VITAL ANNOUNCES JORC 2012 COMPLIANT RESOURCES FOR THE NECHALACHO RARE EARTH DEPOSIT

Highlights

- A measured indicated and inferred JORC Resource of **94.7MT at 1.46% TREO** at a 0.1% Nd2O3 cutoff grade **(25.2% NdPr)** contained in the Upper Zone at Nechalacho Rare Earth Project
- Within this resource the Tardiff Zones contains:
  - Measured Resource of **286,563T at 2.7% TREO** at a 0.3% Nd2O3 cutoff grade **(24.2% NdPr)**
  - Indicated Resource of **1.6MT at 2.4% TREO** at a 0.3% Nd2O3 cutoff grade at a 0.3% Nd2O3 cutoff grade **(24.2% NdPr)**
  - Inferred Resource of **1.3Mt at 2.2% TREO** at a 0.3% Nd2O3 cutoff grade at a 0.3% Nd2O3 cutoff grade **(24.2% NdPr)**
- The additional North T Deposit demonstrates excellent potential for a high grade start-up operation containing:
  - Indicated Resource of **36,813T at 1.7% Nd_2O_3**
  - Inferred Resource of **23,492 at 1.4% Nd_2O_3**
- Drill and resampling program completed in Q3 2019 on North T deposit aiming to expand the current resource with results pending
- Drilling to commence on Tardiff Zones in early 2020 with aim to expand existing high grade resource
- The Tardiff Zones contain bastnaesite mineralisation, similar to the North T Deposit which was the subject of successful ore sorting concentration (see ASX Announcement 5/12/19)

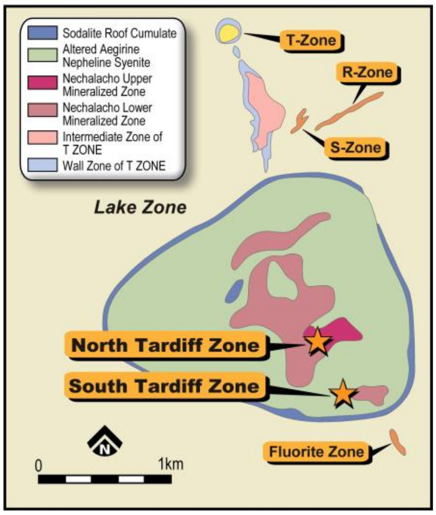
Vital Metals Limited (ASX: **VML**) ("**Vital**" or the "**Company**") via its subsidiary Cheetah Resources Pty Ltd, is pleased to advise it has completed geological work to re-estimate the resources in its 100% owned Nechalacho Upper Zone Rare Earth Project in North West Territories, Canada. The resource is calculated in accordance with JORC Code 2012 and utilizing neodymium cutoff grades.

Commenting on the JORC resource, Vital Metals Managing Director Geoff Atkins said:

"The estimation in accordance with JORC of the Upper Zone of the Nechalacho Rare Earth Project highlights its potential as a world class rare earth project. The high grade targets and high NdPr content has reinforced our belief that the Nechalacho Rare Earth Project has potential for a near-term start-up operation exploiting high-grade, easily accessible near surface mineralisation initially from the North T and Tardiff Zones"

Nechalacho Rare Earth Project

Location and Tenure



Nechalacho Rare Earth Project is located at Thor Lake in the Mackenzie Mining District of the Northwest Territories, approximately 100km southeast of the city of Yellowknife. The district is blessed with substantial infrastructure including roads and railways with the project located on the Great Slave Lake allowing for direct barge access during summer or ice road access during winter.

The Upper Zone - Nechalacho Project Mineral Resource

An updated resource estimate for the Upper Zone of the Nechalacho deposit in accordance with the JORC 2012 code was prepared following geological re-interpretation and creation of new geological wireframes. The estimate is given in Table 1 at varying cutoff grades. The Upper Zone is estimated to contain combined measured, indicated and inferred mineral resources of 94.7 MT grading 1.46% REO including 0.29% Nd_2O_3 at a cutoff grade of 0.1% Nd_2O_3 above the 150 m elevation level.

Compared to the previously announced foreign estimate for the Upper Zone of the Nechalacho Project (refer to announcement 25 June 2019), the current JORC 2012 estimate for the Upper Zone (Table 1) is based on more constrained geological model, a higher cutoff grade and includes only resources above 150 m elevation, but uses the same drill hole assay data as the 2013 estimate. Within the Upper Zone, the high grade Tardiff Zones, have been estimated to a JORC 2012 Resource of **3.19 MT @ 2.4% TREO** using a cutoff grade of 0.3% Nd_2O_3 (Table 2). The Tardiff Zone resources are contained within the Upper Zone resource of the Nechalacho deposit.

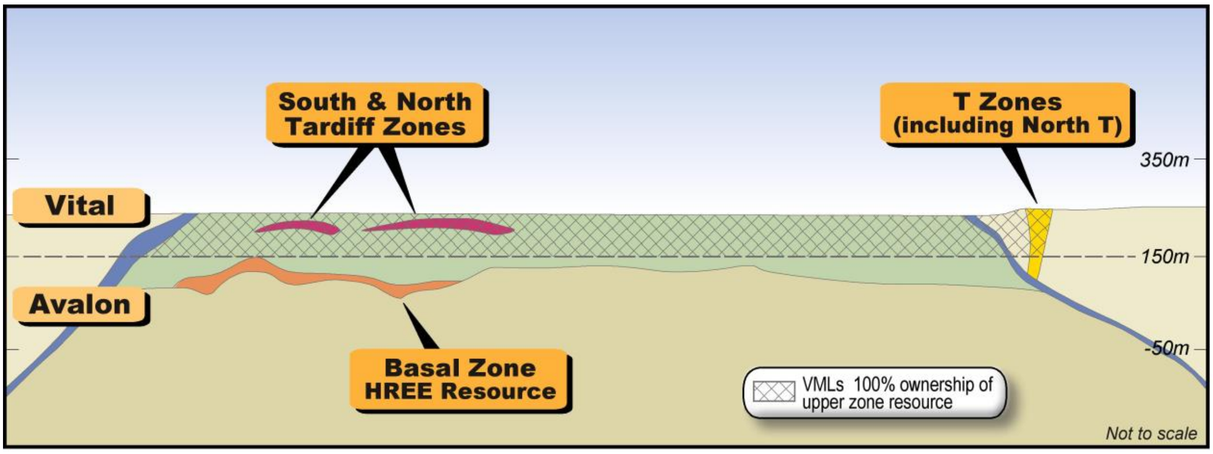


Figure 1. Cross section depicting ownership zones of Nechalcho Rare Earth Project with Vital owing 100% of the Upper Zone Resource depicted in this release and Avalon Advanced Metals owning the Basal Zone (not the subject of this release).

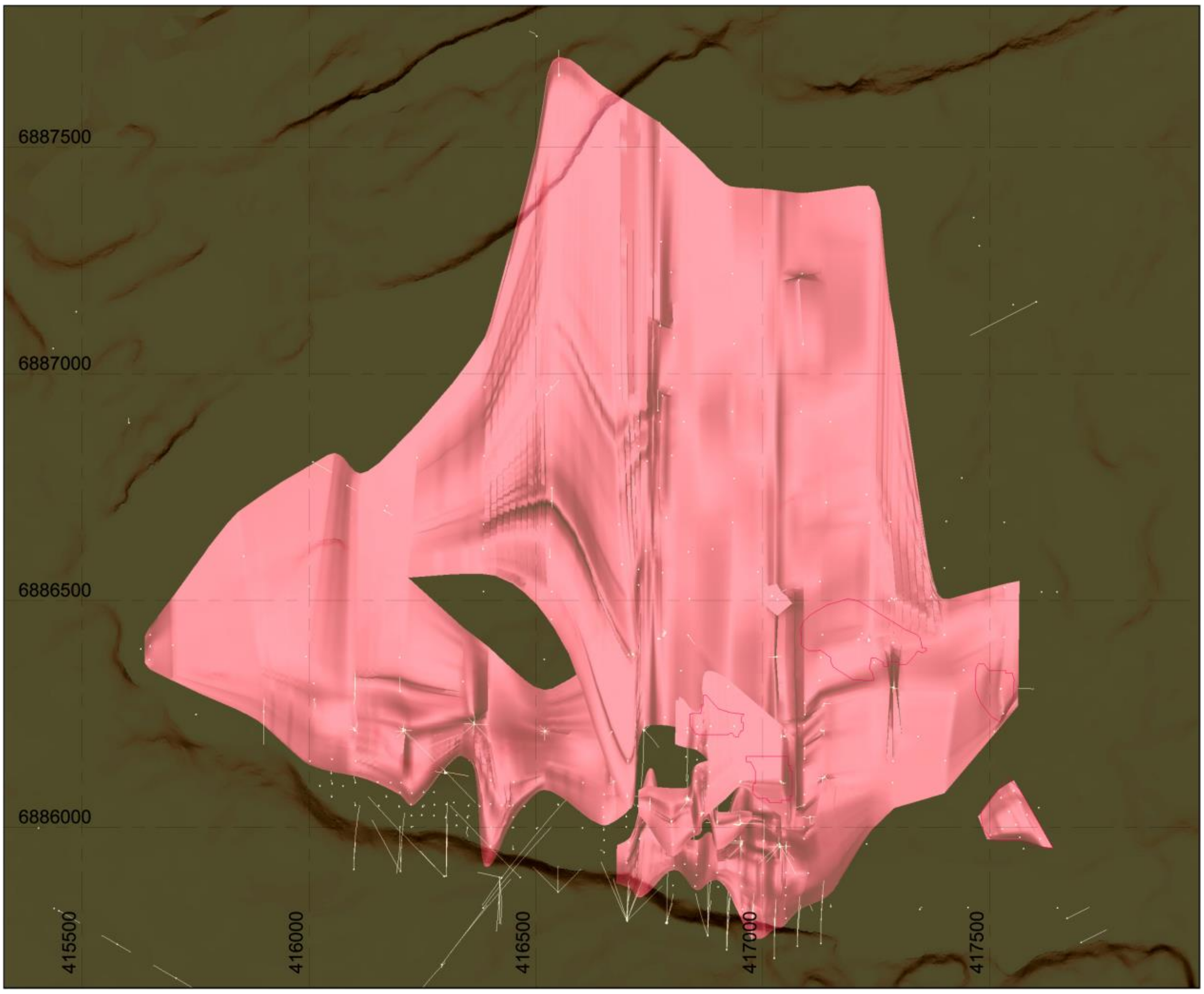


Fig. 2: Plan view showing the wireframe for the whole Upper Zone with the topography and the drill holes. For scale, UTM grid lines are shown at a 500 m spacing.

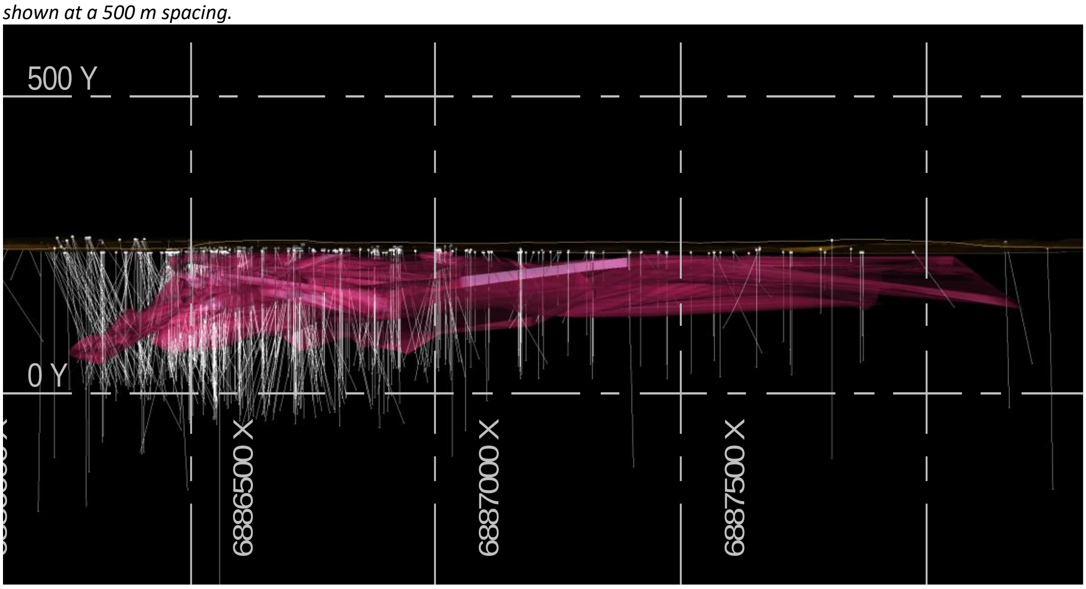


Fig. 1: North-South Section 416,800, looking west, showing the wireframe for the whole Upper Zone with the drill holes

Confidence Category	ND2O3 cutoff grade	Tonnage	REO	LREO	HREO	ND2O3	PR6O11	NdPr:TREO
	%	Mt	%	%	%	%	%	%
Measured	0.3	1.094	2.004	1.817	0.186	0.394	0.106	25.0%
	0.1	2.914	1.468	1.326	0.142	0.288	0.077	24.9%
Indicated	0.3	6.246	1.928	1.762	0.166	0.380	0.102	25.0%
	0.1	14.662	1.508	1.372	0.137	0.295	0.080	24.9%
Inferred	0.3	30.945	1.797	1.637	0.161	0.360	0.094	25.3%
	0.1	77.159	1.456	1.323	0.133	0.291	0.077	25.3%
Measured, Indicated and Inferred	0.3	38.285	1.825	1.662	0.162	0.364	0.096	25.2%
	0.1	94.735	1.464	1.330	0.134	0.291	0.078	25.2%

Table 1: Rare Earth Resources in the Upper Zone, Nechalacho deposit. Mineral Resource Estimation prepared in accordance with JORC 2012 under the supervision of Dr. William Mercer, registered Professional Geoscientist (P. Geo.) in the Northwest Territories and Ontario, Canada, as the Competent Person. The preferred cutoff grade for this resource estimate is preliminary, at pre-scoping study level, as no detailed market, metallurgical or engineering studies have been performed. Only resource blocks located above 150 m elevation are reported.

Tardiff Zone Project Mineral Resource

The criteria that were applied to select near-surface high-grade domains as a subset of the whole Upper Zone resources are as follows:

- Clusters of blocks >2% REO with sufficient tonnage and three-dimensional drilling (>3 drill holes) were identified
- Outlines around each of the four clusters of blocks >2% REO were manually digitized, draped on the topography and then extended 50m downwards to create four 3D wireframes
- Blocks within these wireframes were selected and number-coded using vertical needling with integration level 10 on a >50% basis. The selected blocks are located at <50m depth relative to the topography and include all grades enclosed.

This procedure yielded four distinct zones comprising approximately 3.2 MT of mineralised material at a cutoff grade of 0.3% Nd_2O_3 (see Figure 3). These zones are:

- West of North Tardiff Lake
- West of South Tardiff Lake
- North Tardiff Lake
- North-east of South Tardiff Lake

A drilling program is scheduled to be completed in February/March 2020 targeting the Tardiff zone with the aim to expand the above high grade zones.

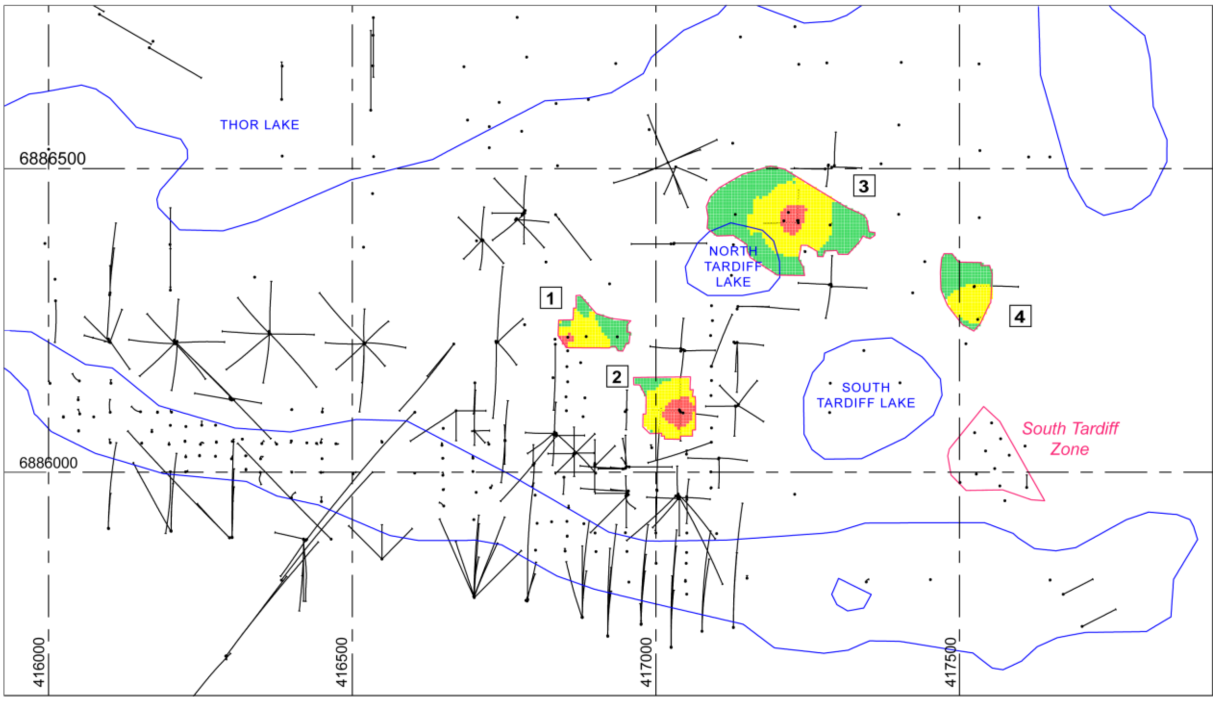


Figure 3: Plan view showing the blocks of the four near-surface high-grade zones, colour coded by confidence level (red = measured, yellow = indicated, green = inferred).

Confidence	*% Nd2O3 cutoff*	*Tonnage*	*TREO*	*LREO*	*HREO*	*ND2O3*	*PR6O11*	*NdPr:TREO*
All 4 surface zones <50 m depth outlined by 2% TREO								
Measured	0.3	286,563	2.729	2.518	0.211	0.515	0.144	24.1%
Indicated	0.3	1,611,345	2.429	2.254	0.176	0.457	0.128	24.1%
Inferred	0.3	1,297,073	2.237	2.085	0.152	0.423	0.119	24.2%
Measured + Indicated + Inferred (JORC)	0.3	3,194,982	2.378	2.209	0.169	0.449	0.126	24.2%
1 - West of North Tardiff Lake								
Measured	0.3	5,963	2.438	2.037	0.401	0.469	0.119	24.1%
Indicated	0.3	129,427	2.020	1.765	0.255	0.397	0.102	24.7%
Inferred	0.3	117,150	1.960	1.768	0.192	0.376	0.100	24.3%
2 - West of South Tardiff Lake								
Measured	0.3	134,337	2.266	2.058	0.208	0.466	0.124	26.0%
Indicated	0.3	319,182	2.023	1.837	0.186	0.418	0.110	26.1%
Inferred	0.3	42,090	1.976	1.806	0.170	0.414	0.106	26.3%
3 - North Tardiff Lake								
Measured	0.3	146,263	3.167	2.961	0.205	0.562	0.164	22.9%
Indicated	0.3	963,510	2.718	2.545	0.173	0.490	0.142	23.3%
Inferred	0.3	929,137	2.358	2.205	0.153	0.440	0.125	24.0%
4 - NE of South Tardiff Lake								
Measured	0.3	0	-	-	-	-	-	
Indicated	0.3	199,226	1.951	1.829	0.122	0.400	0.106	25.9%
Inferred	0.3	208,696	1.904	1.785	0.119	0.379	0.103	25.3%

Table 2: Tardiff Zones high-grade near-surface subset of the Rare Earth Resources of the Upper Zone, Nechalacho deposit. Mineral Resource Estimation prepared in accordance with JORC 2012 under the supervision of Dr. William Mercer, registered Professional Geoscientist (P. Geo.) in the Northwest Territories and Ontario, Canada, as the Competent Person. The cutoff grade for this resource estimate is preliminary, at pre-scoping study level, as no detailed market, metallurgical or engineering studies have been performed.

The North T Zone Nechalacho Project Mineral Resources

The North T-Zone of the Nechalacho Rare Earth Project separate deposit located approximately 2km north of the centre of the Upper Zone. The North T Zone contains two distinct zones of REE mineralisation, a Bastnaesite Subzone at surface with an underlying Xenotime Subzone.

A new resource estimate for the Bastnaesite and Xenotime Subzones, based on new geological interpretations and a validated historic database, was prepared according to the 2012 version of the

JORC code (Table 3). Although the historic assays have been validated by core duplicates and the drill coverage is considered adequate, due to a lack of QAQC records for the historic assays, the resources have been classed as indicated and inferred. The JORC 2012 mineral resource estimate of the Bastnaesite Subzone of the North T-Zone comprises 60,305T at 1.600% Nd2O3 (Table 3) with a 0.3% Nd2O3 cutoff grade. It is important to note that historical drilling only assayed for Nd, Ce and Y. A resampling program commenced in Q3 2019 assaying historical core for the full suite of rare earth elements with data being incorporated in to a new resource upgrade in 2020.

JORC Resources in Bastnaesite Subzone 1, North T-Zone

Bastnaesite Subzones	**Cutoff grade**	**Tonnage**	**Nd_2O_3**	**CeO_2**	**Y_2O_3**
	Nd_2O_3		**%**	**%**	**%**
Indicated	>0.3%	36,813	1.711	3.615	0.036
Inferred	>0.3%	23,492	1.428	2.612	0.038
Indicated + Inferred	**>0.3%**	**60,305**	**1.600**	**3.224**	**0.037**
Xenotime Subzones	**Y_2O_3**				
Indicated	>0.1%	346,270		0.156	0.271
Inferred	>0.1%	4,700		0.177	0.224
Indicated + Inferred	**>0.1%**	**350,970**	Not Estimated	**0.156**	**0.270**

Table 3: Rare Earth Resources of the North-T Zone Nechalacho. Mineral Resource Estimation prepared in accordance with JORC 2012 under the supervision of Dr. William Mercer, registered Professional Geoscientist (P. Geo.) in the Northwest Territories and Ontario, Canada, as the Competent Person. The cutoff grade for this resource estimate is preliminary, at pre-scoping study level, as no detailed market, metallurgical or engineering studies have been performed.

The North T Zone

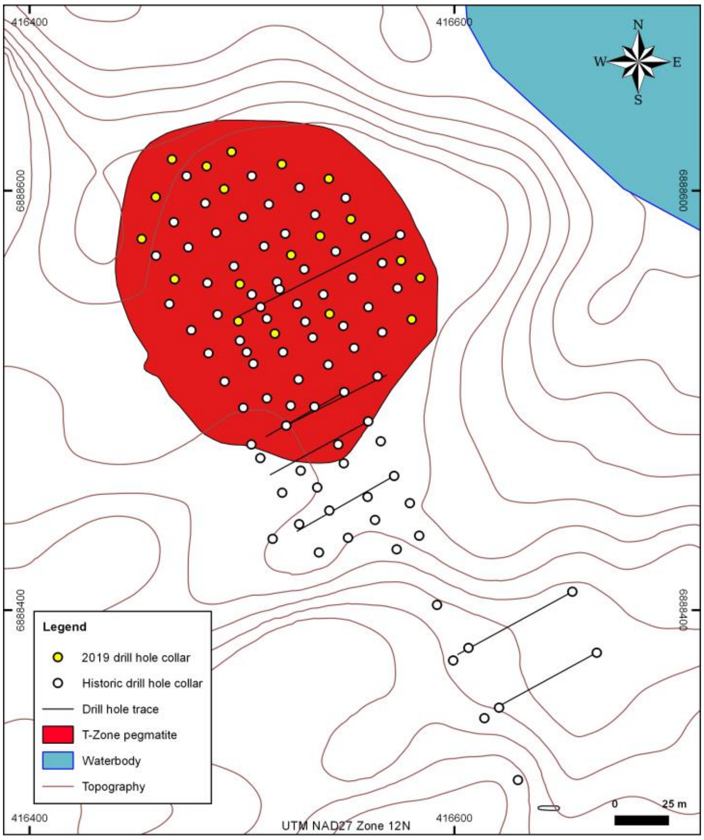


Fig. 4: Drill hole collar locations and geological interpretation of the North T-Zone pegmatite (Assays for 2019 drill holes are pending)

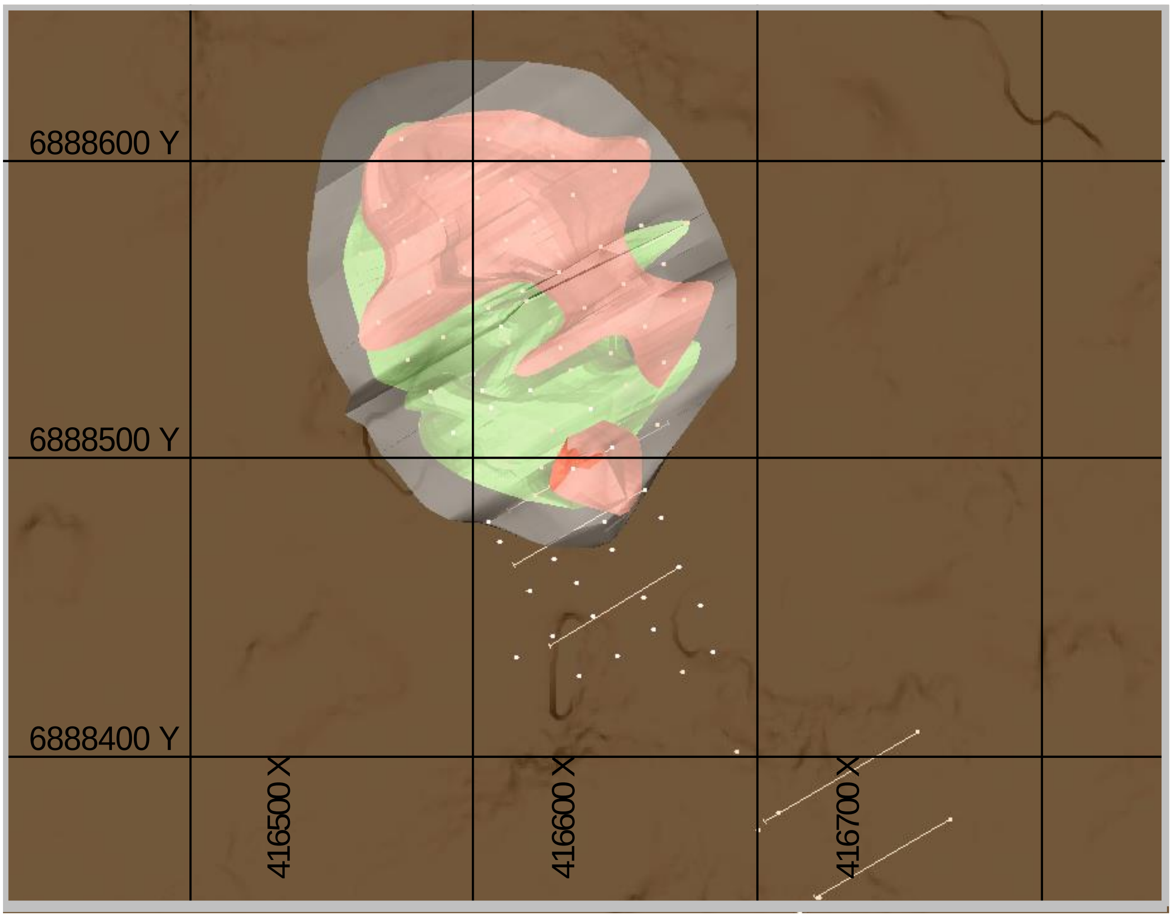


Fig. 5: Plan view showing the topography and the 3D geology wireframes for the North T-Zone. Bastnaesite zones are shown in red, with Xenotime zones in green

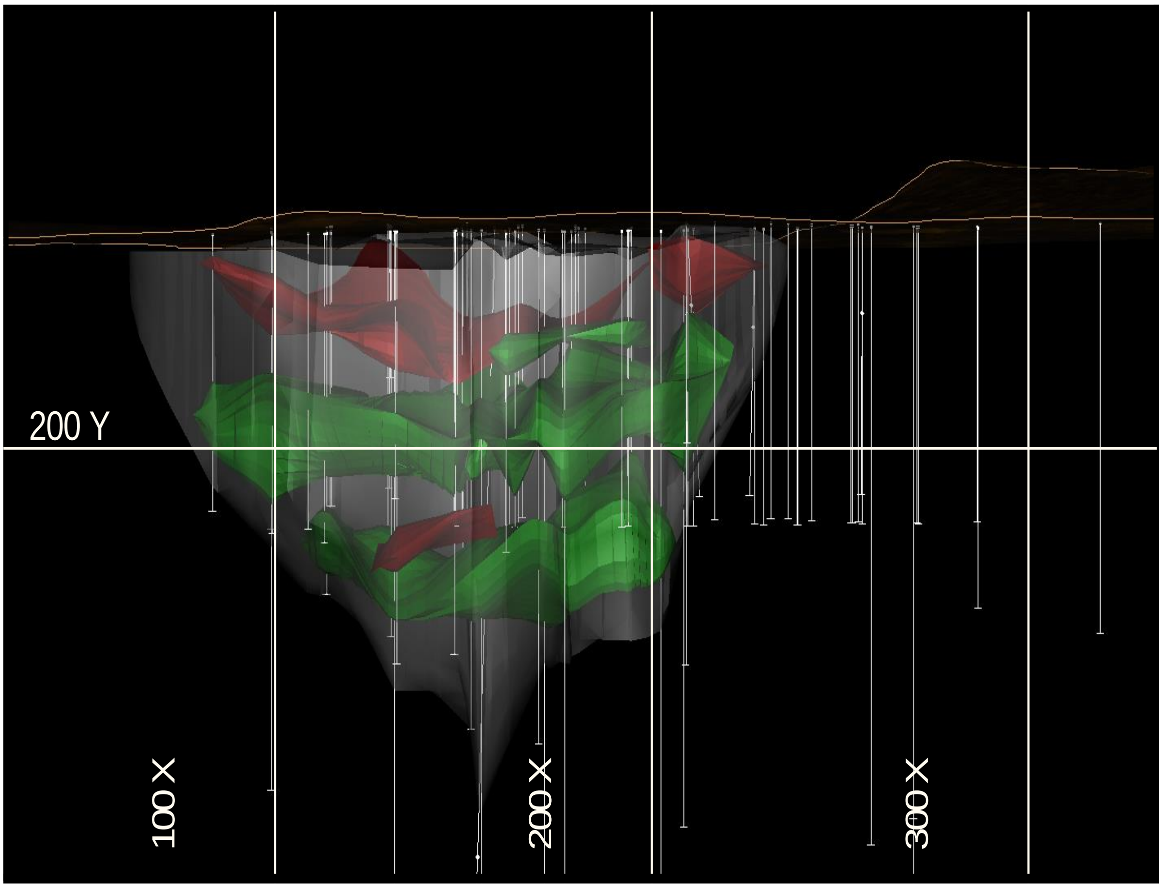


Fig. 6 Section view of the 3D geology wireframes for the North T-Zone (section direction approximately NW to SE)

Additional Drilling Completed Assay Results Pending

In Q3 2019 the Company completed a drill program consisting of 19 holes for approximately 770m. A campaign was also undertaken to resample core from previous drilling that had not been assayed for the full suite of rare earth elements. During this campaign, gaps were identified and resampling was undertaken to confirm the continuation of the bastnaesite mineralisation at North T Zone. Details of these programs will be released in early 2020 when all assays are received and its expected that a resource upgrade will be completed post results which will incorporate the full suite of rare earth elements.

Information provided pursuant to ASX Listing Rule 5.8.1

Definitions

TREO includes the rare earth element oxides, La_2O_3, CeO_2, Nd_2O_3, Pr_6O_{11}, Sm_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, Lu_2O_3 and Y_2O_3.
LREO includes the light rare earth element oxides, La_2O_3, CeO_2, Nd_2O_3, Pr_6O_{11} and Sm_2O_3.
HREO includes the heavy rare earth element oxides, Eu_2O_3, Gd_2O_3, Tb_4O_7, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3 and Y_2O_3.
NdPr is the percentage proportion of Nd and Pr as oxides (Nd_2O_3 and Pr_6O_{11}) of TREO
KT and MT and thousands and millions of metric tonnes, respectively.

Geology and Geological Interpretation

The area referred to in this report is located near Thor Lake in the Mackenzie Mining District of the Northwest Territories. The Nechalacho deposit is hosted by a syenite intrusion that is part of the Blatchford Lake Intrusive Complex. One or several magmatic layers, collectively referred to as the Upper Zone, host the rare earth mineralization in the upper part of the Nechalacho intrusion. The magmatic boundaries of the Upper Zone were wireframed using an approximate outline of 1% TREO. The T-Zone is a peripheral pegmatite to the Nechalacho intrusion, which hosts rare earth and other rare metal mineralization in multiple lenses. The sharp contacts of the Bastnaesite and Xenotime Subzone lenses in the North T Zone pegmatite were outlined using drill hole assay data.

Sampling and sub-sampling techniques

The geological database used for the North T Zone Resource estimate consists of 48 assays from 29 diamond drill holes over a total assay length of 130.73 metres for the Bastnaesite Subzone and 222 assays from 46 diamond drill core holes representing 559.01 assayed meters for the Xenotime Subzone. The drill hole spacing is 15 to 20 metres over most of the deposit. The samples are mechanical half splits of approximately 3 metre long diamond drill core intervals, with lengths adjusted to match mineralisation contacts.
For the estimation of the resources in the Upper Zone, a total of 5,351 samples over a combined length of 9,805.75 metres from 349 diamond drill holes were available, with 2 metres as the most common sample length. Owing to the large spatial extent of the Upper Zone, the drill hole spacing is highly variable, with the closest drill spacing at approximately 25 metres. The diamond drill core was sawn or split mechanically. Samples from both the North T Zone and the Upper Zone were riffle split following crushing, before being pulverized (see Table 1 for further details).

Drilling Techniques

Drilling was diamond core drilling, mainly with a BQ (3.65 cm) inner core diameter in the North T Zone and NQ (4.76 cm), HQ (6.35 cm) or PQ (8.50 cm) drilling with the majority of the holes being HQ diameter for the Upper Zone.

Classification Criteria

The lithological controls on the mineralization have been extensively studied and are well understood, and adequate density data sets are available for the estimated resource domains. The resource confidence categories were assigned based on successively larger search ellipses for Nd_2O_3 in the North

T Bastnaesite Subzone and the Upper Zone, and Y_2O_3 in the Xenotime Subzone of the North T-Zone. Further details are provided in each individual Table 1 for the North T and Upper Zones. Stringent quality control procedures were followed during the acquisition of the geochemical data set for the Upper Zone. For the North T-Zone, although the drill holes are closely spaced, the assay records are historic and very little historic QAQC records were available, hence the Measured and Indicated resource confidence categories were downgraded to Indicated and Inferred, respectively. However, recent drilling has confirmed the continuity of the Bastnaesite Subzone and re-assays have confirmed the historic core assays.

Sample Analysis Method

For the Upper Zone, routine assaying of 14 lanthanides as well as Y, Th, U, Al, Si, P, Mg, Fe, Ca, Ga, Hf, Nb, S, Sc, Ta, Ti and Zr have been performed usually by ALS Global Laboratories in Vancouver, Canada using ICP-MS techniques. Other independent laboratories including Acme, Actlabs and SGS were used for check analyses of one in 10 to 25 of drill core samples at particular periods. For the drill program of 2007 all core samples were analysed in two independent laboratories. For the North T-Zone, Nd, Ce and Y were assayed using NAA and XRF by Chemex Laboratories in Canada. Custom certified standards were prepared from typical project mineralization with similar overall chemistry and utilized in all analyses post 2007. Details of QAQC procedures are publicly available in Canadian NI 43-101 reports.

Estimation Methodology

Grade estimation was performed using the Inverse Distance Squared Method combined with circular (North T-Zone) and horizontal XY-anisotropic (Upper Zone) search ellipses within 3D wireframe models. In agreement with the magmatic mineralization style (pegmatite lenses in the North T Zone, cumulates and magmatic lenses in the Upper Zone), no 3D anisotropy trends of the grades were identified. The number of samples per drill hole was restricted to require samples from a minimum of 3 different drill holes per block. Further details on the grade interpolation methods are given in each separate Table 1 for the North T and Upper Zones below.
For the North T Zone, Nd_2O_3, CeO_2 and Y_2O_3 were estimated, whereas all the rare earth oxides were estimated individually for the Upper Zone.

Cutoff grades

Nd_2O_3, as the rare earth oxide of principal economic interest, was chosen for the cutoff grade for both the North-T Bastnaesite Zone and the Upper Zone. The cutoff grade for this resource estimate is preliminary, at pre-scoping study level, as no detailed market, metallurgical or engineering studies have been performed.

Mining and metallurgical considerations

Mining and metallurgical factors or assumptions were not explicitly used in estimating the Mineral Resource but open pit mining methods will be utilised for any future mining operations. Metallurgical test work and associated mineralogical study work has been carried out both in Australia and Canada to support the process flowsheet development and economic assessment.

Approved by the Board of Vital Metals Limited.

Contact:
Mr Geoff Atkins
Managing Director

Vital Metals Ltd
Phone: +61 2 8823 3100
Email: vital@vitalmetals.com.au

ABOUT VITAL METALS

Vital Metals Limited (ASX:VML) is an explorer and developer focussing on rare earths, technology metals and gold projects. Our projects are located across a range of jurisdictions in Canada, Africa and Germany.

Nechalacho Rare Earth Project

The Nechalacho project is a high grade, light rare earth (bastnaesite) project located at Nechalacho in the Northwest Territories of Canada and has potential for a start-up operation exploiting high-grade, easily accessible near surface mineralisation.

Wigu Hill Project

The Company has signed a project development and option agreement with Montero Mining & Exploration Ltd, to acquire and develop the Wigu Hill Project located near Kisaki in Tanzania.

The Wigu Hill project is a light rare earth element deposit and consists of a large carbonatite complex with bastnaesite mineralisation.

Nahouri Gold Project – Burkina Faso

The Nahouri Gold Project (100% Vital) is located in southern Burkina Faso. The Project is made up of three contiguous permits; the Nahouri, Kampala and Zeko exploration permits. The Project is located in highly prospective Birimian Greenstone terrain with 400 sq km of contiguous tenements lying on the trend of the Markoye Fault Corridor.

Aue Project – Germany

The Aue Project (100% Vital) is located in the western Erzgebirge area of the German state of Saxony. The permit, comprising an area of 78 sq km is located in the heart of one of Europe's most famous mining regions surrounded by several world class mineral fields. Historical mining and intensive exploration work carried out between from the 1940s and 1980s showed high prospectivity of the Aue permit area for cobalt, tungsten, tin, uranium and silver mineralisation.

Competent Persons Statement

Thor Lake Rare Earth Project

Information relating to the Mineral Resource Estimate for the Thor Lake Rare Earth Project is based on, and fairly represents, information and supporting documentation prepared for Vital by Avalon Advanced Materials Inc. and Dr. William Mercer, a Competent Person who is a registered member (ID L2095) of the Northwest Territories Association of Professional Engineers and Geoscientists (NAPEG) of the NWT, Canada. Dr. Mercer is the Vice President-Exploration for Avalon, with a PhD in Geology from McMaster University, Canada and an Honours Geology degree from the Edinburgh University, Scotland. He has 44 years of experience in the mineral exploration throughout the world. He is past president of the Prospectors and Developers Association of Canada and of the Canadian Federation of Earth Sciences. Dr. Mercer has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr. Mercer consents to the inclusion of the information in the report in the form and context in which it appears, including the Mineral Resource Estimate for the Thor Lake Rare Earth Project.

JORC Code, 2012 Edition – Table 1 report - North T Zone

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• Historic samples are half splits of drill core, sampled in approximately 3 m (10 ft.) intervals honouring geological contacts, average sample lengths are approx. 2.5 m and 2.6 m in the Bastnaesite and Xenotime Subzones, respectively. • Historic analyses of Ce and Nd via NAA and Y via pressed pellet XRF analysis were performed by Chemex Labs Inc. (now ALS Laboratories) between 1983 and 1986 on drill core pulps using standard sample preparation methods. • The historic sample preparation method included crushing and pulverizing of a split to <150 mesh in a geochem ring mill. Recent re-analysis of remaining core halves indicates that the method was appropriate.
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• BQ-diameter core drilling
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Good core recovery in outcropping and subcropping competent rock with little weathering, a report by Currie (2003) indicates core recoveries >95%, but percentages were not recorded in the historic logs. • The geological nature of the mineralization in the North T Zone (coarse Bastnaesite), in many cases, is such that the risk of biased sampling is somewhat reduced.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean,*	• Historic geological drill logs completed by an experienced professional geoscientist were used to delimit the outer pegmatite contacts. • Qualitative logging, no systematic core photography available for historic core.

Criteria	JORC Code explanation	Commentary
	channel, etc) photography. • *The total length and percentage of the relevant intersections logged.*	• Most drill core is still on site, as half core, and can be viewed. • Total length of the logged North T-Zone core is 6656 m and the core is 100% logged.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	• Half-core splits, completed mechanically, were sampled for the historic geochemical analyses • Analyses of remaining half core in 2018 (partial overlaps with original intervals): Ce_2O_3: -0.104 to +0.438% deviation from the original assays for 6 samples >0.3% Ce_2O_3, averaging +0.144%, one sample with -3.507% Nd_2O_3: -0.022%, +1.279%, +0.079% for three samples >0.1% Nd_2O_3 Y_2O_3: -0.130 to +0.039%, averaging -0.031 for 6 samples >0.1%, one sample with +0.589% Y_2O_3. Summary of 2018 & 2019 Nd_2O_3 analyses of remaining half core of the Bastnaesite Zone: 11 analyses, on average, 28% higher than historic assays (relative to the original assay), with two outliers 6.2 and 3.8 weight % Nd_2O_3 higher. Good correlation with R^2 = 0.71, considering interval overlaps were ±0.3 m. Analyses of partially overlapping remaining half core samples demonstrate acceptable reproducibility of the historic data.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	• Historic analyses of pulp duplicates by secondary laboratories reported by Lindsey (1987) concluded that Y_2O_3 is accurate, but may have been 6% too low, Ce_2O_3 appeared to be 24% too low, and Nb_2O_5 was within 10% and was considered accurate. • No internal company standards or blanks were inserted during the historic exploration program. •
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.*	• Analyses of remaining half core samples in 2018 and 2019 confirmed REE assays • The historic assay database previously prepared by Wardrop in 2007 was verified using the original assay sheets and 28 corrections were made. • For the Bastnaesite zone samples, the entire data set was re-digitized from the original assay certificates and converted to oxides, as inconsistencies

Criteria	JORC Code explanation	Commentary
	• *Discuss any adjustment to assay data.*	were identified in the original data. The new digitised data was internally verified against the assay sheets by a second staff member and found to be accurate. • Geology tables distinguishing pegmatite and host rock syenite were created from the original drill logs. • Wardrop completed independent sampling of the mineralization and reported this in the Scoping/PEA report.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• All historic holes were surveyed at the time by a professional surveyor – Thomson Underwood McLellan Surveys Ltd of Yellowknife. • Wardrop completed check surveys of 3 drill holes in 2006. • 13 drill hole collars were re-surveyed by a professional surveyor in 2018 and the locations were reproduced within 2.6 m, with an average deviation of 2.3 m. This is considered sufficient accuracy for the purpose here. • Historic collar locations are recorded in UTM NAD27 Zone 12 N • A good agreement was observed between the historic collar elevations and a 2010 satellite topography survey.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• The drill hole spacing is approximately 15 - 20 m throughout the North T-Zone. • The drill hole spacing is considered to be adequate for the measured resource confidence category. • For the Bastnaesite Subzone, limited compositing was performed to produce 3 m sample intervals (the most abundant sample length). • For the Xenotime Subzone, samples were composited into approx. 2.5 m intervals, allowing variable lengths >1.25 m to assign equal lengths to the composites.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• Most drill holes are vertical and there is no bias produced by this drill hole orientation. Vertical drilling is considered adequate for the subhorizontal orientation of the REE-mineralized Subzones consisting of magmatic pegmatite lenses. • Vertical drilling also reduces risk of hole deviation compared to holes at shallow angles.
Sample security	• *The measures taken to ensure sample security.*	• The historic programs included standard provisions for sample security and storage • 2018 check assay samples were sealed using zip locks, and multiple samples

Criteria	JORC Code explanation	Commentary
		were placed in rice bags sealed with zip locks. Independent lab verified sealed sample integrity upon receipt. • Analyses for elements such as rare earths, niobium and beryllium are unlikely to be altered as a result of insecurity of samples such as contamination.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• The historic sample methods and data were externally reviewed by Wardrop, a large Canadian independent engineering company, in 2006/2007 and considered adequate for resource estimation purposes. This included a four day site visit in 2006.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• The North T-Zone is located on Mining Lease NT-3179 registered to Avalon Advanced Materials Inc. and expires 21 May 2027. On June 24, 2019, Avalon Advanced Materials Inc. announced that it has entered into a definitive agreement with Cheetah Resources Pty Ltd. to transfer ownership of the near-surface mineral resources on the Property, which includes the North T-Zone (see News Release NR 19-04). • Operating licenses in the Northwest Territories are subject to the approvals by provincial and environmental regulators, and require consultation with local communities.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• The historic exploration drilling was largely performed by Highwood Resources in 1983-4. • The geologist who supervised the historic work, J.C. Pedersen, P. Geo, is an experienced geologist in the rare metals pegmatites field, and is well known as reliable geoscientist to the present parties.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The North T-Zone is a polymetallic (REE, Nb, Li, Be) NYF-type pegmatite hosted by an Archean alkaline granite intrusion, the Thor Lake Syenite. It is peripheral to the Nechalacho REE-Nb deposit, a large layered magmatic deposit. • REE-mineralization in the North T-Zone is hosted in separate zones of high-grade Bastnaesite and low-grade xenotime enrichment, which form subhorizontal lenses in the quartzofeldspathic pegmatite. Three Bastnaesite

Criteria	JORC Code explanation	Commentary
		and three Xenotime Subzones of the pegmatite have been outlined as wireframes based on cross-sectional interpretations.
Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:* ○ *easting and northing of the drill hole collar* ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* ○ *dip and azimuth of the hole* ○ *down hole length and interception depth* ○ *hole length.* • *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• The historic data set for the North T-Zone includes 86 diamond drill holes with collar coordinates between E 416,460 - 416,667 m and N 6,888,319 - 6,888,607 m (UTM NAD27 Zone 12N) and elevations ranging from 244 to 250 m. 79 holes are vertical and seven holes were drilled at an azimuth of approx. 240° and dips between -46 and -59°. • The drill holes are 31 - 212 m long over a total length of 6,656 m. • Assay intercepts are not provided in this release. • The drill hole list is provided as an appendix.
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cutoff grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• Weighted averages or intercepts are not provided in this release. • The capping and cutting techniques used are detailed in the comments on estimation techniques below.
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Not applicable, as intercepts are not reported. • The sample intervals are suitable for the mineralization. • The drill holes intersect the deposit at approximately right angles to the orientation of the orebody which is the ideal orientation. • The orientation of the holes to the mineralization is well established.
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• Maps and sections for the North T-Zone are provided. • No drill hole intercepts are presented in this news release.

Criteria	JORC Code explanation	Commentary
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• All results are included in the estimation process.
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• Not applicable. • Deleterious and contaminating materials are not present with the exception of some thorium as is commonly present in rare earth deposits and well established with respect to levels.
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• Additional diamond drilling has been performed to test the lateral and vertical extension of REE-mineralization zones; the geochemical core samples are currently being assayed by an independent laboratory. • All available historic intercepts of the Bastnaesite Subzone have been re-sampled; results are currently pending. • All coordinates should be transformed into UTM NAD83 Zone 12N (instead of the older UTM NAD27 Zone 12N). • As the drill spacing would be sufficient for most of the resource of the Bastnaesite to be classified with high confidence, the wireframes should be updated and the resources should be re-estimated, following receipt of the assay data. • Additional drilling may be recommended following integration of the results of the recent drilling and re-sampling campaigns.

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.* • *Data validation procedures used.*	• The data was checked by Wardrop in 2007 for the original Scoping Study of the project. • The assay database was manually checked for errors by comparison with the original assay sheets. 28 corrections were made. • The assay database for the Bastnaesite Subzone was re-typed from the original assay certificates following the discovery of inconsistencies. Any assays not listed on the assay sheets were discarded. • The drilling data is maintained in a Maxwell DataShed database which has built-in error detection systems.

Criteria	JORC Code explanation	Commentary
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• William Mercer, the competent person for this mineral resource, has visited the site at least twice per year between 2007 and 2014. • William Mercer, as VP-Exploration, supervised the exploration since 2007 at the site.
Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* • *Nature of the data used and of any assumptions made.* • *The effect, if any, of alternative interpretations on Mineral Resource estimation.* • *The use of geology in guiding and controlling Mineral Resource estimation.* • *The factors affecting continuity both of grade and geology.*	• The geological interpretation was limited to distinguishing pegmatite and host rock syenite. There is a high degree of confidence that these units were correctly recorded in the historic drill logs and transcribed into the database correctly. • The outlines of the REE-mineralized zones were created within the pegmatite outline based on the drill hole assays. • The pegmatite has an intrusive contact with the surrounding syenite, thus providing a 'hard' outer boundary. The continuity of the REE-mineralization zones was controlled by magmatic processes in the pegmatite, i.e., the formation of pegmatitic lenses.
Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• The zones of REE-mineralization extend 150 m in NNW direction and 120 in the ENE direction, and from the surface to a depth of 80 m.
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* • *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.* • *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the resource estimates.* • *Discussion of basis for using or not using grade cutting or capping.*	• Based on visual observation of outliers, the samples were capped as follows prior to compositing: - Bastnaesite Subzones: Y_2O_3 (0.1%), CeO_2 (8.5%) - Xenotime Subzones: Y_2O_3 (1.0%), Ce_2O_3 (0.6%) • The number of composites was insufficient for variography • Block size was set to 3 x 3 x 3 m. • Grade interpolations were constrained by 6 wireframes outlining the zones of REE-mineralization, 3 Bastnaesite Subzone and 3 Xenotime Subzone wireframes. • For grade interpolation, the IDW^2 method was used with a limit of one composite per hole and 3 – 6 composites were used for each block. • Search ellipses with successively larger radii were used for Pass 1 (20 m), Pass 2 (30 m), Pass 3 (60 m) for Nd_2O_3 in the Bastnaesite Subzones and for Y_2O_3 in the Xenotime Subzones. CeO_2 was interpolated using the Pass 3 search ellipse. Nb and Be are not reported; sampling data was insufficient for the interpolation of other elements. Only composites located within each of the interpolated Subzones were used to interpolate the Subzone.

Criteria	JORC Code explanation	Commentary
	• *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	• Previous resource estimates: - Lindsey, 1987: 50,803 t grading 4.12% Ce_2O_3 at a cutoff grade of 1.00% Ce_2O_3. - Wardrop, 2007: Indicated 43,877 t grading 3.14% Ce_2O_3 and 1.55% Nd_2O_3, Inferred 1,338 t grading 2.41% Ce_2O_3 and 0.56% Nd_2O_3, both at a cutoff grade of 0.10% Ce_2O_3. (data from the decline/ramp that was previously mined does not include REE assays except yttrium). • Validation of the grade estimates was performed by checking the block grades relative to the composites and assays, and by visual inspection in cross-sections. • Validation of the volumes was performed by comparing the volume of the blocks to that of the wireframes • The general deposit characteristics were validates using swath and grade-tonnage diagrams.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• Tonnage was estimated on a dry basis. • As a pegmatitic igneous rock which experienced little weathering it has a low porosity and a very low moisture content can be expected.
Cutoff parameters	• *The basis of the adopted cutoff grade(s) or quality parameters applied.*	• Estimation of operating costs and potential market value of the final product. • The cutoff grades are preliminary, at pre-scoping study level, as no detailed engineering is available.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• No mine plan or design has been prepared. • However, the deposit is very close to surface, with mineralization located above 80 depth, and it is assumed that open pit mining would be not difficult.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential*	• No recent metallurgical tests have been performed with the exception of ore sorting tests. These demonstrated that the Bastnaesite Subzone material is amenable to ore sorting upgrading.

Criteria	JORC Code explanation	Commentary
	metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.	• The historic Wardrop Scoping Study and a report by Currie (2003) contain considerable discussions of historic metallurgical work performed in the 1980s, which included recovery REE from Bastnaesite and xenotime. • The mineralization under focus is conventional Bastnaesite and thus believed to be amenable to processing similar to other bastnaesite deposits.
Environmen-tal factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	• Extensive environmental baseline studies of the property have been completed, and an approval exists for the mining and concentrating of similar adjacent ore zones found elsewhere on the property. These studies on other zones include aquatic and terrestrial plant and animal studies. Physical studies include groundwater, air quality, weather, soil, sediment and water chemistry. Extensive environmental management plans have been developed and approved for exploration and early construction activities, and well developed for REE mining and concentrating operations, under a different and higher risk business model than proposed for the T Zone. Ore and waste environmental characteristics from the T Zone are anticipated to be very similar with low environmental risk. • A tailing management area has been designed and approved for wastes from a mine concentrator under a different, more complex project processing model. This site could also be suitable for wastes from the North T Zone. The waste rock is anticipated to be barren and can be utilized for road and plant site development and dam construction. • It is assumed that the ore and waste products from the proposed works will be similar to the existing approved project, and the project is anticipated to have the benefits of higher density waste (no grinding), and use less water, reagent and energy than the existing approved project. • In conclusion, while confirmation studies of the ore, waste rock and sorting rejects have not been completed on the T Zone, the rock is expected to be very similar to other zones that have been extensively studied, and no significant new environmental impacts are anticipated from the T Zone.
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods*	• A density of 2.99 t/m^3 was used to estimate the tonnage of the Bastnaesite Subzone. This value, 2.99 ± 0.12 t/m^3 (1 standard deviation), represents an average of 11 measurements performed in 2019, which range from 2.84 to 3.19 t/m^3. Of the 11 measurements, 2 are water immersion method

Criteria	JORC Code explanation	Commentary
	that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit. • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	measurements on core segments (average 3.02 t/m^3), 5 are pycnometer density on assay pulp done by ALS (2.98 t/m^3) and 4 are averages of water immersion method measurements of all core fragments in a whole assay interval (2.99 t/m^3). • The density value used for estimating the tonnage of the Xenotime Subzones is that reported in the Wardrop 2007 Scoping study, 2.72 t/m^3 (average of 15 analyses). • Visual inspection indicates that the porosity of the rocks of the North T-Zone is very low.
Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).* • *Whether the result appropriately reflects the Competent Person's view of the deposit.*	• The resource confidence categories were assigned based on the interpolation of Nd_2O_3, the principal rare earth oxide of economic interest. • Despite the interpolation of a significant percentage of the resources using the Pass 1 search ellipse (circular, 20 m radius) which would normally be considered to represent Measured Resources, because of uncertainty related to the historic quality control, the Pass 1 resources were classed as indicated as a conservative approach. Those interpolated with the Pass 2 search ellipse (circular, 30 m radius), together with blocks interpolated with the Pass 3 search ellipse (circular, 60 m radius) were assigned the inferred category. A minimum of 3 and maximum of 6 drill holes were used to estimate the grade of each block. • William Mercer, the competent person for this resource estimate, regards these criteria as appropriate for the deposit and the estimate, which is largely based on historic data that has been verified by analyzing remaining core splits in 2018 and 2019.
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• The current resource estimate has not been externally reviewed. • The very close agreement with the historic independent Wardrop estimates and an internal peer review indicate that no external review is warranted.
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.*	• No detailed statistical estimate has been made of the accuracy of the mineral resource estimate, however, the new density values and classification of the resource as Indicated rather than Measured both suggest that it is a conservative estimate and can be relied upon at the stated classification. • The resource has been estimated a number of times by different organisations using different estimation methodologies and the results

Criteria	JORC Code explanation	Commentary
	• *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	have always been very similar. • Comparisons between the volumes of the wireframes and those of the blocks indicate that the volumes for the REE-mineralized zones were estimated accurately. • Global comparisons between the grades of the composites and those of the blocks (averages and ranges) indicate that the grades were estimated accurately. • Local comparisons between block and sample grades in cross-sections indicate that the grades were interpolated accurately. • The classification of most of the resource as Indicated and Inferred reflects mainly the uncertainties of the the quality control standard for the historic assays and the lower number of assays for Nd_2O_3 than for Ce_2O_3. • No production has taken place at the North T-Zone. A bulk sample was extracted in the 1980s, but the REE grades were not systematically recorded at the time.

Appendix 2: List of Drill Holes – North T Zone

Hole ID	easting (m)	northing (m)	elevation (m)	length (m)	azimuth (°)	dip (°)
83-1	416545.3	6888479.0	245.0	61.0	0	-90
83-2	416534.1	6888497.0	244.8	122.8	0	-90
83-3	416519.3	6888523.0	244.6	61.0	0	-90
83-4	416518.9	6888456.0	246.3	61.0	0	-90
83-5	416504.4	6888479.0	246.1	90.8	0	-90
83-6	416491.8	6888509.0	244.6	152.4	0	-90
83-8	416476.1	6888533.5	244.7	61.0	0	-90
83-9	416504.6	6888550.5	244.6	61.0	0	-90
83-10	416487.8	6888580.0	244.1	61.0	0	-90
83-11	416459.5	6888569.0	244.1	61.0	0	-90
83-12	416547.7	6888535.5	244.9	61.0	0	-90
83-13	416563.8	6888511.5	244.9	61.0	0	-90
83-15	416526.9	6888441.0	245.6	61.0	0	-90
83-16	416529.3	6888562.5	245.5	61.0	0	-90
83-17	416558.1	6888578.0	245.9	61.0	0	-90
83-18	416573.2	6888553.5	245.6	61.0	0	-90
83-33	416536.2	6888427.5	245.6	152.4	0	-90
83-34	416559.1	6888454.0	245.3	127.1	0	-90
83-35	416511.7	6888501.0	244.8	61.0	0	-90
83-36	416571.6	6888464.0	245.3	61.0	0	-90
83-37	416571.6	6888464.0	245.3	76.2	240	-46
83-38	416559.4	6888490.0	245.3	61.0	0	-90
83-39	416559.4	6888490.0	245.3	76.2	241	-46
83-40	416527.6	6888466.5	246.2	61.0	0	-90
83-41	416541.1	6888447.5	245.8	61.0	0	-90
83-42	416562.6	6888443.0	245.5	121.9	0	-90
83-43	416540.6	6888517.0	245.1	61.0	0	-90
83-44	416583.4	6888435.5	245.6	61.0	0	-90
84-46	416548.1	6888504.0	244.9	61.0	0	-90
84-47	416548.1	6888504.0	244.9	61.0	240	-46
84-48	416520.8	6888488.0	244.7	61.0	0	-90
84-49	416520.8	6888488.0	244.7	76.2	63	-46
84-50	416535.4	6888458.5	245.8	61.0	0	-90
84-51	416565.3	6888480.5	245.1	61.0	0	-90
84-52	416579.0	6888451.0	245.3	61.0	0	-90
84-53	416549.9	6888434.5	245.4	61.0	0	-90
84-54	416533.3	6888530.0	244.8	61.0	0	-90
84-55	416511.7	6888539.0	244.5	61.0	0	-90
84-56	416526.0	6888546.0	245.0	61.0	0	-90
84-57	416514.4	6888434.0	245.6	61.0	0	-90
84-62	416547.9	6888470.0	245.1	61.0	0	-90
84-63	416508.6	6888472.5	246.2	61.0	0	-90
84-64	416500.6	6888496.5	244.5	61.0	0	-90
84-65	416526.6	6888510.0	244.7	61.0	0	-90
84-66	416552.8	6888525.0	244.7	61.0	0	-90
84-67	416505.3	6888517.5	244.5	61.0	0	-90
84-68	416499.0	6888528.5	244.5	61.0	0	-90
84-75	416522.9	6888497.5	244.5	191.1	0	-90
84-76	416508.7	6888544.5	244.8	212.5	0	-90
84-77	416496.2	6888564.0	244.8	191.1	0	-90
84-78	416482.7	6888594.0	244.4	114.9	0	-90
84-79	416529.8	6888537.5	244.8	178.9	0	-90
84-80	416572.8	6888429.0	245.2	78.3	0	-90
84-81	416510.4	6888573.5	245.5	84.4	0	-90
84-82	416483.7	6888556.0	244.4	89.0	0	-90
84-83	416502.2	6888523.0	244.7	105.8	0	-90
84-84	416591.8	6888402.5	246.2	84.4	0	-90
84-85	416599.4	6888376.0	246.2	40.2	0	-90
84-86	416614.1	6888348.5	247.1	63.1	0	-90
84-87	416629.9	6888319.0	249.6	73.8	0	-90
84-88	416606.6	6888382.0	245.3	78.3	0	-90
84-89	416621.0	6888353.5	246.5	76.8	0	-90

85-94	416544.1	6888571.0	245.7	75.3	0	-90
85-95	416534.4	6888588.5	245.8	63.1	0	-90
85-96	416527.1	6888601.5	245.4	57.5	0	-90
85-97	416520.3	6888579.5	245.4	31.1	0	-90
85-98	416512.6	6888593.5	245.3	68.9	0	-90
85-99	416504.6	6888607.0	244.9	61.7	0	-90
85-100	416548.8	6888596.5	245.6	54.0	0	-90
85-101	416500.6	6888587.5	245.1	75.3	0	-90
85-102	416474.7	6888573.0	244.1	63.7	0	-90
85-103	416465.8	6888546.0	244.2	54.9	0	-90
85-104	416559.5	6888544.5	245.2	50.0	0	-90
85-105	416538.3	6888550.5	245.3	77.1	0	-90
85-106	416566.0	6888532.5	244.9	46.5	0	-90
85-107	416566.0	6888565.5	245.6	60.1	0	-90
85-108	416552.0	6888558.5	245.6	72.2	0	-90
85-109	416473.9	6888607.0	243.8	57.0	0	-90
85-110	416467.9	6888585.0	244.0	61.6	0	-90
85-111	416488.5	6888541.0	244.1	86.6	0	-90
85-112	416484.2	6888522.5	244.0	65.5	0	-90
85-113	416516.5	6888556.5	245.2	36.0	0	-90
85-114	416517.7	6888553.0	244.8	102.7	0	-90
86-115	416574.5	6888579.0	245.0	166.7	243	-59
86-116	416655.5	6888408.8	245.1	108.8	241	-56
86-117	416667.0	6888379.7	245.5	84.4	241	-50

JORC Code, 2012 Edition – Table 1 report - Upper Zone

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• All samples are splits of diamond drill core over lengths of one (PQ-diameter core) or two meters (NQ and HQ diameter). Shorter samples were taken in cases where geological contacts were encountered. Of the NQ- and HQ-diameter core, a half or quarter mechanical split was sampled; the PQ-diameter core was sampled entirely in the mineralized zones and a third of the core was sawn and sampled in unmineralized or weakly mineralized zones. The drill core was crushed and splits for geochemical analysis were prepared by independent laboratories. • The samples are considered representative because the drill core was marked with a centre line for the sampler, so that no sampling bias was introduced by choosing the location of the split. • Drill core was crushed to 90% passing 10 mesh. The PQ core was crushed to 6 mesh (about 3.3 mm) and about 2 kg was split off using a rotary splitter which were then crushed to 10 mesh. Splits of 250 g pulps were then prepared. • The REE concentrations were determined using ICP-MS and XRF for the highest concentrations by several geochemical laboratories. The laboratory packages used were 4B2-STD and 4B2-RESEARCH (Acme Laboratories), 4B (Actlabs), and ME-MS81d, ME-MS81h and XRF10 (ALS Laboratories). The majority of the samples were analysed by ALS Laboratories.
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• Diamond core drill of PQ, NQ, HQ diameter using wireline recovery. A limited number of oriented core holes were drilled for geotechnical purposes.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• RQD logging was performed on all drill holes starting in 2009. Due to the very limited weathering profile, core recovery was generally excellent. For the entire data set for the Nechalacho deposit, RQD averages 96.2% with a median of 98.7%. • The split lines were marked on the core to ensure systematic representative sampling. • Owing to the semi-massive nature of the mineralization in combination with the drill method (diamond core drilling) and the excellent core

Criteria	JORC Code explanation	Commentary
		recovery, grade modification due preferential loss/gain of material is highly unlikely.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• All drill core was logged geologically by qualified personnel to a level adequate for mineral resource estimation. • The logging is qualitative. • All drill core was photographed digitally and Avalon maintains a database. • 477 drill holes logged and sampled intersections of the Upper Zone over a total length of 9,805.75 m were used for the resource estimate.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	• Of the NQ- and HQ-diameter core, a half or quarter mechanical split was sampled; the PQ-diameter core was sampled entirely in the mineralized zones and a third of the core was sawn and sampled in unmineralized or weakly mineralized zones. • Sampling of mechanical or sawn splits of core is standard practice and considered appropriate for hard rock deposits. • Duplicate analyses of the rejects and the pulps were routinely performed (see detailed procedures and results in Avalon's public reports: Pre-Feasibility Study, 2010; Updated Pre-Feasibility study 2011; Feasibility Study, 2013) • Independent core duplicates sampled by RPA in 2010 yielded similar assay values to the original data (see Pre-Feasibility Study, 2010). • The sample size (one- or two-meter-long core intervals) is considered appropriate for the rock type (hydrothermally altered nepheline syenite containing REE in in finer-grained replacement mineral assemblages).
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	• The analyses of the REE are considered total analyses. The methods include lithium metaborate/tetraborate fusion (Actlabs), in some cases followed by dilute nitric digestion (Acme Labs, ALS Laboratories) of 0.1 g of pulp followed by multi-element ICP-MS analysis. Samples with high REE values were analysed via XRF or further diluted using ICP-MS. These methods are deemed appropriate to analyse the REE. • Handheld XRF was only used as a guide for drill core logging. • The pulp of every tenth sample was analysed by a secondary laboratory. Every 40th sample was a blank and one of several in-house standards was inserted as every 15th sample. Assay batches that did not meet the quality control criteria were re-assayed. Acceptable levels of accuracy and precision

Criteria	JORC Code explanation	Commentary
		were maintained, as reported in a Pre-Feasibility Study (2010), an Updated Pre-Feasibility study (2011) and a Feasibility Study (2013), all publicly available on SEDAR.ca), in which the quality control procedures are discussed in-depth.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• The assay values of the REE-mineralized zones were confirmed by multiple independent consultants, universities and laboratories. • No twinned holes were drilled. However, in multiple cases, zones of REE-mineralization were intersected from different drill hole collar locations. • Industry standard procedures were followed for data entry, verification and storage (see detailed procedures in Avalon's public reports: Pre-Feasibility Study, 2010; Updated Pre-Feasibility study 2011; Feasibility Study, 2013) • Following industry standard reporting practices, oxides were calculated from the ppm assay values for the REE.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• All drill hole collar locations were determined by registered surveyors. • All collar location data are in the UTM NAD83 Zone 12N coordinate system. • A 0.5 m resolution satellite digital elevation survey was obtained by in 2010, providing adequate topographic data.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• The drill hole collars are spaced 25 m, 50 m, or wider in the less explored areas. In combination with geological and grade continuity in the deposit, these spacings are considered adequate for the assigned resource confidence categories. • The drill hole assays were composited in two-meter intervals within the intercepts of the mineralized zones.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• The zones of REE mineralization are subhorizontal magmatic layers which have not been structurally modified. As the drill holes generally dip -45 to -90°, averaging -76°, the REE-mineralized zones were intersected at appropriate angles. However, the apparent drill hole intercept lengths may be longer than true thicknesses in cases where the drill hole dip ≠ -90°.
Sample security	• *The measures taken to ensure sample security.*	• Samples were double-sealed and standard chain of custody procedures were applied. Due to the nature of the mineralization (wt. % concentration levels) and the number of drill hole samples, post-sampling modification is highly unlikely.

Criteria	JORC Code explanation	Commentary
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• The sampling techniques and data have been independently reviewed and approved multiple times, including reviews by consulting firms RPA and MICON.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• The property is located in the Northwest Territories of Canada, approximately 100 km ESE of Yellowknife, centred on coordinates 416,400 m E / 6,887,000 m N or 112° 36' 6" W / 62° 6' 20" N. The Upper Zone REE deposits are located mainly on Mining Lease NT-3178, which is 100% owned by Avalon Advanced Materials Inc. and expires 21 May 2027. The adjacent properties include Mining Leases NT-3179, NT-3265, NT-3267 and NT3266, and Mining Claims Angela 1, Angela 2 and Angela 3 (all registered to Avalon Advanced Materials Inc.). On June 24, 2019, Avalon Advanced Materials Inc. announced that it has entered into a definitive agreement with Cheetah Resources Pty Ltd. to transfer ownership of the near-surface mineral resources on the Property, which includes the Upper Zone and will grant Avalon a royalty (see Avalon's News Release NR 19-04). A 2.5% NSR royalty to J. Daniel Murphy applies to the Thor Lake property which is capped at an escalating amount indexed to the rate of inflation. Cheetah has been granted the option to purchase Avalon's option in this third party-owned royalty for a payment of $1.5 million provided that, upon exercising the option, Cheetah extinguishes this royalty. Avalon has also agreed to waive the Avalon-owned 3% net smelter royalty (over the same mining leases), for the first five years of commercial production and to grant Cheetah the option to pay Avalon $2.0 million within eight years of the transaction closing to extend the waiver of Avalon's royalty in perpetuity (see Avalon's News Release NR 19-04). • Although there are no known impediments, provincial and/or federal approvals and consultation with local communities are standard requirements for obtaining a license to operate in the area.

Criteria	JORC Code explanation	Commentary
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• Historic exploration drilling on the property was performed by Highwood Resources in the 1980s.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The Nechalacho deposit is hosted near the top of a layered nepheline syenite intrusion, which is part of an anorogenic alkaline intrusive complex. The REE mineralization is hosted in hydrothermally altered eudialyte syenite and the REE are mainly contained in the minerals Bastnaesite, synchysite, parisite, fergusonite, samarskite, allanite, monazite.
Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:* o *easting and northing of the drill hole collar* o *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* o *dip and azimuth of the hole* o *down hole length and interception depth* o *hole length.* • *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• There are too many drill holes to practically list the information. The plan and section views illustrate the collar positions and traces of the holes.
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cutoff grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• There are a total of 477 drill hole intercepts of the Upper Zone. They are not presented as part of this report.
Relationship between mineralisation widths and	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should*	• Drill hole intercepts are not reported.

Criteria	JORC Code explanation	Commentary
intercept lengths	*be a clear statement to this effect (eg 'down hole length, true width not known').*	
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• Drill hole intercepts are not reported. A map and a cross-section showing the drill hole collars and traces with the geological wireframe for the Upper Zone are attached.
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• No reporting of select or representative intervals.
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• An airborne magnetics survey has been performed. • A bulk sample of the Upper Zone has not been extracted. • Most of the previous metallurgical test work for the deposit has been performed on the Basal Zone with very limited and preliminary whole-ore "acid bake" leaching tests of REE-mineralized rock from trenches in the Upper Zone with recoveries of the order of 98%. • The rocks do not contain significant amounts of sulphide and, with the exception of low thorium concentrations (~140 ppm on average), there are no deleterious elements in the Upper Zone.
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• It is recommended that the high-grade near-surface REE mineralization zones, in particular the North Tardiff area, are drilled on a closely-spaced (25 m) grid to increase the confidence category of the mineral resources and to allow mine planning for potential small-scale open pit operations. • Historic drill holes in the South Tardiff area, which contains high-grade REE mineralization in two trenches, have been re-assayed; the results should be integrated into the database and a resource estimate for the area should be prepared. • A drill plan to target high-grade Bastnaesite veins in the South Tardiff area, as exposed in a trench, should be prepared.

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for*	• The database has been routinely validated against the original assay sheets (see procedures in the 2013 Feasibility Study).

Criteria	JORC Code explanation	Commentary
	Mineral Resource estimation purposes. • *Data validation procedures used.*	
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• William Mercer, the competent person for this mineral resource, has visited the site at least twice per year between 2007 and 2014. • William Mercer, as VP-Exploration, supervised the exploration since 2007 at the site.
Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* • *Nature of the data used and of any assumptions made.* • *The effect, if any, of alternative interpretations on Mineral Resource estimation.* • *The use of geology in guiding and controlling Mineral Resource estimation.* • *The factors affecting continuity both of grade and geology.*	• The geology on the intrusion is well understood from drill hole logs and outcrop observations. • The Upper Zone is hosted in mafic, hydrothermally altered eudialyte syenite. It has been outlined by modelling an approximately 1% TREO shell. Continuity between drill holes has been assumed and is supported by the predictable nature of the layered mineralization as observed in drill holes. • The outer intrusion contacts are sharp and provide a horizontal limit to the mineralization. The lower contacts of the Upper Zone are also commonly sharp. • The continuity of the mineralization was largely controlled by the deposition of eudialyte crystals in magmatic cumulate layers and by the interstitial crystallization of eudialyte in distinct horizons. Localized hydrothermal REE-mobilization and redeposition in locally semi-massive Bastnaesite veins and pervasive disseminated zones is less predictable and no attempt has been made to outline these zones in 3D.
Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• In plan, the wireframe outline for the Upper Zone extends approximately 1,940 m in N-S and E-W direction at its widest points. Vertically, the Upper Zone extends from the surface to a maximum depth of 190 m, but it is generally <100 m deep.
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* • *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.*	• The Dassault Systems / Geovia GEMS 6.8.2.2 software was used to generate the resource model. • The block model uses a block size of 5 x 5 x 5 m • The blocks were assigned the rock code for the Upper Zone from the 3D wireframes using vertical needling with an integration level of 10 on a >50% basis. • All REE, Nb, Ta, Ga, Zr, Hf, Th and U were estimated. • No assumptions about correlation between variables were made. • Prior to compositing, the assays of all estimated elements were capped,

Criteria	JORC Code explanation	Commentary
	• *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the resource estimates.* • *Discussion of basis for using or not using grade cutting or capping.* • *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	except for Zr, Hf, Th and U, which did not display any outliers. All other elements were capped at the limits of continuous grade distribution in order to limit the influence of the high-grade outliers. • The capped assays were composited into two-meter intervals using the variable length function in GEMS. • An IDW^2 interpolation with a search ellipse that is circular in the X- and Y-directions (radii of 30, 60 and 300 m for Pass 1, 2 and 3, respectively) and 12, 24 and 120 m for Pass 1, 2 and 3 in the Z-direction was used. The Pass 2 dimensions are based on the ranges found in variograms for the REE. No preferential grade continuity was observed in the X- and Y-directions, as would be expected for a cumulate deposit. • Between 9 and 18 composites with a limit of maximum 3 composites per drill hole were used, i.e., the grade of each block was interpolated with samples from 3 to 6 drill holes. • By-products were not considered in the cutoff grade calculation. • For validation, the statistics for the capped assays, the composites and the interpolated blocks were compared and swath plots and grad-tonnage curves were prepared. Visual comparisons between assay and block grade and in cross-sections support the validity of the grade estimates.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• Tonnage was estimated on a dry basis. • The moisture content was not measured, but is expected to be insignificant because the rock is solid and competent with little porosity.
Cutoff parameters	• *The basis of the adopted cutoff grade(s) or quality parameters applied.*	• The cutoff grade for this resource estimate is preliminary, at pre-scoping study level, as no detailed market, metallurgical or engineering studies have been performed.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• No mine plan or pit design has been prepared, but the reported near-surface resources are located at the surface and at <50 m depth, and are thus amenable to small-scale open pit mining.

Criteria	JORC Code explanation	Commentary
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	• As there is only very limited available test work, no metallurgical factors or assumptions have been applied to this resource estimate.
Environmen-tal factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	• Conventional waste dumps would be designed as part of the future mine design, but would require permitting. No substantial environmental impacts are predicted, given the small scale of the potential operation and largely inert nature of the waste material, which is similar to the mineralized rock, but low-grade. The characteristics of possible waste materials have been discussed in the 2013 Feasibility Study.
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	• Density was measured every five meters on a 10 cm size core segment using the water displacement method. This method is considered adequate, as the rock contains little porosity. • The average density for the Upper Zone is 2.806 ± 0.156 t/m^3 (N = 1,907, 1 standard deviation). • Rock density displays only a weak correlation with the REE concentration (R^2 = 0.1835). Hence, using the average for the rock unit is considered appropriate.
Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).* • *Whether the result appropriately reflects the Competent Person's view of the deposit.*	• The interpolation passes were used as a basis for assigning the confidence categories. Measured: Pass 1, ≥4 holes, <25 m from next composite, manually refined confidence zone edges & isolated blocks Indicated: Passes 1 + 2, ≥3 holes, <50 m from next composite, manually refined confidence zone edges & isolated blocks Inferred: Passes 1 + 2 + 3, ≥3 holes, ≥50 m from composites

Criteria	JORC Code explanation	Commentary
		This procedure results in 3.3% of the blocks being classed as measured, 19.7% as indicated, and 77.0% as inferred. • The relevant factors affecting the confidence in the block model estimates have been considered. The main control on block confidence is the distribution of the drill hole data, as the input assays are considered to be of high quality and the geology is well understood. • William Mercer, the Competent Person for this report, has reviewed the procedures for classifying block confidence and considers the methods and criteria to be adequate.
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• The current mineral resource estimate has not been externally reviewed or audited.
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• The relative accuracy and confidence in the mineral resource estimate is considered to be adequately reflected by the confidence categories assigned to the blocks of the resource model, which are based on the block's distance from at least nine samples from at least 3 drill holes used to interpolate the block grade. • Geostatistical methods have helped to produce a robust resource estimate for the entire Upper Zone (global estimate); local variability in the uncertainty may exist, however. • There has been no production from the Upper Zone of the Nechalacho deposit.

Section 4 Estimation and Reporting of Ore Reserves

(Criteria listed in section 1, and where relevant in sections 2 and 3, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	• *Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.* • *Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.*	• No ore reserves have been estimated.

Criteria	JORC Code explanation	Commentary
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	•
Study status	• *The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves.* • *The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.*	•
Cutoff parameters	• *The basis of the cutoff grade(s) or quality parameters applied.*	•
Mining factors or assumptions	• *The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).* • *The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.* • *The assumptions made regarding geotechnical parameters (eg pit slopes, stope sizes, etc), grade control and pre-production drilling.* • *The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate).* • *The mining dilution factors used.* • *The mining recovery factors used.* • *Any minimum mining widths used.* • *The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.* • *The infrastructure requirements of the selected mining methods.*	•
Metallurgical factors or assumptions	• *The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.* • *Whether the metallurgical process is well-tested technology or novel in nature.* • *The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the*	•

Criteria	JORC Code explanation	Commentary
	corresponding metallurgical recovery factors applied. • *Any assumptions or allowances made for deleterious elements.* • *The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.* • *For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?*	
Environmen-tal	• *The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.*	•
Infrastructure	• *The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.*	•
Costs	• *The derivation of, or assumptions made, regarding projected capital costs in the study.* • *The methodology used to estimate operating costs.* • *Allowances made for the content of deleterious elements.* • *The source of exchange rates used in the study.* • *Derivation of transportation charges.* • *The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.* • *The allowances made for royalties payable, both Government and private.*	•
Revenue factors	• *The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.* • *The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.*	•
Market assessment	• *The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.* • *A customer and competitor analysis along with the identification of likely market windows for the product.*	•

Criteria	JORC Code explanation	Commentary
	• *Price and volume forecasts and the basis for these forecasts.* • *For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.*	
Economic	• *The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.* • *NPV ranges and sensitivity to variations in the significant assumptions and inputs.*	•
Social	• *The status of agreements with key stakeholders and matters leading to social licence to operate.*	•
Other	• *To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves:* • *Any identified material naturally occurring risks.* • *The status of material legal agreements and marketing arrangements.* • *The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.*	•
Classification	• *The basis for the classification of the Ore Reserves into varying confidence categories.* • *Whether the result appropriately reflects the Competent Person's view of the deposit.* • *The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).*	•
Audits or reviews	• *The results of any audits or reviews of Ore Reserve estimates.*	•
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which could*	•

Criteria	JORC Code explanation	Commentary
	affect the relative accuracy and confidence of the estimate. • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.* • *It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	