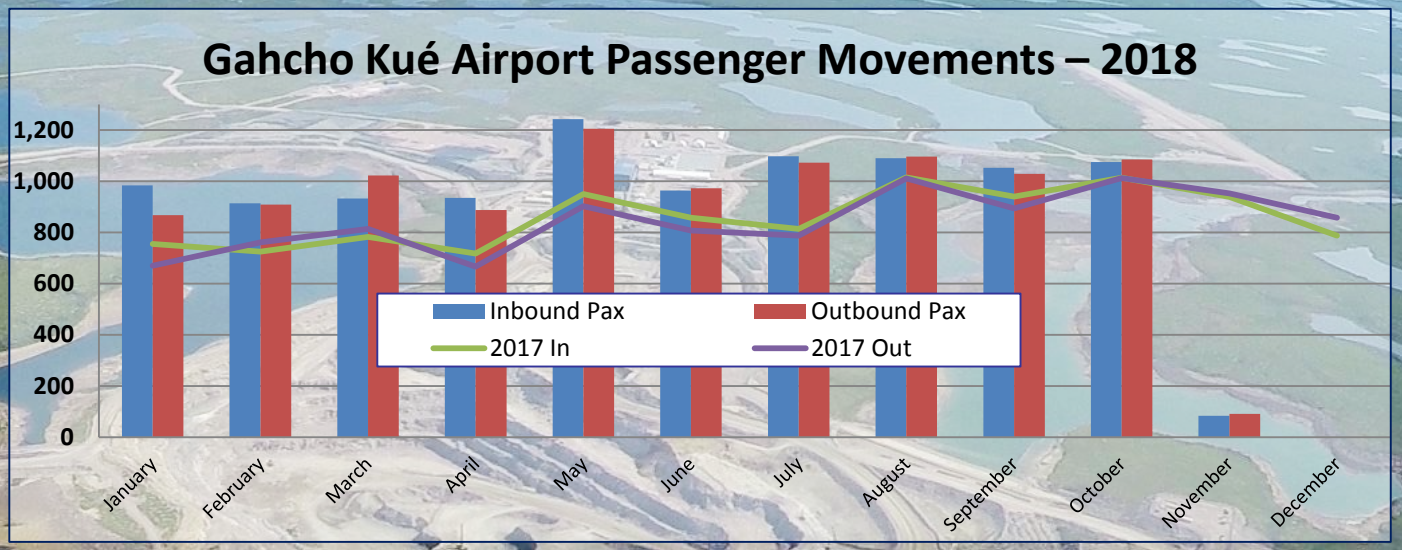
Diamond mine fuel needs are significant

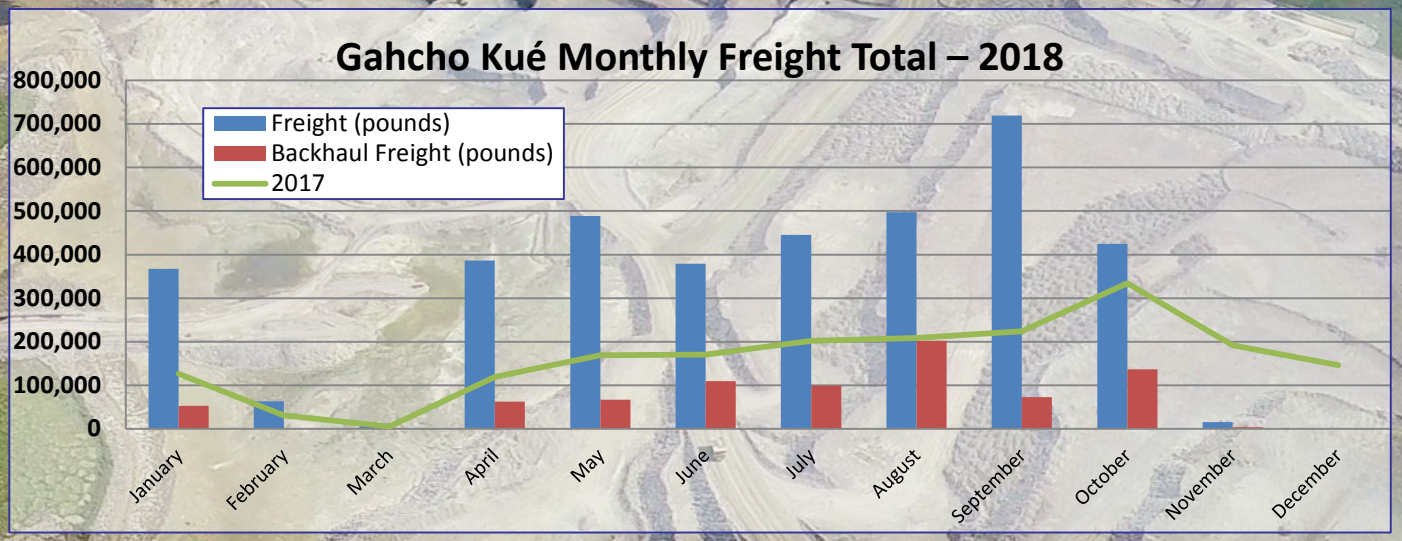
- Westcan constructed tank farm to store diesel fuel for the diamond mines.
  - 160 million litres in four 40 million litres holding tanks.
  - State-of-the-art facility is filled during the ice road pre-haul season. Ultimately the fuel is reloaded and trucked up the Ice Road during the Winter Road season.

Diavik Diamond Mine – air movements

- 470 passenger flights/year originating in the NWT/Nunavut
  - 18,860 passengers moved / year originating in the NWT/Nunavut:
- 106 flights per year originating outside the NWT/Nunavut
- 230 freight flights per year originating in the NWT/Nunavut
- 0 general freight flights per year originating outside the NWT/Nunavut
  - **Benefit of public highway to Yellowknife**
- Variety of aircraft types:
  - RJ100 / Dash7 / Twin Otter / Jetstream32 / King Air / ATR72 / Dash8
  - Boeing 737-200 Cargo / ATR72 LCD / Dash7 / Hercules

Gahcho Kué Diamond Mine Air Traffic





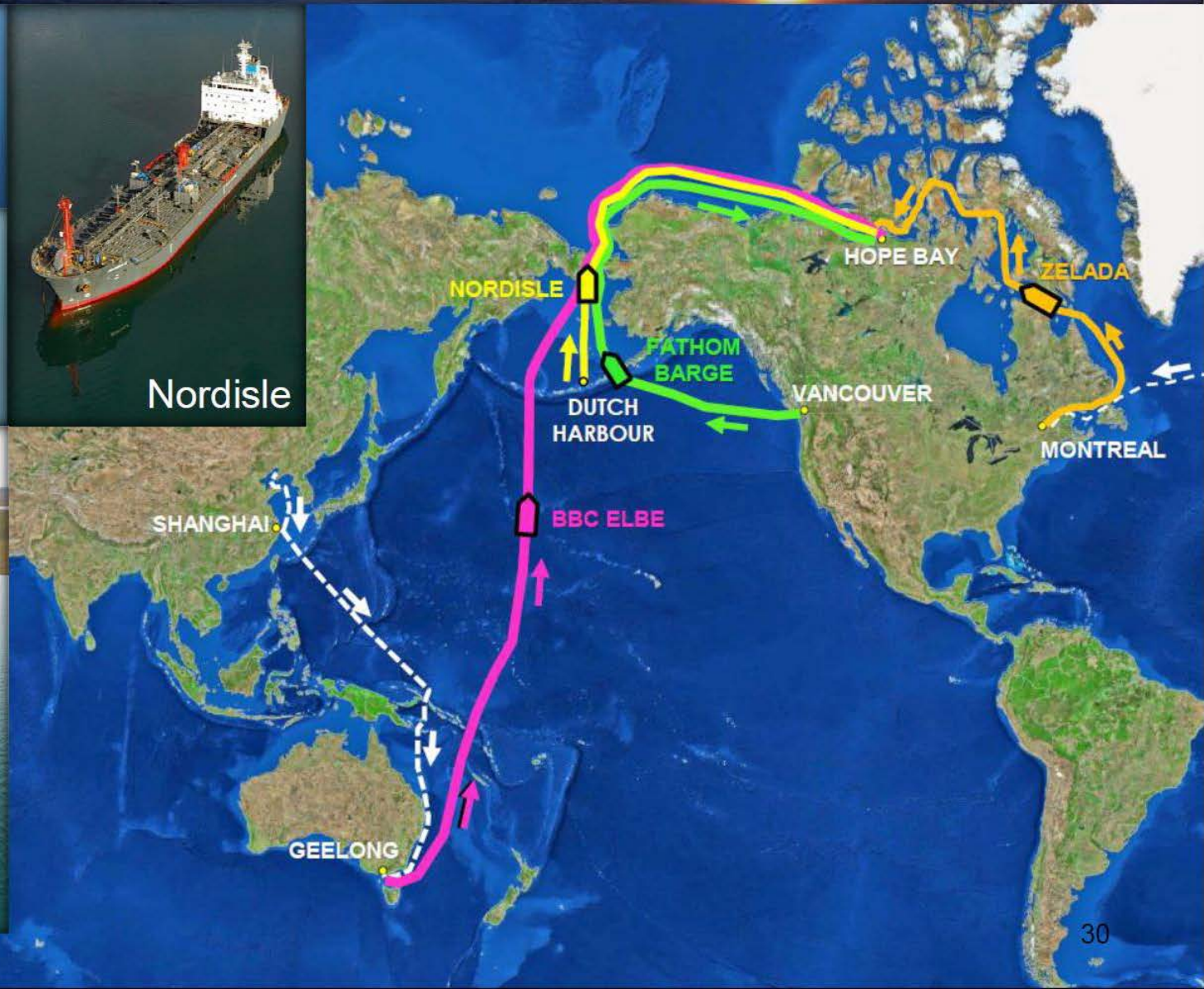
Aircraft used: C-130; B-737F; Dash-7; ATR-42; Dash-8; JS-31; JS-32; Navajo; ATR-72; RJ-85; Be-20; ATR-72F; Twin Otter; Dornier; B-06; B407; A-Star; B-737P; C-177; C-208; Kamov; HB-205; BK117; H-500

Hope Bay Gold Mine, Nunavut

Hope Bay gold mine – 2017

- Marine:
  - 4 vessels
  - 10,700 Tonnes dry cargo
  - 17.8M litres of fuel
- Air:
  - 70,000 Lbs Cargo per week
  - 60-70 passengers twice per week.
  - Approx. 24 flights per month
- Double this in Phase 2 (Madrid, Boston)

Sealift Routes



Back River gold mine, Kitikmeot region, NU

- 2018 constructed a fit-for-purpose seasonal marine lay down area to receive future mine supplies
- 5 voyages / year as one ship or multiple barges
- Annually construct 157-km winter ice road to the mine
- 1,500-3,000 truck loads

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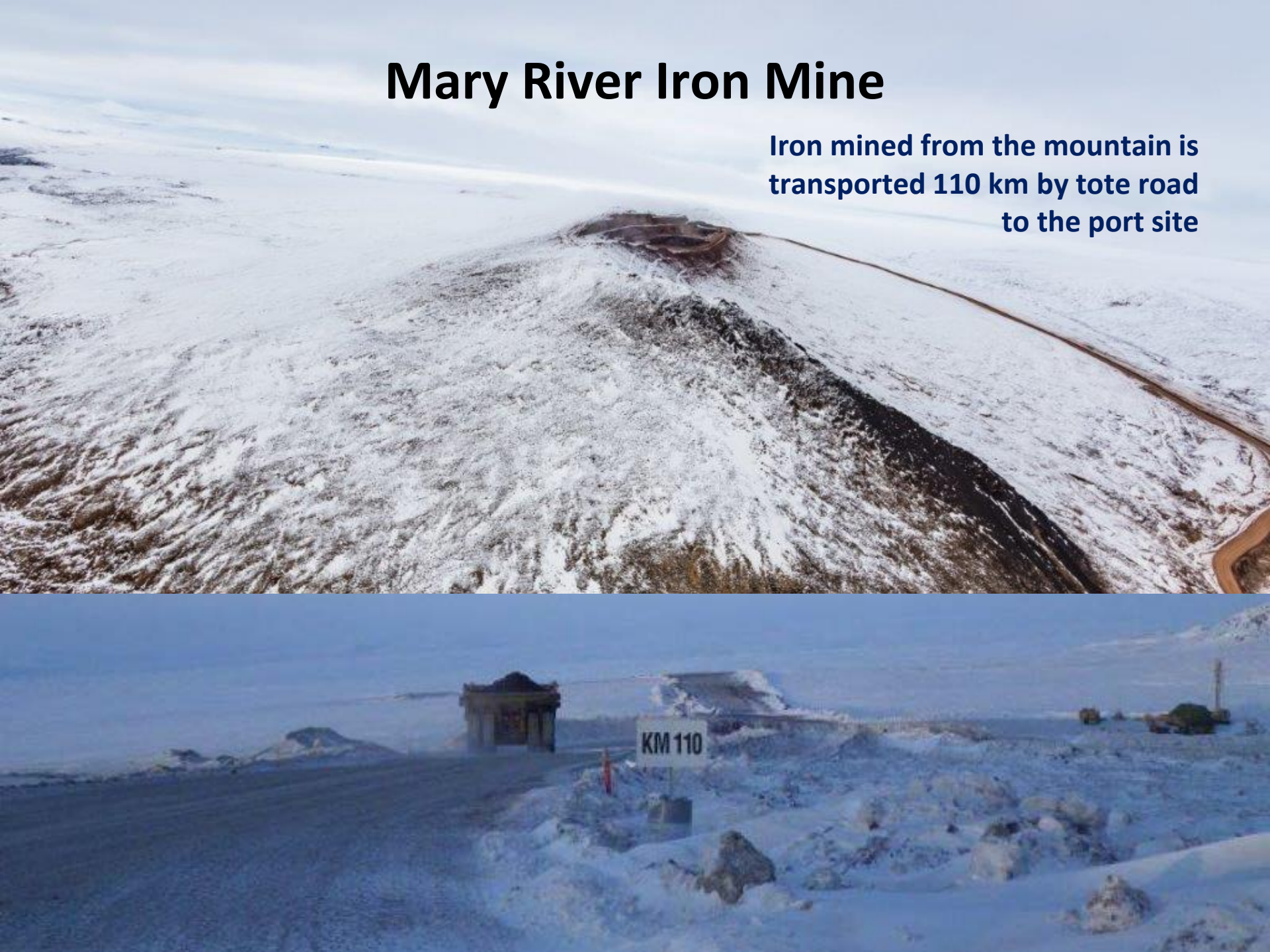
Mary River Iron Mine

Iron mined from the mountain is transported 110 km by tote road to the port site



Mary River Port Site – Milne Inlet

- 2018 – Largest shipping program by volume ever executed in the Canadian High Arctic
- 5.1 million tonnes in 71 voyages over 86 days to Europe, UK, Taiwan, and Japan
- Plus 2 Northern Sea Route transits to Asia, a first for iron ore bulk carriage.

Mary River mine air movements – 2017

- Air Cargo
  - 2,300 tonnes freight inbound to the Mine
- Passenger movements
  - 13,594 passengers inbound to the Mine
    - Note: Not unique individuals as work at the site is on a 2 week work rotation
  - 1,628 local community air movements

Table 8-2: Number of Project aircraft movements at LSA community airports (2014 to 2017)

Number of Project Aircraft Movements at LSA Community Airports				
Community	2014	2015	2016	2017
Arctic Bay	122	126	120	138
Clyde River	114	112	112	144
Hall Beach	130	122	122	152
Igloolik	118	106	114	122
Pond Inlet	212	136	134	162
Iqaluit	876	708	652	910
Total	**1,572**	**1,310**	**1,254**	**1,628**

Source: Baffinland

Notes: Records are available from 2014 onwards. 2014-2016 records are for fixed-wing aircraft movements only. 2017 records are for fixed-wing and rotary-wing aircraft.

North Eastern Arctic Shipping (NEAS)

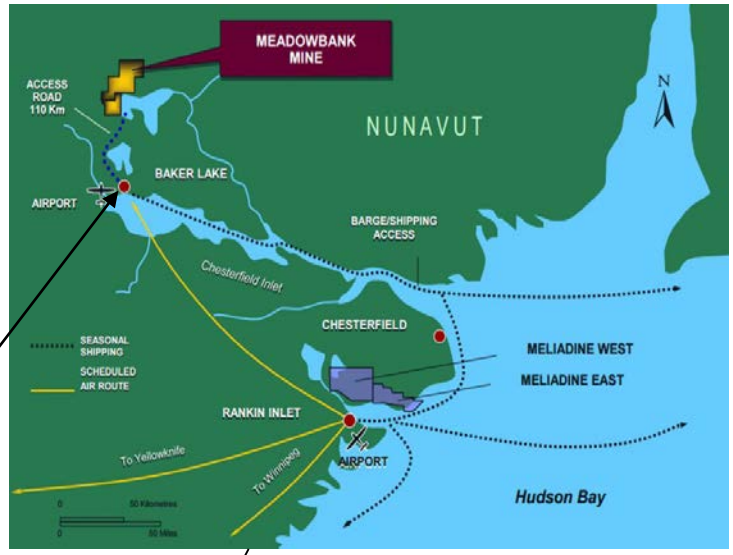
- Transported over 100,000 cubic metres of mining cargo.
- Purchased the MV Nunalik geared with 2 X 180MT cranes and built two 104ft long barges with an interlock system capable of moving a 300MT piece to shore.
- Mining sector North of 60 is generating growth that pushes NEAS teams to handle and move heavier, larger pieces of cargo to mine sites.

Mary River Iron Mine – Milne Inlet Port

AGNICO EAGLE MINES – MEADOWBANK & MELIADINE GOLD MINES, NUNAVUT

Meadowbank Mine and Meliadine Mine

- Meadowbank Mine in operation since 2010 (70 km North of Baker Lake)
- Meliadine Mine in construction, operation will start Q2 2019 (30 km NW of Rankin Inlet)
- 10 ships to transport cargo (258K M3) from Becancour, Quebec to Nunavut 3,400km
  - 60 Barges between mothership and Baker Lake or Rankin Inlet
- 2 motherships to transport Fuel from Becancourt to Nunavut (99ML)
  - 24 trips between mothership and Baker Lake or Rankin
- 10 flights (737-200) by week Mirabel-Val D'or-Meadowbank or Rankin Inlet
  - 700 persons / 110,000 lbs of cargo
- The fuel and cargo must be transported by truck from:
  - Baker Lake to Meadowbank Mine on a 110 km road
  - Rankin and Meliadine Mine on a 30 km road



Floating Barge
Tank Farm
110km Road

3,400km Marine
Supply Chain

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Electrical power challenges

- All 6 mines are off-grid and require diesel power; or in some cases wind power
- Adds to the cost burden
- Adds to the logistics for fuel
- Carbon tax cost implications too, despite lack of alternatives

Heat recovery on Diavik diamond mine diesel powerplant #1

2 of the 4 wind turbines at Diavik diamond mine

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Developing the Northern mining industry

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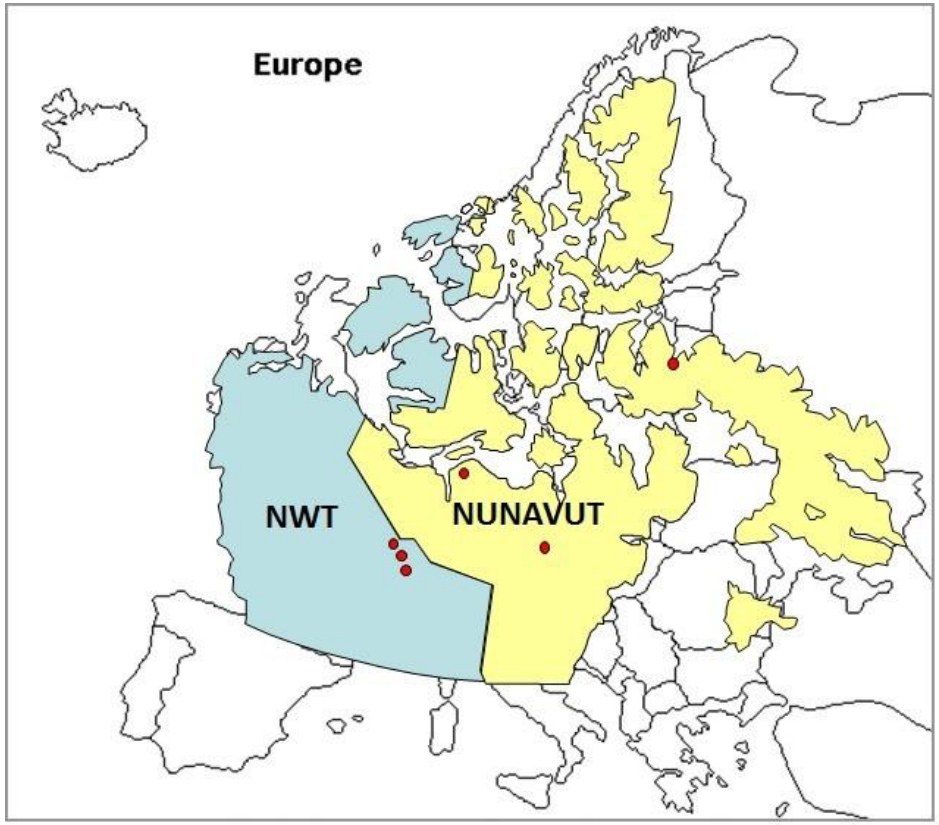
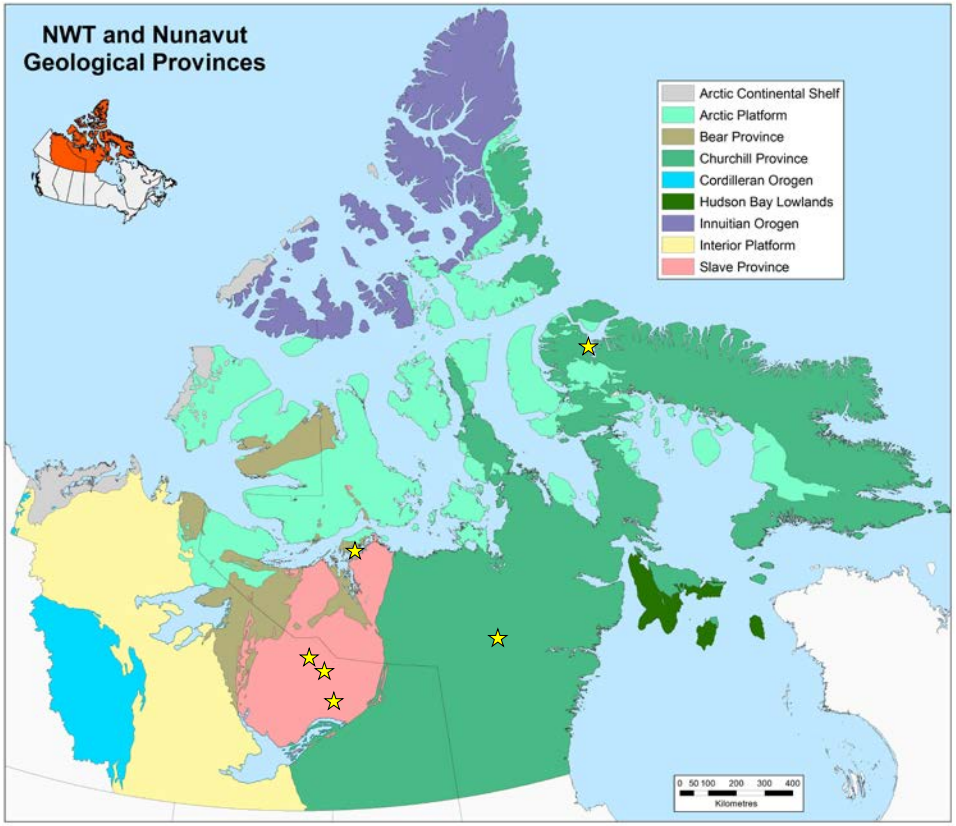
Huge potential but mining is underdeveloped

Huge Geography



Rich Geology, but barely tapped



- Only 6 operating mines in an area the size of Europe
- Mining footprint is tiny: < 0.006% of area of NWT + Nunavut
- Mining is under-developed largely because of costs, infrastructure

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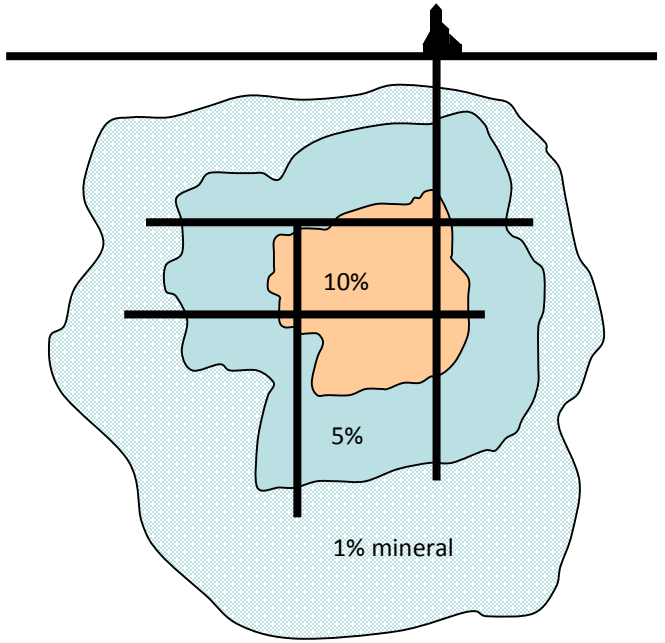
CHAMBER OF MINES

Geology 101: What is an ore body?

- Mineral deposits are irregular, complex shapes
- Mineral concentration varies
- Definition: only rocks that can be economically mined can be called “ore”
- Ore shrinks and grows dependent on commodity prices and mining costs



If you want more ore, hope for high market prices or take actions to reduce your costs

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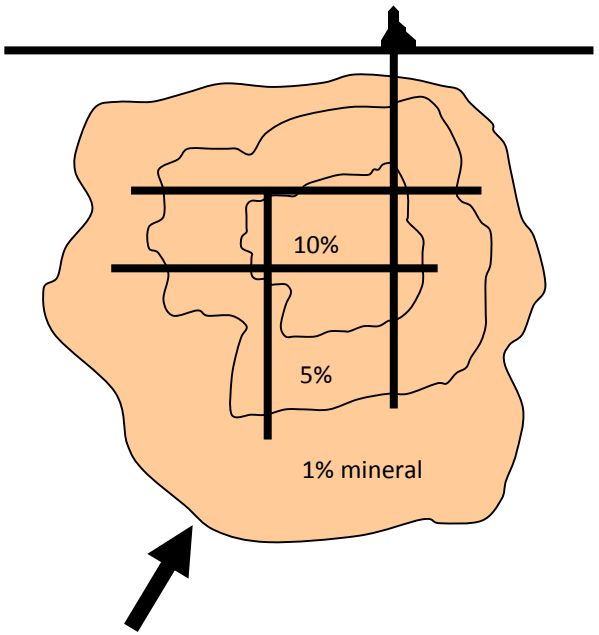
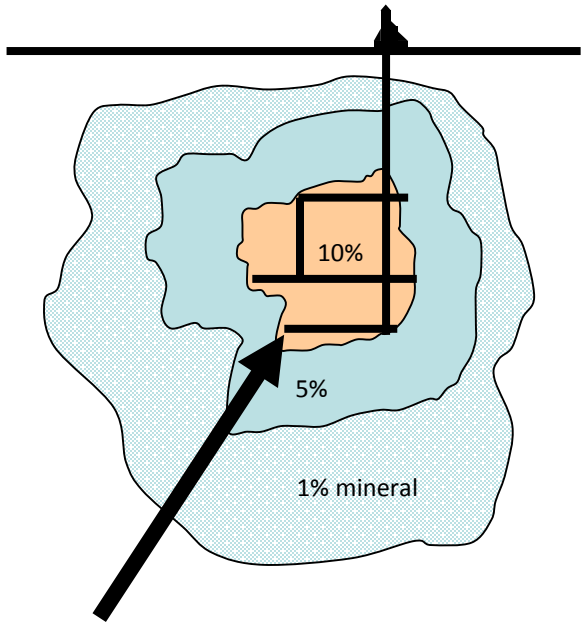
Northern cost premium shrinks ore bodies

- **Deposit in south is <u>NOT</u> always economic in the North**





- Deposit in Ontario
- Ore is larger because costs are lower.
- Mine life can be longer.

- Identical deposit in North.
- Ore shrinks because costs are higher, and only richer parts can be mined economically.
- Mine life is shorter, perhaps not even a mine

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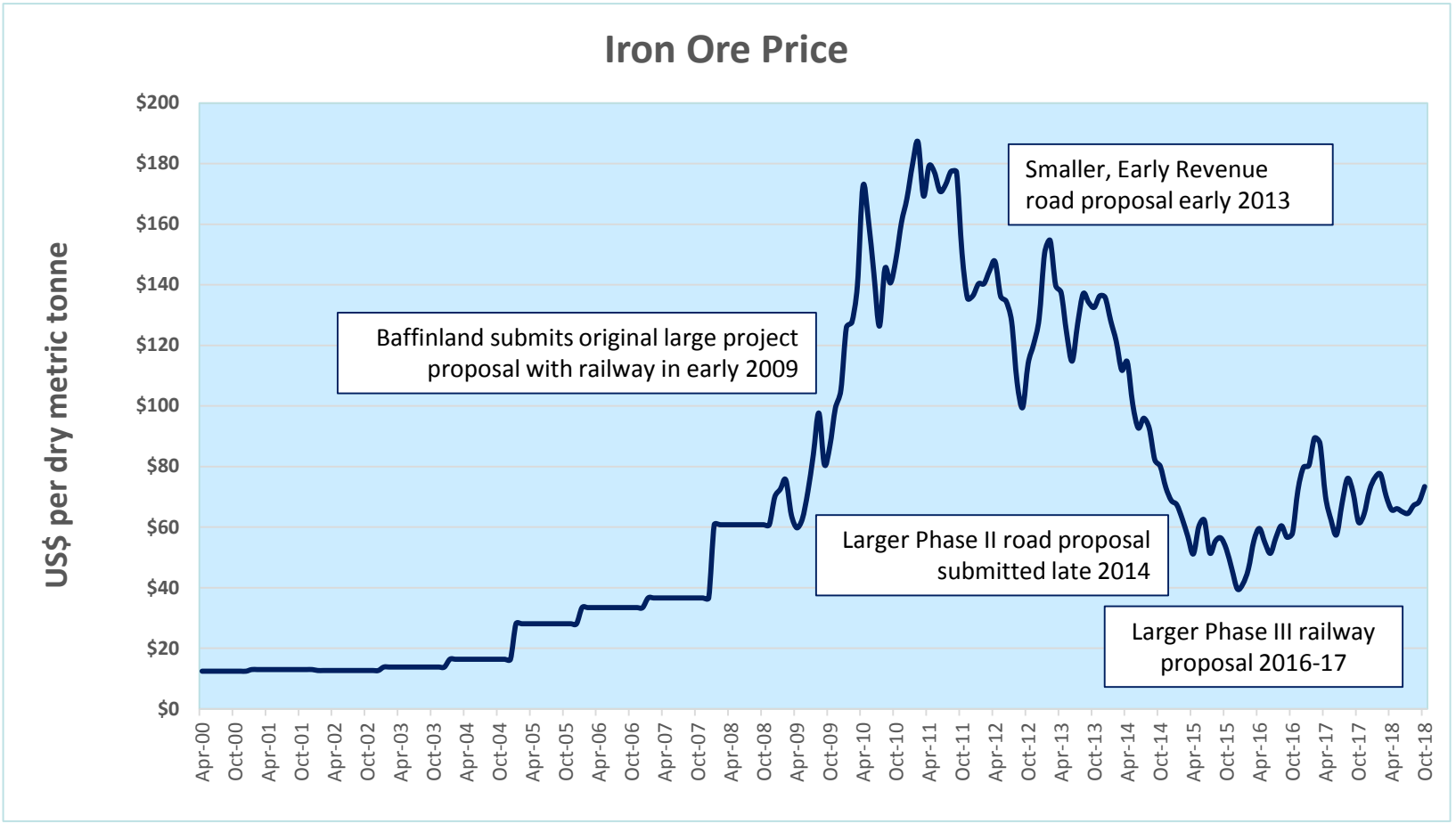
When we are at the whim of the markets …



… then we must find ways to reduce costs

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The North: Canada's largest Infrastructure deficit

- Infrastructure deficit adds significant costs:
  - Exploration costs up to 6 x higher
  - Mine capital costs up to 2.5 times
  - Mine operating costs 30 to 60% higher
- Hinders growth
- Our competitiveness is affected by the un-level playing field

Industry Study: *Levelling the Playing Field, May 2015*

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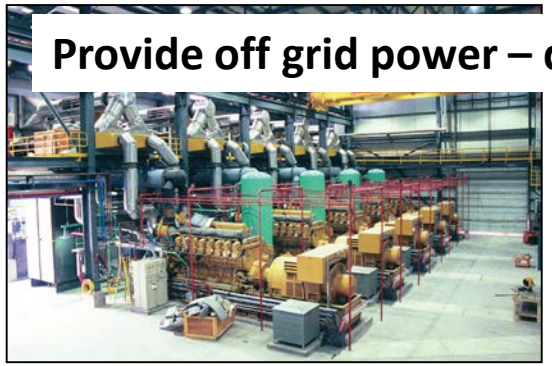
Today, mines are on their own to pay it all



Provide off grid power – diesel, wind

Buy & Store Annual Inventories

Build Roads – seasonal, all weather

Provide room & board, medical

Build Sea Ports and Air Ports

$!

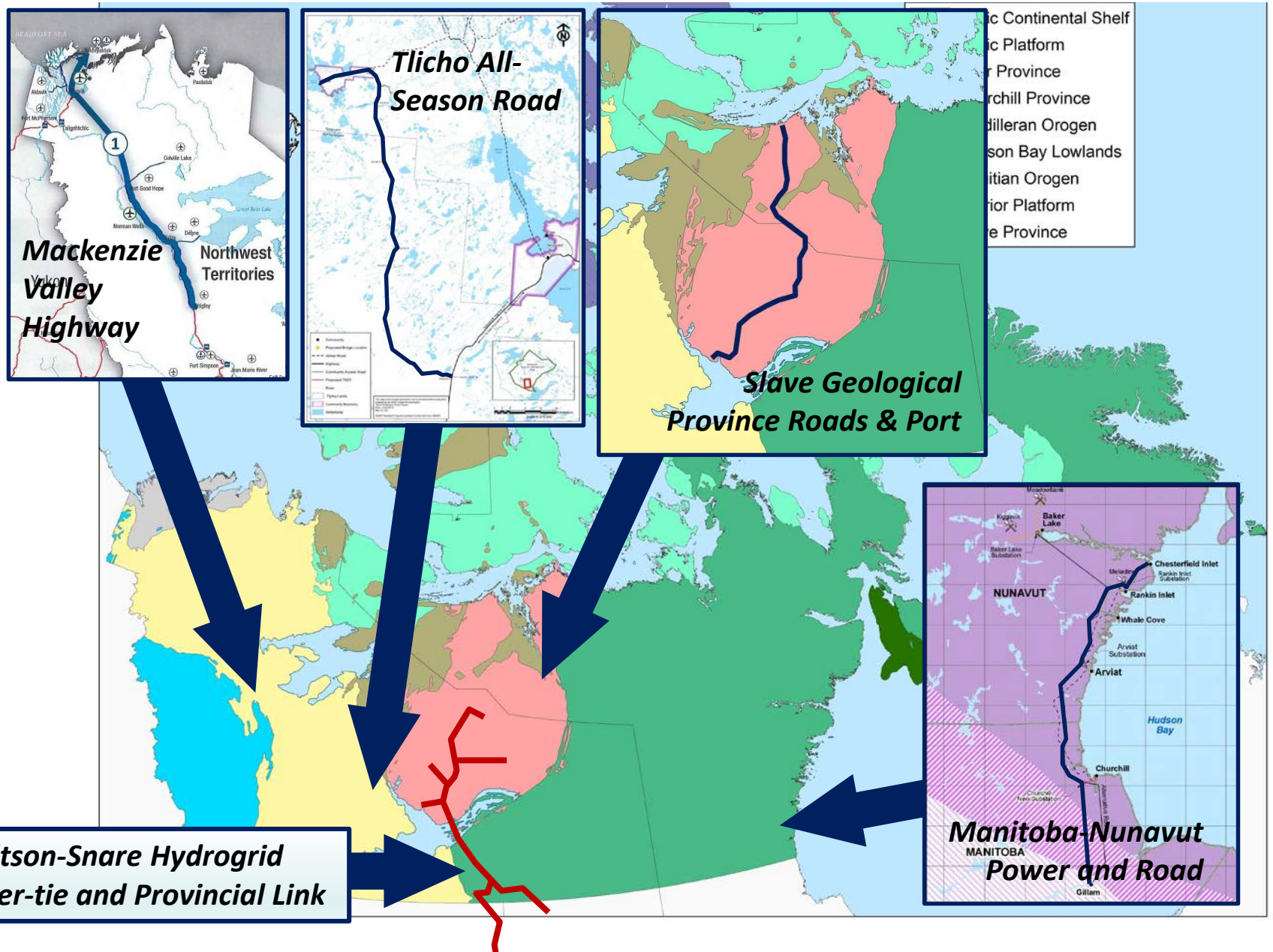
It wasn't always this way …

Federal Government partnership in Northern mining Infrastructure

- 1948 – Snare Hydropower for Yellowknife gold mines
- 1959 – Roads to Resources, highways to mining towns
- 1961 – Great Slave Lake Railway for Pine Point zinc-lead mine
- 1966 – Taltson Hydropower for Pine Point mine
- 1974 – Townsite, dock, airport for Nanisivik zinc-lead mine
- 1975 – Ice-breaking cargo ship to service Nanisivik & Polaris mines
- **40 YEAR FEDERAL INVESTMENT GAP FOR NORTHERN MINING**
- 2017 – Tlicho road with indirect benefit for NICO mine project



Catching up: Seeking infrastructure investments



Federal Infrastructure support pays off

- The Pine Point Mine example -

- **$125 million total cost** of Pine Point Mine project, including …
- **$88 million Federal Government investment** for railway and hydropower
- **$1.8 billion return** over 25 year mine life (1964-1988):
  - $339 million in dividends;
  - $176 million in taxes;
  - $400 million estimated freight charges paid to the Federally-owned Canadian National Railway;
  - $246 million in wages and salaries;
  - $500 million estimated spending on supplies and services; and
  - $100 million to the Northern Canada Power Commission.
- The Pine Point partnership between government and private enterprise returned handsome rewards to both.

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The time is right for Vision and Action

- Industry is proving it can provide significant benefits: northern, southern and Indigenous. We need to grow them.
- Indigenous governments and organizations are increasingly supportive to participate and to take equity interests.
- Provincial governments should be supportive as they benefit.
- Timely opportunity to rejuvenate the Government(s) – Industry partnership in policy development:
  - *Arctic Policy Framework*
  - *Arctic Transportation Policy Framework*
  - *Canada Mineral & Metals Plan*

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While policy is developing …

- Consider some feedback from industry
  - Explore collective fuel purchase by government and industry to further reduce per unit fuel cost for both
  - Military – Coast Guard – Industry partnership opportunities?
    - TMAC will build only operating deep water dock in the Canadian Arctic west of Nanisivik
    - Proposed Gray's Bay Port & Road would add to that capacity
  - Can Nanisivik provide bunker storage for increased shipping in area?
  - Can Coast guard increase ice breaking capacity and seasons?

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A recent Baffinland Experience

- May 2018- Canadian Ice Services forecast extreme ice conditions
- Canadian Coast Guard advised limited access to ice breaker
- Baffinland communicates concerns this could compromise their sealift & ore carrier season
- Baffinland forced to hire Estonian Ice Breaker (Botnica) to complete sealift
  - Baffinland will increase production and shipping in 2019 and will again employ Botnica
- Baffinland recommendations:
  - Strengthen Canadian ice breaker support capacity to match changing user needs
  - Adjust Coast Guard 'Level of Service' to reflect increase in shipping volumes
  - Military make fuel available at Nanisivik to help with these circumstances where private sector must bring in extra help that government cannot provide, but then needs extra fuel

Estonian ice breaker MPSV Botnica

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Conclusions

- There is a lot of logistics around our northern mining industry
- We could use help from governments, help like we had in the past, eg, with infrastructure
- This would ease logistics costs, make our industry more robust, and able to deliver even more benefits
- Let's talk

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Why it all matters – people success!