



Unlocking our **Potential**

December 2020

Mineral Commodity Fact Sheets

Cobalt Copper Diamonds Gold Lead-Zinc
Lithium Rare Earth Tungsten Vanadium



Cobalt-Co

Investment Opportunities

NORTHWEST TERRITORIES

December 2020

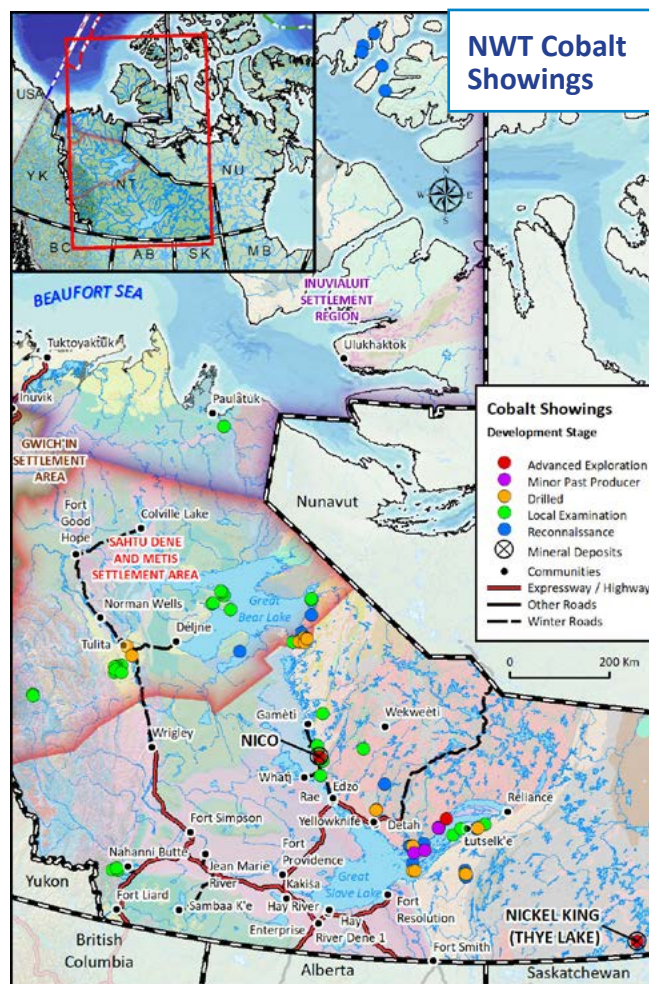
Cobalt is recognized as a strategically important metal by both the US and European Union. This is because cobalt has become an essential metal in the rechargeable battery manufacturing and electric car industries. Metal forecasts predict that by 2019 over half of the cobalt that is produced will be used to make rechargeable batteries¹.

Northwest Territories Activity

Fortune Minerals' NICO project is an advanced cobalt-gold-bismuth-copper project that has been approved for mine development following an environmental assessment and a positive feasibility study completed in 2014. The mine, as proposed, was expected to support a 21-year mine life. Fortune is working on an updated feasibility study that will incorporate changes in the production rate amongst other variables. The NICO deposit contains proven and probable reserves of 33 million tonnes, including 1.1 million ounces of gold, 82 million pounds of cobalt, 102 million pounds of bismuth and 27 million pounds of copper. Negotiations into project financing are ongoing.

Fortune Minerals has received environmental assessment approval to build a 49-kilometre spur road from Whati to the proposed mine. Construction of the Tlicho Highway from existing Highway 3 to the community of Whati is being funded by government and began in 2019. Fortune completed a socio-economic agreement with the Government of the Northwest Territories in early 2019. Geophysical surveys were completed on new targets at the Nico property during 2020.

Cornish Metals Inc.'s Nickel King deposit in the NWT is close to the border with Saskatchewan, and approximately 145 kilometres northeast of the town of Stony Rapids, Saskatchewan. A resource estimate was calculated in 2009 at



various nickel cut-off grades. (Nickel is the primary resource, whereas cobalt is a secondary product.) Several satellite deposits and geophysical targets that remain to be tested in the area may contain additional resources.

¹ <https://electrek.co/2016/11/01/breakdown-raw-materials-tesla-batteries-possible-bottleneck/>

Cobalt-Co

NWT Cobalt Showings

The Northwest Territories has seen cobalt production in the past from various operations located at the eastern edge of Great Bear Lake and in the vicinity of the East Arm of Great Slave Lake. Cobalt was commonly produced as a by-product of polymetallic veins.

Uses

- A positive electrode in lithium-ion batteries in electric vehicles and portable electronics.
- Forms a superalloy that is used in the aerospace industry to make power and jet engine turbines.
- A component of a hard-wearing alloy used in wind turbines.
- Electromechanical devices such as magnets, electric motors, generators and transformers.
- Potential as a catalyst in hydrogen fuel cells.

Growth of Cobalt Demand

Cobalt demand is currently driven by consumer demand for portable electronic devices and for electric vehicles. China is the world's largest consumer of cobalt and the Democratic Republic of Congo is the world's leading producer with over one-half of the world's total production.

In a typical Lithium Cobalt Oxide (LCO) battery, used in cell phones, laptops and cameras, cobalt is used as the positive electrode with approximately 60 per cent cobalt by weight. In electric vehicle batteries and power tools there is between 10-20 per cent cobalt by weight.



Cobalt is used in electric vehicle batteries.

Prospects

Name	Status	Project Owner / Manager	Resource Category	Total Resource: million tonnes (Mt)	Grade: grams per tonne (g/t)
NICO	drilled; advanced project	Fortune Minerals Ltd.	Proven and Probable Reserve	33 Mt	0.11% Co + 1.03 g/t Au + 0.14% Bi + 0.04% Cu
THYE LAKE (NICKEL KING)	drilled	Strongbow Exploration Inc.	Indicated (Main Zone)	11.1 Mt	0.4% Ni, 0.1% Cu, 0.018% Co

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For more information about these deposits, please refer to Guide to Selected Mineral Deposits of the Northwest Territories

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Copper-Cu

Investment Opportunities

NORTHWEST TERRITORIES

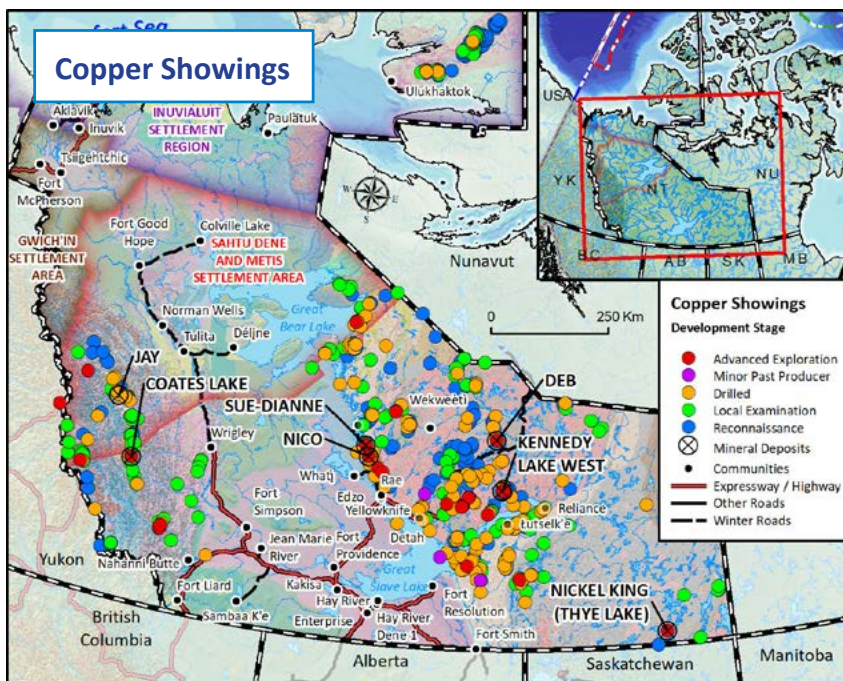
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Copper is second only to silver in its ability to conduct electricity. Native copper was initially discovered by Inuit in the Coppermine River and Coronation Gulf areas. Since then, copper has been found in sedimentary rocks in the Mackenzie Mountains, in polymetallic veins associated with silver, tungsten and gold, in iron oxide copper gold (IOCG) type deposits, in volcanogenic massive sulphide deposits and in magmatic sulphide deposits.

Past Production and Current Activity

Copper has been produced as a significant by-product in several mines that operated in the Northwest Territories. Examples of this include the Echo Bay Mine, which was primarily a silver mine. However, from 1964 to 1976, the mine produced 4935 tonnes of copper. Echo Bay Mines Ltd.'s Eldorado Mine produced 2114 tonnes of copper between 1975 and 1982 as a by-product of silver production; and Terra Mine produced silver and by-product copper beginning in 1969 through until 1985. In total, 1633 tonnes of copper were produced (in addition to 14.5 million ounces of silver). The Cantung Mine area was initially staked in the 1950s because of its copper showings. Cantung produced 1202 tonnes of copper in addition to over 5.3 million stu (standard ton units) of tungsten between 1962 and 1986.

Fortune Minerals Ltd.'s NICO project is a proposed bismuth, gold, cobalt and copper producer. The company has construction permits, is negotiating financing and will benefit from Tlicho all-season road construction by the Government of the Northwest Territories (GNWT), planned to begin in



2019. Fortune Mineral's Sue-Dianne deposit 25 kilometres north of NICO hosts an indicated 8.4 million tonnes of ore with an average grade of 0.8% Cu.

Redbed Resources Corp. (RRC) owns a property that covers the Coates Lake/Redstone deposit. An historic NI 43-101 non-compliant inferred resource was estimated using widely spaced holes over a strike length of 6.5 kilometres; a possible 33.6 million tonnes at a grade of 3.92% Cu was calculated.

Seabridge Gold Inc. holds the Deb deposit within its Courageous Lake project. Since 2003, SG has focused its work on other areas, so the historic NI 43-101 non-compliant inferred resource of one million tonnes with an average grade of 0.83% copper, 2.96% zinc and 21.9 g/t silver has not changed.

Copper-Cu



Panarc Resources Ltd.'s Indian Mountain Lake property hosts several volcanogenic massive sulphide deposits, one of which, Kennedy Lake West, is copper enriched. An historic NI 43-101 non-compliant resource estimated the deposit contained 550,000 tonnes at an average grade of 1.12% copper.

Several other known polymetallic deposits in NWT contain copper and, if they were to be brought into production, copper would likely be produced as a by-product.

Other Prospects

The Jay deposit lies within sedimentary rock within the Sahtu Dene and Metis Settlement Area Conservation Zone. The showing was first discovered in 1969. A non-compliant historic inferred resource estimated the stratiform deposit contained 1.2 million tonnes with an average grade of 2.7% copper.

Uses

- Widely used in the automotive industry, copper is a component in wiring, motors, radiators, connectors, brakes, and bearings.
- Electrical wiring, power distribution cables, appliance wiring and communications cables all contain copper.
- Copper is in integrated circuits and printed circuit boards, electromagnets, magnetrons in microwave ovens and some cooking utensils.
- Buildings contain copper wiring, plumbing, water pipes, thermostats and paint pigments and may be used in roofs and flashing and in heat sinks and heat exchangers.
- Copper has anti-microbial applications that kill bacteria, so it is a component within bedrails, handrails, doorknobs, computer keyboards and health club equipment.

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Diamonds

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Ekati Diamond Mine, Diavik Diamond Mine and Gahcho Kué Mine are all diamond producers in the Northwest Territories (NWT). The NWT accounts for three per cent of the world's diamond production by value. De Beers Canada's past producing Snap Lake mine received approval to begin closure work in May of 2020.

Diamond Production

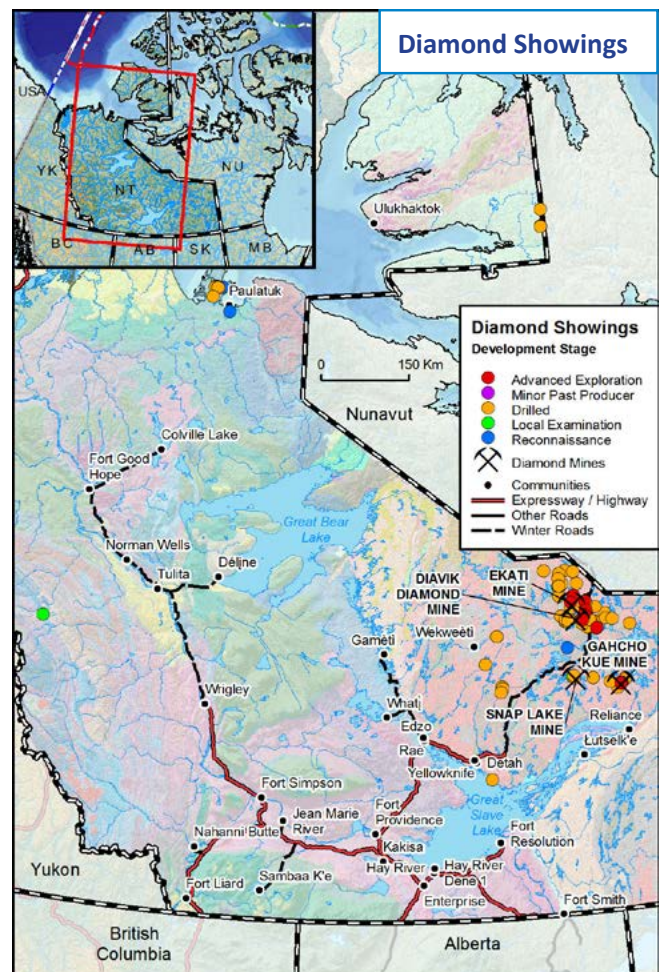
In the first nine months of 2020, Diavik Diamond Mines (60% Rio Tinto and 40% Dominion Diamond Mines ULC) produced 4.701 million carats from 1.876 Mt of ore.

Dominion Diamond Mines ULC owns 89.9 per cent of Ekati Mine and is the operator. In March of 2019, operations at the Ekati diamond mine were suspended and the property was put under care and maintenance. Dominion Diamond Mines filed for creditor protection. As of December 2020, operations were planned to restart by the end of January 2021, pending a sale to the bond holders of the company.

Gahcho Kué Mine began full commercial production in March 2017. The mine is a joint venture between De Beers Canada Inc. and Mountain Province Diamonds Inc. During the first nine months of 2020, Gahcho Kué produced 4.997 million carats from 2.510 Mt of ore. Exploration activities on the mine leases continue, though at a reduced capacity due to COVID-19.

Diamond Exploration

Mountain Province Diamonds Inc. acquired Kennady Diamonds Inc. in 2018 whose Kennady North project is adjacent to the Gahcho Kué Mine. Two pipes on the property have seen extensive work. Kelvin pipe contains an indicated resource of 8.5 million tonnes at an average grade of 1.6 carats per tonne of diamonds, while an inferred resource estimate for the Faraday 2 kimberlite stood at 2.07 million tonnes with a grade of 2.63 carats per tonne (March 2019). In the winter of 2020, a limited amount of geotechnical drilling and geophysics was conducted on the Kennady North project.



Exploration continues to the south of the Ekati and Diavik diamond mines. Dominion Diamond Mines and North Arrow Minerals Inc. conducted geophysical surveying on the Lac de Gras joint venture project.

GGL Resources Corp. announced promising results from its 2019 till indicator mineral survey in April 2020, highlighting the potential for new kimberlite discoveries on the Zip property.

Diamonds

Project Name	Project Owner / Manager	Sample Result ¹	Sample Size ²	Diamonds Recovered
Lac de Gras (WO / DO27)	72.1% De Beers Canada Inc.; 17.6% Archon Minerals Limited; 10.3% DHK Diamonds Inc.	DO 27 Ind (Aug. 7 2008)	19.5 Mt	0.94 ct/t
Yamba Lake/ Torrie/Triceratops	GGL Resources Corp.	Prelim	83.6 kg	68 diamonds; 6 macros
CL 25 (Camsell Lake)	Mike Magrum	Prelim	350.4 kg	221 diamonds; 9 macros
Afridi Lake	Crown Land	Prelim	511.3 kg	46 diamonds; 4 macros
Blue Ice/ Victoria Island	Crown Land	Prelim	934 kg	172 diamonds
Nicholas Bay	Crown Land	Prelim	127.7 kg	1,174 diamonds
Drybones Bay/ Mud Lake	David Smith	Prelim	10 t (Drybones); 100 t (Mud Lake)	97 macros; 11 macros
Snap Lake Mine	De Beers Canada Inc.	Prb (Dec. 31, 2015)	5.7 Mt	1.26 ct/t
Kennady North	Mountain Province Diamonds Inc.	Kelvin (Ind); Faraday 2 (Inf), Faraday 1-3(Inf)	8.5 Mt; 2.07 Mt, 1.87 Mt	1.6 ct/t; 2.63 ct/t, 1.04 ct/t
Ranch Lake	Mike Magrum	Prelim	855 kg	266 diamonds; 46 macros
Hoam	Olivut Resources Ltd.	Prelim	TBD	6 diamonds from 3 kimberlites
Darnley Bay Gravity Anomaly	Generation Mining Ltd.	Prelim	533.1 kg	65 diamonds; 2 macros
Roundrock	Stornoway Diamond Corp.	Prelim	134.2 kg	19 diamonds; 6 macros
Cross Property	Stornoway Diamond Corp.	Prelim	2.4 t	7 diamonds
Munn Lake/ Mackay Lake	Zimtu Capital Corp. / DG Resource Management	Prelim	42 kg	14 diamonds; 2 macros

¹ Indicated Resource (Ind); Inferred Resource (Inf); Probable Reserve (Prb); Preliminary Sample Result (Prelim) ²Tonnes (t); Million tonnes (Mt); Kilograms (kg); TBD (to be determined)

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Gold-Au

Investment Opportunities NORTHWEST TERRITORIES

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Gold is among the most useful of metals. It conducts electricity, does not tarnish, is very easy to work, and alloys with other metals. The Northwest Territories is renowned for its deposits of gold, often hosted in quartz veins in Archean volcanic rocks such as the Yellowknife Greenstone Belt and associated with shear zones in the Slave Structural Province.

The former Con and Giant mines in Yellowknife are examples of this type of host. Together, they produced over 12 million ounces of gold over a mine-life of close to 70 years. The Discovery Mine, north of Yellowknife, produced one million ounces from one million tonnes of ore.

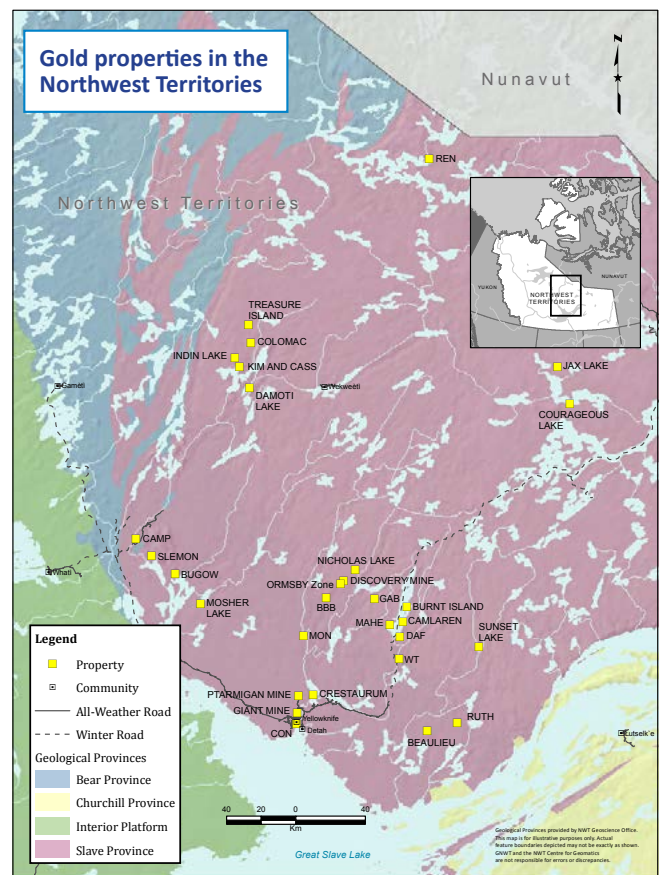
Other known gold deposits are found in folded Archean banded iron formations, and quartz-sulphide veins within granodiorite.

Current Activity

Extensive gold exploration activity is underway across the NWT. Several past-producing mine properties and their environs are being explored: **Seabridge Gold Inc.** has proven and probable resources at Courageous Lake of 91.1 Mt of 2.20 g/t Au and exploration is ongoing.

Nighthawk Gold Corp. is exploring in the Indin Lake area and, apart from expanding the Colomac resource, has identified near-surface gold in several zones. In 2020, Nighthawk commenced a 25,000m drill program to advance the Colomac project, with up to an additional 75,000m of drilling in 2021. The updated 2020 mineral resource assessment on the Colomac project (Colomac, Goldcrest, Grizzly Bear, 24 and 27 deposits) includes 25.89 Mt at 2.01 g/t Au indicated and 5.71 Mt at 2.03 g/t Au inferred.

Gold Terra Resource Corp. is exploring its Yellowknife City Gold Project (which hosts past producers Crestaurum and Burwash Mines) and covers a 70-kilometre stretch of the Yellowknife Greenstone Belt. In late 2019, Gold Terra released an inferred Mineral Resource Estimate of 12.769 Mt of 1.79 g/t Au. During 2020, drilling was conducted at the Sam Otto and Crestaurum deposits. Additionally, Gold Terra optioned claims surrounding the historic Con mine from Newmont and began drilling in the fall of 2020.



Sixty North Gold Mining Ltd. expanded its Mon property in 2020 by optioning the neighbouring Hangstone property.

GoldMining Inc. released a technical report and resource estimate on its Yellowknife Gold project in April 2019. This resource estimate included 14.108 Mt at 2.33 g/t Au measured and indicated, and 9.302 Mt at 2.47 g/t Au inferred.

Rover Metals Corp. was active on its Cabin Lake property (Bugow) in the Tlicho Region in 2020, drilling nine diamond drillholes.

Golden Pursuit Resources Ltd. staked a large area of ground in the Gordon Lake area, acquiring several small past producing mines.

Gold-Au

Uses

- Gold is used in clean and green technology
- Gold is usually alloyed with other metals, commonly copper
- Gold is a coating on aircraft windows and thin gold films protect spacecraft and office towers from infrared rays
- Gold is used in connectors, switch contacts and connection wires
- Computer cable fittings contain gold and small amounts of nickel or cobalt to increase durability
- A small amount of gold is used in cell phones, GPS units and television sets
- Gold is used in medicine to seal wounds, to treat arthritis and in laser surgery tools
- Gold is used in auto airbag deployment systems.

Business case

The NWT has highly prospective geology for gold mineralization, and many prospective areas remain underexplored when compared with other jurisdictions. An extensive collection of scientific data from previous studies, exploration records and assessments is available from the Northwest Territories Geological Survey to aid in exploration targeting.

Prospects

Name	Owner	Resource Category ¹	Total Resource tonnes (t);	Au Grade g/t
Cabin Lake (Bugow)	Rover Metals Corp.	~	70,000t	10.29g/t
Gab	Silver Range Resources Ltd.	~	27,215 t	10.63 g/t
Camp Lake	Rover Metals Corp.	~	46,400/N Zone 11,840t S Zone	13.70/12.00 g/t
Slemon	Rover Metals Corp.	~	31,751 t	6.80 g/t
Discovery Mine	GoldMining Inc.	Ind/Inf; OP/UG	OP-244,000 t (ind); 591,000 t (inf); UG- 37,000 t (ind); 502,000 t (inf)	OP- 1.85 g/t (ind); 1.80 g/t (inf); UG- 2.87 g/t (ind); 2.94 g/t (inf)
Nicholas Lake	GoldMining Inc.	Ind/Inf; OP/UG	OP-1.550 Mt (ind); 1.073 Mt (inf); UG- 10,000 t (ind); 687,000 t (inf)	OP- 2.72 g/t (ind); 2.15 g/t (inf); UG- 2.95 g/t (ind); 3.59 g/t (inf)
Ormsby Zone	GoldMining Inc.	Meas/Ind/Inf; OP/UG	OP- 1.176 Mt (meas); 10.568 Mt (ind); 1.382 Mt (inf); UG- 524,000 t (ind); 1.423 Mt (inf)	OP- 2.12 g/t (meas); 2.25 g/t (ind); 2.30 g/t (inf); UG- 3.41 g/t (ind); 3.69 g/t (inf)
Mosher Lake	Lane Dewar/ M.Magrum/T.Teed	~	500,765 t	2.81 g/t
Ren	Lane Dewar/ Mike Magrum	~	1.8 Mt	10.00 g/t
Mon	60 North Gold Mining Ltd.	PP	10,070 t	10.00 g/t (recov)
Damoti	Nighthawk Gold Corp.	Inf; UG	UG- 736,000t (inf)	UG- 4.97 g/t (inf)
Treasure Island	Nighthawk Gold Corp.	~	105,400 t	14.09 g/t
Indin Lake	Nighthawk Gold Corp.	Ind/Inf; OP/UG	OP-9.986 Mt (ind); 554,000 t (inf); UG- 15.904 Mt (ind); 5.158 Mt (inf)	OP- 1.70 g/t (ind); 1.75 g/t (inf); UG- 2.20 g/t (ind); 2.06 g/t (inf)
Jax Lake	Lane Dewar	~	36,287 t	14.10 g/t
Kim and Cass	Pine Cliff Energy Ltd.	~	448,950 t	7.37 g/t
Courageous Lake	Seabridge Gold Inc.	Prv; Prb	12.3 Mt/Prv 78.8 Mt/Prb	2.41 / 2.17 g/t
Mahe	Golden Pursuit Resources Ltd.	~	156,840 t	17.28 g/t
Yellowknife City Gold Project	TerraX Minerals Inc.	Inf; OP/UG	OP- 11.617 Mt (inf); UG-1.152 Mt (inf)	OP- 1.4 g/t (inf); UG- 5.70 g/t (inf)

¹ indicated (ind); inferred (inf); Measured (Meas); Proven Reserve (Prv); Probable Reserve (Prb); Historic (NI 43-101 non-compliant)(~); Past Production mined (PP);

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Lead-Zinc – Pb-Zn

Investment Opportunities

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Zinc and lead are commonly found together in deposits and mined as co-products. Zinc is the fourth most consumed metal after iron, aluminum and copper. It bonds well with other metals and resists corrosion. Three-quarters of global zinc production is used in the manufacturing of galvanized metal.

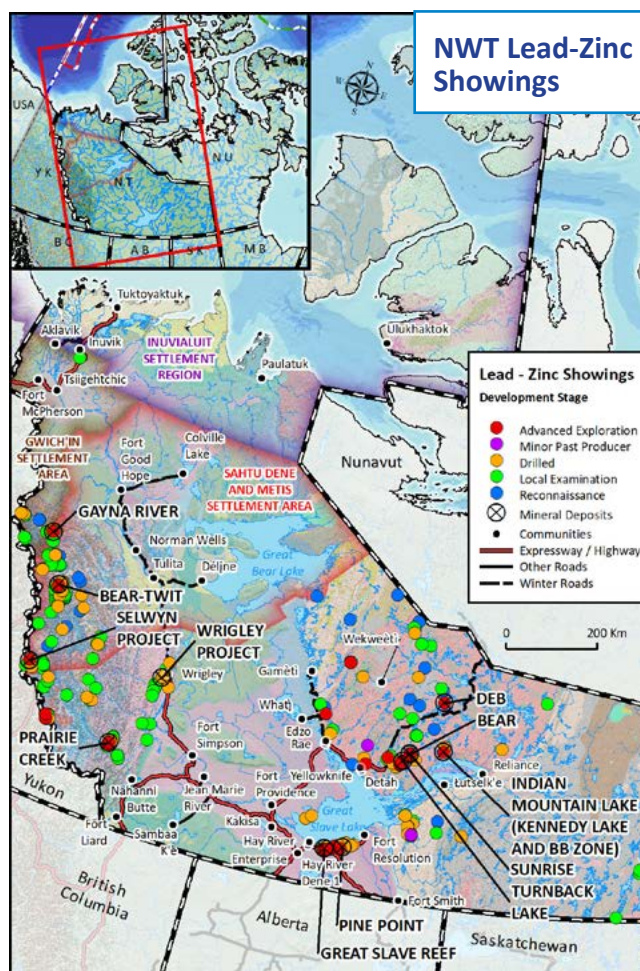
Lead's high density and corrosion-resistant properties make it ideal for use in highly acidic environments. Its primary use is in lead-acid storage batteries.

Current Activity

The Northwest Territories (NWT) is home to three advanced-stage lead-zinc exploration projects, namely Prairie Creek Mine, the Pine Point project and the Selwyn Project. Many other projects have identified resources that could lead to economic discoveries.

NorZinc Ltd.'s (CZN) Prairie Creek Mine project has obtained the permits necessary to commence mining and milling. NorZinc has received a permit to build and use an all-season access road. Prairie Creek already has extensive infrastructure (e.g. 5 km of underground workings, 1,000-metre airstrip, 180-km winter road, and a 1,000 ton per day mill); the 2017 preliminary feasibility study estimated pre-production capital costs of \$279 million. The study outlined a 15-year mine life, an after-tax NPV (net present value) of \$188 million and an IRR (internal rate of return) of 18.4 per cent. These values were calculated using lead and zinc prices of US\$1.00 per pound and US\$1.10 per pound, respectively, and a silver price of US\$19 per ounce, plus an exchange rate of \$1.25 Canadian for each US dollar. Exploration drilling continued in the fall of 2020, with a focus on evaluating Ag potential.

Pine Point Mining Ltd. (a wholly owned subsidiary of Osisko Metals Inc.) is actively drilling targets in several zones within the Pine Point Project. Historically, the property



hosted Pine Point Mine, which produced lead and zinc from 51 deposits beginning in 1964 through 1987. In July of 2020, the company released a positive Preliminary Economic Assessment which updated the pit-constrained inferred mineral resource to 12.9 Mt of 1.73% Pb and 4.56% Zn indicated and 37.6 mT of 1.91% Pb and 4.89% Zn inferred.

Lead-Zinc – Pb-Zn

Selwyn Chihong Mining Ltd.'s (SCML) Selwyn Project is one of the largest undeveloped zinc-lead deposits in the world. The project area hosts 14 drill-defined deposits within a 40-km-long belt along the NWT/Yukon border. Approximately 10 per cent of the project is located within the NWT. SCML was in the process of getting approval for the upgrade of the access road to the project when a decision was made to wait for a more opportune time. The project as planned has a capital cost of approximately US\$2.12 billion and a mine life of more than 11 years at a mining rate of 35,000 tonnes of ore per day.

Numerous companies hold the rights to other significant NWT lead-zinc rich VMS deposits including SSR Mining Inc. (Sunrise Project), Panarc Resources Ltd. (Indian Mountain Lake Project), Silver Bear Mines Inc. (Bear Property, adjacent to the Sunrise deposit). These deposits are polymetallic and may also contain, Cu, Au and Ag. Additionally, there are other carbonate hosted Pb-Zn resources which are currently on Crown land and available for staking such as the AB and Gayna River deposits.

Prospects

Name	Owner	Resource Category	Total Resource tonnes (t);	Grade (%)
Prairie Creek	NorZinc Corp.	Prv+Prb	8.1 Mt	8.6% Zn, 8.1% Pb, 124 g/t Ag
Pine Point	Pine Point Mining Ltd.	Ind/Inf	OP-12.9 Mt (ind); 27.2 Mt (inf); UG -10.5 Mt (inf)	OP-1.73% Pb (ind); 4.56% Zn (ind); 1.37% Pb (inf); 4.11% Zn (inf); UG-3.3% Pb (inf); 6.93% Zn (inf)
Selwyn Project	Selwyn Chihong Mining Ltd.	Inf.	185.6 Mt	5.20% Zn, 1.79% Pb

Uses

- Zinc provides corrosion protection on immersed steel structures such as ships, pipelines, and drill rigs
- Building and construction industries use zinc in the coated steel strips of roofing and for cladding
- Zinc oxide is used in the production of rubber (tire industry) and in ceramics, paints and agriculture. It also has medicinal uses
- Brass is an alloy containing 95 per cent copper and five per cent zinc. Bronze is primarily an alloy of copper with tin, but it may contain zinc. Other zinc alloys are used in automobiles and electrical components
- Lead is a significant component in batteries, particularly in lead-acid ignition (vehicle) batteries
- Lead is widely used in manufacturing various alloys
- Lead is used as ballast in the keel of sailboats
- Lead is able to shield radiation, so it is commonly used in the medical field to shield x-rays.

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Lithium-Li

Investment Opportunities

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Demand is growing fast for lithium, the wonder metal powering electric vehicles, smart phones and space exploration. The Yellowknife area has high potential to become a hub for lithium-bearing pegmatites that were discovered by extensive exploration in the mid to late 1950s.

In the mid to late 1970s, numerous pegmatites were evaluated within a 100-km radius east, northeast and southeast of Yellowknife. Historic (pre NI 43-101) inferred tonnage for eight of those deposits varied from 2.3 million tonnes (grading 1.5% Li_2O) to 13.9 million tonnes (grading 1.2% Li_2O).

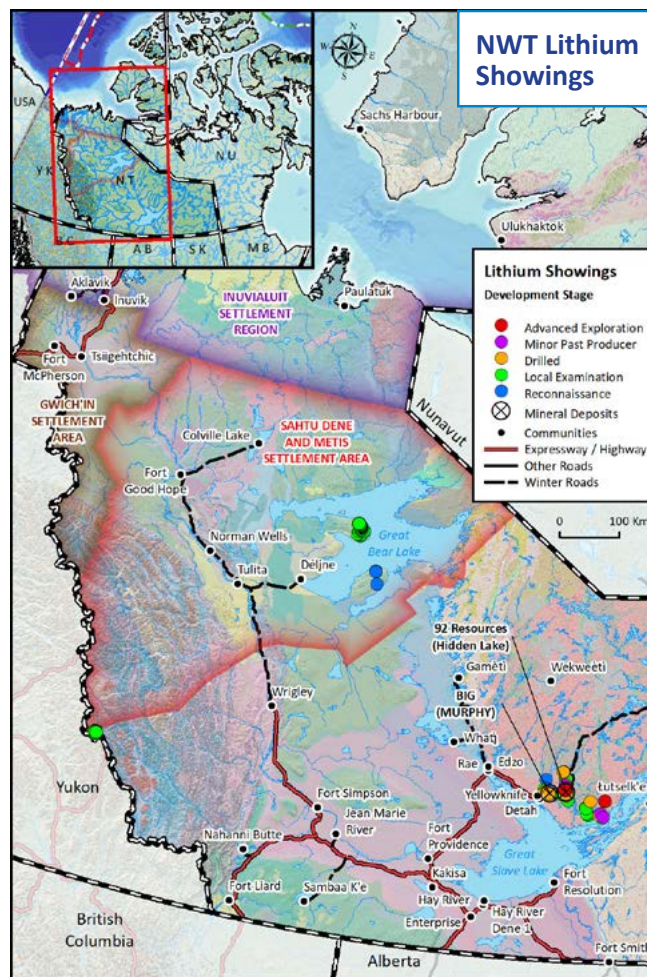
Past Production and Current Activity

Destaffany Mine southeast of Yellowknife produced some 17,052 lb of lithium in the late 1940s and early 1950s, before the mine closed due to lack of demand.

Erex International Ltd., a private company, holds mineral leases on the majority of the large known deposits, including the Big/Murphy lithium deposit, 21 km east of Yellowknife, which was first staked in the 1950s.

Gaia Metals Corp. (formerly 92 Resources Corp.) holds claims in the vicinity of Hidden Lake. A 10-hole drill program in 2018 followed up on extensive surface sampling that identified significant lithium values on four main dikes. Drilling resulted in assays from 1-2% Li_2O intersected over widths of 2 to 9 metres.

Dixie Gold Inc. (formerly Clean Commodities Corp.) holds the Phoenix lithium project, about 300 km north of Yellowknife. Drilling results for 2009 are highlighted by a hole that cut 34.3 metres that assayed 1.24% Li_2O .



Archer, Cathro and Associates (1981) Ltd. holds the Little Nahanni Pegmatite (LNPG) property in the Mackenzie Mountains. In 2016, channel sampling was highlighted by one sample within a pegmatite dike that cut 2.04 per cent Li_2O , 57.8 g/t Ta_2O_5 and 0.05 per cent SnO_2 across 4.0 metres.

Lithium-Li

Uses

- Lithium, the lightest metal, is extremely soft, highly reactive and flammable
- Automakers around the world are now competing to develop electric cars that are expected to use large, rechargeable lithium-ion batteries
- Highly efficient, rechargeable, lithium-ion batteries are used extensively in portable electronic devices such as cell phones, cameras, music players, and GPS units, and as batteries for electric tools
- Lithium is an ingredient in high temperature lubricating greases.
- Alloys are used to create high performance aircraft parts
- Lithium is used to remove carbon dioxide in space vehicles and submarines
- Lithium also has a medical use, as it appears to lighten moods
- Glazes containing lithium are used for ovenware.

Lithium is in world demand

China dominates the world lithium market. China is also stepping up production of electric vehicles, including buses. South Korea, Japan and Hong Kong buy significant quantities of lithium for battery use. In the United States, Tesla Motors is planning to produce lithium-ion batteries for up to half a million cars. Lithium can also be used to store electricity generated by wind or solar power. Tesla Motors has announced it will be selling and installing battery packs for US and Australian homes to store solar-generated energy. Power utilities, including one in Alaska, are testing the viability of giant lithium-ion back-up battery packs to store power for use at peak demand times.

The demand for supplies of lithium was expected to grow by some eight per cent annually in 2014. However, with the creation of mega lithium-ion battery factories, analysts believe demand will double.



Little Nahanni pegmatites in the Mackenzie Mountains

Prospects

Name	Commodity	Owner	Historic Inferred Resource (tonnes)	Grade Li ₂ O
Big/Murphy	Li	Erex International Ltd.	7.2 million	1.47%
FI Main Dyke	Li	Erex International Ltd.	6.5 million	1.49%
Echo-Thor	Li	Erex International Ltd.	1.7 million	1.50%

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Rare Earth Elements-REE

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Rare earth elements (REE) is the term used to describe 17 elements that include lanthanum and the lanthanide elements¹ (atomic numbers 57 through 71 on the periodic table), as well as scandium and yttrium. These elements tend to occur together, but are rarely found concentrated in deposits that can be mined. The rare earth elements are all metals and are also known as rare earth metals (REM).

Rare earth elements are commonly found as oxides and categorized as heavy rare earth oxides (HREO) and light rare earth oxides (LREO). The two can be combined and reported as total rare earth oxides (TREO).

Current Activity

Avalon Advanced Materials Inc. (AVL) calculated a proven and probable mineral reserve in April 2013, which formed part of a feasibility study for the Nechalacho project, located at Thor Lake about 100 kilometres southeast of the capital city of Yellowknife. In August, 2013, an updated resource estimate was released taking into account zircon, niobium and tantalum oxides.

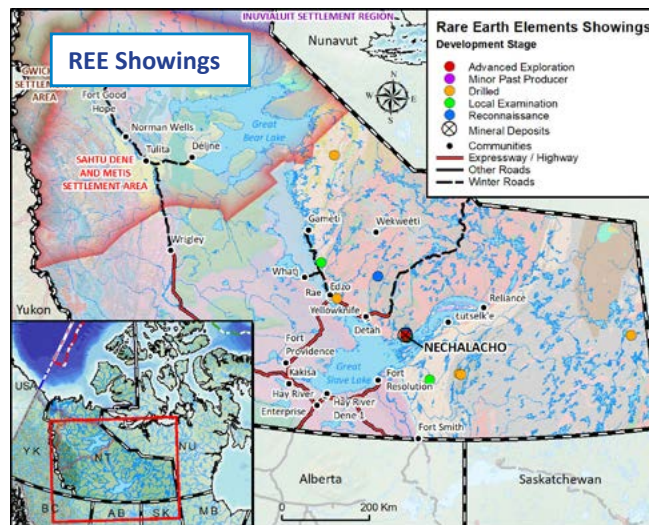
The project has undergone an environmental assessment and in 2014 was approved for pre-construction work that included the development of an underground decline. Avalon has not begun this work as the company continues to explore options to improve the economics of the project.

The deposit is flat lying, lies approximately 200 metres below surface and is amenable to low-cost underground bulk mining methods.

The mine-life is forecast to be 20 years using a mining production rate of 2,000 tonnes per day. AVL is working to optimize value by making changes to the metallurgical process flowsheets.

In the past, deposits in the Thor Lake area have also been assessed for their Beryllium, Tantalum, Niobium (Columbium) and Thorium content.

Cheetah Resources Pty. Ltd. In 2019, Avalon entered into a collaborative agreement with a private Australian company,



Cheetah Resources Pty Ltd, enabling Cheetah to participate in small-scale, minimal environmental impact, near surface development at the project site. The objective is to mine the near surface deposits between surface and 150 meters depth at the T-Zone and Tardiff zones, and supply a high purity mixed rare earth feedstock to established third party Rare-Earth Oxide (REO) separation and refining facilities. The plan shortens lead time to production to capture increased demand for REOs. The Nechalacho property is a rich polymetallic rare metals resource, with additional potential for economic recovery of beryllium, lithium, zirconium, niobium, and tantalum. Presence of high-grade, near-surface neodymium-praseodymium (Nd-Pr) and dysprosium resources is indicated at the T-Zone, Tardiff zone and Lake Zone areas.

Vital Metals Ltd. In 2019, Cheetah Resources was acquired by Vital Metals Limited, an ASX traded public company. Vital is targeting production start in early 2021 from a starter pit at the North T zone. Vital Metals released a JORC 2012 compliant resource of 3.196 Mt 2.38% TREO (Measured, Indicated, and Inferred), for the deposit above the 150m elevation level.

Rare Earth Elements-REE

Uses

- High strength permanent magnets used in electric vehicles, industrial motors, air-conditioners, wind and tidal turbine generators
- LED Lighting in consumer goods such as televisions, computers, mobile phones, cameras and tablets, and in fluorescent lighting
- Military technologies such as satellite communication, radar, night-vision goggles, mine detectors, jet engines and sonar
- Rare Earths are used in catalysts for air pollution control

Global production and market price

China produces over 80 per cent of the world's rare earth metal materials and is host to over 30 per cent of the world's reserves (USGS Mineral Commodity Summary Fact Sheet 2017). China is starting to control its production (including a crackdown on illegal miners) which will lead to improved prices. Companies with resources are poised to begin work that will fast-track to production when the market rebounds.

Other Known REE Showings

Several showings south of Great Slave Lake have been drilled and tested for their uranium, thorium and rare earth potential. Some of the uranium showings in the Churchill Geological Province were found to contain highly anomalous REE values. Other IOCG (Iron Oxide Copper Gold) targets northwest of Yellowknife in the Bear Geological Province have been found to contain anomalous REE values and REE have also been found within carbonatite in the Slave Geological Province.



Rare Earth elements used in satellite communication technologies.

Prospects

AVALON ADVANCED MATERIALS NECHALACHO DEPOSIT AS AT AUGUST 15, 2013

Resource Category	Zone	Tonnes millions	TREO %	HREO %	%HREO/ TREO	ZrO2 %	Nb2O5 %	Ta2O5 %
Measured	Basal	12.56	1.71	0.38	22.50	3.20	0.40	0.04
Indicated	Basal	49.33	1.62	0.35	21.27	3.07	0.40	0.04

Note: HREO comprises Y_2O_3 , Eu_2O_3 , Gd_2O_3 , Tb_4O_7 , Dy_2O_3 , Ho_2O_3 , Er_2O_3 , Tm_2O_3 , Yb_2O_3 and Lu_2O_3 , while TREO comprises HREO plus La_2O_3 , CeO_2 , Pr_6O_{11} , Nd_2O_3 and Sm_2O_3

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Tungsten-W

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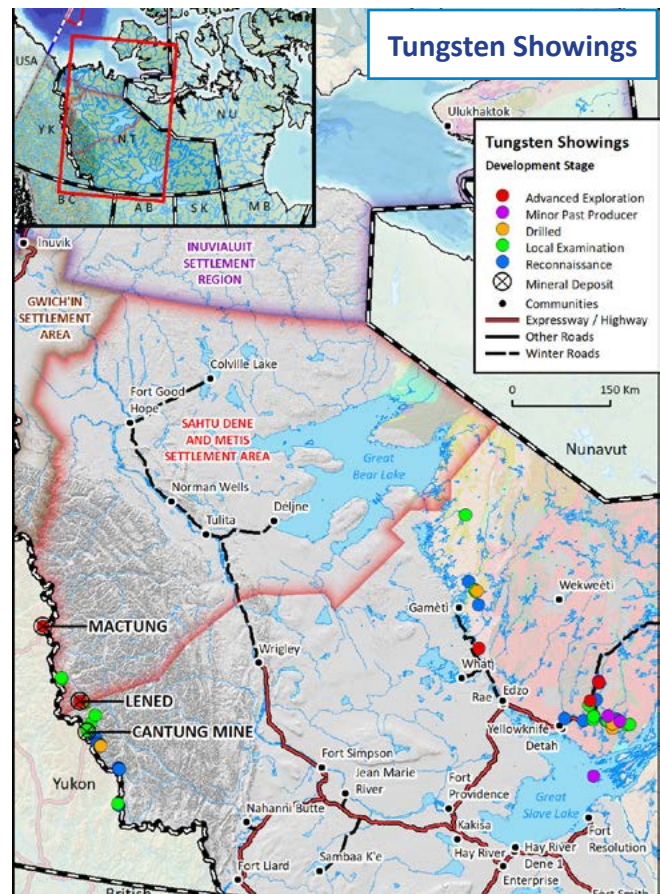
Tungsten is a metal with a unique set of chemical properties that contributes significantly to products manufactured and used globally. With qualities that include a high melting point ($3,422 \pm 15^\circ\text{C}$), high density, high tensile strength, exceptional hardness and corrosion-resistance, tungsten has many uses.

Known world class NWT Tungsten resources

The Northwest Territories (NWT) hosts globally significant tungsten resources and is home to one of the world's largest tungsten deposits outside of China. Two substantial tungsten deposits overlap the NWT/Yukon border, the past-producing Cantung Mine and the Mactung deposit.

The Cantung Mine is road-accessible via Watson Lake, Yukon, which lies about 300 kilometres southwest of the mine. Discovered in 1954 and mined since 1962, the Cantung Mine produced tungsten, off and on, until October 2015. The price of tungsten has been cyclical. Between 2011 and 2014, the mine profited from prices that were sporadically almost double of what they had been (and later would become).

The undeveloped Mactung is one of the world's highest grade deposits. It lies 160 kilometres northwest of Cantung and is currently accessible via road from Ross River, Yukon. Mactung has an indicated mineral resource that totals 33 million tonnes with an average grade of 0.88% WO_3 and an additional inferred resource of 11.9 million tonnes at 0.78% WO_3 (as of April, 2009). In



2009, a feasibility study was completed for Mactung; an underground mine was envisioned with a mining rate of 2,000 tonnes/day. Mine life for the underground development was predicted to be 11 years, while an open pit had the potential to expand the mine life by 17 years.

Tungsten-W

Other Prospects

Historically, small deposits in the NWT have produced tungsten as a by-product (e.g. the Outpost Island Mine) and this may happen in the future (e.g. Fortune Minerals' NICO deposit hosts some tungsten).

Uses

- Cemented carbides used by the metalworking, mining, and construction industries
- Hardened steel manufacturing
- Wires and electrodes in modern lamp systems
- X-Ray tubes (as both filament and target)
- Windings and heating elements for electrical furnaces
- Electrodes in TIG welding, superalloys and radiation shielding
- Military applications
- Vehicle window heating
- Industrial catalysts



Tungsten is used in the development of wires and electrodes.

Prospects

Name	Project Owner / Manager	Resource Category	Total Resource	Grade	Resource Calculated
Mactung	Government of the NWT	Indicated	33 million tonnes	0.88% WO ₃	April 2009
Cantung Mine	North American Tungsten Corp. / Government of Canada	Indicated	3.45 million tonnes	0.97% WO ₃	Sept. 2014

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Vanadium

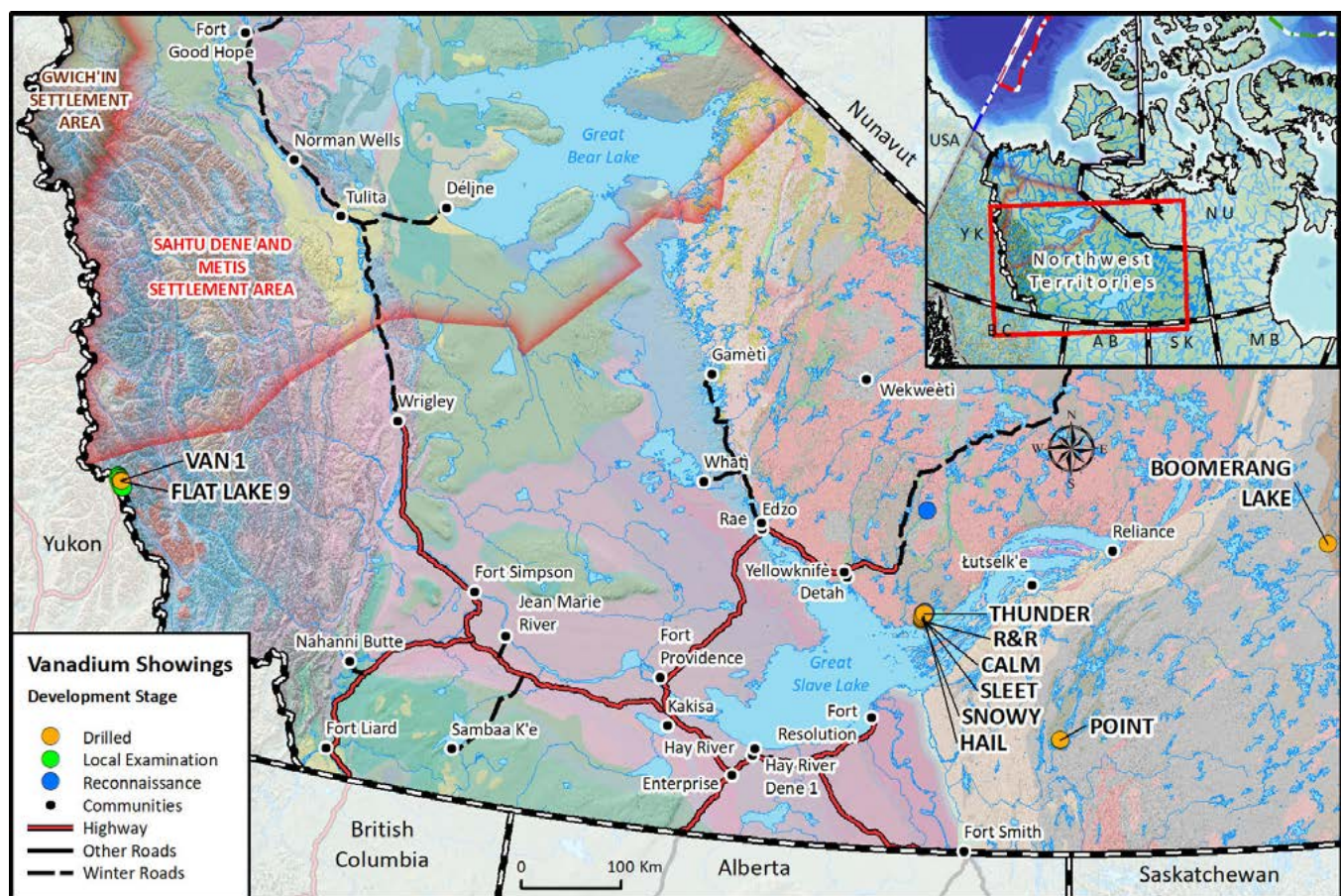
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Vanadium is a metal that has been used for many years in small amounts to strengthen steel used in automobile and air transport parts. Currently 90 per cent of V_2O_5 consumption is steel-related. Vanadium's use in new technology - vanadium redox flow batteries - is set to considerably expand the market.

Canada is not a primary vanadium producer. However, as a secondary producer (by-products and recycling) in 2014, it accounted for about one per cent of global production. Vanadium has been mined and extracted from titaniferous magnetite deposits, vanadium-rich sandstone and carbon-rich shales. The principal sources of vanadium commonly contain from 0.1 to one per cent vanadium pentoxide.



Vanadium

Current Activity

In 2018, Vanadium North Resources Inc. optioned the Van project located about 10 kilometres northwest of the past producing Cantung tungsten mine and host to a vanadium-rich carbonaceous mudstone. In early 2019, Regency Gold Corp. offered to acquire Vanadium North in order to explore and profit from the vanadium potential of the expanded Valley of Vanadium property. The acquisition was cancelled later in 2019. Previous work on the VAN showing focused on a unit that was about 50 metres thick. In 1970, one drillhole returns 0.49 per cent V_2O_5 over a true width of 30 metres (calculated using 0.4 per cent V_2O_5 as a cut-off grade). In 1998, chip sampling in two areas returned assays that averaged 0.6 per cent V_2O_5 over 56-60 metres.

The Valley of Vanadium project is close to the historic Cantung mine and is close to infrastructure including a road access and an airport that were established to support that mine site.

Uses

- About 90 per cent of consumption is in the manufacturing of steel
- Adds strength and heat resistance to iron alloys (in automobile and machinery parts)
- Used in alloys that are non-ferrous such as titanium (in jet engines and high-speed airframes)
- Used in catalysts, dyes and phosphors
- Vanadium-redox flow batteries and other vanadium redox batteries have potential to expand the market – these batteries have large capacities with limited self-discharge and have potential to replace lead-acid batteries and possibly diesel generators.

Prospects

Apart from the VAN and adjacent Flat Lake showings, a few other vanadium occurrences have seen limited work in the past. Vanadium has been found in uranium-bearing sandstones east of Great Slave Lake and in Iron Oxide Copper Gold (IOCG) deposits by Great Bear Lake. Elevated vanadium assays have been recorded from core samples of the Caribou Lake Gabbro near the East Arm of Great Slave Lake, drilled for its magmatic sulphide copper, nickel, and platinum group metals potential.

Other potential vanadium prospects in the territory include various layered igneous complexes.

Business Case

Currently, China produces over one-half of the world's V_2O_5 . South Africa and Russia account for another 25 per cent, while the United States produces around four per cent. The majority of the world's vanadium production is a co-product of iron ore mining and only about one-quarter is sourced from primary vanadium mining.

There are other vanadium showings in the Selwyn Mountains of the Cordillera but they have seen limited exploration in the past. Vanadium is recyclable. However, an expanding market will lead to new opportunities to source the metal.

The vanadium price is similar to other commodities in that it is cyclical. The average price in 2018 was almost double that of 2017. The price was at a high that had not been realized in 10 years. In late 2018, the price began to fall back and in May 2019 it was similar to what it was in the first few months of 2018.

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Unlocking
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