



# Nickel in Nunavut: Renewable Interest

Sam de Beer  
District Geologist, Mineral Resources





## Presentation Outline

- Significance of Nickel
- Nickel Discovery
- Mining History in Nunavut
- Exploration History in Nunavut
- Nunavut Nickel Occurrences
- Geological Environments
- Example: Ferguson Lake
- Example: Muskox Layered Intrusion
- Benefits and Outlook





# Importance of Nickel

- Canada is a global leader in nickel production
- Canada was the world's sixth-largest nickel producer and seventh largest nickel reserve holder in 2022
- Global demand for high-grade nickel will outweigh supply by 2024
- There is an incredible opportunity to do more exploration, to develop its reserves and boost overall production of nickel





# Importance of Nickel

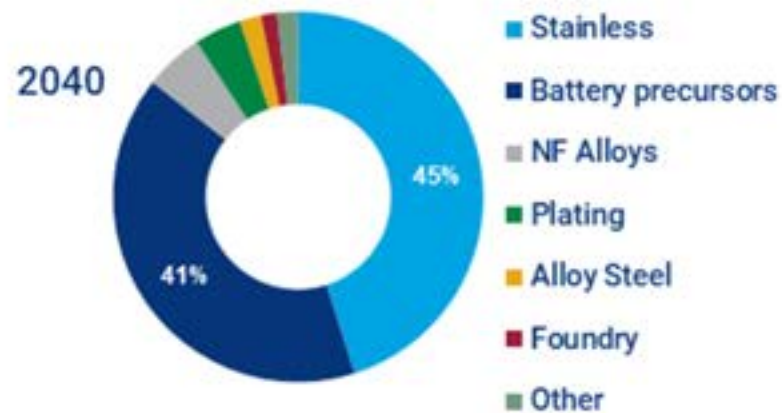
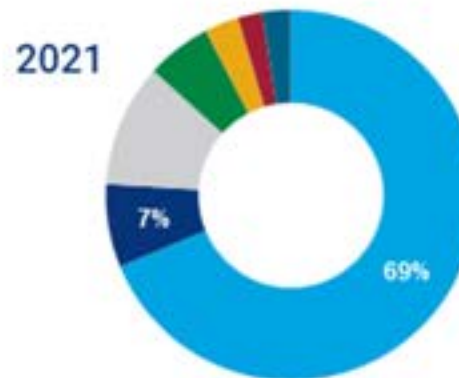
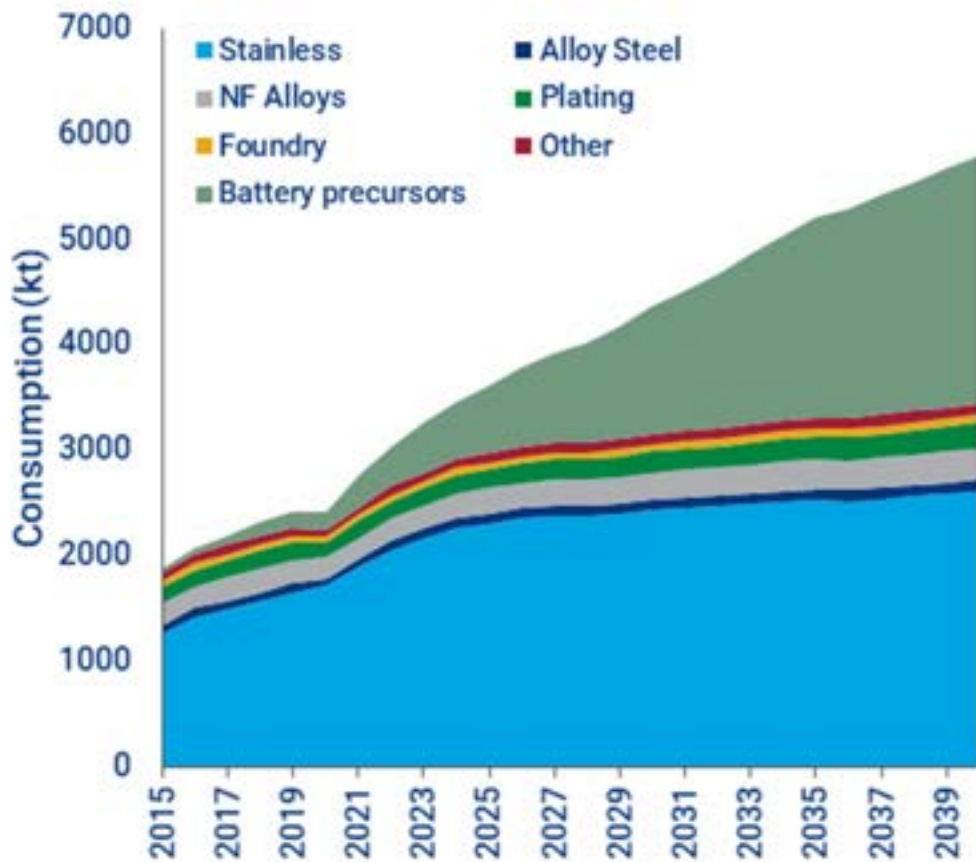
- ±70% is used for Stainless-steel
- Nickel's primary use in EVs is in rechargeable nickel-cadmium and nickel-metal hydride batteries, which are used in both hybrid and fully electric vehicles.
- Superalloys (in more than 3,000 different alloys)
- Anti-corrosion alloys
- Metal plating
- Power tools
- Jet engines





# Demand for Nickel by different industries.

## Use in batteries will double global nickel demand by 2040

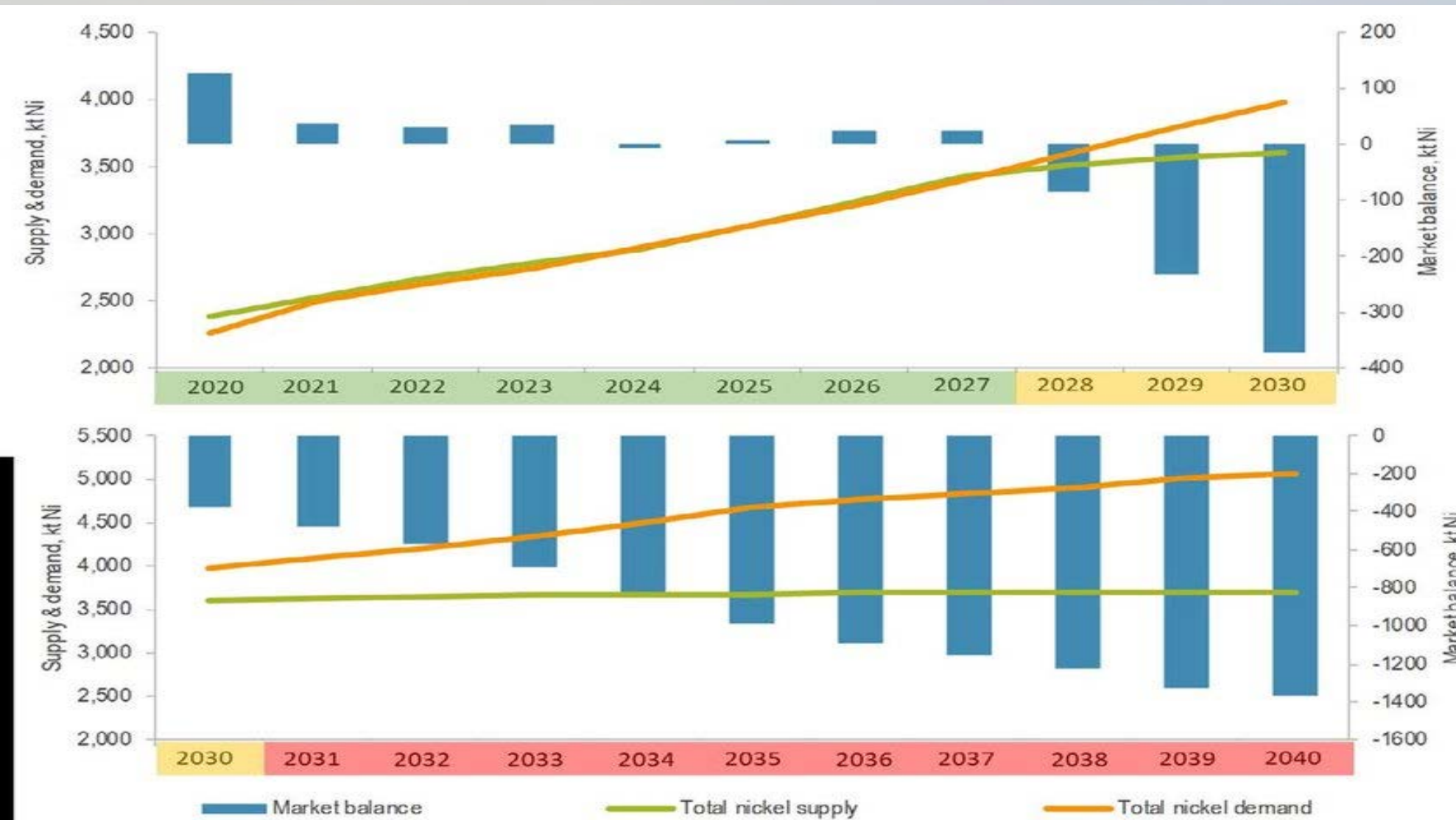


Source: Wood Mackenzie



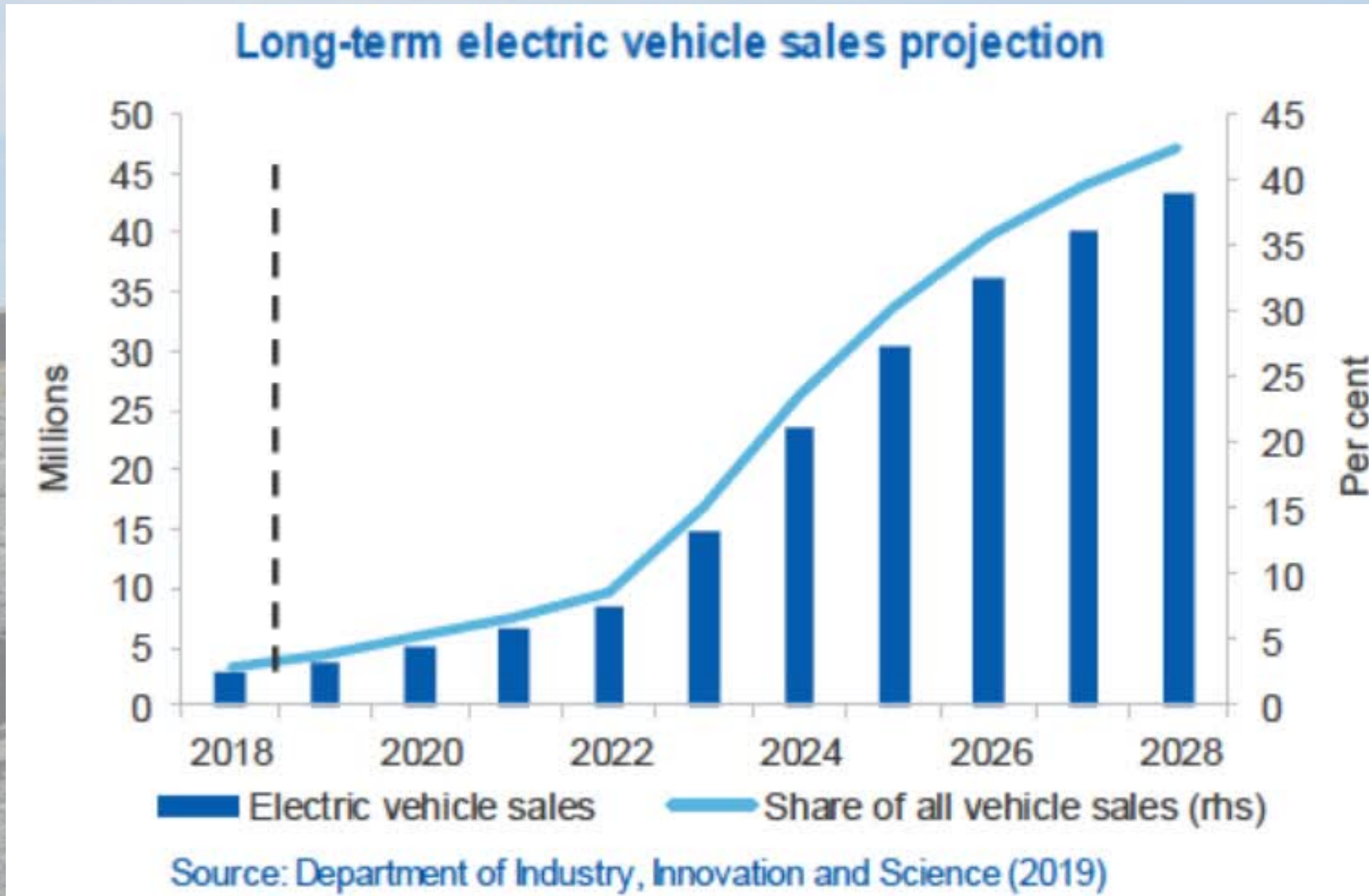


# Global Nickel Supply-Demand balance (Research Gate)



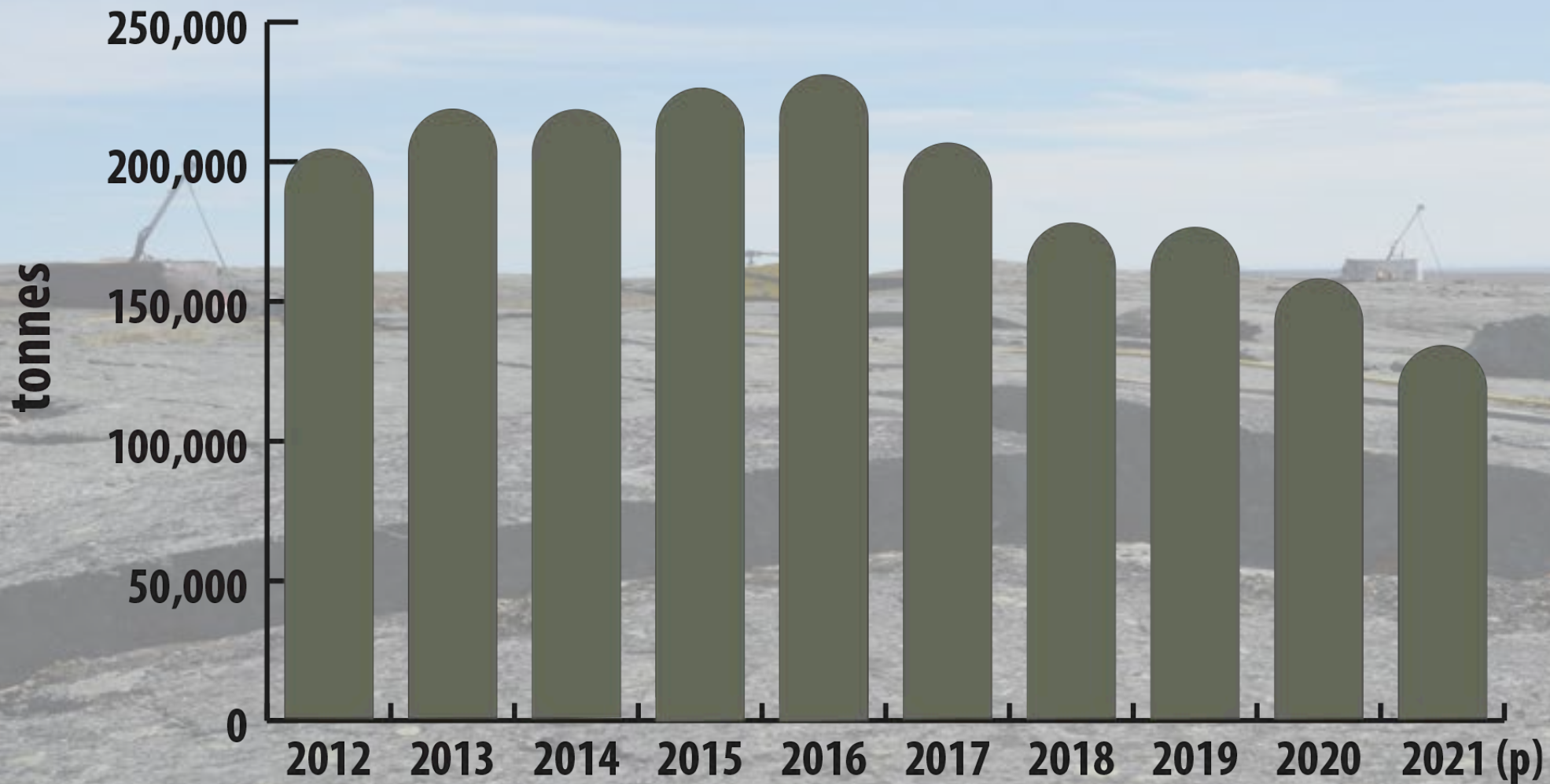


# Long Term Electric Vehicle Sales Projection





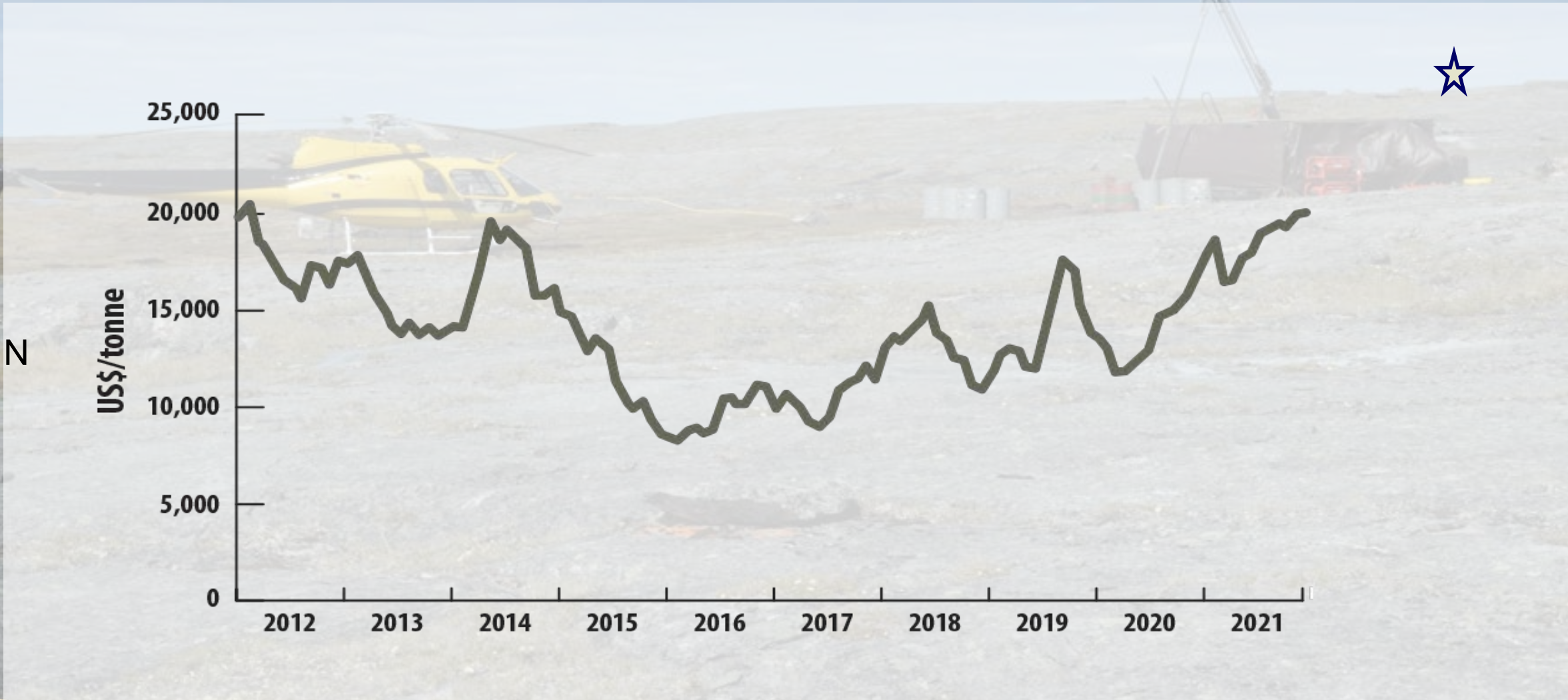
# Canadian Nickel Production from mines (NRCan)







# Nickel Price and Trend (NRCan)





## Nickel Discovery

- 1883 Nickel is discovered in Canada near Sudbury, Ontario.
- 1928 R.G.O. Johnson discovered a nickel-sulphide deposit on the north shore of Rankin Inlet in Nunavut.
- The deposit was drilled between 1930 and 1937
- Ferguson Lake Ni-Cu-PGE deposit discovered in 1950
- Muskox deposit was discovered in 1956 by H. Vuori of the Canadian Nickel Company
- Turner Lake /James River disseminated Cu and Ni sulphide deposits discovered in 1964.
- Prince Alfred Hills on the Melville Peninsula discovered in 2008 by Geological Survey of Canada





# Mining History in Nunavut

- In 1928 R.G.O. Johnson discovered a nickel sulphide deposit on the north shore of Rankin Inlet.
- Drilled between 1930 and 1937.
- In 1951 North Rankin Nickel Mines was started to develop a mine.
- It was the first mine in Canada to hire First Nation's People.
- Deposit was mined between 1957 and 1962.
- 460,000 tonnes of Ni-Cu sulphide mined at
- average grades of 3.3% Ni, 0.8% Cu, 0.2% Co, 0.93g/t Pt and 1.87g/t Pd





**Nunavut Ni occurrences:**

**156 Nickel showings since 1928  
in the NUMIN database.**

**Most related to mafic and  
ultramafic volcanic rocks**

**Green crosses represent Ni  
showings**





# Geological Environments

- Deposits are typically hosted by mafic and ultramafic volcanic intrusive rocks
- Large parts of Nunavut ( $\pm 50\%$ ) is underlain by mafic and ultramafic rocks
- Few deposits occur in metasediments
- Large scale mantle melting is the primary driver and source of mafic and ultramafic rocks associated with mineral systems
- Large proportion of Canadian Ni production is sourced from magmatic Ni $\pm$ Cu sulphide mineral systems hosted by mafic and ultramafic rocks
- Sulphide rich and sulphide poor deposits
- Nickel comes from **pentlandite** in magmatic sulfide deposits and **limonite** and **garnierite** in lateritic deposits
- Sulphide rich deposits are preferred because it requires less energy to process the ore
- Large parts of Nunavut has seen only reconnaissance mapping
- Nunavut has undetermined potential for mafic and ultramafic rock occurrences

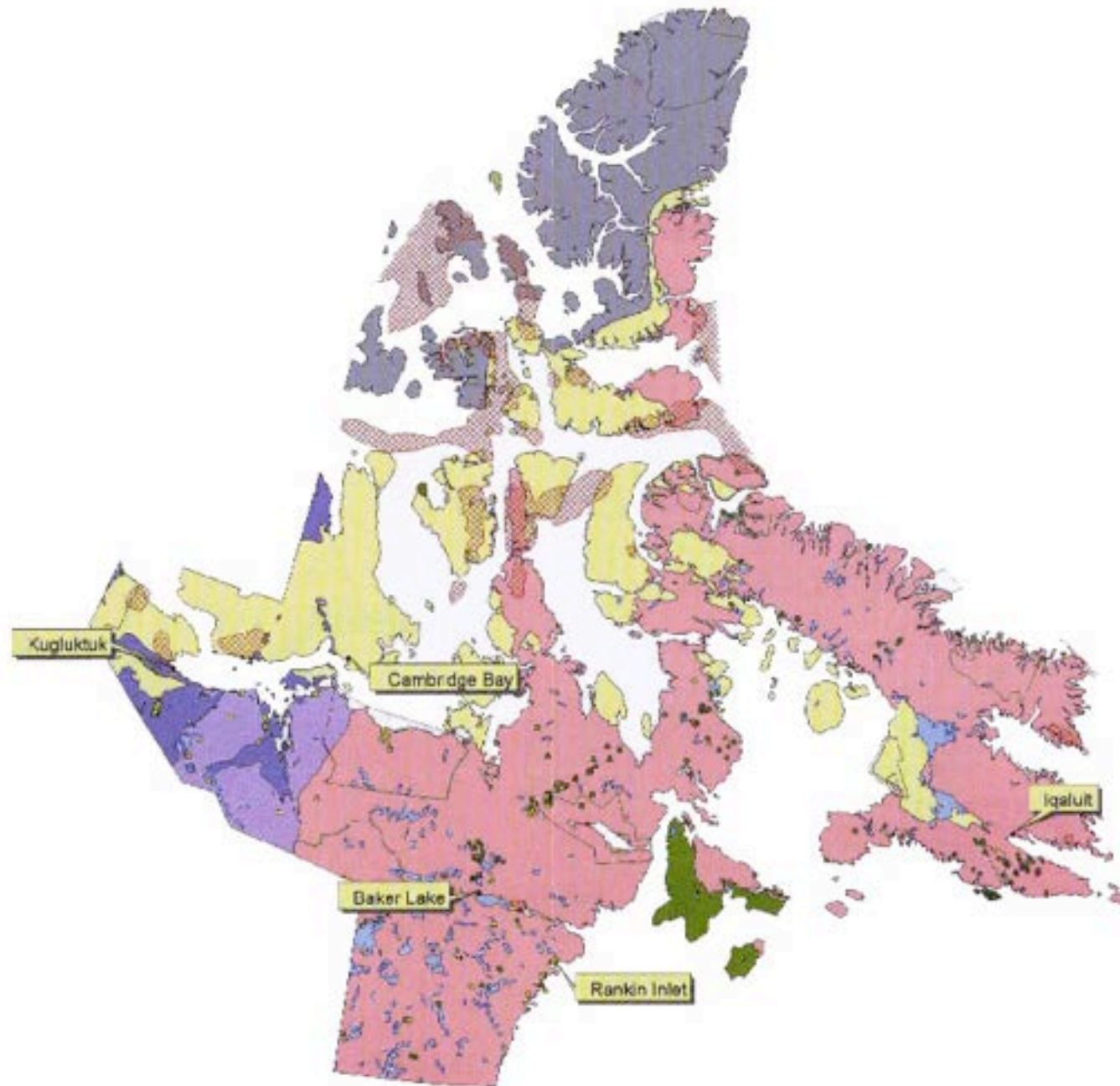
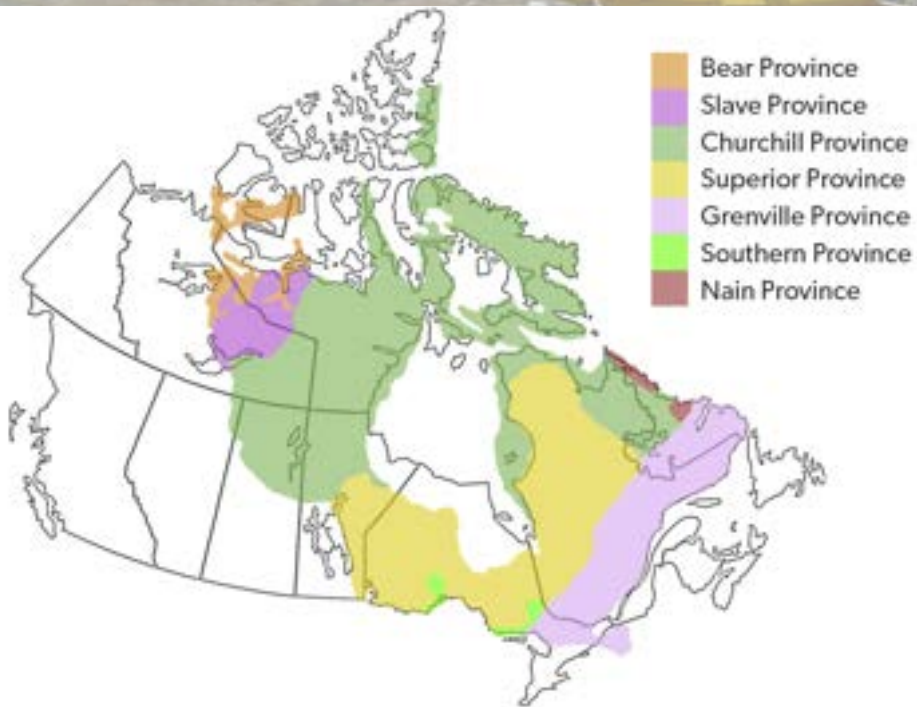




# Geology of Nunavut

Pink, violet and purple represent  
Churchill, Slave and Bear  
provinces of the Canadian shield

Areas underlain by mafic and  
ultramafic volcanics





# Ferguson Lake - Canadian North Resources Inc.



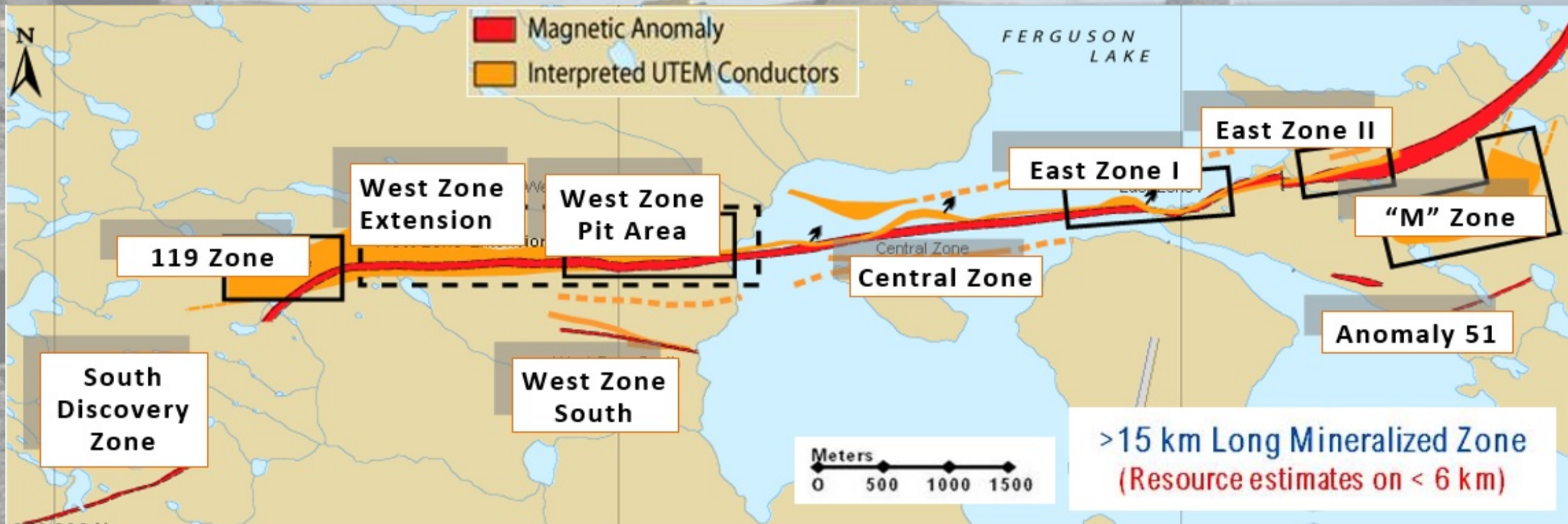
- Ferguson Lake Project is 150 km south of Baker Lake in the Kivalliq. Covers ±15,700 ha.
- Covers an extension of the Yathkyed Greenstone Belt in the western Churchill Province.
- Previous owners were Starfield Resources
- Canadian North Resources has completed its second season of diamond drilling on the property. Planned to drill 15,000 m in 2022, buoyed by good results they ended up drilling more than 18,300m. Plan to drill more than 20,000m in 2023.





# Ferguson Lake

- The West, Central and East mineralized zones remain open down-plunge to the west, along strike to the east and down dip at multiple locations along its mineralized horizon. There is significant potential for resource expansion along strike and at depth over the 15 km long mineralized belt.
- The potential is high to add significant PGM-rich tonnage by grid-drilling in the Low-Sulfide Zones.
- The Rhodium content of the mineralization has never been systematically evaluated.







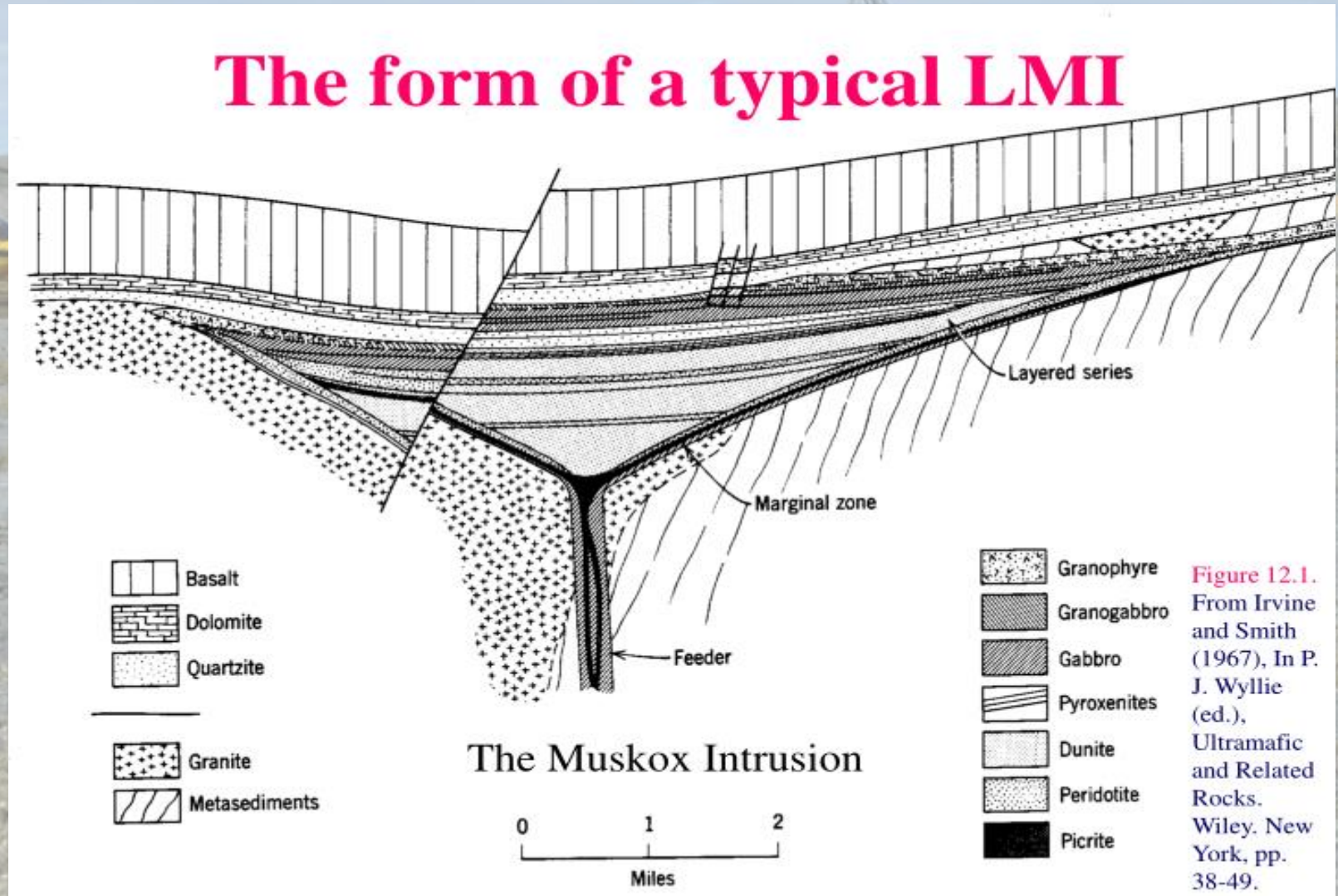
# The Muskox Layered Intrusion

- 90 km South of Kugluktuk in the Kitikmeot
- Discovered in 1950s by Inco, then followed BHP, Anglo American Exploration, Equinox Resources, Silvermet Inc., and more
- In the Mesoproterozoic Coppermine continental flood basalts of the Bear Province
- Part of the Mackenzie Large Igneous Province
- Similar to Bushveld Igneous Complex in South Africa
- Trough shaped: 120 km long, 15 km wide and 6 km thick, expected to be much larger to the north
- Rich in nickel, copper and PGMs



# The Muskox Intrusion - Section

The geology of the Muskox Intrusion is comprised of 4 key units called the Keel (Feeder) Dyke (sulphides), Marginal Zone (sulphides in footwall benches), Layered Series (PGE-enriched layers) and the Roof Zone.



**Figure 12.1.**  
From Irvine and Smith (1967), In P. J. Wyllie (ed.), *Ultramafic and Related Rocks*. Wiley, New York, pp. 38-49.



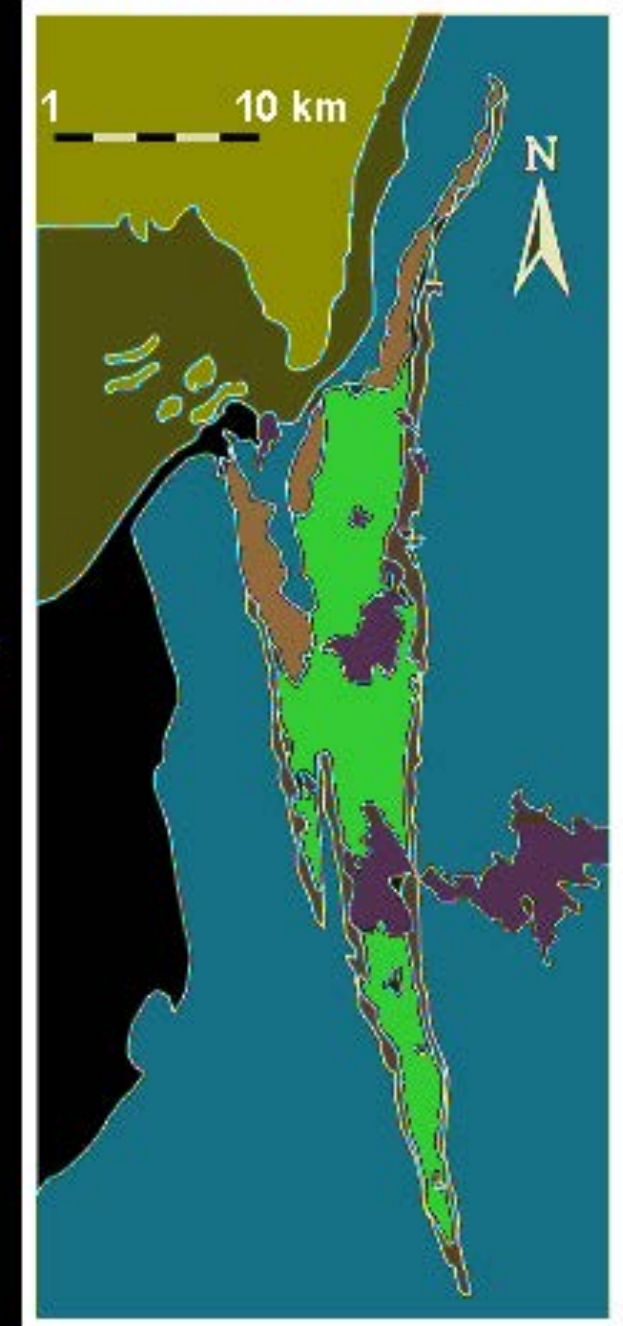


# Muskox Layered Intrusion

- The most recent exploration over the Muskox intrusion has been undertaken by SPC Nickel Corp. and Bathurst Metals Corp.
- Bathurst Metals 2021 assay results from a field sampling program confirmed historic results.
- SPC's 2022 exploration program included a reinterpretation of historic geophysical data as well as a sampling program during June and July 2022. High grade samples were collected at the SKOX and Spider Lake areas, with the highest grade sample collected along the West Margin of the main Muskox Intrusion.



Plan view of the Muskox Intrusion





# Benefits and Outlook

- **Investment in Nickel and associated critical minerals would diversify Nunavut's mining sector.**
- **Large parts of Nunavut ( $\pm 50\%$ ) is underlain by mafic and ultramafic rocks**
- **Large parts of Nunavut has seen only reconnaissance mapping**
- **Huge potential for greenfields discovery**
- **Nunavut is prospective for high grade nickel.**
- **There is potential for further exploration**





# Thank you very much.



Contact: E-Mail: [samuel.debeer@rcaanc-cirnac.gc.ca](mailto:samuel.debeer@rcaanc-cirnac.gc.ca)  
Telephone: 1 (867) 975 4569

