Mining = Opportunity for Indigenous Communities in Ontario

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November 2023 - slide deck

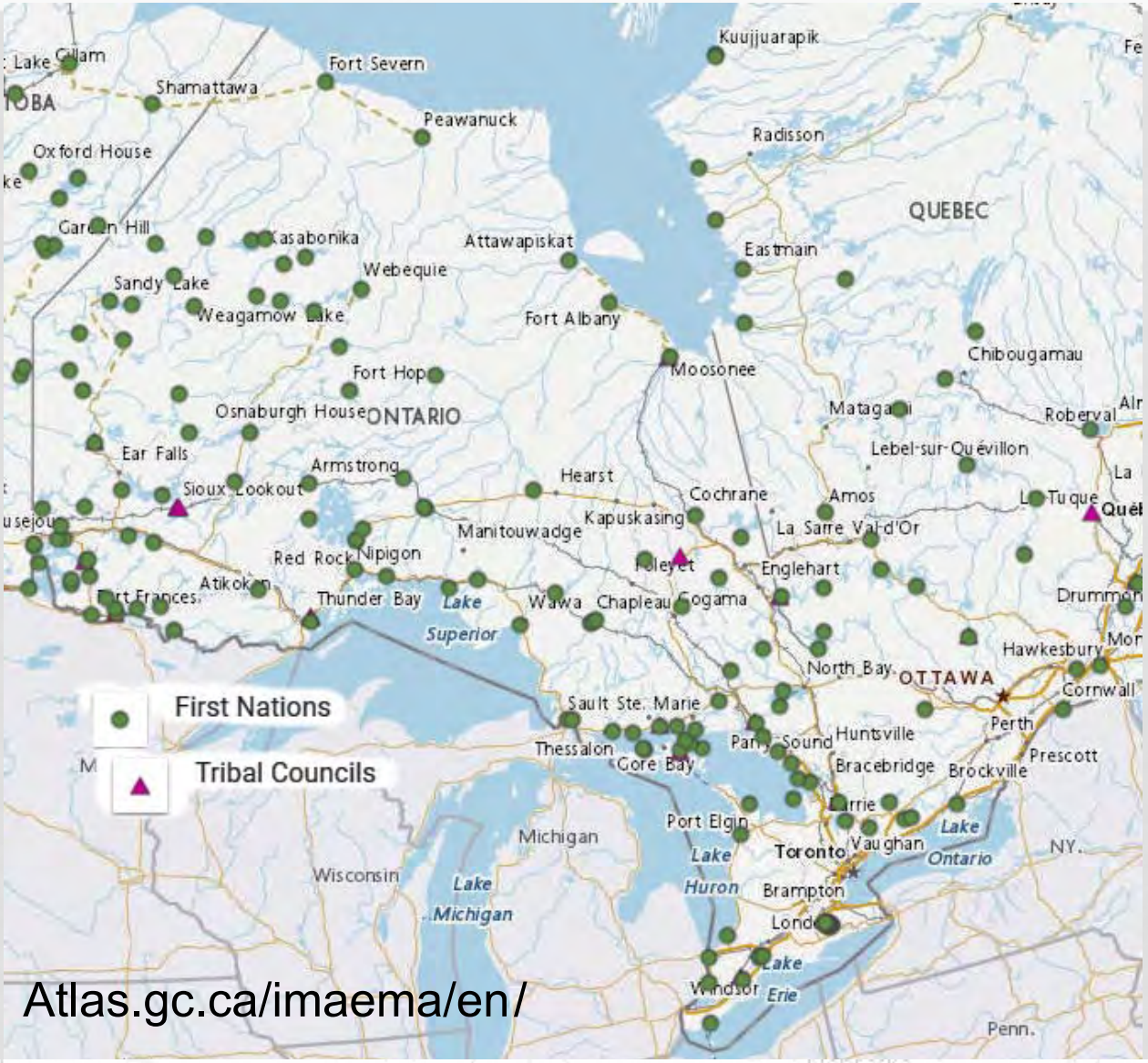
cando
Inspiring Success

Natural Resources Canada
Ressources naturelles Canada

Canada

Acknowledgements

Ontario Indigenous Communities



Presentation Outline

Our Goal Today:

Gain awareness of Ontario's mineral industry and Indigenous Opportunities

3-part presentation separated by interactive opportunities

- Use "raise-hand" function at any time for next interaction

Economic overview of Ontario's mineral industry

- Interactive opportunity

Today's mining activity life cycle related to Ontario

- Interactive opportunity

End with few key points relevant to economic development officers related to Ontario mining opportunities

- Interactive opportunity

References Cited and Appendicies

Links and references will be provided at the end of the presentation.

- References Cited Indexed By Slide Number
- Appendix A: Mining Information Sources
- Appendix B: Anthropological Series
- Appendix C: Professional Leading Practices

My Role Today

Part 1: Economic Overview – Production Focus

- Recognizing the basis for Indigenous opportunities

Part 2: Ontario Mining Today – The Full Cycle

- Explain today's mining stages in everyday language

Part 3: Recommended Follow-up

- Opportunity insights into the mining sector

Part 1: Economic Overview

Why Talk About Mineral Development?

Four sub-parts:

a) Indigenous Participation and Opportunity
- Brief historical review of Ontario's mineral past
- UNDRIP provides a path to further participation going forward

b) Economic and Environmental Benefits
- Mining is significant to the health of the environment and economy

c) Today's Mineral Developments Across Ontario
- Can provide the raw materials needed today and for the future

d) Today's Mining Cycle Is Not Well Known By The Public … Why?
- Most Canadians are unaware how mining benefits their everyday life.

ECONOMIC OVERVIEW
Part 1a: Indigenous Participation and Opportunity

- Review of Ontario's mineral history and early Indigenous mining
- UNDRIP has provided a path to further opportunity going forward

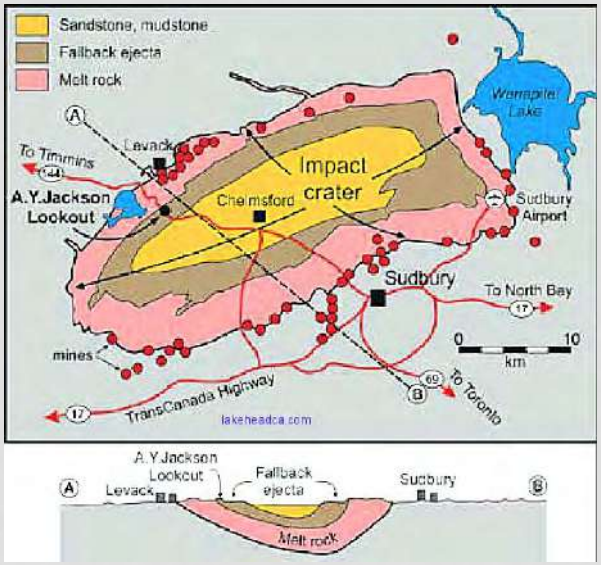
Earliest Ontario Mineral Deposit Formation Natural Events

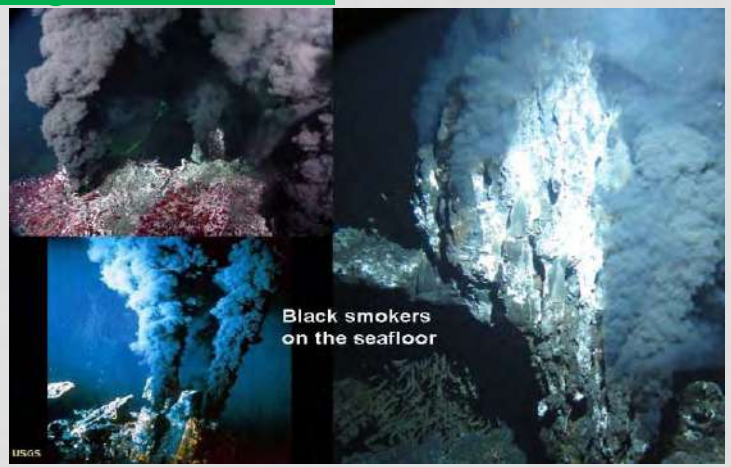
The Earth and its Moon formed about 4,500,000,000 years ago
- this resulted in Earth becoming enriched with metals and the moon setting up tidal forces that have been vital to Earth's evolution.

Today's Ontario mines formed by **a few major** geological events that occurred about:

2,700,000,000 years ago

In Archean greenstone belts as hotspring gold and base metal deposits on the seafloor and as precious metal deposits in related intrusions





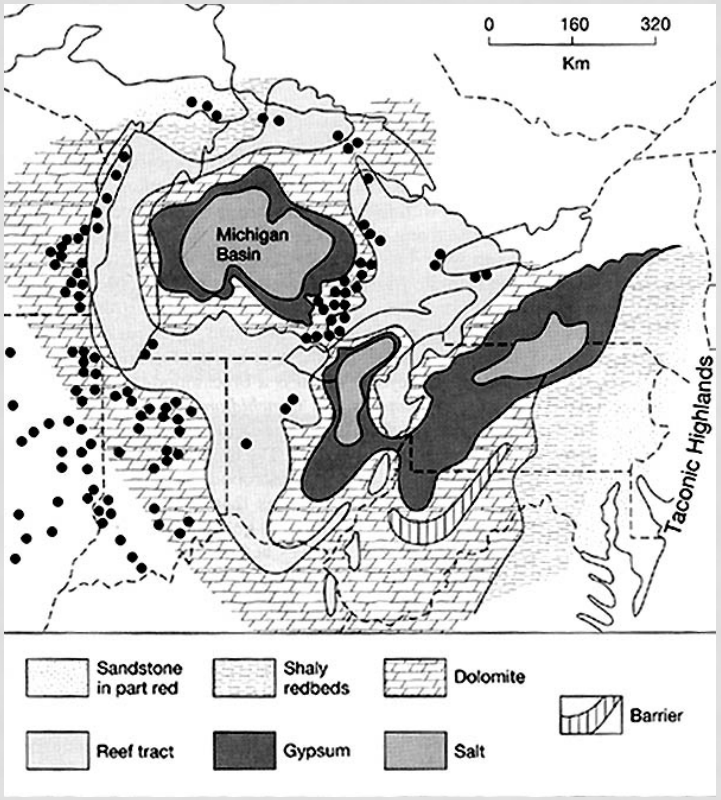
1,849,000,000 years ago

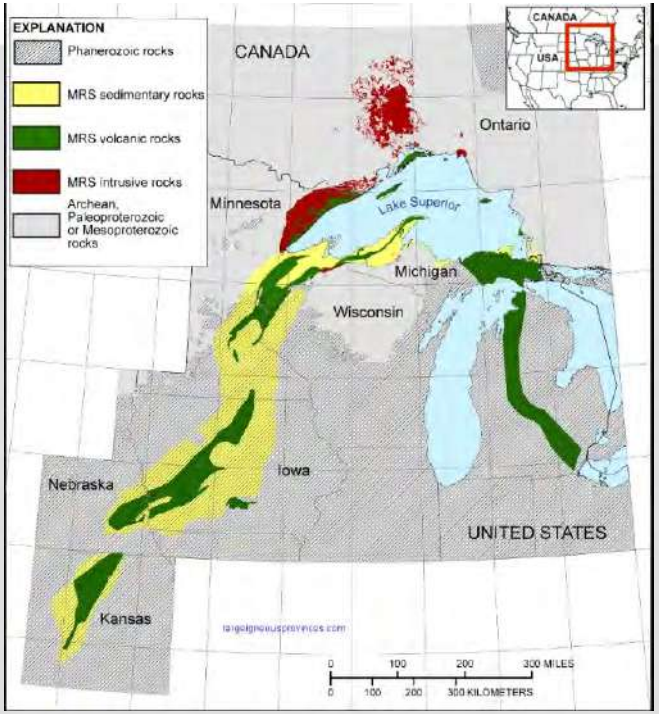
A meteorite impact formed the Sudbury crater and the copper-nickel-PGE deposits settled out from the melt.

Early Ontario Mineral Deposit Formation Events

1,100,000,000 years ago

Pure copper filled cooling cracks in Keeweenawan Flood Basalts and copper-nickel-PGE's were trapped in feeder intrusions within the Mid-Continent Rift





426,500,000 years ago

Widespread salt and gypsum evaporite deposits formed when an inland sea dried out over 7 million years.
(Late Silurian Salinas Formation)

Latest Ontario Mineral Events

Most Ontario aggregate deposits formed during the Wisconsin Glaciation 75,000 to 11,700 years ago. Ice caps built up to four kilometres thick and glacial flow flattened, gouged and ground solid rock into gravel, sand and clay.

Thick Wisconsin ice caps meant sea levels dropped 120 metres allowing multiple, modern human migrations across the Beringia land bridge beginning over 20,000 years ago.

Another impact event 12,895 years ago caused a sudden 1200 year “cold snap”, global wildfires, mass extinctions of North American megafauna and a major change for the continent’s existing Clovis culture.

Early Indigenous Mining

New research indicates that **9500** to 5000 years ago, the **world's first** copper industry flourished around Lake Superior where 95%-pure natural copper was mined from thousands of shallow (<10m) workings (greatest activity at Isle Royale, Keewenaw, Ontagon, Calumet). *(Pompeani et al, 2021, Milwaukee Museum mpm.edu). Referred to as the Old Copper Culture / Complex*

Peak copper mining was from 7000 to 5000 years ago as evident from elevated lead levels in lake sediments.

Total early Indigenous copper production (1.5 billion lbs, *Drier et al, 1961 estimate*) would **exceed** Ontario's current annual copper production

Milwaukee Public Museum Diorama

Early Indigenous Manufacturing

- Mined copper was used for utilitarian purposes: axes, chisels, wedges, pikes, awls, needles, fish hooks, harpoons, knives, and projectile points

Rat-tail points

Saw-tooth base points

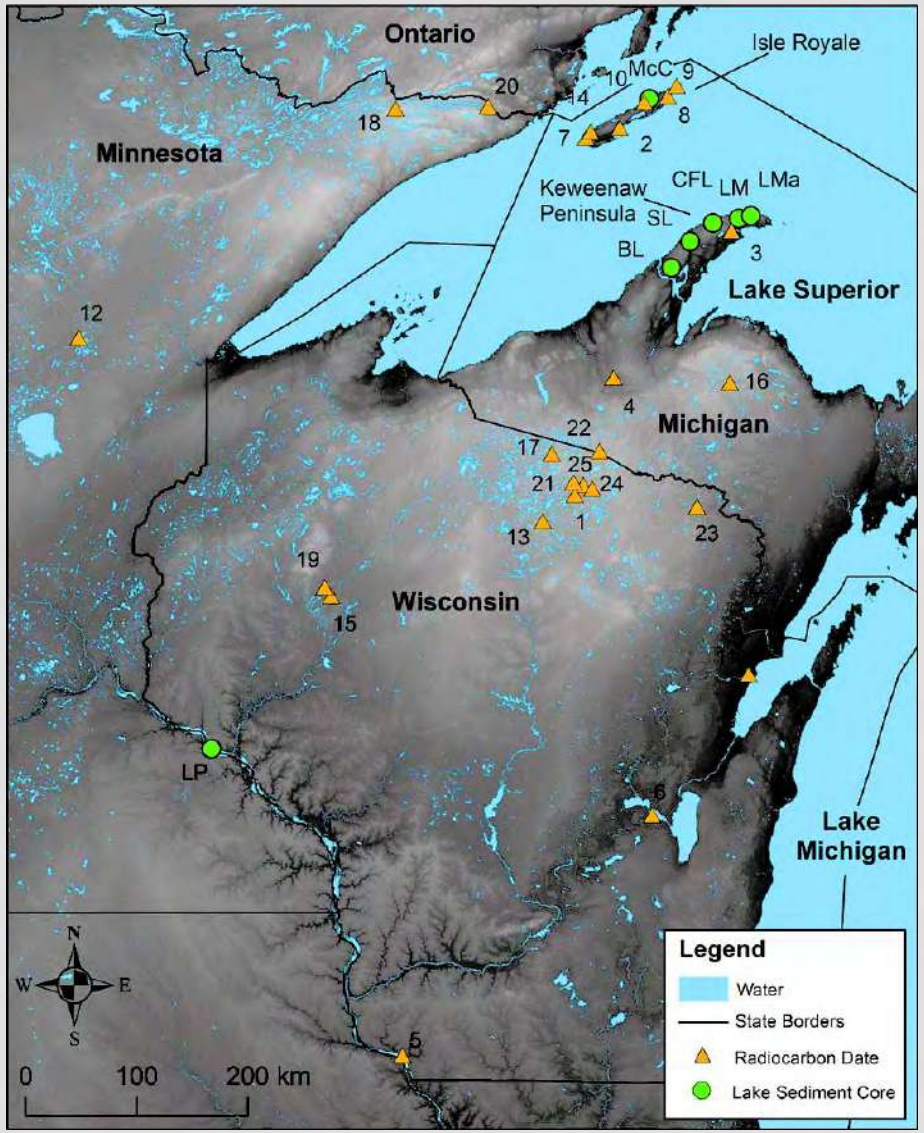
Harpoon points

All tools shown were fabricated over 5000 years ago from mined copper

Later Indigenous Copper Usage

Copper artifacts are found away from mines adjacent Lake Superior. Similar Indigenous mining in the Arctic involved copper trading between communities.

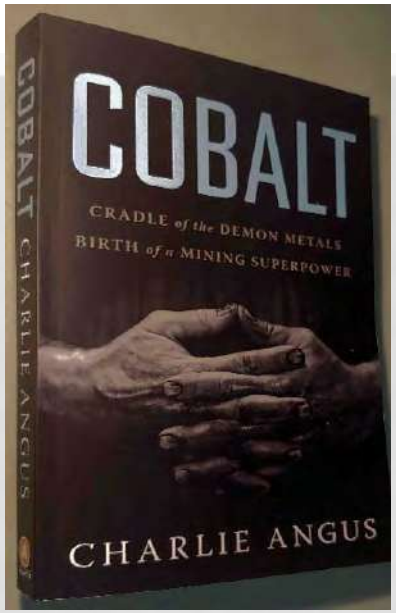
About 3500 years ago, copper usage changed to include beads, necklaces and pendants.



1800's – An Overview

- Starting in 1842, "government" geologists and specialists observed the terrain, geology, ethnology and mineral occurrences with the assistance of Indigenous guides and meetings with community members. (Zaslow, 1975)
- Ethnology data was eventually documented in 30 anthropological reports (12 for Ontario; Appendix B)
- Early government surveys and railroad building resulted in "mineral "discoveries" and new systems were soon needed by governments to manage mineral development.
- The system changed from an exclusive regional mineral title ownership by one company to a competitive "finders-keepers" claim model.
- In theory, this created the opportunity for persons with local knowledge to benefit through participation in mineral resource discovery and development.
- Around Confederation, federal land use management shifted to provinces whereby "mineral claim staking" became formalized as the means to provide a form of legal assurance to a "stake-holder" who then needed to prove the mineral potential of their claim within specified time limits through "assessment work". Today's obligations are similar.

Early Indigenous Mining



Charlie Angus's 2022 best-seller *Cobalt* provides numerous accounts of Indigenous participation in Ontario's mining history.

Silver objects from Algonquin and Ojibway mining and manufacturing industries in the Cobalt-Gowganda region are found in "Hopewell Culture" sites (200-500 CE) centred along the Mississippi River.

Indigenous peoples around Lake Timiskaming over the past 200 years were repeatedly forced to migrate north despite the efforts of leaders like Chief Ignace Tonené who recognized gold in outcrops and then methodically followed the new laws and staked the first gold claims in the Kirkland Lake – Larder Lake gold camp; only to have them claim-jumped in 1906 by prospectors and developers who built and prospered from the rich Kerr-Addison Mine.

Indigenous Participation: Then and Now

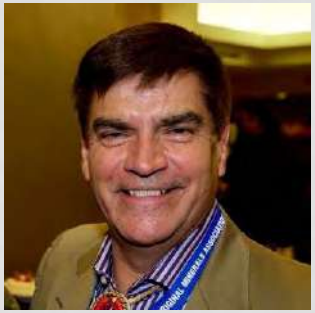
In 1896, “Skookum Jim” Mason, a prospector and Tagish member of the Dak l’a Weidi Clan, along with his nephew, his sister and her American husband and prospector George Carmack staked, discovered and developed gold from Rabbit/Bonanza Creek which started the Klondike Gold Rush.

For the past 15 years, the Prospectors and Developers Association of Canada (PDAC) has annually awarded the Skookum Jim Award to a Canadian Indigenous person who has demonstrated exceptional achievement and/or service to the mining industry. Five recent recipients include:

2023: Glenn Nolan

2022:Colin Webster

2021 Nalaine Morin



2020 Hans Matthews

2019 Gordon Maxwell

Traditional Staking 1864-2018

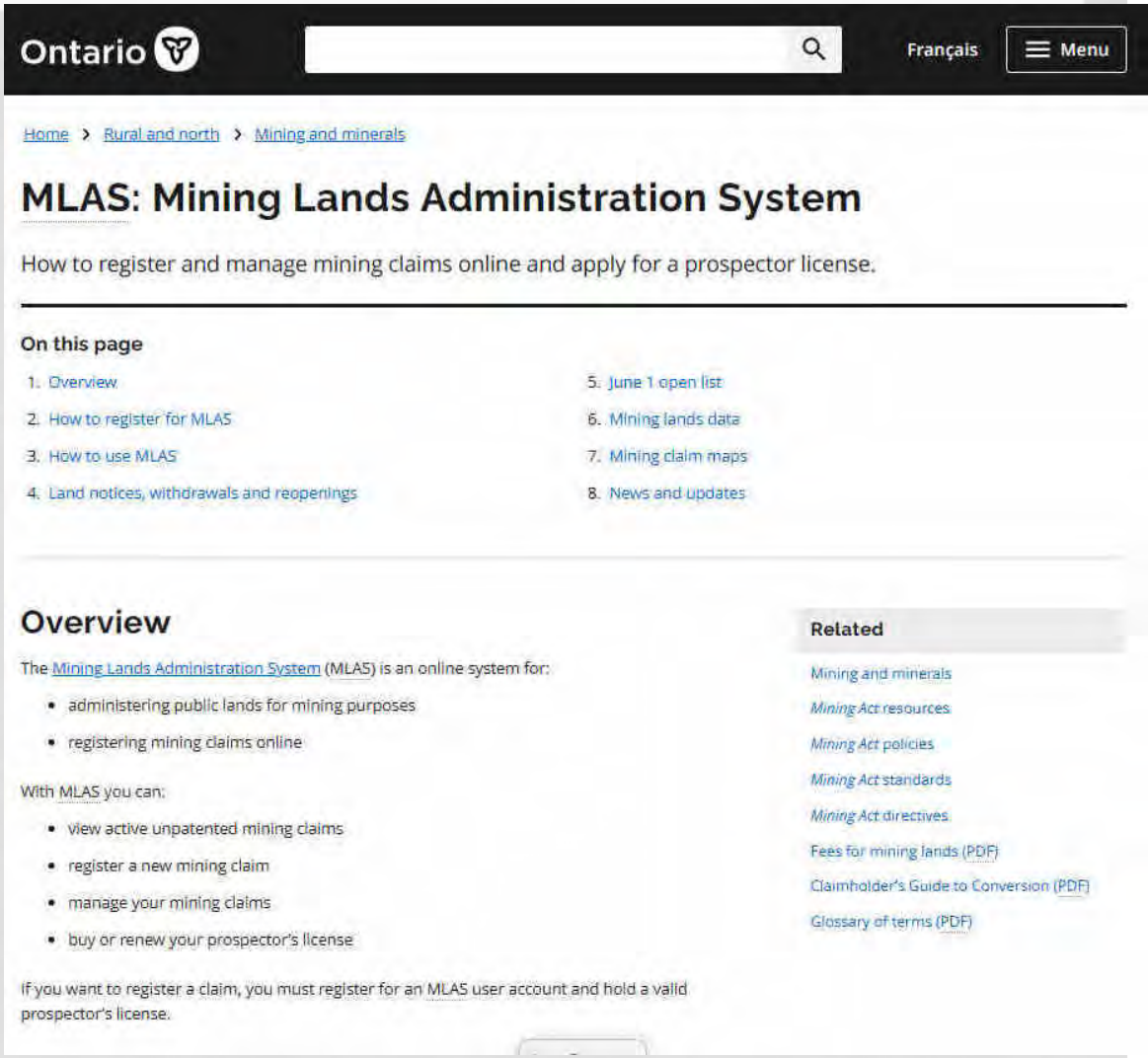
- Mineral tenure laws for Ontario were first introduced in 1864.
- Laws allowed rapid discovery to development timelines as seen with nickel mines in Sudbury (1883-1888), silver mines in Cobalt (1903-1905) and gold mines in Timmins/Porcupine (1906-1910)
- Major 1908 revisions to the *Mining Act of Ontario* lasted a century

Physical mineral claim staking was used for over 150 years in Ontario where 4 claim posts with metal tags were to be erected 400 metres apart with clearly marked boundaries between claim posts.

Grounds for dispute were common and technology permitted a good alternative.

Current Mineral Staking

- In the past 50 years across Canada, mineral tenure acquisition laws changed to map-staking which has many environmental, social and economic benefits over traditional claim-staking.
- Ontario adopted online map-staking in 2018
- Aggregate and industrial mineral tenure/permits follow different paths.



Ontario | Français | Menu

Home > Rural and north > Mining and minerals

MLAS: Mining Lands Administration System

How to register and manage mining claims online and apply for a prospector license.

On this page

1. Overview
2. How to register for MLAS
3. How to use MLAS
4. Land notices, withdrawals and reopenings
5. June 1 open list
6. Mining lands data
7. Mining claim maps
8. News and updates

Overview

The Mining Lands Administration System (MLAS) is an online system for:

- administering public lands for mining purposes
- registering mining claims online

With MLAS you can:

- view active unpatented mining claims
- register a new mining claim
- manage your mining claims
- buy or renew your prospector's license

If you want to register a claim, you must register for an MLAS user account and hold a valid prospector's license.

Related

- Mining and minerals
- *Mining Act* resources
- *Mining Act* policies
- *Mining Act* standards
- *Mining Act* directives
- Fees for mining lands (PDF)
- Claimholder's Guide to Conversion (PDF)
- Glossary of terms (PDF)

MLAS: Mining Lands Administration System | ontario.ca

UNDRIP

- 1982-2007: a 25-year consultation resulted in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

- The 2015 Truth and Reconciliation Commission records Calls to Action #43 and #44 with respect to UNDRIP.

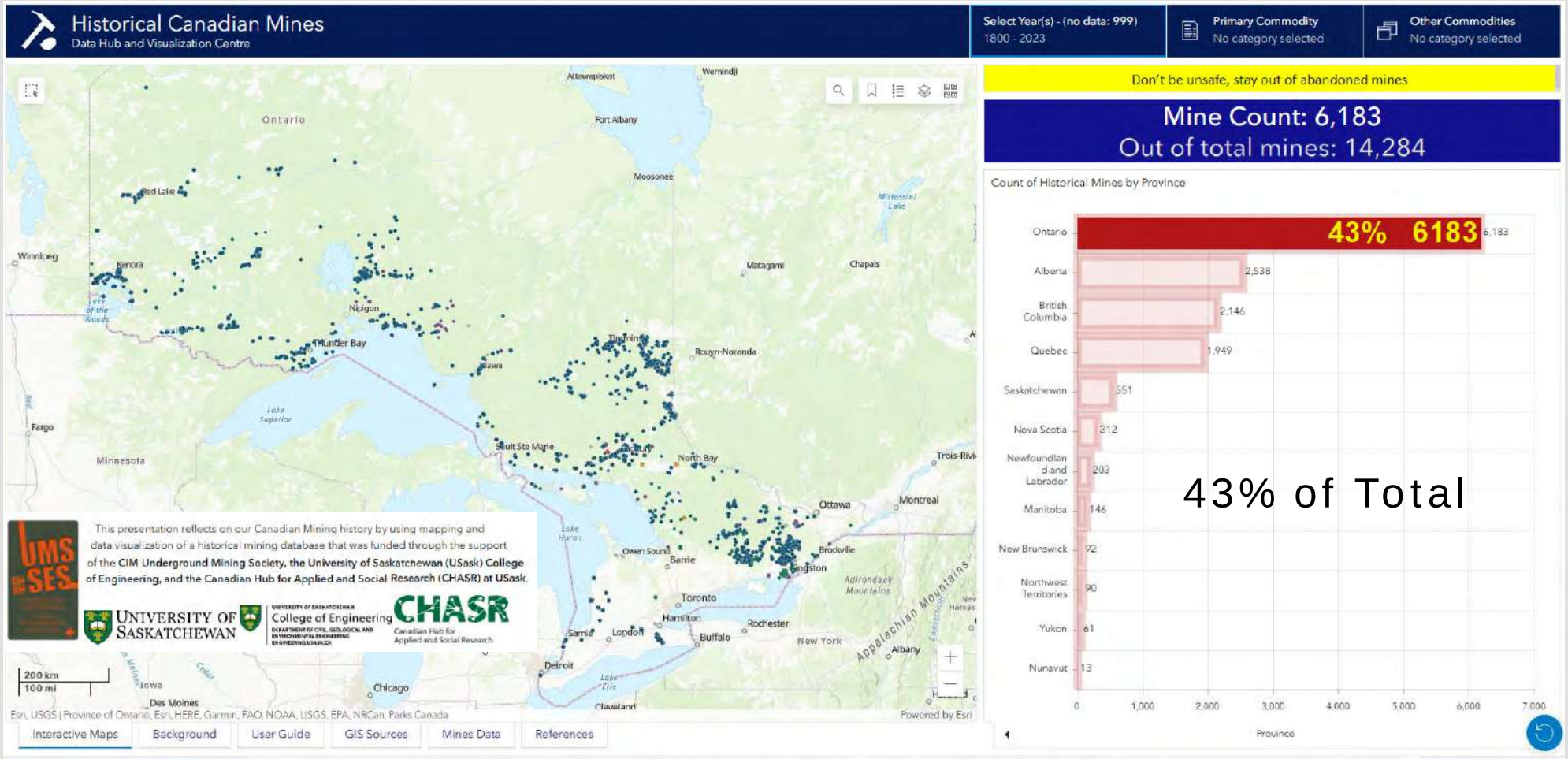
#43. We call upon federal, provincial, territorial, and municipal governments to fully adopt and implement the UNDRIP as the framework for reconciliation.

#44. We call upon the Government of Canada to develop a national action plan, strategies, and other concrete measures to achieve the goals of the UNDRIP.

- Canada's UNDRIP Act (June 21, 2021): federal legislation
- British Columbia's 2019 UNDRIP Act on provincial legislation

- The Ontario government introduced Bill 76 (a UNDRIP Act) in March 2019 that passed second reading and was referred to the Standing Committee on General Government. The government was re-elected in 2022.

Historical Ontario Mines 1800 to present



https://www.arcgis.com/apps/dashboards/780a4bc0aa524cc38e10a4699bc3511e

Historical Mines and Systems Are Under Review Today

Numerous reviews are still being undertaken related to sharing the resource wealth harvested from the Land.

- **1850 Robinson-Huron Treaty annuities**: $10 billion (2023)
- UNDRIP-backed reviews on **British Columbia's online staking system** remains to be sorted out in British Columbia (2023).
- There are still many historical issues to be sorted out at this inter-governmental level.
- Historical minesite reclamation could represent an opportunity.

Communities and Industry Are Looking Forward

In the past 30 years, there have been a wide variety of **forward-looking agreements** made for mineral exploration and development projects between communities and mining industry proponents and many more agreements are still in progress.

Project proponents prefer working with community businesses near their project whenever possible.

Community businesses make themselves more attractive to proponents when the businesses can demonstrate significant Indigenous participation. (An opportunity for EDO's)

Indigenous community businesses can maximize the benefits of set-aside contracts for procurement of goods and services that are included in Community-Proponent agreements or other agreements.

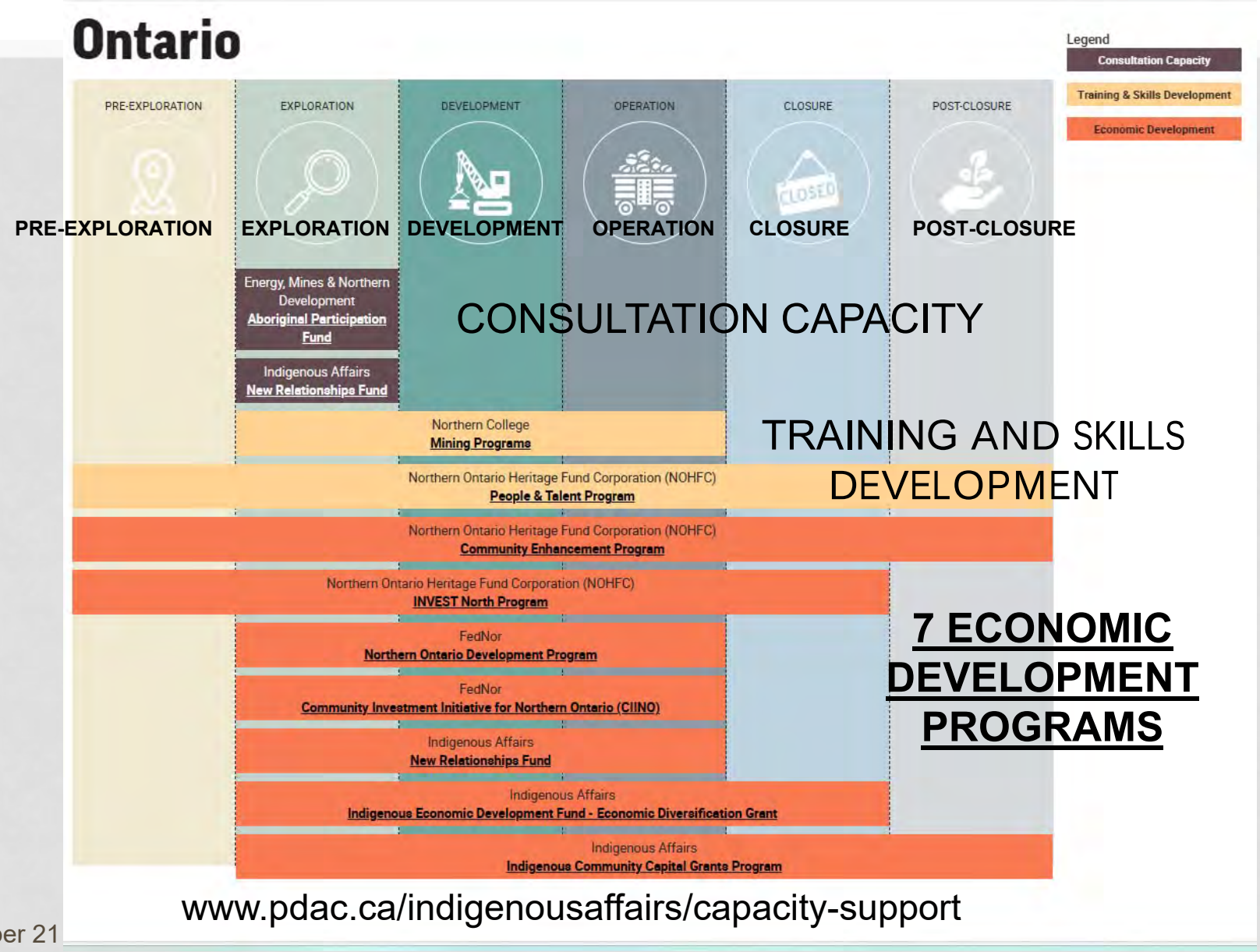
Indigenous Community Active Mining Agreements

Current Ontario Agreements

Impact and Benefits Agreement	17
Socio-Economic Agreement	2
Exploration Agreement	43
Participation Agreement	2
Cooperation Agreement	2
Memorandum of Understanding	60
Letter of Intent	4
Surface Lease Agreement	1
Other Agreement Type	11

INDIGENOUS PARTICIPATION AND OPPORTUNITY

SOME MINING STAGES



CONSULTATION CAPACITY

TRAINING AND SKILLS DEVELOPMENT

7 ECONOMIC DEVELOPMENT PROGRAMS

www.pdac.ca/indigenousaffairs/capacity-support

Part 1b: Economic and Environmental Benefits For Canada

- “Canadian mining” employs 665,000 people; 403,000 directly
- 106,000 in “mining” (near mine) versus 297,000 in “mineral processing” (away from mine; smelters/refineries, corporate)
- Inter-provincial work for professionals is common in mining.
- Mineral exploration and development projects naturally have high staff turnover because of seasonality and specialized skillsets for each project stage.
- 16,500 Indigenous people employed in mining which is the most employed in any non-governmental sector.
- minerals represent 22% of merchandise exports; $127 billion
- 155 million tonnes of minerals move on trains annually (53% of tonnage)

Mineral Economics "By-The-Numbers"

- In 2021; the Canadian mining sector accounted for $125 billion or 5% of Canada's Gross Domestic Product.

- 2022: Canadian **mineral** production value was $61.4 billion

Mining is part of the **Primary "Resource" Sector** in the Canadian Economy

- Primary "Resource" Sector = 13% ($247 billion)
- Secondary "Manufacturing Sector = 17% ($319 billion)
- Tertiary "Services" Sector = 70% ($1318 billion)

Sources: Statscan, NRCAN, MAC

Canadian Primary "Resource" Sector Components (% Value in Sector; 13% of Canadian GDP)

The 2022 Canadian Primary "Resource" Sector

48%: Fossil fuel industries ($114 billion)

18%: Electrical, gas, water utilities ($42 billion)

17%: Agriculture ($41 billion)

15%: Mining ($35 billion)

1.6% Forestry ($3.6 billion)

0.5% Wildlife ($0.5 billion)

GRAPHIC COMPARISON OF THE 2022 ENTIRE CANADIAN ECONOMY BASED ON GDP CONTRIBUTIONS

						% Economy
TERTIARY "SERVICES" SECTORS	SERVICES					70%
SECONDARY "MANUFACTURING" SECTORS	MANUFACTURING					17%
PRIMARY "RESOURCE" SECTORS	1 2	MINING	AGRICULTURE	UTILITIES	FOSSIL FUELS	13%
WILDLIFE						
FORESTRY						
Percentage of Primary Resource Sector	1 2	15%	17%	18%	48%	100%

Economic and Environmental Benefits in Ontario

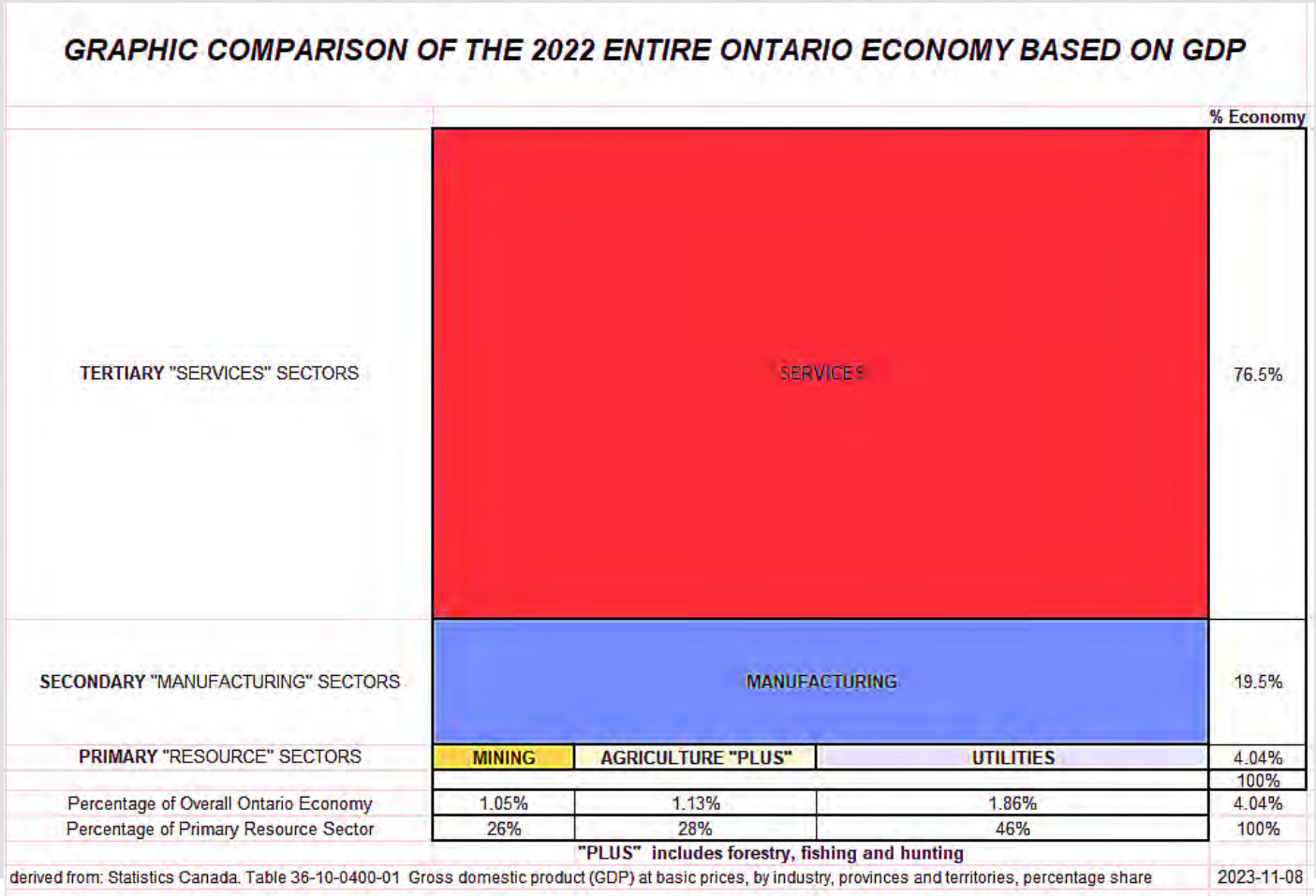
- Ontario Mining Association reports the 2016 Census found the mining industry workforce was 9% Indigenous and 13% women.
- Ontario's mining sector currently employs ~78,000 people
- ~31,000 jobs are directly in "mining" and another ~47,000 jobs are in "mineral processing & services"

Today's Ontario mining industry is safer, better-paid and better-regulated than 30 years ago.

It has an evolving and highly regulated professional sub-culture whose primary duty is protection of the public and the environment.

Economic and Environmental Benefits in Ontario

In 2022; the Ontario mining sector accounted for $13.5 billion or 22% of Canada's total mineral production value. This is comparable to Quebec who have a similarly rich natural geological endowment.



ECONOMIC OVERVIEW

Part 1c: Today's Mineral Developments Across Ontario

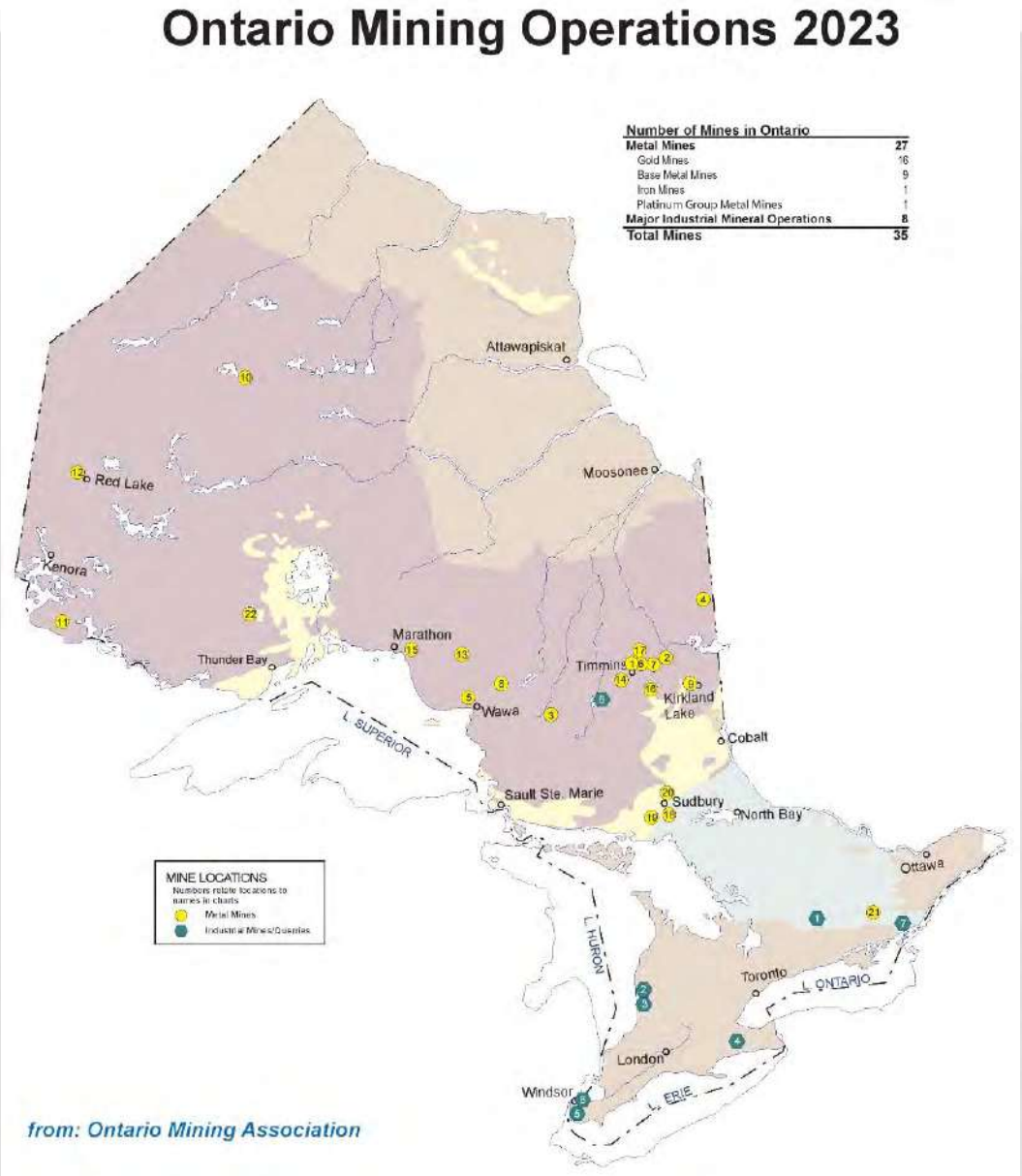
$13.5 billion value from Ontario mineral production (2022)

5192 aggregate pits and quarries

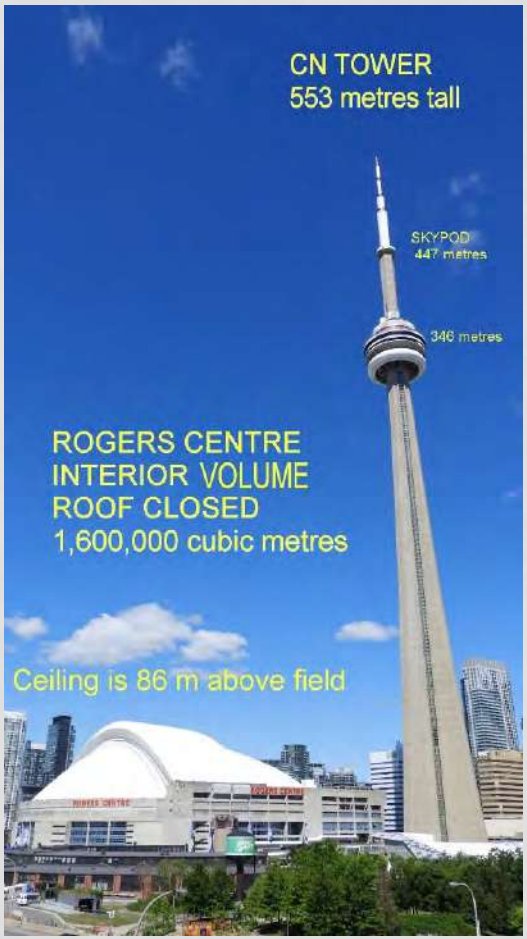
17 precious metal mines
9 base metal mines
9 industrial mineral mines
35 mines operated by 21 companies

2022: $989m invested in mineral exploration on 323 projects

>43 Advanced Exploration Projects



Some Comparisons for Unfamiliar Units Commonly Used In Discussing Mineral Economics



Today's precious metal mines have very large tonnages with very low grades that can only be reliably determined by systematic sampling and accurate assaying.

"High grade" precious metal results are 6 grams per tonne which can also be stated as 6 parts per million (ppm) or 0.2 troy ounces per tonne. …What's that mean?

……

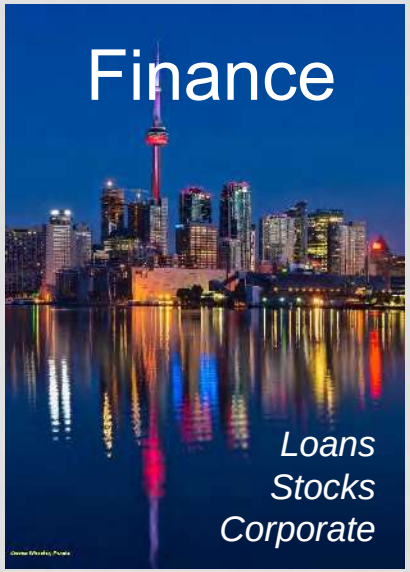
The sun's shadow cast by a baseball covers 6 parts per million of the 90' square MLB infield = 0.0006% = 6 grams per tonne = 6000 parts per billion (ppb). Only 15 ppb can spark interest in exploration (400x)

The shadow of a hockey puck on a NHL rink = 3 parts per million

The shadow of a golf ball on a MLB infield is = 2 ppm = avg PGE ore

The shadow of a golf ball on a hockey rink is = 1 ppm

Ontario's Mining Industry Major Components



TMX & TMV 2022 Equity Financings

- CDN $ 7.5 Billion
- CDN $ 1035 Million In Flow-Through Shares
- 29% of the Global US$17 Billion Invested In New Mining Equities

2022 Sales Value

CDN $1.588 Billion

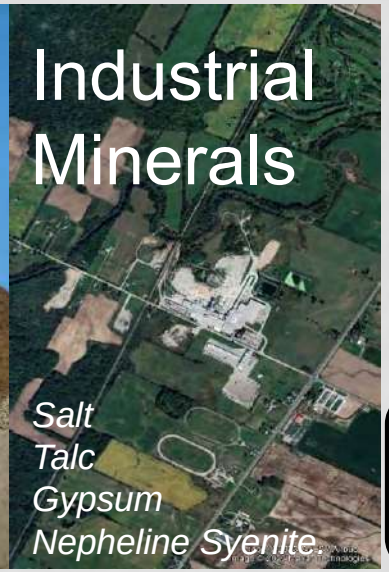
12 % Sales

5912 sites,
100's of operators

164 million tonnes

~nil waste

40 "Rogers Centres"



2022 Sales Value

CDN $ 0.997 Billion

7 % Sales

9 minesites,
7 operators

11.1 million tonnes

~2% waste

~3 "Rogers Centres"

2022 Sales Value

CDN $ 3.906 Billion

29 % Sales

9 minesites,
3 operators

6.4 million tonnes mined

~96% waste

~1 "Rogers Centre"

2022 Sales Value

CDN $ 7.002 Billion

52% Sales

17 minesites,
11 operators

145 million tonnes mined
99.99994 % waste

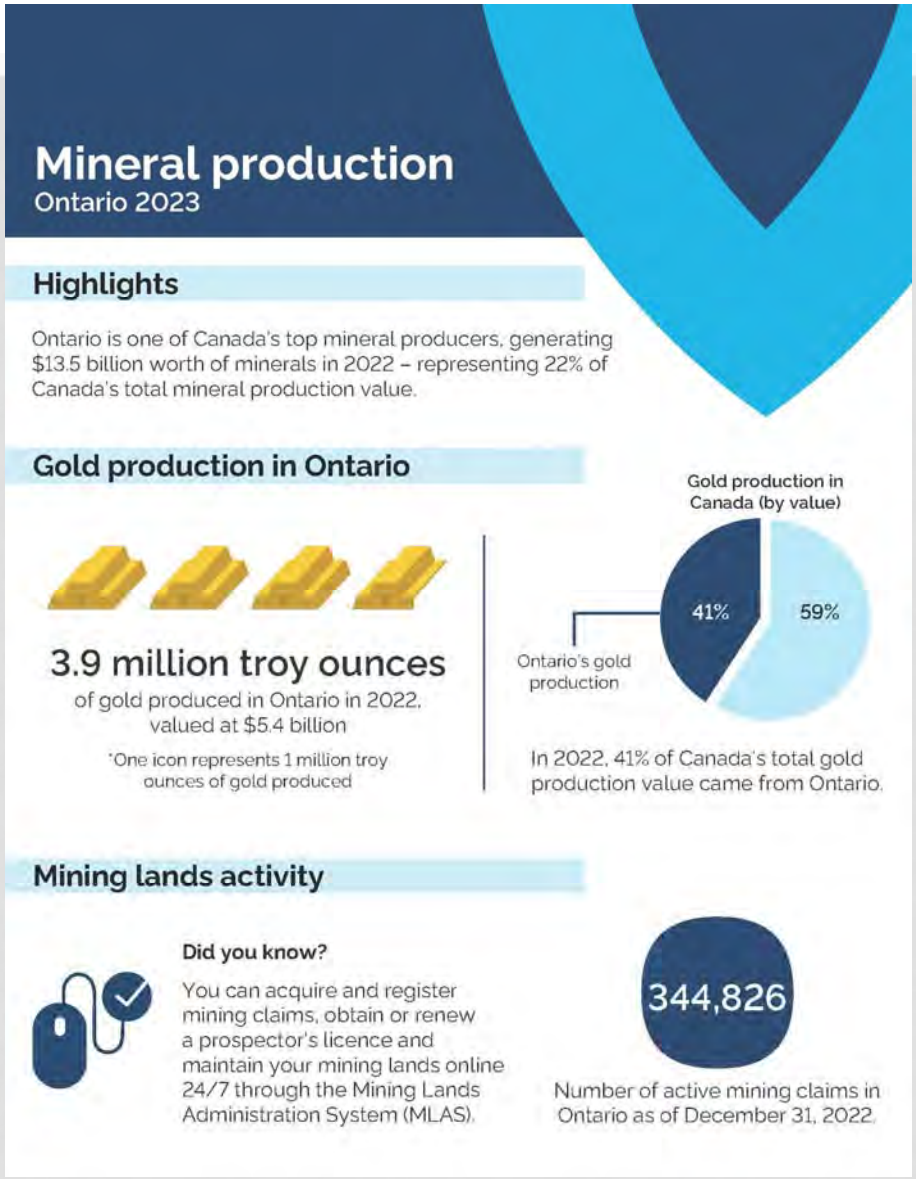
~30 "Rogers Centres"

Mineral Commodity Value Per Kilogram (Ontario; CDN$/kg)

COMMODITY	PRODUCT VALUE CDN$ / kg	SUB-SECTOR	SHIPPED VALUE ($ CDN MILLION)	% Shipped Ontario Mineral Value (2022p)	OVERALL SUB-SECTOR VALUE
Platinum Group Elements (Pd & Pt)	$ 96,585.80	Precious Metals **$ 66,809 per kg**	$ 1,644	12%	**52%**
Gold	$ 57,672.93		**$ 5,358**	40%	
Cobalt	$ 77.71	Base Metals **$ 20.59 per kg**	$ 96	1%	**29%**
Nickel	$ 26.42		$ 1,883	14%	
Copper	$ 12.04		**$ 1,926**	14%	
Wollastonite	$ 0.41	Industrial Minerals **$ 0.12 per kg**	$ 8	0.1%	**7%**
Clay products	$ 0.29		$ 119	1%	
Nepheline syenite	$ 0.20		$ 140	1%	
Lime	$ 0.19		$ 161	1%	
Salt	$ 0.04		**$ 568**	4%	
Stone	$ 0.010	Aggregate **$ 0.01 per kg**	**$ 809**	6%	**12%**
Sand and gravel	$ 0.009		$ 779	6%	
Clay	$ 0.005		$ 0.4	0.003%	
			$ 13,493		**100%**

Derived From: Projected 2022 NRCAN Shipment Values For Ontario

2022 ONTARIO BASE AND PRECIOUS METALS PRODUCTION



Production and exploration by critical mineral type

Critical mineral	Details
Chromite	The Ring of Fire, in the Far North of Ontario, has the second largest chromite deposit globally in terms of tonnes of ore resources.
Cobalt	In 2022, Ontario produced an estimated 1,235 tonnes of by-product cobalt worth approximately $96 million, making up 36% of Canada's cobalt production.
Copper	Copper produced in Ontario in 2022 totaled 32% of Canada's copper production by value, with 160,030 tonnes valued at $1,926 million.
Graphite	Ontario has several active graphite exploration programs.
Lithium	Ontario has several hard-rock lithium deposits that are being actively explored in the hopes of eventually supplying raw materials for electric vehicle batteries.
Nickel	In 2022, Ontario produced 71,277 tonnes of nickel valued at $1,883 million (45% of Canada's nickel production by value).
Platinum Group Elements	In 2022, Ontario produced 77% of Canada's PGE* production by value with an estimated 547,232 troy ounces of PGE valued at $1,644 million.
Vanadium	Ontario has exploration potential for vanadium exploration in the southeastern Ontario.

* Platinum Group Elements (PGE) include: platinum (Pt), palladium (Pd), rhodium (Rh), ruthenium (Ru), iridium (Ir) and osmium (Os)

World's largest mining capital market: TSX & TSX-V

Toronto, Ontario is the mining finance capital of the world.

The Toronto Stock Exchange (TSX) and Toronto Venture Exchange (TSX-V) list more mining companies than any other exchange with over 1,150 listed in 2022. The Toronto Stock Exchange and Toronto Venture Exchange are first among exchanges worldwide in equity capital raised and are home to about 40% of the public mining companies in the world.

ONTARIO CANADA

For more information about Ontario's mineral resources:

ontario.ca/mineralsector

mineralsinfo@ontario.ca

+1 888 415-9845

Note: All monetary values are in Canadian dollars. This information is accurate to April 20, 2023.

Source: Natural Resources Canada and the Ministry Mines.

ANNUAL VOLUMES OF FINAL PRODUCTS SOLD

The volume of the "Rogers Centre" with the roof closed is 1,600,000 cubic metres.

Annual (2022) Ontario mined volumes for each mineral sectors are:

AGGREGATE = **40** filled "Rogers Centres"

INDUSTRIAL MINERALS = **~ 3** filled "Rogers Centres"

BASE METALS = 26,038 cubic metres **won** from **1** filled "Rogers Centre"
Equivalent to the Blue Jays baseball infield filled 35 metres (113') high, (40% to roof)

PRECIOUS METALS= **7.6** cubic metres won from **30.4** "Rogers Centres"
Equivalent to a cube with **63** centimetre sides per "Rogers Centre"

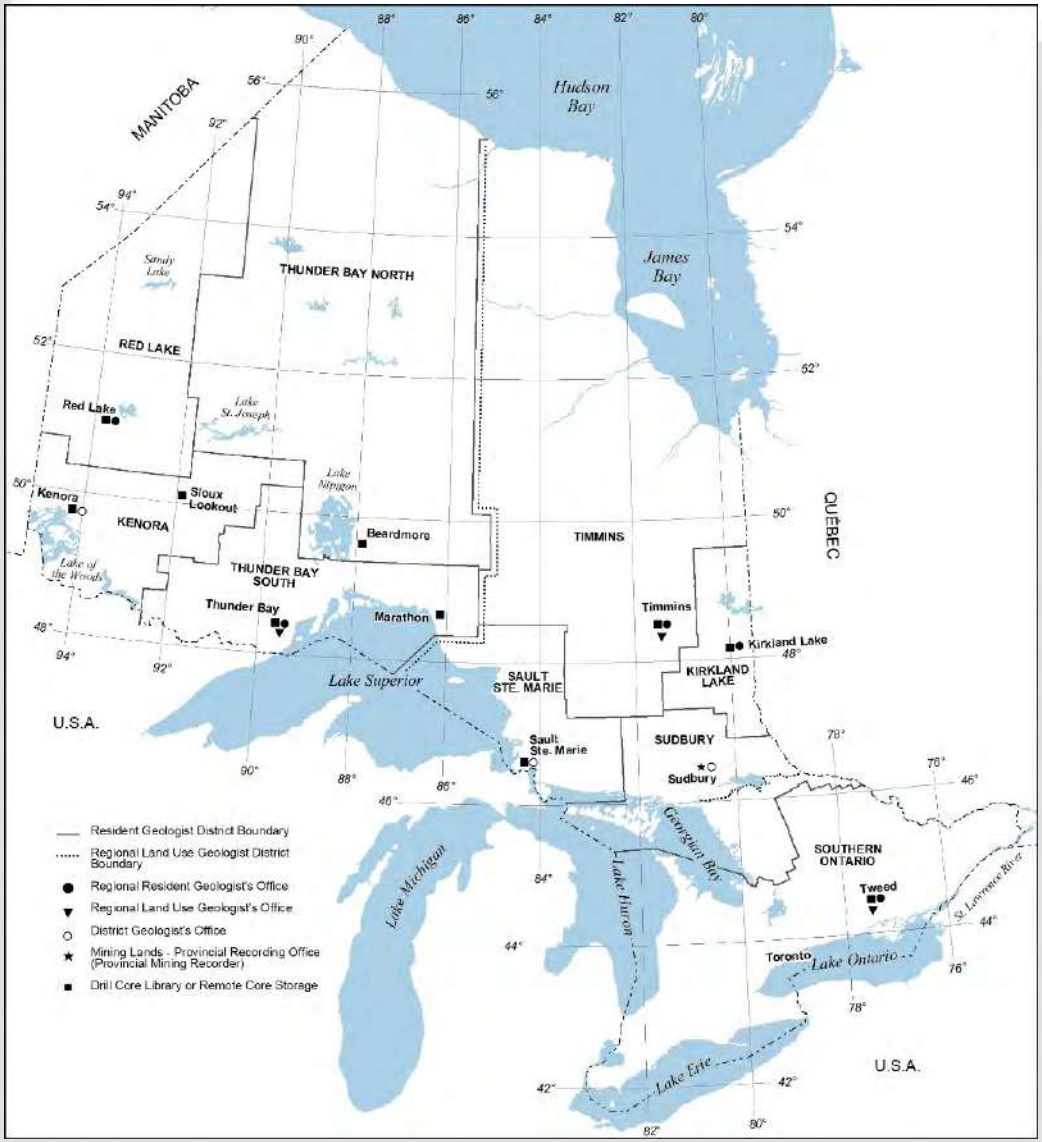
Gold = 6.28 cubic metres pure gold **won** from 29.6 "Rogers Centres" mined rock
Palladium and Platinum = 1.33 cubic metres metal from 0.83 "Rogers Centres" rock

Where to Find Information

The first resource contact should be your region's Ontario Geological Survey Resident Geologists Office and their detailed annual reports available online.

Other sources are provided at the end of this presentation in Appendix A.

Ontario Geological Survey Resident Geologist Program



10 Districts, 8 Offices

6 Annual Reports of Activities

Reports provide information on the following:

- mining activity
- exploration activity
- Resident Geologist staff activities
- property examinations
- recommendations for exploration
- land use planning

CITY	ADDRESS	OFFICE(S)	TELEPHONE
Kenora	Suite 104, 810 Robertson St., Kenora P9N 4J2	○ ■	(807) 468-2813
Red Lake	227 Howey Street, P.O. Box 324, Red Lake P0V 2M0	● ■	(807) 727-3272
Thunder Bay – North Thunder Bay – South	Suite B002, 435 James St. S., Thunder Bay P7E 6S7	● ■ ▼	(807) 475-1332
Sault Ste. Marie	740 Great Northern Road, Sault Ste. Marie P6B 0B4	○ ■	(705) 943-2219
Timmins	Ontario Government Complex, P.O. Bag 3060, 5520 Hwy 101 East, South Porcupine P0N 1H0	● ■ ▼	(705) 235-1615
Kirkland Lake	1451 Hwy. 66, P.O. Box 40 Swastika P0K 1T0	● ■	(705) 718-8735
Sudbury	Willet Green Miller Centre, Level A3, 933 Ramsey Lake Rd., Sudbury P3E 6B5	○ ★	(705) 670-5733 (705) 670-5742 Toll-Free (Canada, USA (888) 415-9845
Tweed (Southern Ontario)	P.O. Bag Service 43, 126 Old Troy Rd., Tweed K0K 3J0	● ■ ▼	(613) 243-0739

www.geologyontario.mndm.gov.on.ca/report_of_activities_en.html

AGGREGATE
5912 Pits and Quarries

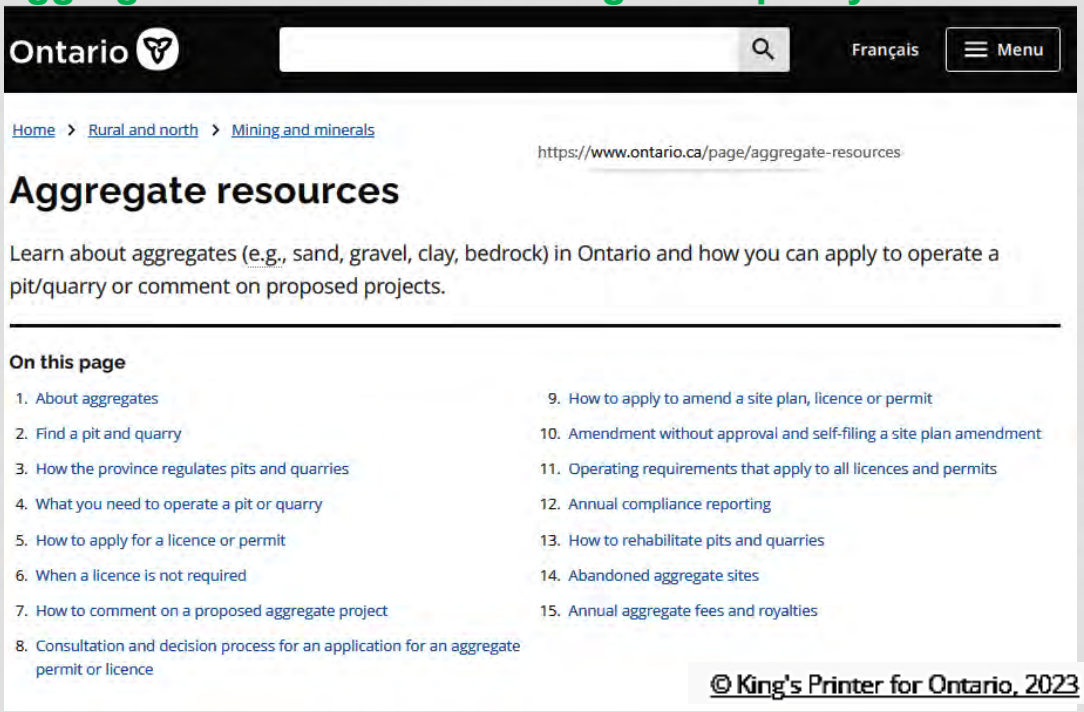
Pits and Quarries Online (gov.on.ca)

Ontario Aggregate Industry Information

- Principle Legislation: *Aggregate Resources Act*
- $1.6 Billion contribution to Ontario GDP (12%)
- Very low resource unit value of **$0.01 / kilogram**
- 60% of aggregate unit cost is transportation
- 40% of Ontario's consumption is in the GTA vs 25% supply

= 54% of total volume mined in Ontario: **40 Rogers Centres**

- no chemical processing, net-zero water usage, nil waste
- **aggregate is critical for drinking water purity**



Ontario | Français | Menu

Home > Rural and north > Mining and minerals

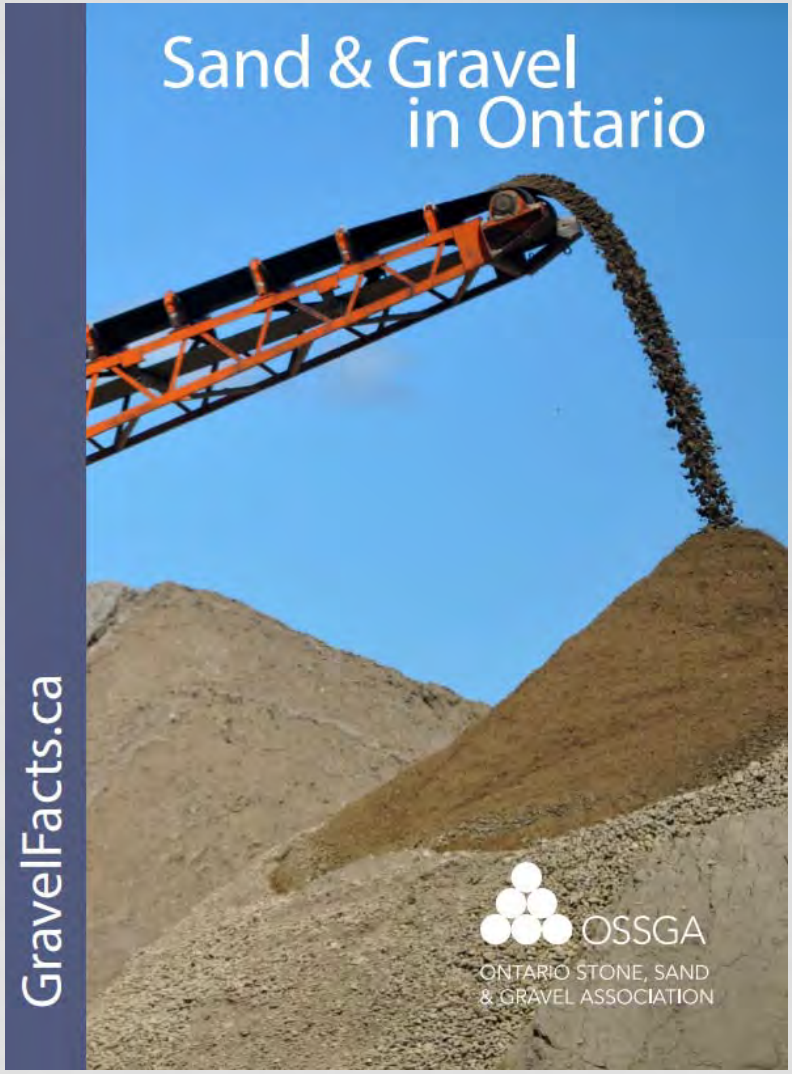
https://www.ontario.ca/page/aggregate-resources

Aggregate resources

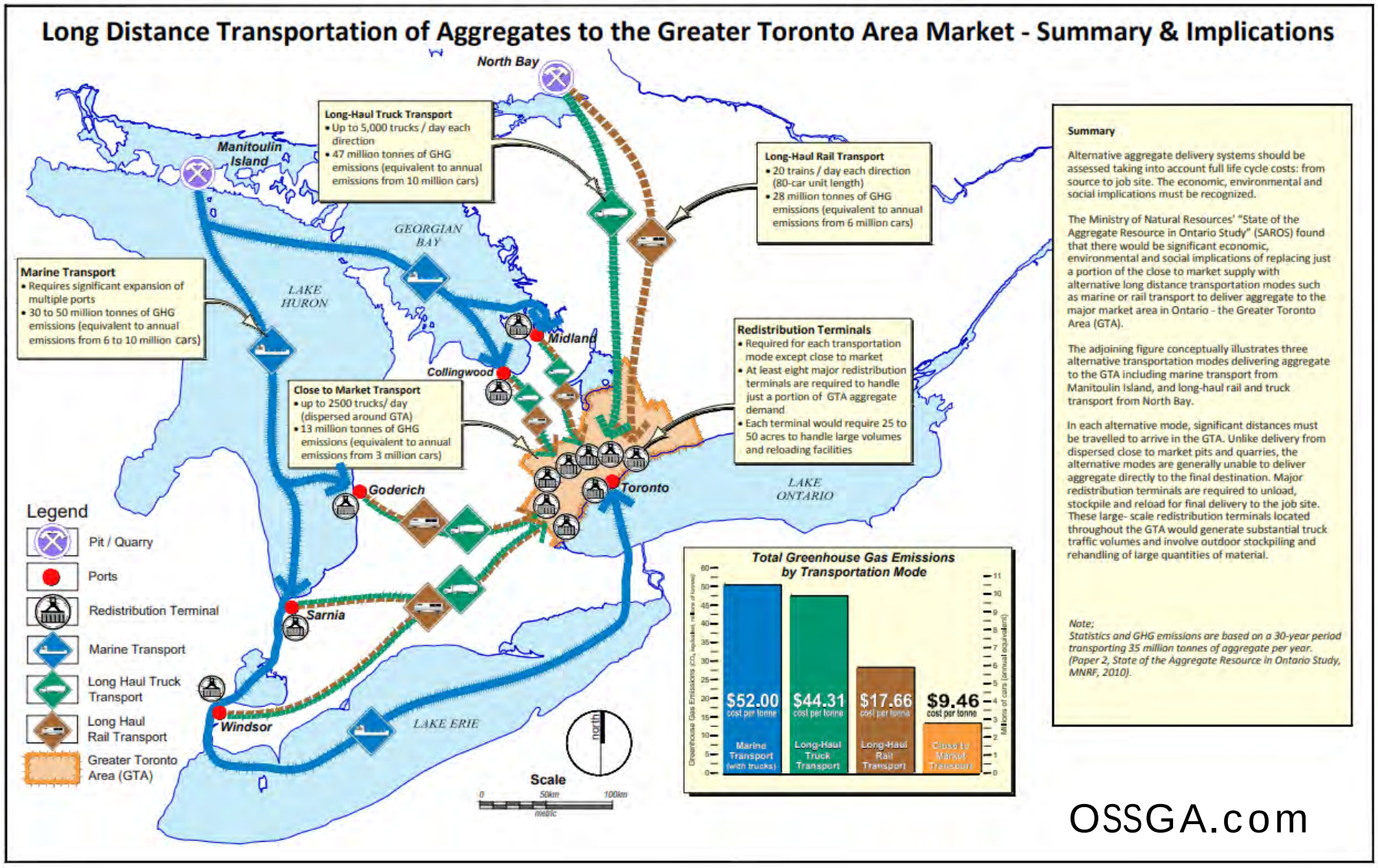
Learn about aggregates (e.g., sand, gravel, clay, bedrock) in Ontario and how you can apply to operate a pit/quarry or comment on proposed projects.

On this page

1. About aggregates
2. Find a pit and quarry
3. How the province regulates pits and quarries
4. What you need to operate a pit or quarry
5. How to apply for a licence or permit
6. When a licence is not required
7. How to comment on a proposed aggregate project
8. Consultation and decision process for an application for an aggregate permit or licence
9. How to apply to amend a site plan, licence or permit
10. Amendment without approval and self-filing a site plan amendment
11. Operating requirements that apply to all licences and permits
12. Annual compliance reporting
13. How to rehabilitate pits and quarries
14. Abandoned aggregate sites
15. Annual aggregate fees and royalties



“Don’t Make Gravel Travel”



“Aggregate” Can Include Stone

The aggregate sector has shortest and simplest mineral resource timeline from “discovery” to “development”. (An EDO opportunity consideration)

Southern Ontario provided 23% total mineral wealth in 2019 (2020=16%) due to mining in the aggregate and industrial mineral sectors.

>9000 people directly and indirectly employed in the South’s mineral industry.

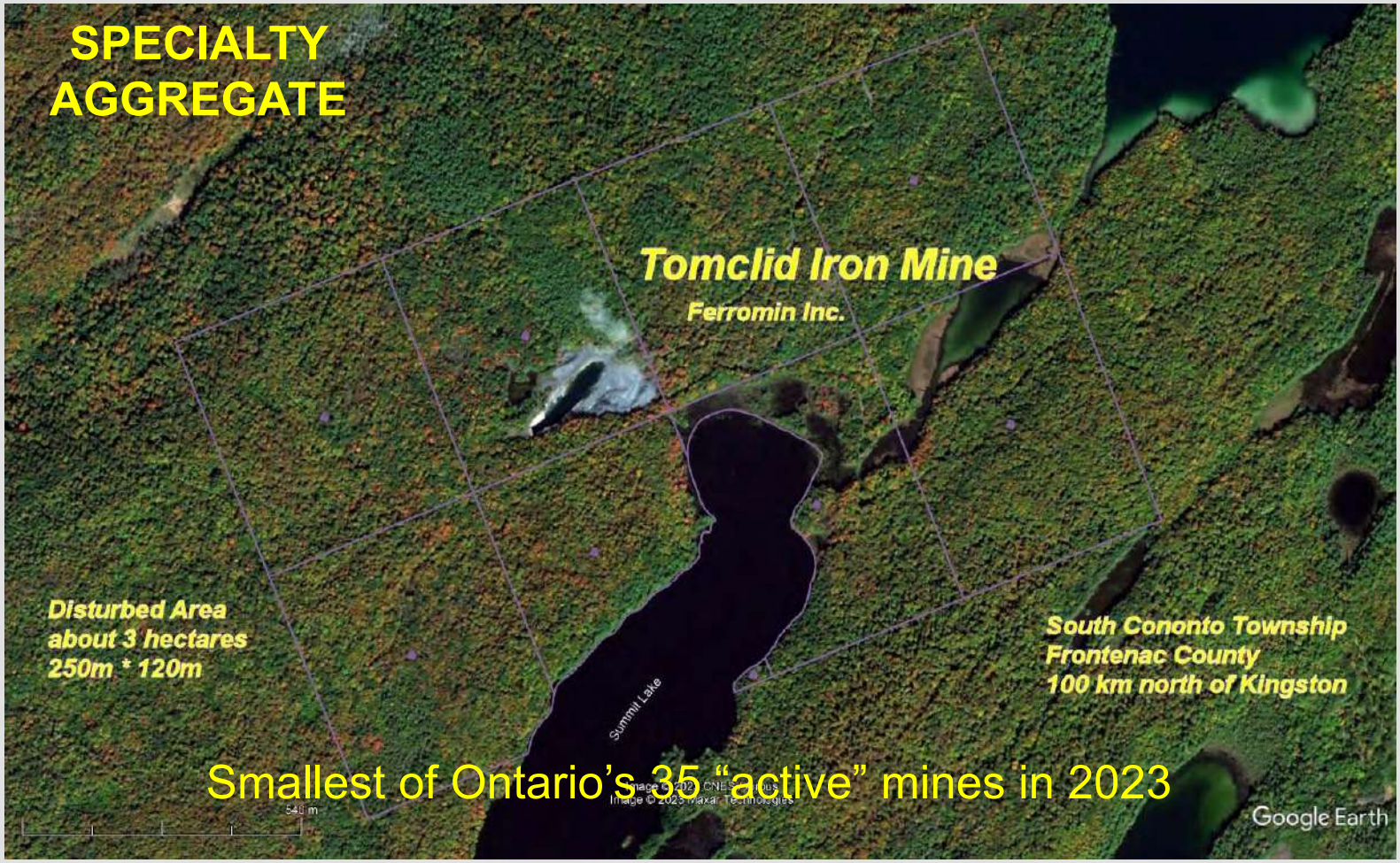
Other non-metallic stone resource sites in Southern Ontario that fall under the *Aggregate Resources Act* include:

“too numerous to list” limestone quarries
67 dimension stone quarries,
16 specialty aggregate producers
10 industrial mineral operations
6 cement producer’s quarries
4 brick producer’s quarries
5 trap rock producers
2 gemstone and mineral specimen sites

OGS Open File Report 6386, Southern Ontario Report of Activities, 2021, Resident Geologist Program

Some Other Mines Span Definitions:

Magnetite mined from a small open pit near Kingston is used in concrete in nuclear medical facilities for its more favourable higher density characteristics than normal stone



INDUSTRIAL MINERALS
9 minesites, 7 operators

Mainly in Southern Ontario

Salt: 4 operations, 2 companies

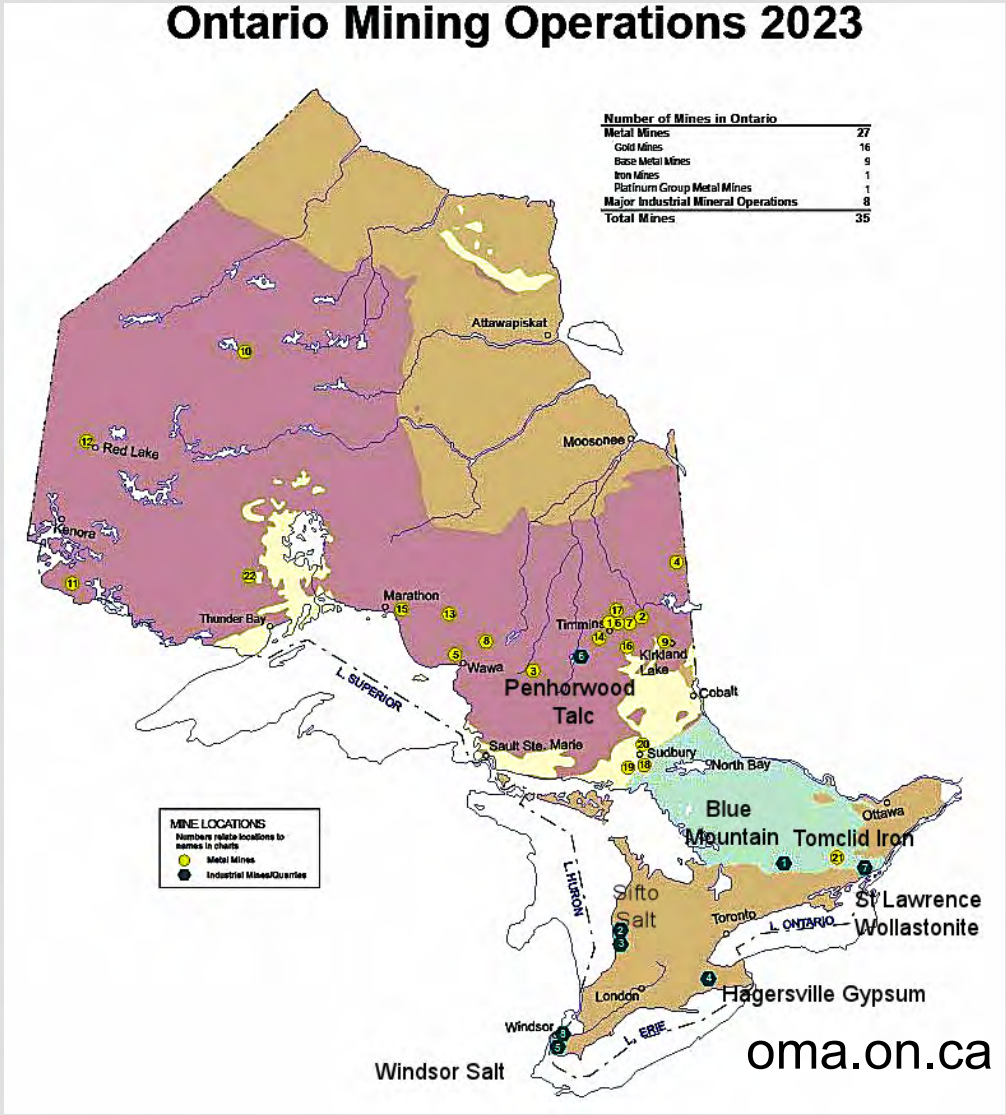
Gypsum: 1 operation

Nepheline Syenite: 1 operation

Wollastonite: 1 operation

Talc: 1 operation

Magnetite: 1 operation

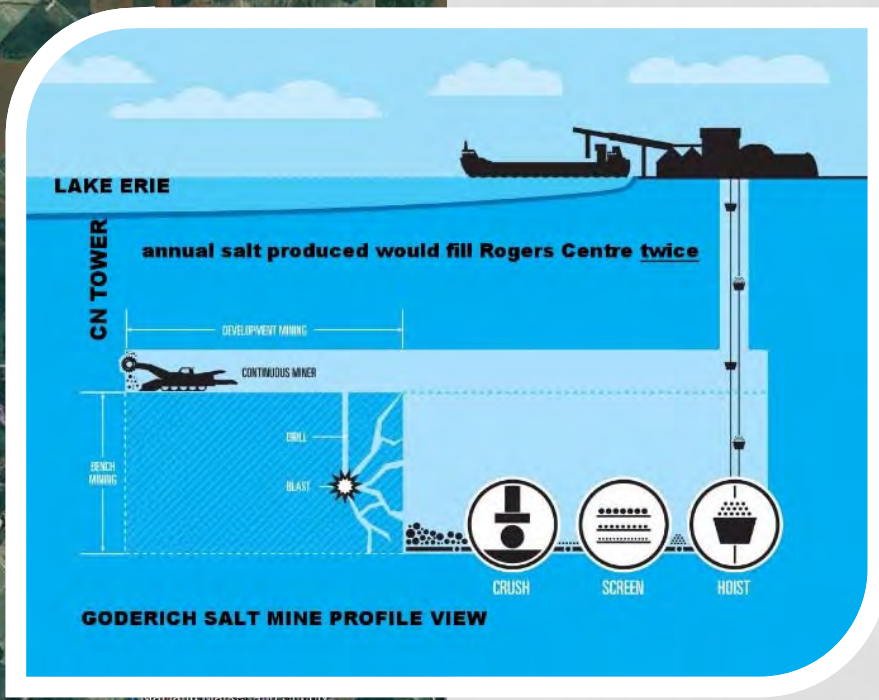


Industrial Minerals

- Principle Legislation: *Mining Act*

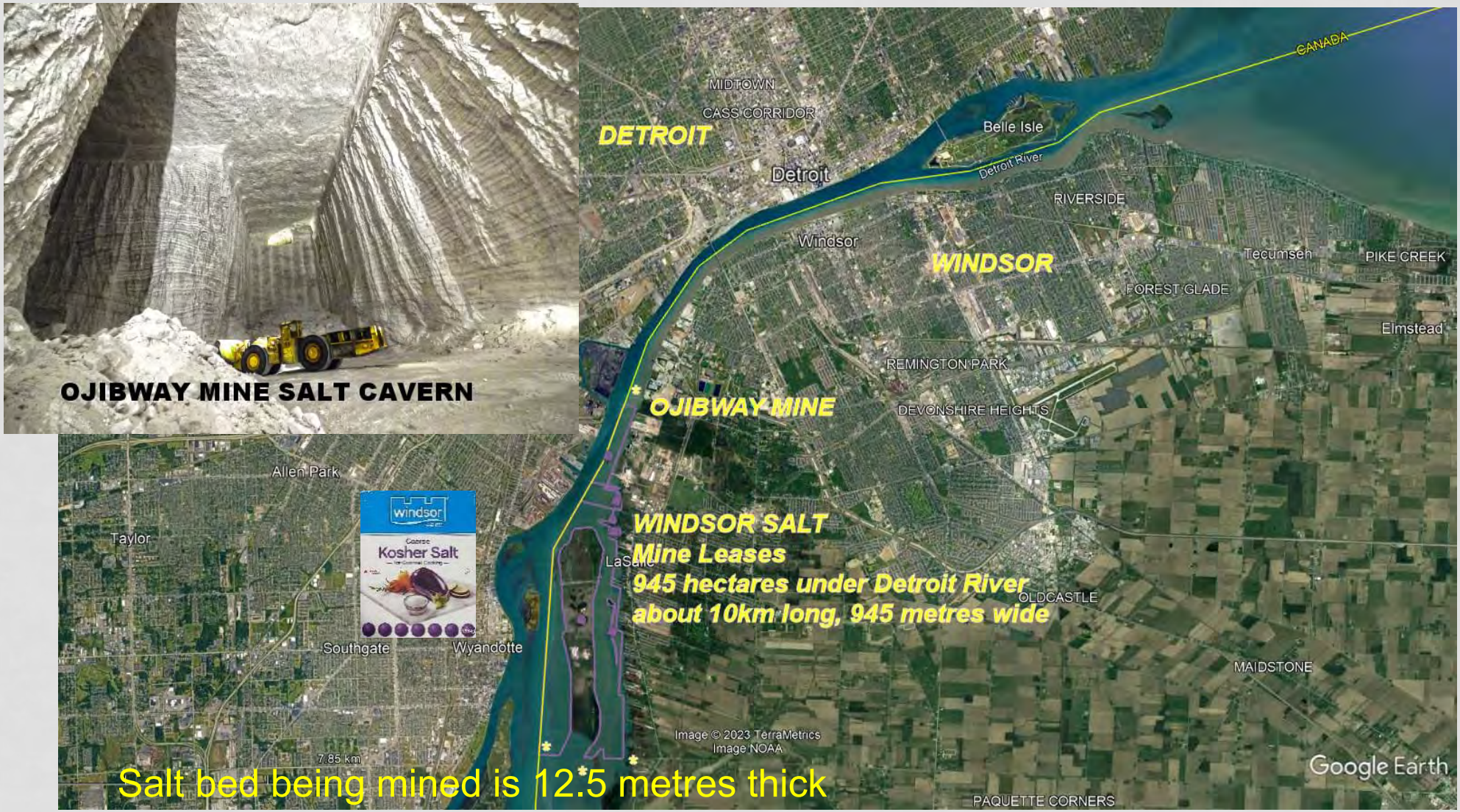
- $1 Billion to Ontario GDP (7% of Mining's GDP)
- Low resource unit value of $0.10 / kilogram; salt = $0.04/kg
- 4% of total volume mined in Ontario (~3 Rogers Centres)
- specialty markets require downstream expertise in advance
- negligible exploration with long-term development timelines
- 98% mined product sold, low waste
- Ontario's salt market demand is weather dependent
  - 80% of salt is used on roads for public safety

Goderich:
World's Largest Underground Salt Mine



Mines Can Operate For Over 100 Years

The Ojibway Mine has operated next to Detroit-Windsor since 1893



Aggregate /Industrial Mineral Value-Added Products Manufactured in Ontario

- Salt products
- Dressed stone
- Ceramics and Glass
- Infrastructure / foundations: cement / concrete
- Wallboard (gyprock)
- Agricultural Fertilizers (lime, gypsum, wollastonite)

BASE METALS MINES
9 minesites, 3 operators

2022 Total Mined Volume Equivalent to 1 filled “Rogers Centre” of rock
Average value of recovered base metals are $20.59/kilogram
Base Metals sales are 29% of Provincial Total Minerals Sales

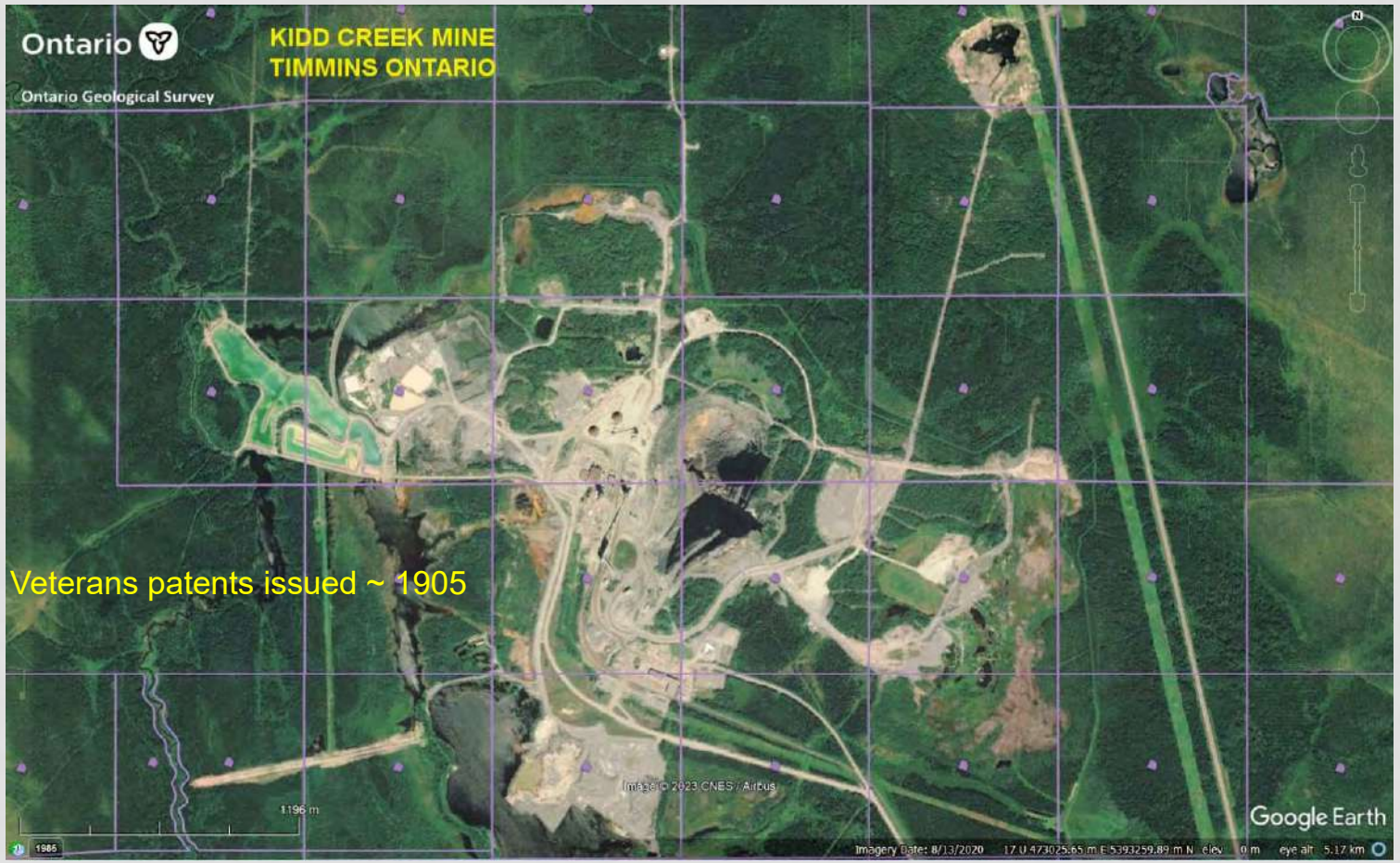
Glencore: Kidd Creek Mine, Cu-Zn-Ag, Timmins
Fraser Mine. Ni-Cu-PGE, Sudbury
Nickel Rim South Mine, Ni-Cu-PGE, Sudbury

KGHM: McCreedy West Mine, Ni-Cu-PGE, Sudbury

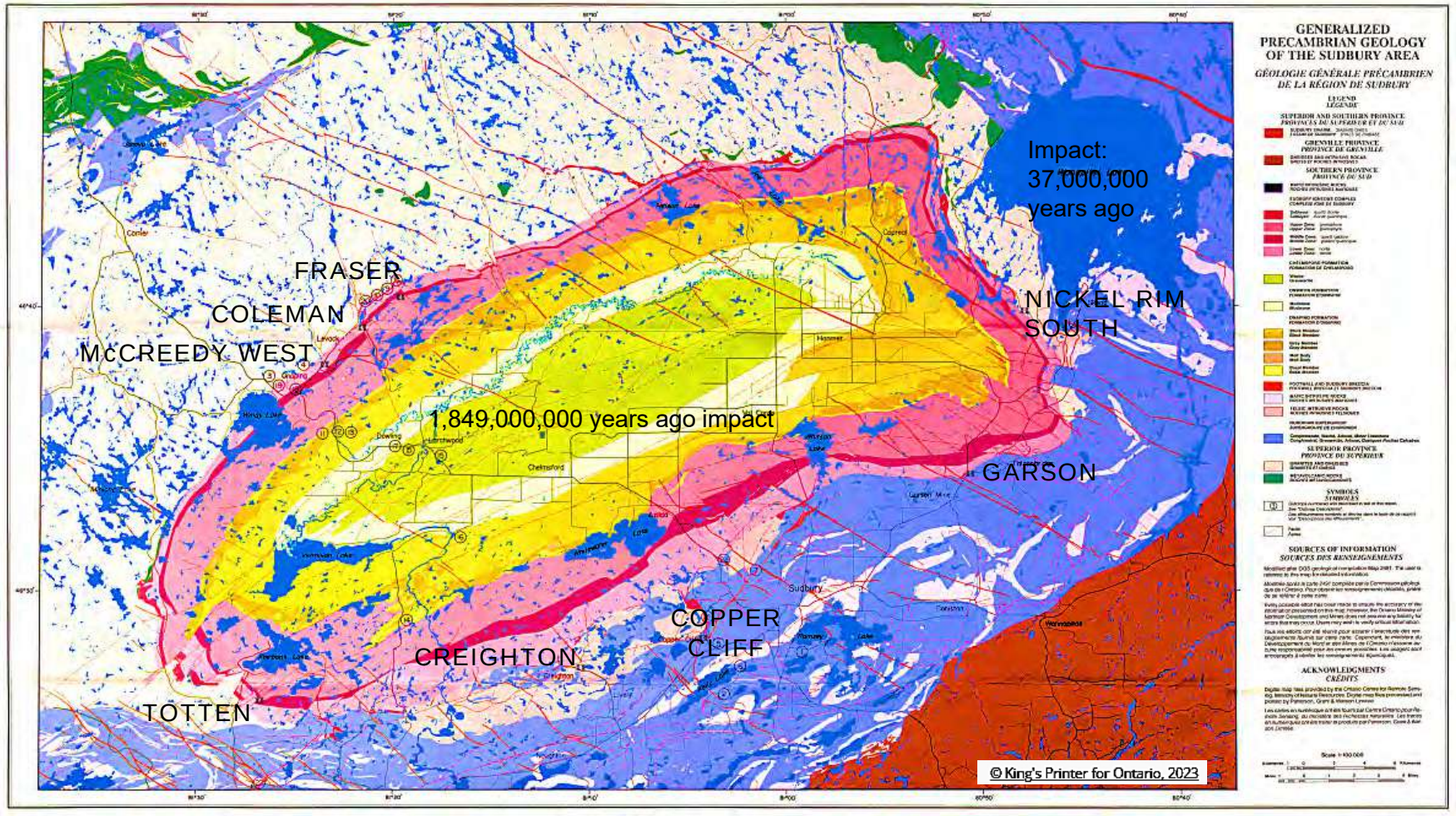
Vale: Coleman Mine, Ni-Cu-PGE, Sudbury
Copper Cliff Complex, Ni-Cu-PGE, Sudbury
Creighton Mine, Ni-Cu-PGE, Sudbury
Garson Mine, Ni-Cu-PGE, Sudbury
Totten Mine, Ni-Cu-PGE, Sudbury

Kidd Creek Mine, Timmins

- Almost 60 years old and approaching end of mine life.
- Polymetallic base metals deposit mined from surface to 3014 metres below surface
- Bottom of mine is closest point to the centre of Earth that is “easily accessible” from surface.
- 2022 production was about 24% of Ontario’s base metal mined volume



Sudbury



from Dressler et al, 1992

8 base metal mines operated by 3 companies within the Sudbury Structure

PRECIOUS METALS MINES

1 PGE and 16 Gold minesites, 10 operators

Lac des Isles – Impala Canada Ltd.

<u>Gold Mines - Operators</u>

Detour Lake, Macassa – Agnico Eagle Mines Ltd.
Island, Young-Davidson – Alamos Gold Inc.
Williams – Barrick Gold Corp.
Red Lake – Evolution Mining Ltd.
Fox Complex – McEwen Mining Inc.
Rainy River – New Gold Inc.
Musselwhite, Borden, Hollinger, Hoyle Pond – Newmont Corp.
Bell Creek – Pan American Silver Corp. Lake Shore Gold Corp.
Eagle River – Wesdome Gold Mines Ltd.

PRECIOUS METAL MINES

Finished product is worth tens of thousands of dollars per kilogram.

Precious metals, the size of a hockey puck, are worth ~$100,000.

Ore grade can be only 1 to 2 grams per tonne with bulk mining.

Highly efficient milling and processing is needed to recover just a 63 cm square cube of precious metal from 1.6 million cubic metres of ore.

Part 1d: Today's Mining Cycle Is Not Well Known By The Public... Why?

In Canada, the Land and its minerals are shared by the public under evolving understandings and agreements.

- "Reality placer mining shows" do not represent Ontario's professional mining today.
- The mineral industry's continued role in society is rarely considered
- Mines are easily overlooked (pits, quarries, underground, NIMBY)
- Mineral product origins are often unrecognized by the end user.
- All recycled metals are only made reusable by mineral processors
- Access to mining sites is restricted for safety reasons.
- Regulations and thin economic margins for the public's benefit require focus on safety, confidentiality, environmental protection and cost-effective production and processing by qualified and responsible professionals.

PART ONE: Completed
ECONOMIC OVERVIEW OF ONTARIO'S MINING INDUSTRY- PRODUCTION FOCUS

a) Indigenous Participation and Opportunity

b) Economic and Environmental Benefits

c) Today's Mineral Developments Across Ontario

d) Today's Mining Cycle Is Not Well Known By The Public

BREAK: QUESTIONS OR COMMENTS ABOUT PART ONE

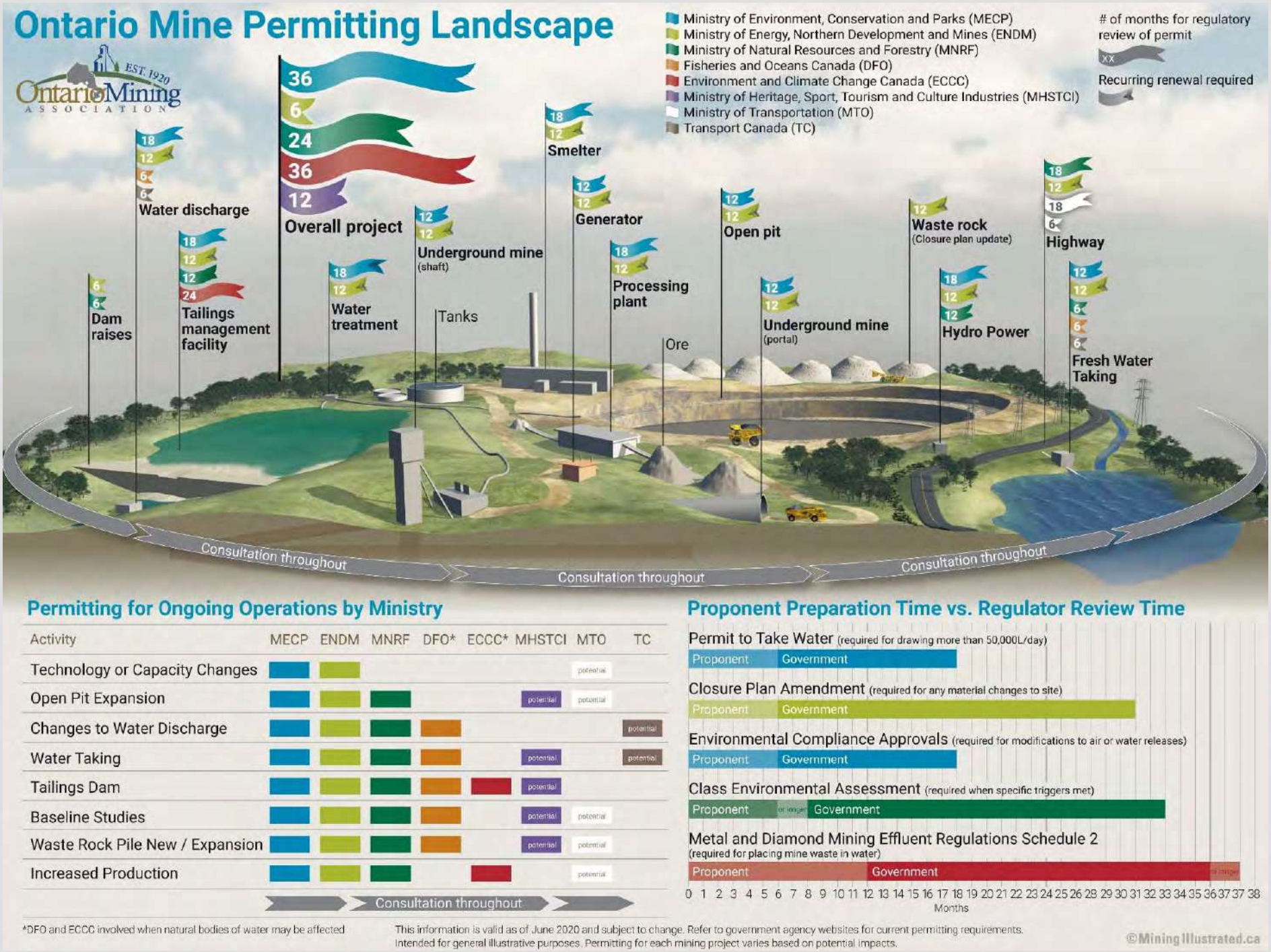
PART TWO: Next
ONTARIO MINING TODAY – THE FULL CYCLE

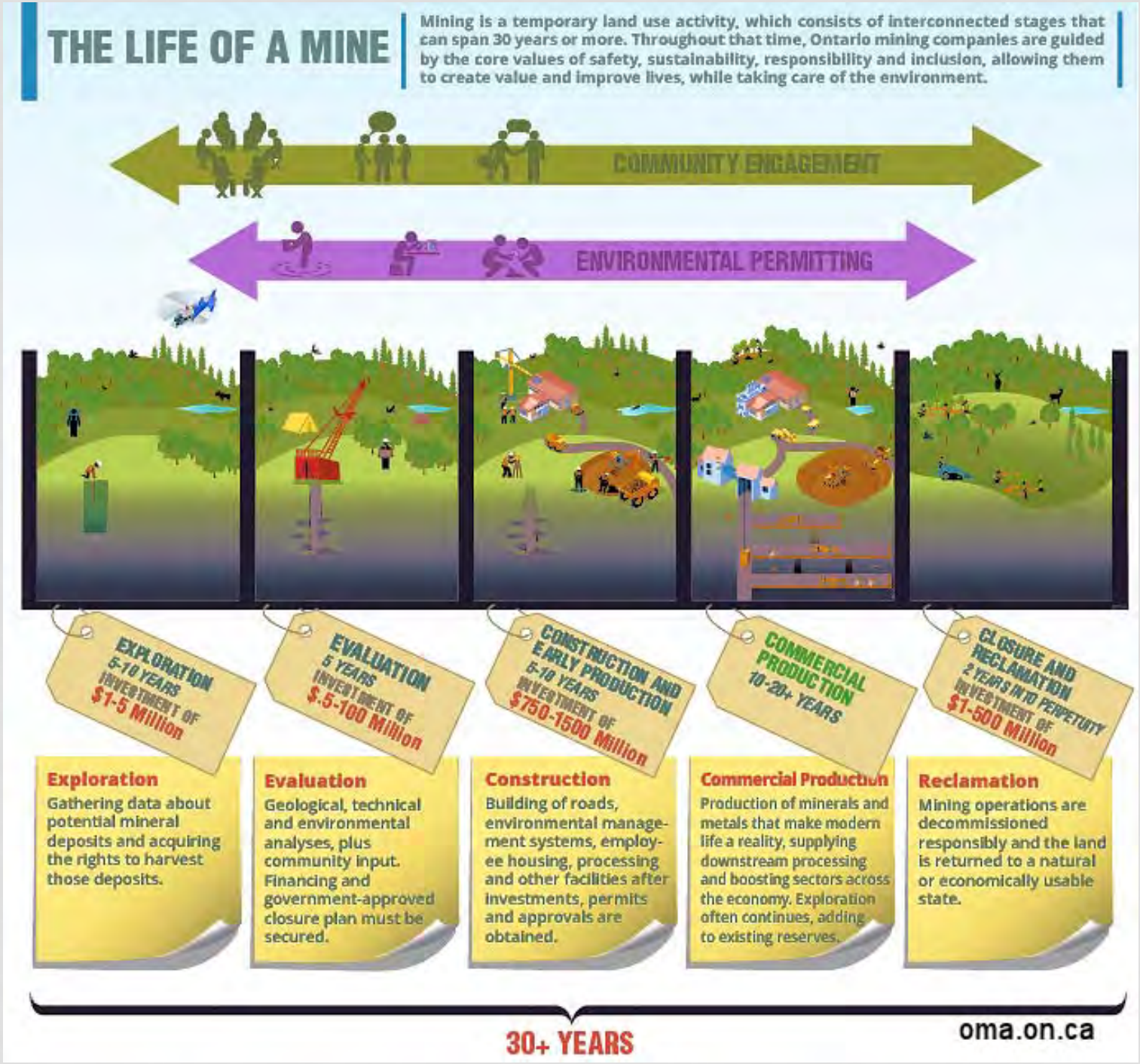
PART TWO:
ONTARIO MINING TODAY – THE FULL CYCLE

1. Pre-Exploration = 3 KEY TURNING POINTS
2. Early Exploration (Surveys, drill targets, drilling)
3. Discovery (drilling results) = KEY TURNING POINT
4. Advanced Exploration (Evaluation, Validation, Planning)
5. Feasibility = KEY TURNING POINT
6. Mine Lease, Construction
7. **Production… a project's only revenue-generating phase**
8. Closure = KEY TURNING POINT
9. Reclamation
10. Repurposed Land Usage = KEY TURNING POINT

REGULATION

- In the past 30 years, increased regulatory requirements have been applied on the mining industry on every front.
- Government legislation requires qualified geoscientists (P.Geo) and engineers (P.Eng) to be licensed with Professional Geoscientists Ontario or Professional Engineers Ontario, the regulators, for their work on stages of the mining cycle for which they are responsible.
- Professional practice guidelines for Indigenous consultation and technical work are provided by government and industry-affiliated organizations. (Appendix C)


Ontario Mine Permitting Landscape
Ontario Mining Association EST. 1920
Ministry of Environment, Conservation and Parks (MECP)
Ministry of Energy, Northern Development and Mines (ENDM)
Ministry of Natural Resources and Forestry (MNRF)
Fisheries and Oceans Canada (DFO)
Environment and Climate Change Canada (ECCC)
Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)
Ministry of Transportation (MTO)
Transport Canada (TC)
# of months for regulatory review of permit
XX
Recurring renewal required
Water discharge
Overall project
Smelter
Generator
Underground mine (shaft)
Open pit
Waste rock (Closure plan update)
Highway
Dam raises
Tailings management facility
Water treatment
Tanks
Processing plant
Ore
Underground mine (portal)
Hydro Power
Fresh Water Taking
Consultation throughout
Consultation throughout
Consultation throughout
Permitting for Ongoing Operations by Ministry
Activity
MECP
ENDM
MNRF
DFO*
ECCC*
MHSTCI
MTO
TC
Technology or Capacity Changes
Open Pit Expansion
Changes to Water Discharge
Water Taking
Tailings Dam
Baseline Studies
Waste Rock Pile New / Expansion
Increased Production
potential
Consultation throughout
*DFO and ECCC involved when natural bodies of water may be affected
Proponent Preparation Time vs. Regulator Review Time
Permit to Take Water (required for drawing more than 50,000L/day)
Closure Plan Amendment (required for any material changes to site)
Environmental Compliance Approvals (required for modifications to air or water releases)
Class Environmental Assessment (required when specific triggers met)
Metal and Diamond Mining Effluent Regulations Schedule 2 (required for placing mine waste in water)
Proponent
Government
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 28 29 30 31 32 33 34 35 36 37 37 38
Months
This information is valid as of June 2020 and subject to change. Refer to government agency websites for current permitting requirements.
Intended for general illustrative purposes. Permitting for each mining project varies based on potential impacts.
©Mining Illustrated.ca


THE LIFE OF A MINE
Mining is a temporary land use activity, which consists of interconnected stages that can span 30 years or more. Throughout that time, Ontario mining companies are guided by the core values of safety, sustainability, responsibility and inclusion, allowing them to create value and improve lives, while taking care of the environment.
COMMUNITY ENGAGEMENT
ENVIRONMENTAL PERMITTING
EXPLORATION
5-10 YEARS
INVESTMENT OF
$1-5 Million
EVALUATION
5 YEARS
INVESTMENT OF
$.5-100 Million
CONSTRUCTION AND EARLY PRODUCTION
5-10 YEARS
INVESTMENT OF
$750-1500 Million
COMMERCIAL PRODUCTION
10-20+ YEARS
CLOSURE AND RECLAMATION
2 YEARS IN TO PERPETUITY
INVESTMENT OF
$1-500 Million
Exploration
Gathering data about potential mineral deposits and acquiring the rights to harvest those deposits.
Evaluation
Geological, technical and environmental analyses, plus community input. Financing and government-approved closure plan must be secured.
Construction
Building of roads, environmental management systems, employee housing, processing and other facilities after investments, permits and approvals are obtained.
Commercial Production
Production of minerals and metals that make modern life a reality, supplying downstream processing and boosting sectors across the economy. Exploration often continues, adding to existing reserves.
Reclamation
Mining operations are decommissioned responsibly and the land is returned to a natural or economically usable state.
30+ YEARS
oma.on.ca

Pre-Exploration / Project Generation: Stage 1/10

Experience, public geoscience information and other information are diligently integrated to generate a potential mineral opportunity concept which can be considered intangible **Intellectual Property**.

Confidentiality is still the only protection for intangible Intellectual Property.

This is Ojibway Traditional Knowledge based on Nanabijou's Silver Islet revelation and cautionary story (re-shared by Charlie Angus in *"Cobalt, Cradle of the Demon Metals, Birth of a Mining Superpower"*)

Meaningful Indigenous consultation by new project proponents is difficult due to their unprotected Intellectual Property at this early stage but it is widely encouraged.

Early, sustained, meaningful consultation is a project's first key turning point. This includes nation-with-nation to community-with-company consultation.

Pre-Exploration / Project Generation: Stage 1/10

Today's Ontario online Mineral Land Administration System still registers mining claims on a "first come-first served" basis. This system may be further refined in the near future.

Acquisition of mining claims is a project's second key turning point.

There were 344,826 active mining claims and 35 mines in Ontario at the end of 2022;… (~10,000 claims per mine)

Pre-Exploration / Project Generation: Stage 1/10

Mining claims, the Intellectual Property, a reasonable exploration action plan and a clear understanding of project risk mitigation are needed for project financing, optioning or sale.

A NI43-101 technical report may be required at this stage.

Prospectors and junior companies may self-finance their own prospecting activity to try to advance the project.

Initial financing for exploration activity is a project's third key turning point.

Mineral exploration
Ontario 2023

Highlights

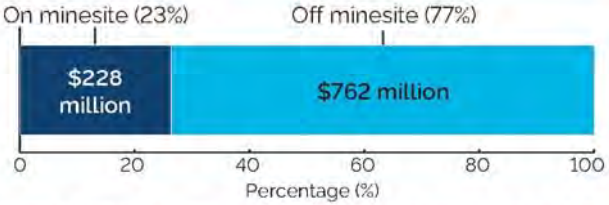
Ontario is a world-class mining jurisdiction and is among the top 10 jurisdictions in the world for mineral exploration spending. Ontario is one of the leading producers of gold, copper, nickel and platinum group elements.

In 2022, gold was the most sought-after mineral in Ontario, with exploration spending of $659 million totalling 67% of the province's total exploration spending.

Value of exploration spending in 2022:

$989 million

Exploration spending in 2022



Exploration spending by mineral, including critcal minerals

Mineral	Exploration spending ($ million)	Percentage (%)
Gold	659	67
Base metals*	219	22
Other critical minerals** (platinum group elements, lithium, cobalt, etc.)	108	11
Other non-critical minerals*** (silver, iron, diamond, etc.)	3	>1
Total	989	100

* Base metals include: copper (Cu), nickel (Ni) and zinc (Zn).

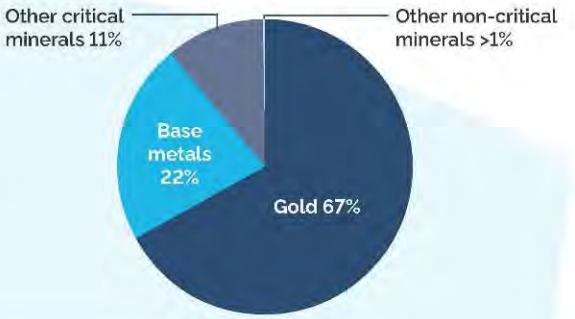
** Other critical minerals include the remaining minerals on the Ontario critical minerals list

*** Other non-critcal minerals expludes gold and all other minerals on the Ontario critical minerals list

Note: Data has been aggregated to preserve confidentiality, numbers may not add up due to rounding.

Exploration spending by mineral, including critical minerals

Ontario is well-positioned to be a global supplier of critical minerals with its vast supply of minerals, processing capabilities and world-class mining supply and services sector.



Mining lands activity

Did you know?

You can acquire and register mining claims, obtain or renew a prospector's licence and maintain your mining lands online 24/7 through the Mining Lands Administration System (MLAS).

344,826

Number of active mining claims in Ontario as of December 31, 2022.

World's largest mining capital market: TSX & TSX-V

Toronto, Ontario is the mining finance capital of the world.

The Toronto Stock Exchange (TSX) and Toronto Venture Exchange (TSX-V) list more mining companies than any other exchange with over 1,150 listed in 2022. The Toronto Stock Exchange and Toronto Venture Exchange are first among exchanges worldwide in equity capital raised and are home to about 40% of the public mining companies in the world.

ONTARIO CANADA

For more information about Ontario's mineral resources:

ontario.ca/mineralsector

mineralsinfo@ontario.ca

+1 888 415-9845

Note: All monetary values are in Canadian dollars. This information is accurate to April 20, 2023.

Source: Natural Resources Canada and the Ministry Mines.

Early Exploration: Stage 2/10

- Early exploration work generally requires an exploration action plan used to obtain field work permits from the Ontario Government.
- The goal is to get an indication of a mineral deposit discovery through integrated surveys that define reasonable targets for exploration drill testing.
- Environmental impacts are minimal and short term with project management using qualified professionals.

Early Exploration

Airborne Geophysical Survey

- Geophysical Survey – the collection of data from above or below the earth's surface using a sensing instrument to measure a characteristic like magnetism

Early Exploration

Collect Rock and Soil Samples to Identify Target Areas

Grid line-cutting and geophysical surveys are recommended target definition methods

Early Exploration

Outcrop Stripping / Trenching Observe & Sample Bedrock

Minimize Impact

Large Trench

- Explorationists clear bedrock by hand or use excavators
- Collect and analyze mineral or metal content over a specific interval
- Very useful prior to drill testing

Henry Schenkels photo on left, online photo on right

Reclamation of an Exploration Trench

Henry Schenkels photos

SCIENCE-BASED TARGETS ARE PRIORITIZED FOR TESTING WITH DRILLING

Geologists describe the cored rock noting features and selecting samples for analysis.

Geophysical surveys down the drill hole can allow geophysicists to refine targets.

Diamond Drill Site and Initial Reclamation of Site

Drilling in a clearing where trenching had identified targets requiring drilling follow-up

Recontoured trench and diamond drillsites prior to reseeding

Henry Schenkels photos

Discovery: Stage 3/10

A **maiden drill hole discovery** is one that encounters ore grade mineralization over mineable true widths.

Drilling continues in the advanced exploration stage to **build** a mineral deposit resource around the maiden drill hole discovery.

After more than a century of discoveries and mine developments over the past 50 years, the rate of **discoveries that resulted in mines have steadily declined** due to several factors.

A mineral deposit resource that merits consideration for development is a project's fourth key turning point.

Advanced Exploration: Stage 4/10

Drilling programs and advanced geophysical, geochemical and metallurgical studies are focused on resource definition, evaluation and validation.

Ontario currently has at least 43 advanced exploration projects in addition to minesite exploration programs.

43 Ontario Advanced Exploration Stage Projects

2023 ONTARIO ADVANCED EXPLORATION PROJECTS	
~43 Projects	
PRECIOUS METALS (27)	**BASE METALS (10)**
Bateman	Crawford
Bradshaw	Denison
Cameron Gold	Eagle's Nest
Cote Gold	Edleston
Dixie Lake	Kenbridge
Fenn-Gib	Onaping Depth
Goliath Complex	Shakespeare
Great Bear	Superior Lake
Greenstone Project	Thierry
Hammond Reef	Victoria
Hard Rock	
Hasaga	
Junior Lake	
Magino	
Marathon	**Industrial Minerals (2)**
Moss Lake	Bissett Creek
Pamour	Martison
Pen	
Pickle Crow	
Red Lake	
River Valley	
Springpole	**Lithium (4)**
Thunder Bay North	Georgia Lake
Tower Gold	PAK
Upper Beaver	Pakeagama Lake
Wawa	Separation Rapids
West Cache	

atlas.gc.ca/mins/en/index.html

Feasibility: Stage 5/10

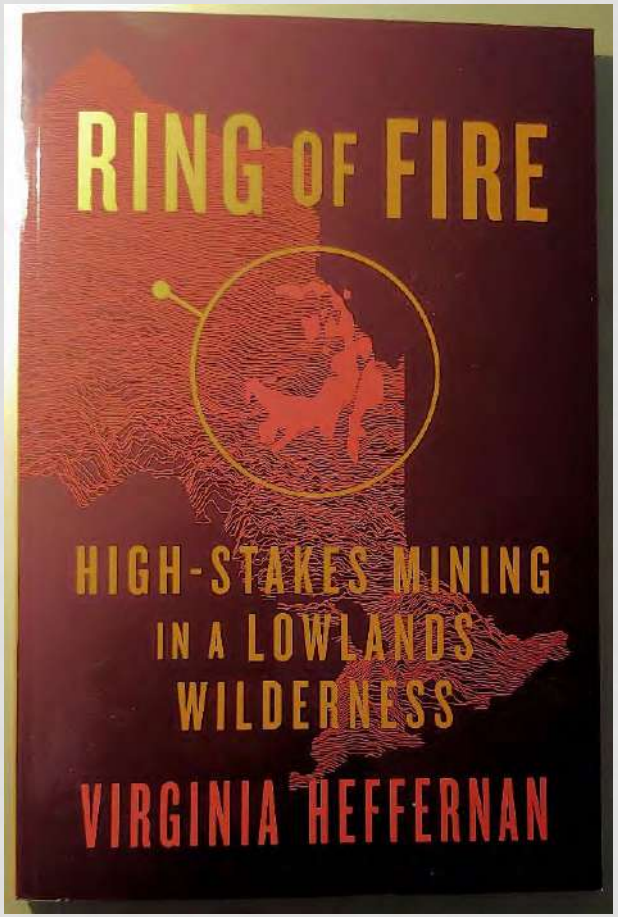
- All technical resource and mine planning data is integrated with financial data to obtain a estimated return on investment for the project.

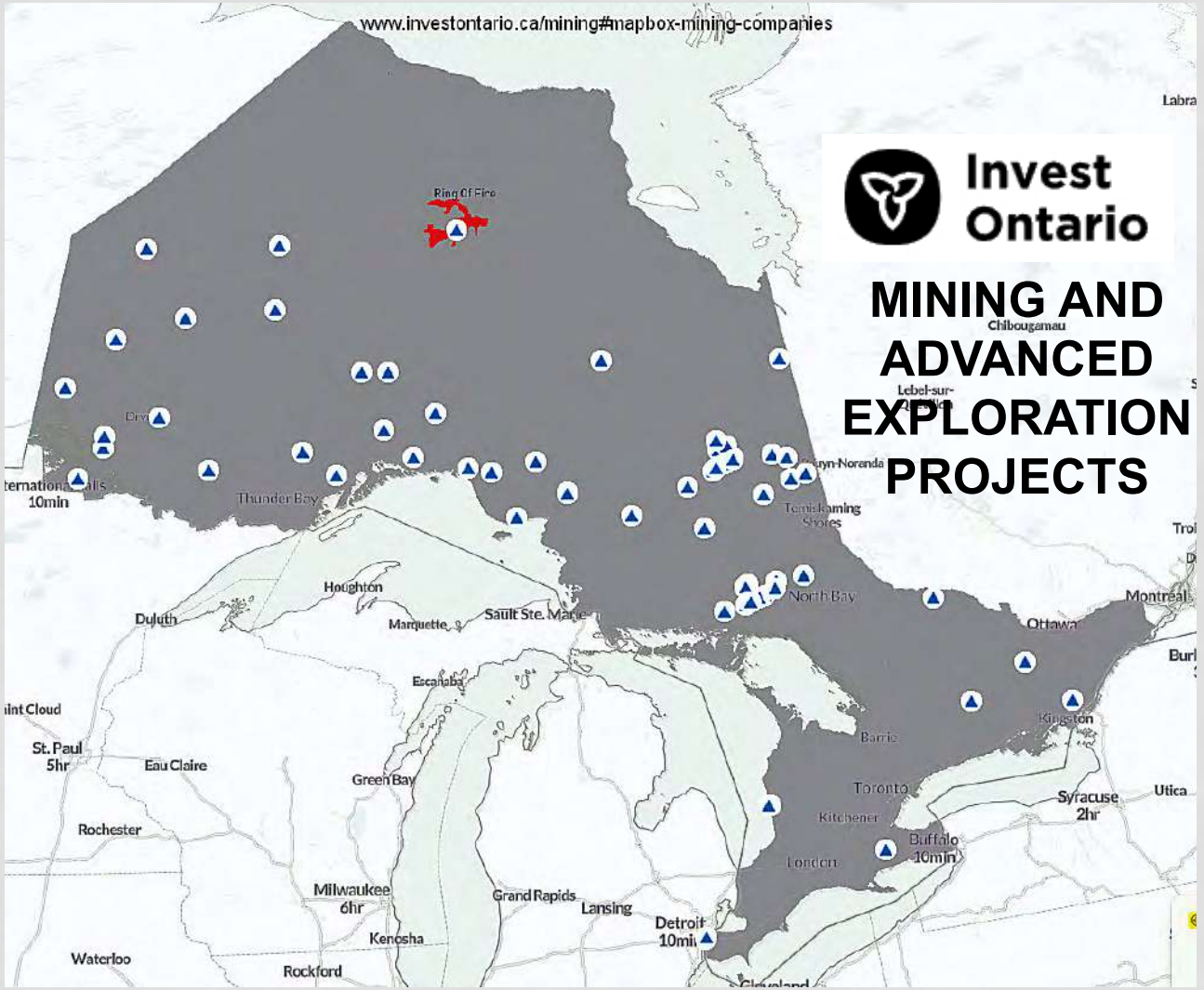
- **A decision to proceed to development is a project's fifth key turning point.**

This marks the end to exploration stages 2 to 5 and the start of development stages 6 to 9.

Mine Lease, Construction: Stage 6/10

- **Getting ready…**





Mine Development

Mine Development Path Metal Mines

More Extensive Environmental Assessments

Bulk Sampling

- Complete economic feasibility studies
- Raise funds
- Get government permits

Justify Mine

Prepare for Mining

Production: Stage 7/10

The production stage is the main revenue-generating stage related to mineral resource development.

Ontario has only 35 active mines at the end of 2022

17 precious metals

9 base metals and

9 industrial minerals

Producing mining operations **may not be** profitable due to current economic conditions.

Closure: Stage 8/10

The closure decision is a project's sixth key turning point.

Exploration, development and mining projects close but go on "care and maintenance" to weather adverse conditions.

A **mine closure plan** was developed in Stage 6.

Companies, communities and government can refine the closure plan to accommodate change.

Reclamation: Stage 9/10

Reclamation applies to all mining stages from early exploration to mine closure for any activities that disturb the land.

Reclamation plans are included as part of permit applications.

Compliance reporting and inspections are common day-to-day procedures.

Kidd Creek Mine Tailings and Former Metsite Reclamation in Progress

Repurposed Land Usage: Stage 10/10

Community consultations before modern mine construction are used to plan how the land will be repurposed after mining.

Repurposed land use decisions by the Public are a project's seventh key turning point.

Historical mining sites can remain a public concern because they did not have closure, reclamation and repurposing plans.

BREAK FOR QUESTIONS OR COMMENTS ABOUT PART 2

Part 3: Opportunities

EDO's can recognize opportunity through awareness of:

Ontario's mineral industry
Community capacity and resources
Community consultations in progress
Community consent and agreements
Mineral projects in and adjacent their community
Aggregate potential and unstaked mineral potential
Local project's key turning points and anticipating needs

Know that industry professionals are willing to fully engage with Indigenous partners, businesses and individuals in exploring and developing mineral opportunities.

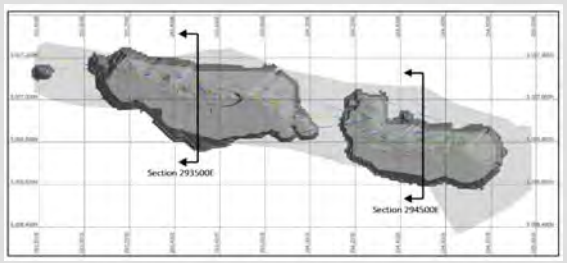
Life Cycle of Metal Mining

“Early Exploration”
(Pre-Exploration, Research, Prospecting)

“Exploration”

D I S C O V E R Y

Indigenous Business Opportunities



Development

F E A S I B I L I T Y

Reclamation

Wide Variety Of Mineral Exploration and Development Jobs

Mine Workings

Surveyor`s helper

Miner

Driller

Heavy Equipment Operator

Shift Foreman

Etc.

Mill/Shop

Trades helper/ apprentice

Warehouse assistant

janitor

Technicians

Certified trades

Etc.

Offices

Students

Assistants

Administration

Engineers

Geologists

Technicians

Accountant

Etc.

Camp

Janitorial

Kitchen

Cook

Admin

Repairs

Safety

Security

Etc.

Roads, Etc.

Snow removal

Road work

Trucking

Gravel pit

Supplies

Diesel fuel

Explosives

Etc.

Over 160 different mining jobs

Canadian Economic Opportunity

Generational Economic Opportunity

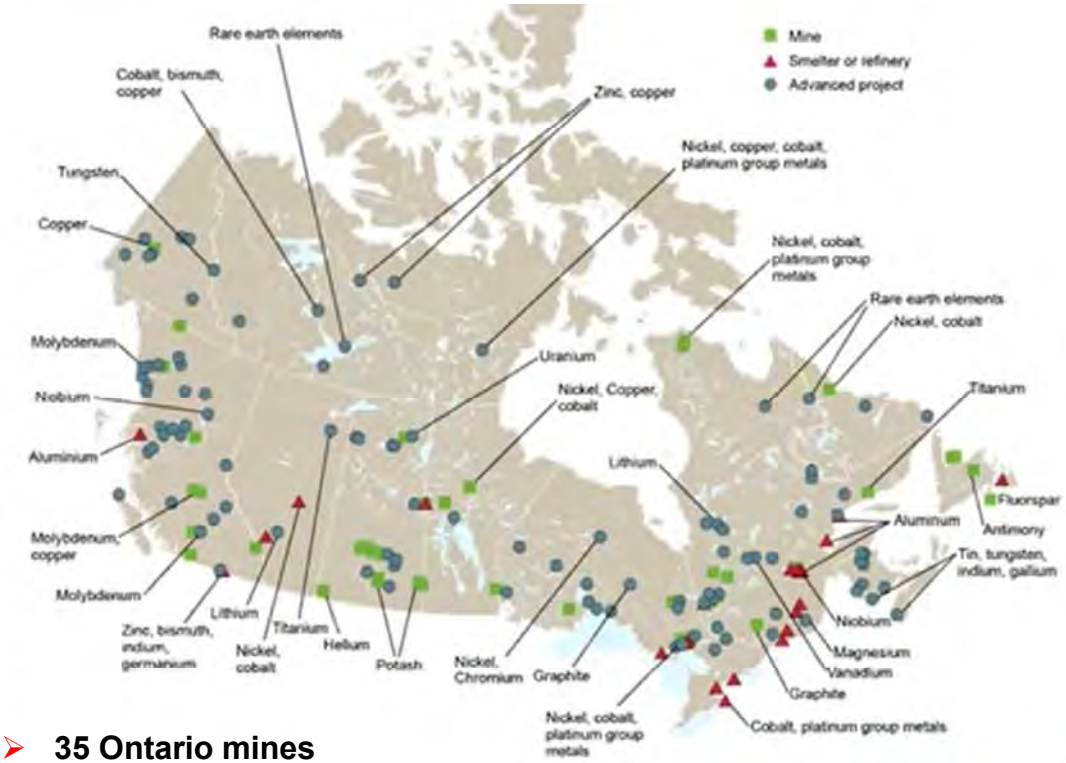
Leveraging Canada's advantages:

- ✓ World-class mineral resource wealth
- ✓ Longstanding mining expertise
- ✓ Extensive technology and manufacturing capabilities
- ✓ Abundant clean energy resources
- ✓ Strong environmental, social and governance (ESG) credentials

Domestic critical minerals can fuel Canadian manufacturing, **employment opportunities**, reduce import dependency, and build economic security.

Focus on 6 priority minerals to develop full Canadian value chains – **from mines to manufacturing** – including recycling waste and end-of-life products

Critical mineral deposits and processing facilities



- **35 Ontario mines**
- **43 Ontario advanced projects**

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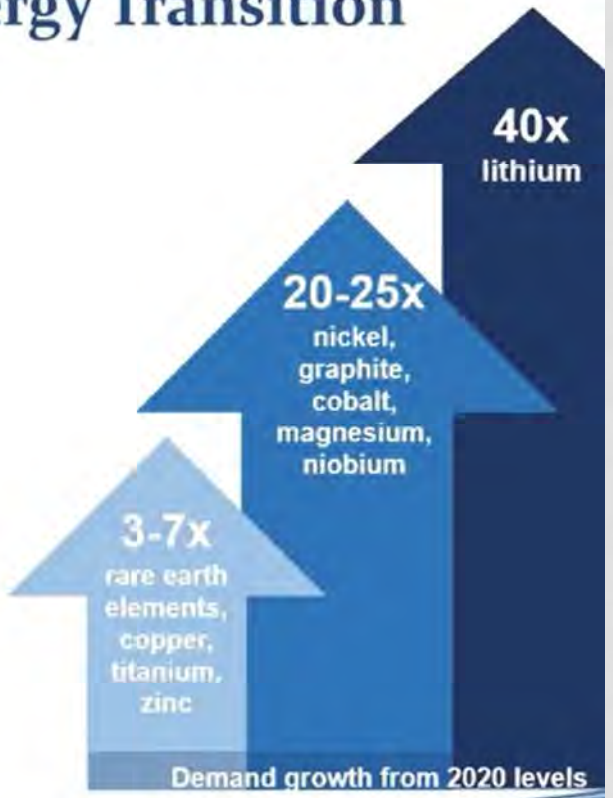
Critical Minerals
Changing to Low Carbon Energy

Critical Minerals Essential to Clean Energy Transition

- **There is no energy transition without critical minerals**
- **Energy security** has become synonymous with critical minerals security
- **Reaching the Paris Agreement goals** mean quadrupling mineral supply requirements for clean energy technologies by 2040.
- Global **demand forecasts significantly outpace mineral supply** and investment
- **If demand is not met**, we cannot produce the technologies to transition our energy systems and meet climate goals



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Connection to Indigenous Peoples

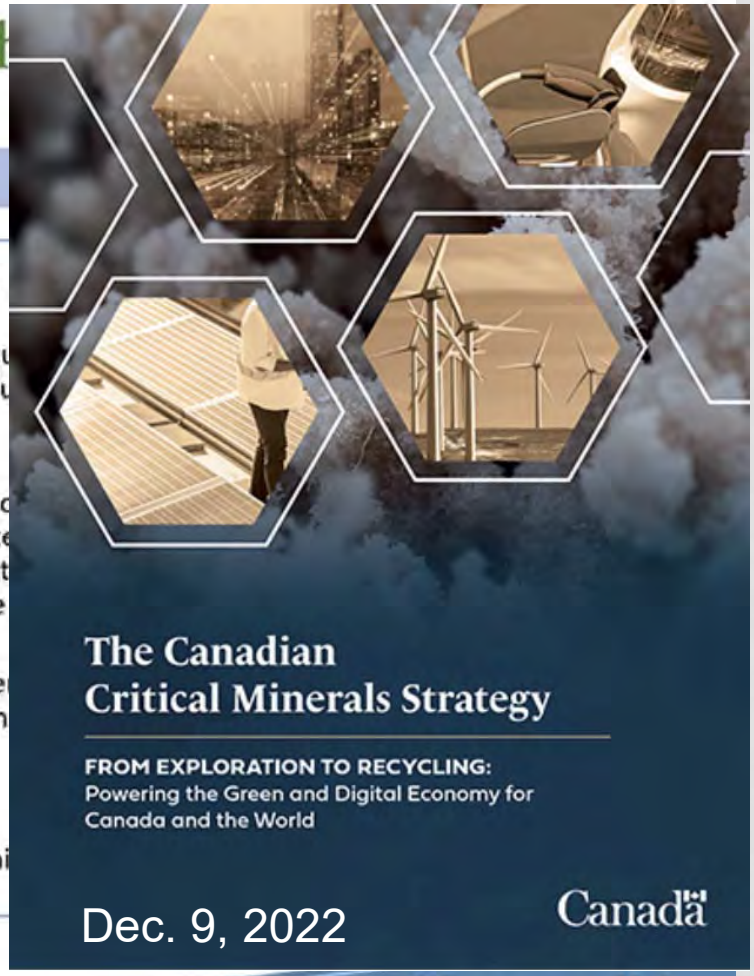
Advancing Economic Reconciliation th

What We Know

- Respecting s. 35 rights and UNDRIP is imperative for existing and new developments
- Indigenous peoples are involved in mining through direct employment and businesses in the mining supply and services sector
- Potential for positive and negative impacts on social and environmental conditions of communities

What We're Hearing

- Capacity building and access to capital is required to facilitate Indigenous participation and equ ownership in critical mineral valu chains/major projects
- Canada must work with Indigenc partners and industry to mitigate social and environmental impact throughout the project life cycle
- Ongoing engagement and conse based relationships with Indigen peoples is essential
- Opportunities for Indigenous partners to gain equity ownershi stakes in major projects



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Watch Out For Next Opportunity!
Indigenous Natural Resource Partnerships

- Canadian government program launched Nov 2022.
- $80 million for projects that:
  - Increase the capacity of Indigenous communities to participate in and benefit from economic development opportunities in the natural resource sectors
  - Increase the investment and/or collaboration between Indigenous Peoples and other natural resource development stakeholders
- Applications closed March 2023. Watch for next round.

Indigenous Natural Resource Partnerships (canada.ca)

BREAK FOR QUESTIONS OR COMMENTS ABOUT PARTS 1, 2 AND 3

Thank you.