# **e**Research

## **Industry Report**

## February 26, 2020



Niobium (Price per Tonne)



	Price	Mkt. Cap
	(\$)	(\$M)
Alkane	0.98	565.5
Auxico	0.06	2.7
Avalon	0.04	13.2
Commerce Res.	0.26	10.8
Endurance	0.04	3.9
Imperial	0.05	3.5
Lithium Corp.	0.11	10.4
Mkango	0.13	16.6
Namibia C.M.	0.16	28.9
Niobay	0.40	20.9
Niocan	0.13	3.4
NioCorp	0.72	169.1
Plato Gold	0.05	9.6
Saville Res.	0.04	2.5
Taseko	0.53	130.5

Source: S&P Capital IQ

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# **Niobium Industry Report**

Strategic Metal Beginning to Shine

**Niobium** is a soft, grey, crystalline, ductile metal often found in the minerals pyrochlore and columbite. **Niobium** is considered quite rare. In 2018, **niobium** was declared a "strategic metal" by the U.S. government, with stockpiling recommended. The U.S. is currently a large importer of **niobium**.

#### **INVESTMENT HIGHLIGHTS:**

- For an investor looking to diversify their portfolio with an investment beyond precious and base metals, **niobium** provides an investment opportunity tied to economic activity, such as infrastructure and pipeline projects.
- **Niobium**-alloyed steel is relatively lightweight, has good corrosion (rust) resistance, and a unique resistance to radiation damage.
- Demand for **niobium** is expected to increase as the world economy continues to recover from the downturn that began in 2008 and has recently been negatively impacted by a global manufacturing decline and rising trade barriers.
- Increased demand for **niobium** is linked to increased consumption of specialty steels or alloys, which are used in the manufacture of automobiles, buildings, ships, refinery equipment, and the aerospace industry.
- For example, according to **SpaceX**, the upper stage of the **Falcon 9** rocket is made from a **niobium** alloy.
- In addition, increased global demand for cell phones, computers, superconducting magnets, and other high-tech devices will likely cause an increase in demand for **niobium**.
- Demand for these types of steels will likely increase with economic development in countries such as Brazil, China, and India.

#### COMPANY SPOTLIGHT IN THIS REPORT:

- Plato Gold (TSXV:PGC)
  - Good Hope Niobium Property near Marathon, Ontario.
  - The property has exceptional mining infrastructure, including road, rail, port, hydro, water, and a mining-experienced labour force.
  - Key drill result: 0.190% Nb<sub>2</sub>O<sub>5</sub> and 2.04% P<sub>2</sub>O<sub>5</sub> over 93.08 metres.

#### **NIOBIUM PRICING:**

- There is no official price for **niobium**, as the commodity is not traded on any metal exchange London Metal Exchange or other metal exchange. The price of **niobium** is negotiated between the buyer and seller.
- The long-term price history of **niobium**, since 1940, has been extremely volatile, ranging from US\$10,000 to over US\$70,000 per tonne.
- Despite the longer-term volatility and reaching a low of US\$10,000 per tonne in 2000, the price of **niobium** has been very stable since 2010.
- Over the last eight years, the average price of **niobium** (in FeNb) has been around US\$41.50 per kilogram, or US\$41,500 per tonne.

All figures in CAD unless otherwise stated.

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## NIOBIUM INDUSTRY OVERVIEW

## **Niobium Overview**

Niobium is a shiny, white metal that typically forms a film on its surface when exposed to air, turning shades of blue, green, or yellow. It has a wide range of uses including hypo-allergenic jewellery to jet engines to super-conducting magnets.

Figure 1: Large Open-Pit Niobium Mine in Brazil



Source: Dialogo Brazil

#### Facts about Niobium:

- The chemical element, niobium, has the symbol "Nb" and atomic number "41".
- Niobium used to be known as columbium. Niobium was officially adopted as the name of the element in 1950, but the name columbium remains in current use in metallurgy in the United States.
- Niobium and tantalum are nearly always found together in nature.
- It was not until the early 20th century that niobium was first used commercially.
- Niobium is considered a technology-critical element.
- Niobium is mostly used in alloys, the largest part in special steel such as that used in gas pipelines. Although these alloys contain a maximum of 0.1%, the small percentage of niobium enhances the strength of the steel.
- The temperature stability of niobium-containing super-alloys is important for its use in jet and rocket engines.
- Niobium is used in various super-conducting materials. These super-conducting alloys, also containing titanium and tin, are widely used in the super-conducting magnets of MRI scanners.
- Other applications of niobium include welding, nuclear industries, electronics, optics, coins, and jewellery.
- The metal is also used in the nuclear industries where neutron transparent structures are required.
- While some compounds of niobium dust can cause eye and skin irritation, there are no known cases of any serious effects of working with niobium. There are also no known environmental effects of niobium.

#### **Physical Attributes of Niobium**

Niobium is a soft, grey, crystalline, ductile metal often found in the minerals pyrochlore and columbite.

- **Pyrochlore** is a name used for the pyrochlore group of niobium oxide minerals of the niobium end member, the pyrochlore super-group. **Pyrochlores** are an important class of materials with diverse technological applications, such as in luminescence, ionic conductivity, nuclear waste immobilization, high temperature thermal barrier coatings, automobile exhaust gas control, catalysts, solid oxide fuel cell, and ionic/electric conductors.
- **Columbite** is a black mineral group that is an ore of niobium.

Niobium is a lustrous, grey, ductile, paramagnetic metal. It becomes a super-conductor at very low temperatures. At atmospheric pressure, it has the highest critical temperature of the elemental super-conductors.

Niobium has the greatest magnetic penetration depth of any element. The super-conductive properties are strongly dependent on the purity of the niobium metal. When very pure, it is comparatively soft and ductile, but impurities make it harder.





Source: Wikipedia

#### Niobium as a Rare and Strategic Metal

Niobium is considered quite rare. It is estimated to be the 34th most common element in the earth's crust. Its abundance on earth could be much greater, such that the element's high density could be concentrated in the Earth's core.

The free element is not found in nature. However, niobium occurs in combination with other elements in minerals. Minerals that contain niobium often also contain tantalum.

In May 2018, niobium was declared a "strategic metal" by the U.S. government, with stockpiling recommended for niobium along with other strategic metals. The U.S. is currently a large importer of niobium.

By far, the largest producer in Brazil is Companhia Brasileira Metalurgica e Mineração (CBMM). CBMM produces over 80% of global supply. The company's deposit at its Araxa mine is sufficient to supply global market demand for an estimated 200 years at current rates. Of note, a Chinese group has a 15% stake in the company, and a South Korean/Japanese consortium own another 15%.

#### World Resources

World resources of niobium are more than adequate to supply projected needs. Most of the world's identified resources of niobium occur as pyrochlore in deposits of carbonatite (igneous rocks that contain more than 50% by volume of carbonate minerals).

Most of the world's production of niobium is sourced from Brazil, approximately 88%. Canada is a distant second at approximately 10%.

Figure 3: World Mine Production & Reserves (US Ton)

	** Mine Prod	uction**	Reserves
	2017	2018E	2018
Brazil	60,700	60,000	7,300,000
Canada	6,980	7,000	1,600,000
United States	0	0	180,000
Other Countries	<u>1,410</u>	1,000	<u>N/A</u>
TOTAL	69,090	68,000	9,080,000

Source: U.S. Geological Survey, February 2019

Demand for niobium is expected to increase as the world economy continues to recover from the downturn that began in 2008 and has recently been impacted by a global manufacturing decline and rising trade barriers. Increased demand for niobium is linked to increased consumption of specialty steels, which are is used in the manufacture of cars, buildings, ships, and refinery equipment. Demand for these types of steels will likely increase with economic development in countries such as Brazil, China, and India. In addition, increased global demand for automobiles, cell phones, computers, superconducting magnets, and other high-tech devices will likely cause an increase in demand for niobium.

#### **Uses for Niobium**

Niobium is primarily used by the steel industry to increase strength, toughness, and corrosion resistance, as well as reduce the weight of alloy products. An estimated 90% of world production of niobium is used in high-grade structural steel.

Niobium is used by the aerospace industry in nickel, cobalt, and iron-based super-alloys. Niobium-geranium, niobium-tin, and niobium-titanium alloys are used in super-conducting magnets for magnetic resonance imaging instruments and in particle accelerators.

The second largest application is super-alloys. However, niobium alloy super-conductors and electronic components account for a very small amount of world production.

Other promising uses for niobium at an early stage of development and discovery include significantly increasing the recharging speed of lithium-ion batteries, and in developing the field of quantum computing.

#### • Steel Production

• Niobium is an effective micro-alloying element for steel. Within steel, it forms niobium carbide and niobium nitride, and these compounds improve the grain refining, as well as retard recrystallization and precipitation hardening. These effects, in turn, increase its toughness, strength, and corrosion resistance, as well as its ability to be formed and welded.

- Within micro-alloyed stainless steels, the amount of niobium is small but it is an important addition to high-strength low-alloy steels that are widely used structurally in modern automobiles.
- Niobium is sometimes used in considerably higher quantities for highly wear-resistant machine components and knives. These same niobium alloys are often used in pipeline construction.
- Super-Alloys
  - Niobium is used in nickel-, cobalt-, and iron-based super-alloys, in proportions as great as 6.5%, for such applications as jet engine components, gas turbines, rocket sub-assemblies, turbo charger systems, and heat resisting and combustion equipment.
  - For example, according to **SpaceX**, the upper stage of the **Falcon 9** rocket is made from a niobium alloy.
- Other Uses
  - **Gas Pipelines:** Niobium plays an important role in the production of oil and gas transmission pipelines. Transporting oil and gas to market from rugged and remote locations requires transmission pipelines to operate at high pressures and with improved toughness over a variety of temperature ranges. The need for specialized steel tubing to meet the growing demand for energy resources has put additional focus on niobium for its ability to retard recrystallization at elevated temperatures. This ability has added a new form of processing of cylindrical tubing to meet American Petroleum Institute (API) standards for pipe called High Temperature Processing or HTP. The benefits of using an HTP niobium micro-alloy approach includes reduced operating cost per ton, ease of rolling and welding, excellent low temperature toughness properties, and high strength.
  - **Electro-Ceramics:** Lithium niobate is used extensively in mobile telephones and optical modulators. Niobium is added to glass to obtain a higher refractive index, which allows for the manufacture of thinner and lighter corrective eyeglasses.
  - **Medicine and Jewellery:** Niobium and some niobium alloys are functionally inert and hypoallergenic and, therefore, niobium is used in prosthetics and implant devices, such as pacemakers. Because niobium oxidizes in the Earth's atmosphere very slowly, it is used in jewellery as a hypo-allergenic alternative to nickel. Niobium is highly prized in the jewellery business as it can be heated to produce a wide array of iridescent colours.
  - **Numismatics:** Niobium is used as a precious metal in commemorative coins, often with silver or gold. In 2011, the Royal Canadian Mint started production of a \$5 sterling silver and niobium coin named Hunter's Moon in which the niobium was selectively oxidized, thus creating unique finishes where no two coins were exactly alike.

#### **Niobium Research**

Niobium, due to its variety of properties, is used in several areas of research, including creating magnets. One of the strongest super-conducting magnets in the world uses niobium alloy wires, such as niobium-tin and niobium-titanium.

One such use for a super-conducting magnet is in magnetic resonance imaging (MRI) or spectroscopy (MRS). The super-conducting magnet uses niobium-titanium wire coils to create an initial magnetic field and additional coils of niobium-tin wire to create a secondary magnetic field. The two fields combine to create a stronger magnetic field than the more traditional niobium-titanium super-conducting magnet.

#### **Niobium Pricing**

The primary use of niobium is in steelmaking, in particular, the production of high-grade structural steel and super-alloys. The steel industry accounts for an estimated 90% of niobium use globally. As a result, the trend for its consumption, and its price, will likely follow the trend in steel production. However, there is a caveat, which is that only about 10% of steel products use niobium and, therefore, it should not be assumed that consumption trends and price influence will automatically follow the trends in steel manufacturing.

There is no official price for niobium, as the commodity is not traded on any metal exchange (London Metal Exchange or other). The price of niobium is negotiated between the buyer and seller. The long-term price history of niobium has been extremely volatile, as would be expected for a rare metal without many large-scale uses.

The following chart shows the price history for niobium since 1940. Despite the longer-term volatility, the niobium price has been very stable since 2010.

Over the last eight years, the average price of niobium (in FeNb) has been around US\$41.50 per kilogram, or US\$41,500 per tonne.





Source: www.metalary.com/niobium-price

#### Niobium Mines

There are only three known mines in the world that are currently mining niobium as the primary ore. Two of these are in Brazil, which produces about 90% of world output, and the third is an underground mine in the province of Québec in Canada.

These mines were founded in the 1950s, and they are still the major producers of niobium mineral concentrates.

#### 1. Brazil

Together, the two large mines in Brazil produce about 88% of the world's supply. Brazil also has a large but still unexploited deposit in the state of Amazonas, as well as a few smaller deposits, notably in the state of Roraima.

The Companhia Brasileira de Metalurgia e Mineração (CBMM) is the company behind the mining and processing of niobium in Brazil.

#### 2. Canada

The third largest producer of niobium is the carbonatite-hosted Niobec mine, near Chicoutimi, Québec, which is owned by Magris Resources. It produces between 7% and 10% of the world's supply.

Magris Resources is a private company founded by ex-Barrick Gold Corp. CEO Aaron Regent. Mr. Regent has some partners in his venture, which include Singapore's Temasek Holdings Private Limited and Hong Kong-based CEF Holdings Ltd. Temasek is an investment holding company based in Singapore and owned by the Government of Singapore. CEF is an investment company 50% owned by Canadian Imperial Bank of Commerce and 50% by billionaire Li Ka-shing's Cheung Kong Holdings Ltd.

Magris Resources purchased the Niobec mine from IAMGOLD Corporation in 2015 for US\$530 million.

#### **3.** Other Countries

Australia, Rwanda, Nigeria, and Mozambique are also countries with Niobium mines but production from these four countries account for approximately 1% of the total worldwide production.

#### 4. United States

In the United States, NioCorp Developments Ltd. is developing its Elk Creek project in southeast Nebraska with an underground mine and an associated manufacturing facility. NioCorp has completed a Feasibility Study and has obtained all required Federal permits. The mine life is estimated to be 36 years. Initial production is currently earmarked for April 2021. When operable, the project will be the only niobium mine and primary niobium processing facility in the United States.

## **COMPANY SPOTLIGHT**

## Plato Gold Corp. (TSXV:PGC)

Plato Gold Corp. ("Plato Gold" or "the Company") is a Canadian junior mining exploration company. It is active in northern Ontario, near both Marathon and Timmins, and in Santa Cruz in southern Argentina. The Company has three significant exploration projects:

- Good Hope Niobium Project (100% ownership), near Marathon, Ontario;
- Pic River Platinum Group Metals (PGM) Option Agreement (to acquire 100% interest), near Thunder Bay, Ontario;
- Timmins Gold Project, with varying interests in four properties, near Timmins, Ontario; and
- Lolita Project in Argentina (75% interest).

The **Good Hope Niobium Project** is located in northern Ontario, approximately45 km northwest of Marathon and 28 km north of Highway 17 (Trans-Canada Highway). Good Hope is close to the Hemlo gold mining camp. The property consists of a total of 254 claims and about 5,100 hectares.

The **Pic River PGM Project** consists of a total of 105 claims, comprising 82 Single Cell Mining Claims and 23 Boundary Cell Mining Claims, and covers an area of approximately 2126 hectares in Foxtrap Lake and Grain Township, near Thunder Bay, Ontario. The claims are contiguous to the gabbros of the Generation Mining property. Generation Mining recently filed a Preliminary Economic Assessment study (PEA) on the Marathon Palladium and Copper Project that is adjacent to Plato's claim block.

**Timmins Gold** is an early stage development project located in northern Ontario. The project encompasses four properties: (1) Guibord (50%); (2) Harker (20%); (3) Holloway (100%); and (4) Marriott (100%). It also includes three leases and one pending lease (Marriott), and 98 claims for a total of 1,658 hectares.

The **Lolita Project**, also early stage, is located in Santa Cruz Province, Argentina, and comprises 9,672 hectares. The property is drill-ready subject to available financing or an option agreement with another company. The environs include three adjoining concessions where a few international exploration companies are active.





Source: Plato Gold Corp.

#### Plato Gold – Flagship Property: Good Hope Niobium Project

- The Company's flagship property is the Good Hope Niobium Property near Marathon, Ontario (see Figure 5). The property has exceptional mining infrastructure, including road, rail, port, hydro, water, and a mining-experienced labour force.
- Plato Gold signed two option agreements in May 2017 to acquire a 100% ownership interest in the Good Hope Niobium Property. To acquire its 100% interest, the Company paid \$127,000 cash and 9.1 million shares. The full acquisition also required a minimum CAPEX spend of \$400,000, which the Company exceeded by spending over \$1.1 million with work up to June 30, 2019.
- The principal host rocks for niobium that are found on the Property are carbonatite and pyrochlorebearing rocks.
- Previous work on the Property has shown that high-grade niobium mineralization predominantly occurs within carbonatite veins that contain cumulates of pyrochlore (niobium-bearing mineral) and apatite (a phosphate mineral).
- The following figure is an image of the drill core to provide an idea of what the pyrochlore and apatite look like. The pyrochlore is often too fine-grained to see with the naked eye.

Figure 6: Apatite and Pyrochlore Minerals in Core Sample



Source: Plato Gold Corp.

## Plato Gold – Good Hope 2018 Drilling Results

Drilling commenced on the Good Hope Property in Q1/2018. Exploratory drill results from nine completed holes (5,016 m of drilling) were announced in Q3/2018. All holes were drilled in a north-westerly direction ranging in length from 372 m to 672 m with a vertical depth between 285 m and 580 m. All holes drilled encountered zones of "massive carbonatite within a brecciated system."

The large amount of carbonatite in every drill-hole suggests there is good potential for niobium mineralization over a large area. The drill-data is being reviewed with outside consultants in order to reach a decision on the next phase, which is likely to include infill drilling and sampling, extension of the drilling to the north-west, and identification of other target areas for exploration.

The two most significant intersections from the drilling program were 0.190% Nb<sub>2</sub>O<sub>5</sub> and 2.04% P<sub>2</sub>O<sub>5</sub> over 93.08 metres and 0.175% Nb<sub>2</sub>O<sub>5</sub> and 2.03% P<sub>2</sub>O<sub>5</sub> over 89.24 metres.

## Plato Gold – 2020 Catalyst

Further exploration and drilling on the Good Hope Niobium Project to follow up on the work completed in 2018.

#### Plato Gold – Team

- Anthony Cohen President and Chief Executive Officer: Anthony Cohen is also the Founder, President, and Chief Executive Officer of Gulf & Pacific Equities Corp. (TSXV:GUF), a real estate company. As well, he currently serves as a director of Gendis Inc., a private energy, real estate, and agribusiness company. Mr. Cohen was a past director of Chauvco Resources Ltd., an international oil and gas company.
- Peter Hubacheck Independent Director: Peter Hubacheck is a consulting geologist and President of W. A. Hubacheck Consultants Ltd. He has over 40 years of experience as a project geologist, exploration manager and Qualified Person for the purposes of NI 43-101, with experience in the exploration for gold, silver, base metals, uranium, and diamonds in Canada and the USA. He holds a Mining Technologist (1974) diploma from the Haileybury School of Mines and Technology, Haileybury, Ontario, and a B.A.Sc. (Geol. Eng. 1977) degree from the South Dakota School of Mines and Technology, Rapid City, South Dakota. From 1996 to 1998, he served as a director of Agnico-Eagle Mines Ltd. (TSX:AEM; NYSE:AEM) and, from 2004 to 2006, he served as a director of Contact Diamond Corporation (acquired by Stornoway Diamond Corporation). Mr. Hubacheck served from 2008 to 2013 as a director of Sheltered Oak Resources Corp., acquired by Foundation Resources.
- John H. Paterson Independent Director: John Paterson has a diversity of experience gained with both major and junior mining companies. He is a professional engineer and currently serves on the boards of several mining and exploration companies. Mr. Paterson was President and CEO of Aurogin Resources Ltd. from 2002 to 2007, which developed the El Sastre gold mine prior to merging with Morgain Minerals (which formed Castle Gold Corp.). Before joining Aurogin, Mr. Paterson was President and CEO of Geomaque Explorations Ltd. from 1991 to 2001, where he directed the development of two heap leach gold mines, the San Francisco gold mine located in Sonora, Mexico, and the Vueltas Del Rio gold mine located in Honduras. Mr. Paterson is also a director of MillenMin Ventures Inc.

#### Plato Gold – Capital Structure

- As at January 9, 2020, Plato Gold had 213.5 million shares outstanding and no debt. As of September 30, 2019, there were 5.88 million warrants outstanding at an average exercise price of \$0.10 per share with a weighted average remaining life of 0.5 years and 16.13 million options outstanding at an average exercise price of \$0.10 per share with a weighted average remaining life of 7.1 years.
- Officers, Directors, and Insiders own or control, directly or indirectly, according to www.sedi.com, approximately 33.3% of the issued and outstanding common shares of the Corporation. Only one shareholder, Anthony Cohen, holds more than 10% and he controls, directly and indirectly, approximately 24.2%.

## **NIOBIUM MINING COMPANIES**

## Alkane Resources Limited (ASX:ALK)



**Alkane Resources** is a gold producer with a multiple-commodity development and exploration portfolio. The Company's flagship mine, Tomingley, has been operating since 2014. Tomingley comprises four exploration licenses. The Company's most advanced non-gold project is the Dubbo project, subject to financing, which has a large in-ground resource of zirconium, hafnium, niobium, yttrium, and rare earth elements with a potential mine life of 75+ years.

## Auxico Resources Canada Inc. (CNSX:AUAG)

Website:	www.auxicoresources.com		
Ticker:	CNSX:AUAG	AUVICO	
Head Office:	Montreal, Canada	RESOURCES	
Price (02/24/20):	\$0.06	0.25	0.60
Market Cap (M):	\$2.7	0.20	0.50
Shares (M):	44.9	@ 0.15	0.40
Cash & ST Inv. (M):	\$0.0	<u><u> </u></u>	<sup>0.30</sup> <b>u</b>
Debt (M):	\$0.0		0.20 <b>S</b>
Ent. Value (M):	\$2.8		0.00
<b>Rev LTM (M):</b>	\$0.00	2-19 5-19 8-19 11-19 2-20	0

Auxico Resources Canada Inc. was founded in 2014 and is based in Montreal. Auxico is focused on the exploration and development of projects in Colombia, Brazil and Mexico. The Company is mainly focused on silver, gold, tin, tantalum, and niobium.

## Avalon Advanced Materials Inc. (TSX:AVL)



**Avalon Advanced Materials** is a Canadian mineral development company specializing in niche market metals and minerals with growing demand in new technology. The Company has three advanced stage projects, providing investors with exposure to lithium, tin and indium, as well as rare earth elements, tantalum, niobium, and zirconium. Avalon is currently focusing on developing its Separation Rapids Lithium Project, in Kenora, Ontario, and the East Kemptville Tin-Indium Project, in Yarmouth, Nova Scotia, to production. Avalon continues to advance its Nechalacho Rare Earth Elements asset, in the N.W.T., in collaboration with Cheetah Resources, while also working to initiate rare earth production from coal mine wastes at Will Scarlett in Illinois, U.S.A. According to the Company's website, social responsibility and environmental stewardship are corporate cornerstones.

### **Commerce Resources Corp. (TSXV:CCE)**

Website:	www.commerceresources.com	n		J,	$) \sim ($			È	
Ticker:	TSXV:CCE			X	RES	OURCES	CORP	-	
Head Office:	Vancouver, Canada			<b>D</b> -		0011020			
Price (09/18/19):	\$0.26		0.90						0.40
Market Cap (M):	\$10.8		0.80 0.70	<u></u>					).35
Shares (M):	31.8	(\$	0.60		` لىر	<b>`</b> \		- (	).25 <b>E</b>
Cash & ST Inv. (M):	\$0.1	ice (	0.40						0.20 <b>E</b>
Debt (M):	\$0.0	2	0.30 0.20					M (	0.10 <b>S</b>
Ent. Value (M):	\$10.1		0.10	h.h.			الم الم ا		).05 ).00
<b>Rev LTM (M):</b>	\$0.00		2.	-19	5-19	8-19	11-19	2-20	

**Commerce Resources Corp.** is an exploration stage company that engages in acquisition, exploration, development, and evaluation of mineral resource properties in British Columbia and Québec, Canada. Its primary focus is on its exploration activities with respect to tantalum and niobium. The Company's Blue River Tantalum/Niobium Project is made up of three major anomalous deposits known as the Upper Fir, the Fir, and the Verity. The Company's Carbo Claims consist of five mineral claims that are located approximately 80 kilometres northeast of Prince George, British Columbia, Canada. The Carbo Claims cover a series of niobium and rare earth elements bearing dike- or sill-like carbonatites, and syenites.

## Endurance Gold Corporation (TSXV:EDG)

Website:	www.endurancegold.com		
Ticker:	TSXV:EDG		7 E
Head Office:	Vancouver, Canada		<b>C</b> 0
Price (02/24/20):	\$0.04		0.07
Market Cap (M):	\$3.9		0.06
Shares (M):	110.4	\$)	0.05
Cash & ST Inv. (M):	\$2.5	ice (	
Debt (M):	\$0.0	<u>م</u>	0.02
Ent. Value (M):	\$1.4		0.01
<b>Rev LTM (M):</b>	\$0.00		2-19 5-19

ENDURANCE GOLD CORPORATION 0.07 0.06 0.05 0.04 0.03 0.02 0.01 0.00 0.15 0.10 0.05 0.10 0.05 0.00 0.15 0.10 0.05 0.10 0.05 0.00 0.15 0.10 0.05 0.00 0.05 0.00 0.15 0.00 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.

**Endurance Gold** is a company focused on the exploration and development of precious metals mineral properties in North America. Key properties include the Elephant Mountain and McCord Gold Properties in Alaska. Endurance Gold also owns a significant shareholding in Inventus Mining Inc. (TSXV:IVS) which controls the Pardo paleoplacer gold district near Sudbury, Ontario, and a 2% NSR on GFG Resources' (TSXV:GFG) Rattlesnake Hills project. Endurance also holds interests in the Bandito Rare Earth Elements-Niobium-Nickel property located in Yukon, Canada.

## Imperial Mining Group (TSXV:IPG)



Imperial Mining Group Ltd. is a Canadian exploration company focused on advancing its copper-zinc, gold, and technology metals properties in Québec. The Company holds a 100% interest in the Crater Lake project, which comprises 96 contiguous claims covering an area of 47km<sup>2</sup> located to the northeast of Schefferville, Québec.

## Lithium Corporation (OTCPK:LTUM)



**Lithium Corp.** is an exploration company focused on lithium assets in Nevada. The Company owns interests in the Fish Lake Valley property, which comprises 143 claims covering ~11,360 acres located in northern Esmeralda County in west central Nevada. The Company is also advancing its San Emidio property located in Washoe County in Nevada.

## Mkango Resources (TSXV:MKA)



**Mkango** is an exploration and development company focused on rare earth elements in the Republic of Malawi. The Company holds interests in three exclusive prospecting licenses in Malawi: Phalombe, Thambani, and Chimimbe Hill. The main exploration target is the 51%-owned PFS-stage Phalombe project. A Feasibility Study is currently underway. In March 2019, the Company received £7 million from an investment from Talaxis to fund completion of the Feasibility Study. Following completion of the Feasibility Study, Talaxis has an option to acquire a further 26%.

## Namibia Critical Metals (TSXV:NMI)



**Namibia Critical Metals Inc.** is an exploration and development company focused in Namibia. The Company explores for heavy rare earths, which include cobalt, copper, lithium, tantalum, niobium, and nickel. Namibia holds a diverse portfolio of 7 projects, which comprises 16 exclusive prospecting licenses for ~6,200km<sup>2</sup>.

## Niobay Metals Inc. (TSXV:NBY)



**Niobay Metals** acquires, explores for, and evaluates mineral properties in Canada. Its main exploration focus is on the "green critical metals" and, in particular, its search for niobium and tantalum deposits. The Company holds a 100% interest in the James Bay Niobium property that covers an area of 2,530 hectares located in the James Bay Lowlands of Ontario. The Company received its exploration permit for this project in January 2019. The program consists of seven holes of an average of 500 metres each. The objective of the program is to test the high-grade extension laterally and at depth. Results will be used in a 43-101 mineral resource update and the Company plans to complete a PEA by Q4/2020. The Company also holds an interest in the Crevier Niobium and Tantalum project, which includes 83 contiguous concessions covering an area of 4,645 hectares located in the Lac Saint-Jean region of Québec.

## Niocan Inc. (TSXV:NIO)

Website:	www.niocan.com	Nlinear
Ticker:	TSXV:NIO	NIOCAN inc.
Head Office:	Montreal, Canada	NIOBIUM / CANADA
Price (02/24/20):	\$0.13	0.30 0.06
Market Cap (M):	\$3.4	
Shares (M):	26.0	
Cash & ST Inv. (M):	\$0.1	
Debt (M):	\$2.27	0.05 0.01
Ent. Value (M):	\$5.6	
<b>Rev LTM (M):</b>	\$0.0	2-19 0-19 11-19 2-20

**Niocan Inc.** is engaged in the exploration and development of the Oka niobium property 40 km northwest of Montreal, Québec. The Company converts the niobium into ferro-niobium products. The Oka ore contains other minerals, including apatite, magnetite, calcite, and rare earths. The Oka project involves the development of a mining complex based on an underground mine, a concentrator, and a converter to produce the ferro-niobium. The project has completed all exploration phases, including two drilling campaigns in 1995, 1996, and 1997 for a total of 22,204 metres, to define two resource ore bodies. Certain conducted tests allow for the development of an optimal pyrochlore recovery process. Pyrochlore is the niobium-bearing mineral.

## NioCorp Developments Ltd. (TSX:NB)



**NioCorp Developments** is developing the Elk Creek Project in southeast Nebraska that will produce niobium, scandium, and titanium, with an underground mine and an associated manufacturing facility. NioCorp has completed a Feasibility Study, has obtained all required Federal permits, and is slated to launch after a three-year construction period, with mine life estimated at 36 years. The Elk Creek Project is North America's only niobium / scandium / titanium project, and is the highest-grade niobium project in North America. It is also one of the largest prospective producers of scandium trioxide in the world. Once in production, it will initiate the first production in the U.S. in decades of niobium and scandium. All three of the Project's proposed super-alloy metals have been designated as "critical minerals" by the U.S. government.

## Plato Gold Corp. (TSXV:PGC)



**Plato Gold Corp.** is a junior mining exploration company. Its flagship property is the Good Hope Niobium Property near Marathon, Ontario, where there is proximity to exceptional mining infrastructure, including road, rail, port, hydro, water, and a mining-experienced labour force. The property is located in northern Ontario approximately 45 km northwest of Marathon and 28 km north of Highway 17 (Trans-Canada Highway), and is in proximity to the Hemlo gold mining camp. The property consists of a total of 254 claims and about 5,100 hectares. Drilling commenced on the Good Hope Property in early 2018 and exploratory drill results from nine completed holes encompassing 5,016 metres of drilling were announced at the end of 2018.

#### Saville Resources Inc. (TSXV:SRE)



**Saville Resources Inc.** is engaged in the acquisition, exploration, development, and mining of mineral properties. The Company's principal asset is the Niobium Claim Group Property, situated within the central Labrador Trough in Québec. It is currently under an Earn-In Agreement from Commerce Resources Corp. for up to a 75% interest. The Property consists of 26 contiguous mineral claims, encompassing an area of approximately 1,223 hectares, and is considered prospective for niobium and tantalum. The Property includes portions of the high-priority, drill-ready Miranna Target, where prior boulder sampling in the area returned 5.9% Nb2O5.

## **Taseko Mines Limited (TSX:TKO)**



**Taseko Mines Limited** acquires, develops, and operates mineral properties in Canada and the United States. The Company explores for copper, molybdenum, gold, niobium, and silver deposits. It holds a 75% interest in the Gibraltar copper-molybdenum mine located in south-central British Columbia. The Company also has interests in the Aley niobium, Harmony gold, and New Prosperity copper-gold projects situated in British Columbia; and the Florence copper project located in Arizona.

## **APPENDIX A: NIOBIUM MINING & EXPLORATION COMPANY COMPARABLES**

	-															
		Feb 25	Mkt Cap	Cash	Debt	EV	Revenue (M)		EV/Revenue		TBV	<b>TBV/Price</b>	SHA	SHARES O/S (M)		
Name	Ticker	Close	(M)	(M)	(M)	(M)	2017A	2018A	2019E	2018A	2019E	/Share	(%)	2017A	2018A	Feb 25
Alkane Resources	ASX:ALK	\$0.98	\$565.5	\$78.4	\$0.0	\$487.1	\$117.8	\$130.0	\$92.1	3.7x	5.3x	\$0.50	51%	506.1	506.1	580.0
Auxico Resources	CNSX:AUAG	\$0.06	\$2.7	\$0.0	\$0.1	\$2.8						-\$0.01	-20%	35.8	39.9	44.9
Avalon	TSX:AVL	\$0.04	\$13.2	\$2.7	\$1.7	\$12.2						\$0.36	908%	211.0	257.5	329.6
Commerce Resources	TSXV:CCE	\$0.26	\$10.8	\$0.7	\$0.0	\$10.1						\$1.49	574%	31.0	31.0	41.5
Endurance Gold	TSXV:EDG	\$0.04	\$3.9	\$2.5	\$0.0	\$1.4						\$0.04	105%	103.6	110.4	110.6
Imperial Mining	TSXV:IPG	\$0.05	\$3.5	\$0.4	\$0.0	\$3.2						\$0.08	176%	0.0	50.3	78.1
Lithium Corporation	OTCPK:LTUM	\$0.11	\$10.4	\$0.4	\$0.0	\$10.0						\$0.01	8%	89.5	95.7	95.7
Mkango Resources	TSXV:MKA	\$0.13	\$16.6	\$10.1	\$0.0	-\$3.6						\$0.15	121%	102.9	111.3	133.0
Namibia Critical Metals	TSXV:NMI	\$0.16	\$28.9	\$0.5	\$0.0	\$28.5						\$0.16	101%	83.7	180.3	180.3
Niobay Metals	TSXV:NBY	\$0.40	\$20.9	\$1.4	\$0.0	\$19.6						\$0.04	10%	36.7	45.7	52.3
Niocan Inc.	TSXV:NIO	\$0.13	\$3.4	\$0.1	\$2.3	\$5.6						-\$0.09	-70%	26.0	26.0	26.0
NioCorp	TSX:NB	\$0.72	\$169.1	\$0.1	\$3.4	\$172.5						\$0.02	2%	208.9	223.9	234.8
Plato Gold	TSXV:PGC	\$0.05	\$9.6	\$0.3	\$0.0	\$9.3						\$0.01	15%	164.7	197.5	213.5
Saville Resources	TSXV:SRE	\$0.04	\$2.5	\$0.1	\$0.0	\$2.4						\$0.03	87%	23.1	63.3	63.4
Taseko Mines	TSX:TKO	\$0.53	\$130.5	\$53.9	\$373.5	\$450.0	\$378.3	\$343.9	\$333.9	1.3x	1.3x	\$1.20	227%	226.7	228.4	246.2
Mean										2.5x	3.3x					
Median										2.5x	3.3x					

Figure 7: Niobium Mining & Exploration Company Comparables

Source: S&P Capital IQ; eResearch Corp.

## **APPENDIX B: THE PERIODIC TABLE OF ELEMENTS**

Figure 8: The Periodic Table of Elements



Source: Los Alamos National Laboratory Chemistry Division; available at http://periodic.lanl.gov/images/periodictable.pdf

## **APPENDIX C: ERESEARCH DISCLOSURE**

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#### ANALYST ACCREDITATION

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Analyst Affirmation: I, <u>Chris Thompson</u>, hereby state that, at the time of issuance of this research report, I do not own shares of any of the Companies mentioned in this Industry Report.

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