Rare Earth Elements-REE

Investment Opportunities

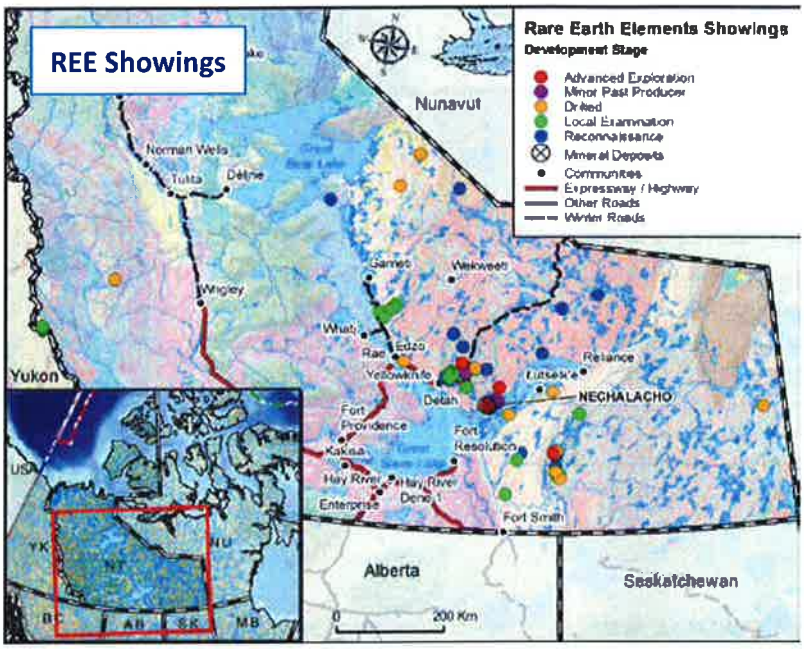
NORTHWEST TERRITORIES

Government of
Northwest Territories

November 2017

Rare earth elements (REE) is the term used to describe 17 elements that include lanthanum and the lanthanide elements[1] (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 estimated mine life is 20 years using a mine 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.

[1] The lanthanides include the metals cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (TM), ytterbium (Yb) and lutetium (Lu).

Unlocking our Potential
NORTHWEST TERRITORIES MINERALS AND PETROLEUM

NWTMINING.COM
E-mail: mining@gov.nt.ca
T: 867-767-9209

NWTGEOSCIENCE.CA
E-mail: ntgs@gov.nt.ca
T: 867-767-9211 Ext.63469

NWTPETROLEUM.COM
E-mail: petroleum@gov.nt.ca
T: 867-777-7480

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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 percent 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 crack-down 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.

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

This publication is produced by the Department of Industry Tourism and Investment (ITI). The Northwest Territories has one of the most diverse geological environments of any jurisdiction in Canada, one that includes the oldest rocks in the world and geological features that have resulted from modern and ongoing processes. The Northwest Territories Geological Survey (NTGS) surveys, collects, analyzes and makes available public geoscience information gathered from a variety of sources, including information on mineral deposits and geology. NTGS, ITI and the NWT and Nunavut Chamber of Mines host the Yellowknife Geoscience Forum each year in November: www.geoscienceforum.com

For more information about these deposits, please refer to Guide to Selected Mineral Deposits of the Northwest Territories
www.iti.gov.nt.ca/en/files/guide-mineral-deposits-northwest-territories

Please visit company websites for latest information.

www.nwtgeoscience.ca www.iti.gov.nt.ca

Note: Discrepancies in the numbers may differ from published reports due to rounding.

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NWTPETROLEUM.COM
E-mail: petroleum@gov.nt.ca
T: 867-777-7480