Independent review increases Wolverine REE Mineral Resource estimate by 47% at Browns Range

Highlights

- An updated Mineral Resource estimate for the Wolverine deposit has resulted in a 47% increase in tonnes of total rare earth oxides (TREO) in the Wolverine Mineral Resource, now estimated at 61,492 tonnes of TREO in 6.44 million tonnes @ 0.96% TREO (classified and reported according to the guidelines of the 2012 JORC Code[1]).

- The Browns Range system global Mineral Resource estimate now stands at 81,450 tonnes of TREO in 10.81 million tonnes @ 0.76% TREO (classified and reported according to the guidelines of the 2012 JORC Code[1]).

- International geological and mining consulting firm CSA Global, completed an independent review and assessment of the Wolverine geological database, including a full rebuild of the wireframe model and preparation of the updated Mineral Resource estimate.

Northern Minerals (ASX: NTU) is pleased to announce a substantial increase in the rare earth Mineral Resource estimate for its Wolverine development project (Wolverine) in northern Western Australia.

Wolverine is a shear hosted deposit and is the most significant within the Browns Range mineralised system. The Wolverine Mineral Resource estimate will form the basis of the forthcoming proposed definitive feasibility study.

CSA Global has prepared an updated Mineral Resource estimate for the Wolverine deposit and has reported it in accordance with the JORC Code[1], which is now estimated at 6.44 million tonnes at 0.96% TREO comprising 61,492 tonnes TREO using a cut-off grade of 0.15% TREO and is a 47% increase in tonnes of TREO from the previous estimate (Table 1, Figure 1).

The Wolverine Mineral Resource increased compared to the 2015 estimate (Table 5) for the following reasons:

- Additional drilling – small increase on flanks
- Detailed analysis of results based on grade-control and exploration drilling
- Gaining confidence in the classification of Inferred Mineral Resources after analysis of continuity based on an exploration grid of 50 x 50 m
- Detailed structural analysis
- Updating wireframes to include the structural controls

[1] Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, The JORC Code 2012 Edition, Effective December 2013, Prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).

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- Updating the grade interpolation methodology to better reflect the grade variability / distribution by adopting the following methods:
  - The application of Multiple Indicator Kriging (MIK)
  - The use of flattening
  - Using a narrow search ellipsoid to better reflect the grade variability.

Measured and Indicated Mineral Resources increased by 18% for tonnage, 12% for TREO grade and 31% for TREO tonnage (Table 5). Inferred Mineral Resources increased by 55% for tonnage, 10% for TREO grade and 69% for TREO tonnage (Table 5).

Incorporating the upgrade of the Wolverine project, the total Mineral Resource identified within the Browns Range system is now estimated at 10.81Mt @ 0.76% total rare earth oxides (TREO) comprising 81,450 tonnes contained TREO using a cut-off grade of 0.15% TREO (Table 2). A Prospect Location Plan is presented in Figure 2.

A key feature of the Wolverine resource is the dominance of high value dysprosium and terbium with average grades of 0.83kg/t and 0.12kg/t respectively contained within xenotime mineralisation. Dysprosium and terbium are essential ingredients in the production of neodymium iron-boron (NdFeB) magnets used in clean energy, military and high technology solutions because their unique properties enable the magnets to better resist demagnetisation.

Northern Minerals' Executive Chairman Nick Curtis said the upgrade in Wolverine resource is highly encouraging for the project and reinforces the project as one of the world's most exciting new sources of dysprosium and terbium, which are critical metals in a low carbon future increasingly reliant on rare earth permanent magnetic electric motors.

"The increased mineral resource at Wolverine is an important step in our plan to establish ourselves as a significant producer of dysprosium and terbium, offering a reliable alternative to production sourced from China," Mr Curtis said.

Table 1: Wolverine Deposit – Mineral Resource Estimate (October 2022)

Category	Mt	TREO %	Dy_2O_3 Kg/t	Y_2O_3 Kg/t	Tb_4O_7 Kg/t	HREO %	TREO Tonnes
Measured	0.14	0.70	0.61	3.99	0.09	88%	986
Indicated	3.24	0.95	0.83	5.53	0.12	89%	30,751
Inferred	3.05	0.98	0.84	5.68	0.13	89%	29,756
Total	**6.44**	**0.96**	**0.83**	**5.57**	**0.12**	**89%**	**61,492**

TREO = Total Rare Earth Oxides – La_2O_3, CeO_2, Pr_6O_{11}, Nd_2O_3, 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, Y_2O_3;
HREO = Heavy Rare Earth Oxides – Total of 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, Y_2O_3
HREO% = HREO/TREO*100

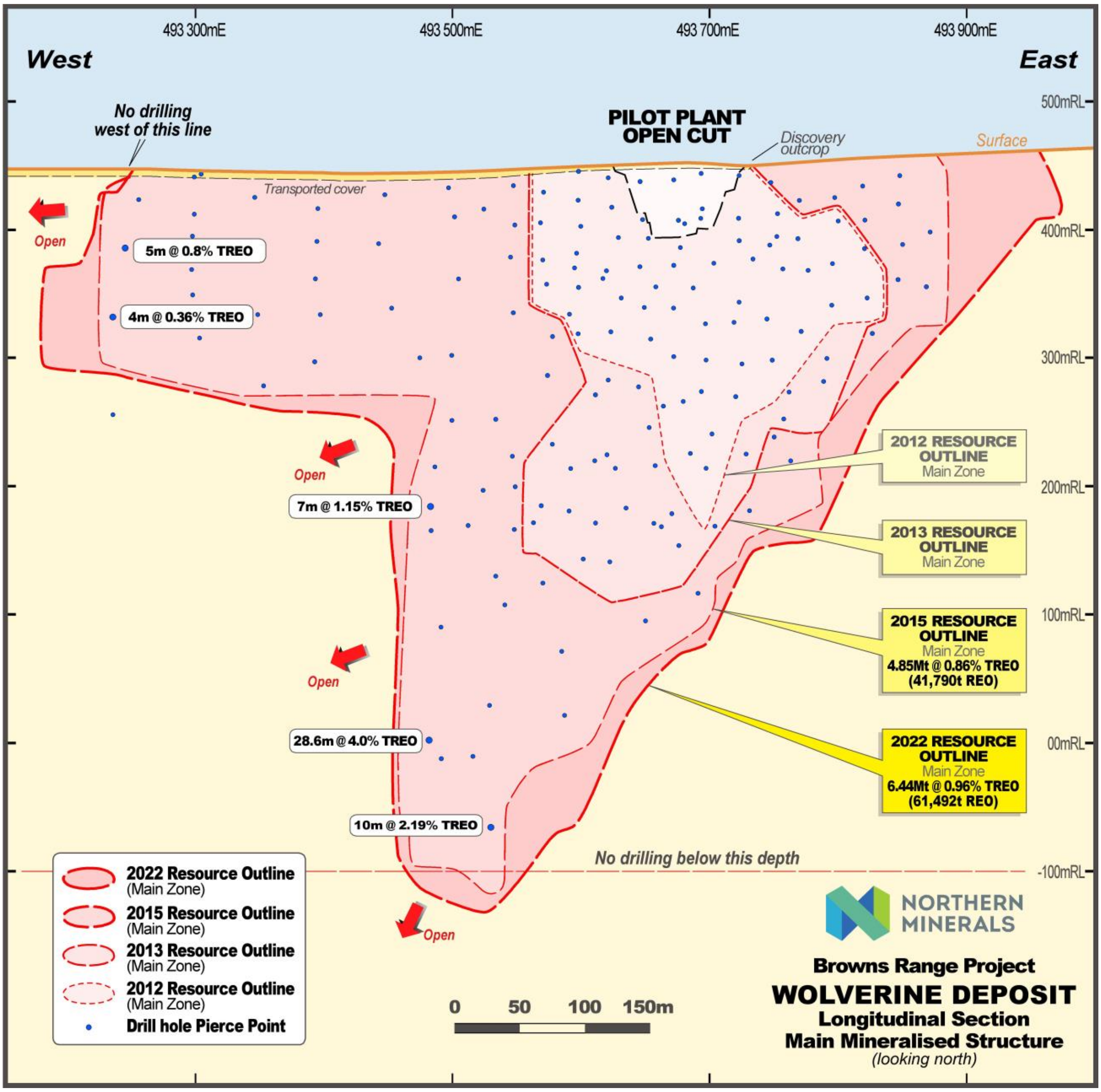

Figure 1 – Wolverine Long Section with 2022 Mineral Resource Outline

Table 2: Global Mineral Resource Estimate (October 2022)

Deposit	Classification	Mt	TREO %	Dy_2O_3 kg/t	Y_2O_3 kg/t	Tb_4O_7 kg/t	HREO %	TREO kg
Wolverine	Measured	0.14	0.7	0.61	3.99	0.09	88	986,000
	Indicated	3.24	0.95	0.83	5.53	0.12	89	30,751,000
	Inferred	3.05	0.98	0.84	5.68	0.13	89	29,756,000
	Total[1]	**6.44**	**0.96**	**0.83**	**5.57**	**0.12**	**89**	**61,492,000**
Gambit West	Measured	-	-	-	-	-	-	-
	Indicated	0.12	1.8	1.62	10.98	0.22	94	2,107,000
	Inferred	0.13	0.51	0.4	2.67	0.05	81	674,000
	Total[1]	**0.25**	**1.11**	**0.97**	**6.56**	**0.13**	**91**	**2,781,000**
Pilot Plant Stockpiles	Measured	-	-	-	-	-	-	-
	Indicated	0.16	0.95	0.83	5.5	0.12	89	1,489,000
	Inferred	0.03	0.26	0.2	1.35	0.03	79	89,000
	Total[1]	0.19	0.82	0.71	4.71	0.1	88	1,577,000
Gambit	Measured	-	-	-	-	-	-	-
	Indicated	-	-	-	-	-	-	-
	Inferred	0.21	0.89	0.83	5.62	0.11	96	1,878,000
	Total[1]	0.21	0.89	0.83	5.62	0.11	96	1,878,000
Area 5	Measured							
	Indicated	1.38	0.29	0.18	1.27	0.03	69	3,953,000
	Inferred	0.14	0.27	0.17	1.17	0.03	70	394,000
	Total[1]	1.52	0.29	0.18	1.26	0.03	69	4,347,000
Cyclops	Measured	-	-	-	-	-	-	-
	Indicated	-	-	-	-	-	-	-
	Inferred	0.33	0.27	0.18	1.24	0.03	70	891,000
	Total[1]	0.33	0.27	0.18	1.24	0.03	70	891,000
Banshee	Measured	-	-	-	-	-	-	-
	Indicated	-	-	-	-	-	-	-
	Inferred	1.66	0.21	0.16	1.17	0.02	87	3,484,000
	Total[1]	1.66	0.21	0.16	1.17	0.02	87	3,484,000
Dazzler	Measured	-	-	-	-	-	-	-
	Indicated	-	-	-	-	-	-	-
	Inferred	0.21	2.33	2.17	13.93	0.29	95	5,000,000
	Total[1]	0.21	2.33	2.17	13.93	0.29	95	5,000,000
Total[1]	Measured	0.14	0.7	0.61	3.99	0.09	89	986,000
	Indicated	4.9	0.78	0.67	4.46	0.1	87	38,300,000
	Inferred	5.76	0.73	0.62	4.22	0.09	89	42,166,000
	Total[1]	10.81	0.76	0.64	4.33	0.09	88	81,450,000

[1]Rounding may cause some computational discrepancies (TREO (metal) tonnes estimated from Mt x TREO%)

TREO = Total Rare Earth Oxides – La_2O_3, CeO_2, Pr_6O_{11}, Nd_2O_3, 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, Y_2O_3;

HREO = Heavy Rare Earth Oxides – Total of 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, Y_2O_3

HREO% = HREO/TREO*100

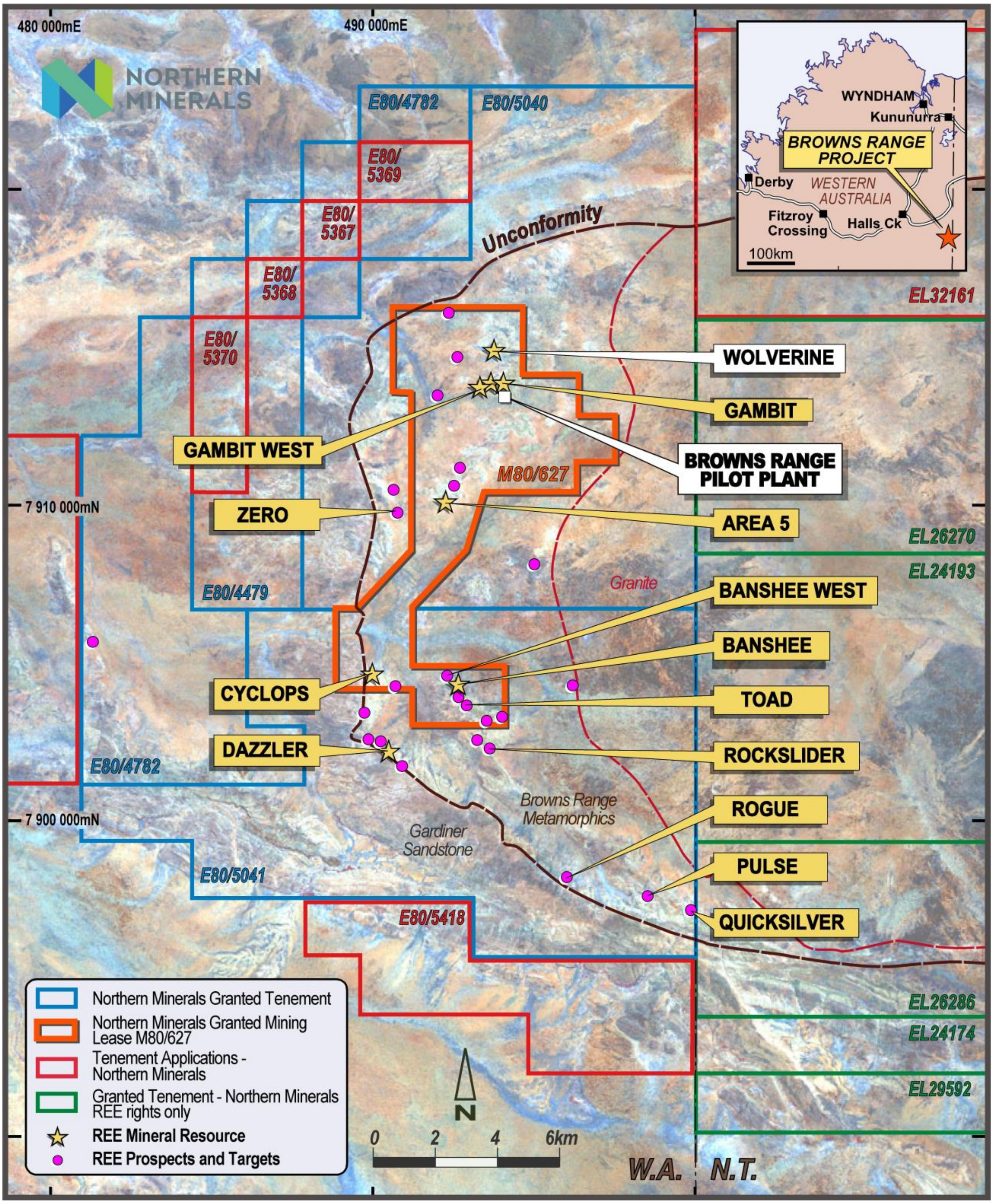

Figure 2: Browns Range Prospect Location Plan

SUMMARY OF MATERIAL INFORMATION

The Project is located in the East Kimberley region of Western Australia, approximately 160km southeast of the town of Halls Creek near the Northern Territory border. The Wolverine, Gambit West, Gambit and Area 5 deposits are all within the Browns Range Project area and are all located wholly within the granted mining lease M80/627. The Jaru Native Title Claim is registered over the project area and Northern Minerals entered into a Co-existence Agreement with the Jaru Traditional Owners in June 2014.

The Project is located on the western side of the Browns Range Dome, a Paleoproterozoic dome formed by a granitic core intruding the Paleoproterozoic Browns Range Metamorphics (meta-arkoses, feldspathic metasandstones and schists) and an Archaean orthogneiss and schist unit to the south. The dome and its aureole of metamorphics are surrounded by the Mesoproterozoic Gardiner Sandstone (Birrindudu Group).

WOLVERINE DEPOSIT

Table 3 -Wolverine Deposit – Mineral Resource Estimate (October 2022)

Category	Mt	TREO %	Dy_2O_3 Kg/t	Y_2O_3 Kg/t	Tb_4O_7 Kg/t	HREO %	TREO Tonnes
Measured	0.14	0.70	0.61	3.99	0.09	88%	986
Indicated	3.24	0.95	0.83	5.53	0.12	89%	30,751
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Total	**6.44**	**0.96**	**0.83**	**5.57**	**0.12**	**89%**	**61,492**

TREO = Total Rare Earth Oxides – La_2O_3, CeO_2, Pr_6O_{11}, Nd_2O_3, 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, Y_2O_3;
HREO = Heavy Rare Earth Oxides – Total of 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, Y_2O_3
HREO% = HREO/TREO*100

Table 4 -Wolverine October 2022 Mineral Resource Individual REO Proportions at 0.15% TREO Cut-off grade

REO	Measured %	Indicated %	Inferred %	Total Resource %
La_2O_3	2.21	1.97	2.05	**2.01**
CeO_2	5.51	4.86	5.08	**4.98**
Pr_6O_{11}	0.80	0.67	0.73	**0.71**
Nd_2O_3	3.80	3.09	3.37	**3.24**
Y_2O_3	57.08	58.38	58.23	**58.29**
Sm_2O_3	2.17	2.07	2.27	**2.17**
Eu_2O_3	0.44	0.44	0.46	**0.45**
Gd_2O_3	5.50	5.60	5.95	**5.77**

REO	Measured %	Indicated %	Inferred %	Total Resource %
Tb_4O_7	1.27	1.29	1.32	**1.30**
Dy_2O_3	8.70	8.77	8.64	**8.71**
Ho_2O_3	1.81	1.82	1.79	**1.80**
Er_2O_3	5.11	5.33	5.10	**5.21**
Tm_2O_3	0.73	0.74	0.66	**0.70**
Yb_2O_3	4.30	4.37	3.82	**4.10**
Lu_2O_3	0.58	0.60	0.51	**0.56**

Geology and Geological Interpretation

Locally at Wolverine the hosting Browns Range Metamorphics are a variable sequence of meta quartz-lithic and arkosic arenites and conglomerates with minor interbedded schists. The host rocks in the mineralised zone are silicified and brecciated along structures trending between east-west and 290 degrees, and dipping steeply to the north. Hematite and sericite alteration are associated with mineralisation.

The style of mineralisation is xenotime hydrothermal breccia. Xenotime is associated with varying degrees of veining and brecciation; from 1mm to 2mm crackle vein selvages to matrix infill in 5m wide zones of chaotic breccia. There are open spaced textures, vugs and minor cross-cutting quartz, pyrite or barite veins that are interpreted to post-date mineralisation.

Mineralogical examination shows the heavy rare earth mineralisation is xenotime (YPO4). The Florencite ((Nd,La,Ce)Al3(PO4)2(OH)6) - Goyazite (Sr Al3(PO4)2(OH)5.H2O) series are the only other rare earth element minerals recognised to date.

Drilling Techniques

Diamond core drill holes account for 45% of the drill metres within the mineralisation and comprises NQ and HQ sized core. Reverse Circulation (RC) drilling accounts for the remainder with diameters of either 115mm or 140mm. Many of the diamond core drill holes had RC drilled pre-collars. Diamond core was orientated using the Reflex ACT orientation tool. RC drilling was completed using face sampling hammer with hole depths ranging from 12m to 324m.

Drilling has been completed on a nominal 25m in easting by 25m in northing grid spacing although this increases to broader spacing at the lateral extremities of the deposit. The spacing of down hole intercepts of the mineralisation varies from the nominal collar spacing due to deviation of drill holes, primarily associated with RC pre-collars. Prior to October 2013 resource drilling was exclusively conducted at -60 degrees to the south. From October 2013, diamond drilling was completed using casing wedges and directional drilling, resulting in variable intersection angles to the Wolverine deposit.

Sampling Techniques

Diamond core was cut in half using an electric core saw. Sample intervals were selected on the basis of lithological and structural features, together with indicative results from hand held XRF measurements. Drill core was sampled at a nominal one metre interval although constrained to within geological intervals.

RC samples were collected from the drill rig by either riffle splitting or using a static cone splitter. All samples were collected dry with a minor number being moist due to ground conditions or excessive dust suppression. RC drill holes were sampled at one metre intervals exclusively and split at the rig to achieve a target 2-5 kilogram sample weight.

Field QAQC procedures included the field insertion of certified reference materials (standards), blanks and duplicates. Earlier drilling (2011 to July 2012) did not include the insertion of standards as suitable materials were not sourced. Blanks were developed from local host rock following chemical analysis. Field duplicates were collected by either a second sample off the splitter (RC) or by quarter core samples of the original half core sample (diamond) and separate submission and analysis at the laboratory. Insertion rates averaged 1:20 for duplicates, blanks and standards, with increased frequency in mineralised zones.

Determinations of bulk density were completed by a combination of core immersion techniques and downhole density surveys with values typically in the range 2.10 g/cm3 to 3.40 g/cm3.

Resource Classification Criteria

CSA Global used the following pattern for Classification criteria:

- Measured Mineral Resources: drill spacing of 12.5 m x 8 m or smaller in the Main mineralised body
- Indicated Mineral Resources: drill spacing of 25 m x 25 m in the Main mineralised body and drill spacing of 12.5 m x 8 m or smaller in Satellite Mineralised bodies to the Main mineralized zone
- Inferred Mineral Resources: drill spacing of 50 m x 50 m in Main mineralised body and drill spacing of 25-50 m x 25-50 m in Satellite Mineralised bodies to the main mineralized Zone
- Exploration Target – other modelled mineralized material including Satellite Mineralised bodies of Banshee Style.

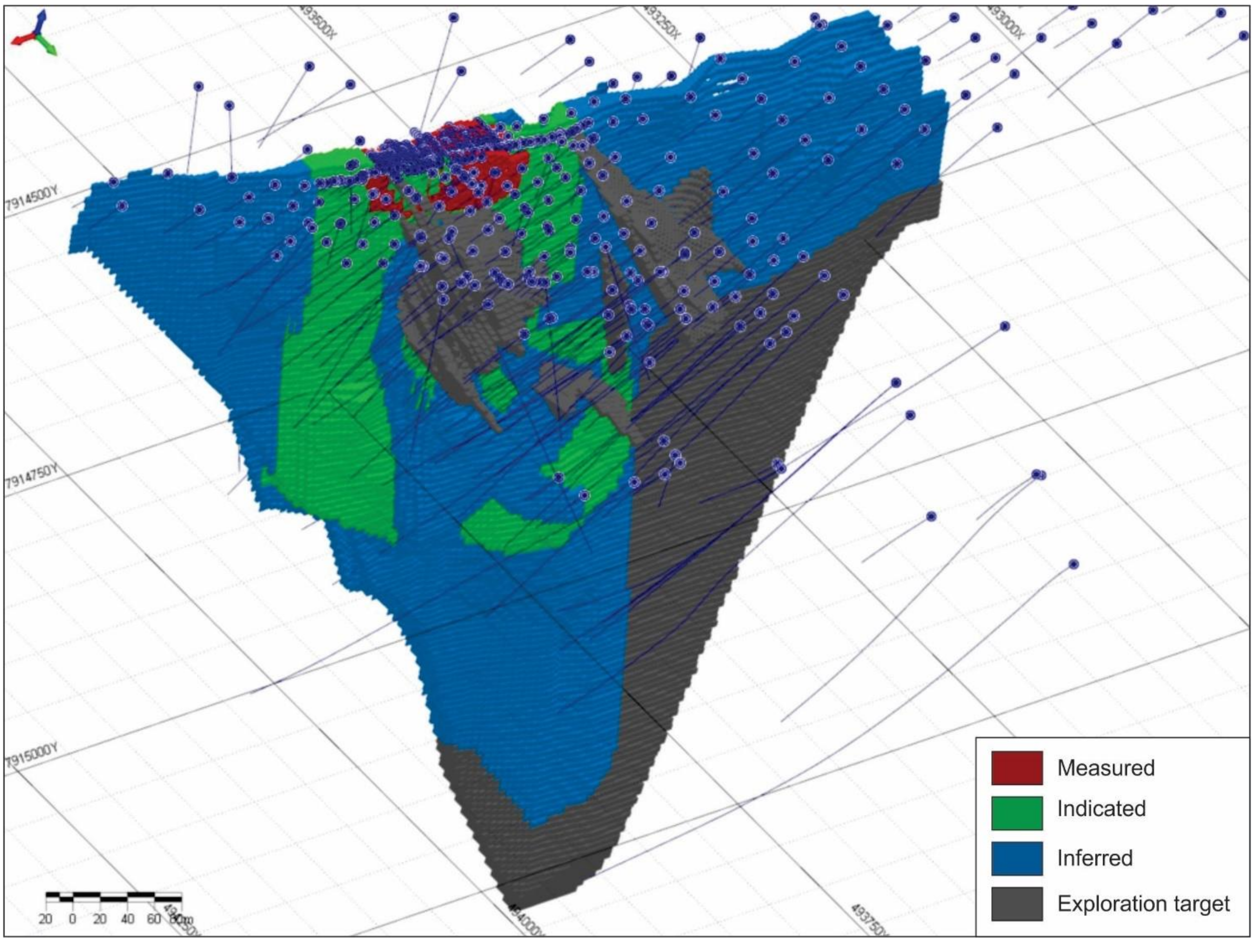

Figure 3: Mineral Resource classification and Exploration Target at the Wolverine deposit

Sample Analysis Method

Diamond and RC samples were dried, crushed, split and pulverised by Genalysis Laboratories in Perth prior to analysis of rare earth element suite using ICP-MS. The sample preparation techniques employed for the diamond and RC samples follow industry best practice.

Samples assayed by Genalysis for rare earth elements were fused with sodium peroxide within a nickel crucible and dissolved with hydrochloric acid for analysis. Fusion digestion ensures complete dissolution of the refractory minerals such as xenotime. The digestion solution, suitably diluted, is analysed by ICP Mass Spectroscopy (ICP-MS) for the determination of the REE (La – Lu) plus Y, Th, U, Sr, W and As.

Estimation and Modelling Techniques

Statistical and geostatistical analysis, block modelling and interpolation of elements were carried out using Micromine software.

The Wolverine block model used a parent block size of 5 m x 1 m x 5 m (East, North, RL) for the Main Mineralised Zone and size of 5 m x 5 m x 1 m (East, North, RL) for the sloped (dipping 20-25^{o}) Satellite mineralised bodies. The chosen block size was based on the closest spaced drilling and to allow for adequate representation of mineralised domains on section. Due to flattening, no sub-celling was used. Blocks above the topographic surface were removed.

Bulk density values were acquired using the Archimedes water immersion method based on whole and half cut diamond core. Measurements are recorded every 3-4 m through barren material and every 1-2 m through mineralised zones. Estimation of bulk density in the block model was carried out based on domains – defined by different mineralisation and weathering zones: bulk density in fresh rocks is 2.54-2.61 t/m^3, in transition from 2.48 to 2.60 t/m^3, in oxidised and box zones from 2.44 to 2.59 t/m^3

REO grade estimation was carried out as follows:

- Block model and composite files were separated into separate wireframe lenses for each domain.
- Block model and composite files were transformed and flattened.
- REOs grades were interpolated into the block model using Multiple Indicator Kriging (MIK). Ordinary Kriging (OK) and Inverse Distance Squared (IDW2) methods were used to verify REO grade interpolation via MIK. The anisotropic directions of the search ellipsoids were selected from the variograms modelled during geostatistical analysis.
- MIK estimation was carried out using combined exploration/grade control drilling.

The block model was validated by several methods:

- REOs grades were visually compared with composite grades in 3D and on sections
- The block model volumes and grades were checked against the wireframe volumes and composite interval grades
- SWATH plots
- Alternate interpolation of REOs by OK and IDW2 with and without the application of top cuts.

Cut-off Parameters and Mineral Resource Estimates

A nominal grade cut off at 0.15% TREO has been used to report the Mineral Resource at the Wolverine deposit. Consideration of mining, metallurgical and pricing assumptions, while not rigorous, suggest that material exceeding 0.15% TREO has a reasonable prospect for eventual economic extraction.

Mineral Resources increased compared to the 2015 estimate (**Error! Reference source not found.**) for the following reasons:

- Additional drilling – small increase on flanks
- Detailed analysis of results based on grade-control and exploration drilling
- Gaining confidence in the classification of Inferred Mineral Resources after analysis of continuity based on an exploration grid of 50 x 50 m

- Detailed structural analysis

- Updating wireframes to include the structural controls
- Updating the grade interpolation methodology to better reflect the grade variability / distribution by adopting the following methods:
  - The application of MIK
  - The use of flattening
  - Using a narrow search ellipsoid to better reflect the grade variability.

Measured and Indicated Mineral Resources increased by 31% for TREO tonnage. Inferred Mineral Resources increased by 69% for TREO tonnage. A comparison with the 2015 Mineral Resource Estimate is given below (Table 5).

Table 5: Comparison of 2015 Estimate with 2022 Estimate

Classification	Tonnage Mt	TREO %	Dy_2O_3 kg/t	Y_2O_3 kg/t	Tb_4O_7 kg/t	HREO rel.%	TREO t
Mineral Resource estimation, 2015 - Depleted[1]							
Indicated	2.88	0.84	0.74	4.89	0.11	89	24,195
Inferred	1.97	0.89	0.76	5.15	0.11	88	17,588
Total	4.85	0.86	0.75	4.99	0.11	89	41,786
Mineral Resource estimation, 2022 – Depleted[1]							
Measured+Indicated	**3.39**	**0.94**	**0.82**	**5.47**	**0.12**	**89%**	**31,737**
Inferred	3.05	0.98	0.84	5.68	0.13	89%	29,756
Total	**6.44**	**0.96**	**0.83**	**5.57**	**0.12**	**89%**	**61,492**
Difference							
Measured+Indicated	18%	11%	10%	11%	8%	0%	31%
Inferred	55%	10%	11%	10%	18%	1%	69%
Total	**33%**	**12%**	**11%**	**12%**	**9%**	**0%**	**47%**

[1]Refers to Mineral Resources depleted by the material mined during the 2017 trial pit mining

Metallurgical and Mining Assumptions

Metallurgical and mining studies at Wolverine are well advanced and have previously been reported to a Definitive Feasibility Study (DFS) standard in 2015 and tested over a 3-year long trial mining and processing. This demonstrated that Wolverine has reasonable prospects for eventual economic extraction.

The DFS study concluded that the Wolverine deposit is amenable to mining methods employing a combination of open pit and underground methods. In the DFS, dilution was estimated as 16.3% and recovery 87.9%. In trial mining, dilution was 10% and recovery 80%. The recovery was lower than that estimated in the DFS given some mineralisation close to the pit walls and in the upper horizons was mined as waste.

The processing flowsheet for the current definitive feasibility study consists of two main stages:

- Stage 1: Radiometric separation of mined material to increase TREO grade in head material for processing
- Stage 2: Processing for production of 25% TREO concentrate:
    - Crushing and milling
    - Magnetic separation
    - Flotation

Recovery of REOs for stages 1&2 is 78% for TREO.

Wolverine Ore Reserve

Northern Minerals has previously estimated an Ore Reserve at Wolverine. However, significant refinements have been made to the Wolverine Mineral Resource model resulting in this current re-estimation of the Mineral Resource.

As such, the previous Ore Reserve at Wolverine is no longer appropriate for the current Mineral Resource model. The technical studies required to support an Ore Reserve at Wolverine have not yet been completed to suit the updated Mineral Resource estimate. These studies are the subject of the current feasibility study due for completion in 2023.

The previous Wolverine Ore Reserve is withdrawn.

Competent Persons Declaration:

The information in this report that relates to the Wolverine Mineral Resource estimate, it is based on information compiled by Dr. Maxim Seredkin. Dr. Maxim Seredkin is a full-time employee of CSA Global Pty Ltd and is a Fellow of Australasian Institute of Metallurgy and Mining (AusIMM) and Member of Australian Institute of Geoscience (AIG). Dr Maxim Seredkin has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking to qualify as Competent Persons as defined in the 2012 edition of the Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code). Dr Maxim Seredkin consents to the disclosure of the information in this report in the form and context in which it appears. Dr Maxim Seredkin assumes responsibility for matters related to Sections 1, 2 and 3 of the Wolverine JORC Table 1 attached to this market release.

The information in this announcement that relates to the Mineral Resource estimates for deposits other than Wolverine was compiled by Mr Bill Rayson who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Rayson is a consultant to Northern Minerals, employed by Total Earth Science Pty Ltd, and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking 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' (the JORC Code). Mr Rayson consents to the inclusion of this information in the form and context in which it appears.

For Pilot Plant Stockpiles, Gambit, Gambit West, Cyclops, Banshee and Area 5, further information that relates to the Mineral Resource Estimates is available in the report entitled “Mineral Resource and Ore Reserve Update” dated 28 September 2018 and is available to view on the company’s website (www.northernminerals.com.au).

For Dazzler, further information that relates to the Mineral Resource Estimates is available in the report entitled “Over 50% Increase In Dazzler High-Grade Mineral Resource” dated 7 April 2020 and is available to view on the company’s website (www.northernminerals.com.au).

Authorised by The Board of Directors of Northern Minerals Limited

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About Northern Minerals:

Northern Minerals Limited (ASX: NTU) (Northern Minerals or the Company) owns 100% of the Browns Range Project in northern Western Australia, tenements uniquely rich in the heavy rare earth elements dysprosium (Dy) and terbium (Tb).

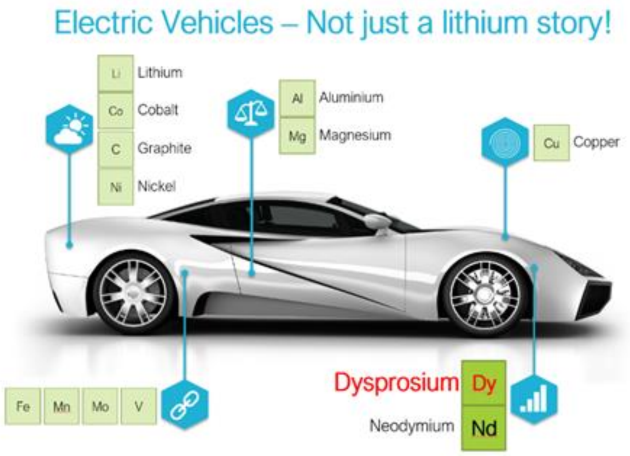
Dysprosium and terbium are critical in the production of neodymium iron-boron (NdFeB) magnets used in clean energy, military, and high technology solutions. Dysprosium and terbium are prized because their unique properties improve the durability of magnets by increasing their resistance to demagnetisation.

The Project's flagship deposit is Wolverine, which is thought to be the highest grade dysprosium and terbium orebody in Australia. The Company is preparing to bring Wolverine into production with the objective of providing a reliable alternative source of dysprosium and terbium to production sourced from China. Northern Minerals is one of only a few companies outside of China to have produced these heavy rare earth elements.

To further its strategic objective, Northern Minerals is preparing to undertake a Definitive Feasibility Study for a commercial scale beneficiation plant to process Wolverine ore.

Apart from Wolverine, Northern Minerals and has several other deposits and prospects within the Browns Range Project that contain dysprosium and other heavy rare earth elements, hosted in xenotime mineralisation.

For more information: northernminerals.com.au.



ASX Code:	NTU	Market Capitalisation:	A$199.5m
Issued Shares:	4,865m	Cash (as at 30 June 2022)	A$2.9m

Appendix 1: Wolverine JORC Code Table 1

Section 1: Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling techniques	*Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as downhole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.*	Wolverine was sampled using a combination of reverse circulation (RC) drilling, diamond core from surface and diamond core tails. A total of 197 RC drill holes, 27 diamond holes and 65 RC holes with diamond tails were available for the resource estimate. RC drilling totalled 27,574 m, with 15,723 m of diamond drilling. Within the mineralisation, 45% of metres were diamond. Holes were typically drilled to UTM grid south at a dip of -60 degrees.
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	Drill hole collars were routinely surveyed on completion using high precision GPS instruments. Down hole surveys were completed either using single shot cameras or down hole gyro. RC drilling was typically employed for shallower levels of the resource, with diamond drilling employed to target the deeper resource areas. RC samples were collected at one metre intervals and subsampled via cone or riffle splitters to achieve a target 2–5-kilogram sample weight. Diamond core was half-core sampled at nominal one-metre intervals and constrained to geological boundaries where appropriate. Sampling was carried out under NTU protocols and employed QAQC procedures in line with industry good practice.
	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 (e.g. "RC 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 (e.g., submarine nodules) may warrant disclosure of detailed information.	Diamond core was drilled using either double or triple tube at HQ and NQ sizes. HQ2 and HQ3 were variably employed for shallower parts of the hole depending on prevailing ground conditions, while the majority of diamond core intercepts within the mineralisation are at NQ3 size and sampled at a nominal one metre interval (constrained to within geological intervals). Diamond and RC samples were dried, crushed, split and pulverised by Genalysis Laboratories in Perth. Following preparation at Genalysis, samples were analysed by a combination of portable XRF and ICP Mass Spectroscopy (ICP-MS). The Competent Person considers that the sampling techniques adopted are appropriate for the style of mineralisation.
Drilling techniques	*Drill type (e.g. core, RC, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. 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 drill holes used in the estimation were NQ and HQ sized core. RC drilling was with nominal diameters of either 115 mm or 140 mm. Pre-collar depths range from 47.9 m to 240.4 m with diamond tail hole depths ranging from 10.2 m to 636.6 m. Diamond core was orientated using the Reflex ACT orientation tool. The quality of orientation marks is recorded in the drill hole database, with orientation lines only marked if two successive orientation marks aligned.

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Criteria	JORC Code explanation	Commentary
		RC drilling was completed using face sampling hammer with hole depths ranging from 18 m to 324 m. The Competent Person considers that the drilling techniques adopted were appropriate for the style of mineralisation and for reporting a Mineral Resource.
Drill sample recovery	*Method of recording and assessing core and chip sample recoveries and results assessed.*	Diamond core recovery was assessed by comparison of the interval of core presented in the core tray against the driller's core blocks. Analysis showed that more than 80% of core intervals had complete recoveries. Core recoveries in the upper 30 m were variable and with losses associated with weathered arenites and transported cover. Recoveries in these zones ranged between 70-90%. These reduced recoveries were not associated with mineralisation and as such are not considered material. RC recovery was assessed by a combination of weight of bulk sample against a nominal recovery mass, and via subjective assessment based on volume recovered.
	Measures taken to maximise sample recovery and ensure representative nature of the samples.	RC recoveries were observed to be generally acceptable with recoveries typically 80% or greater. RC and diamond recovery information is recorded in the geologist logs and entered into the database.
	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.	Diamond drilling utilised triple tube techniques and drilling fluids in order to assist with maximising recoveries. Diamond core is reconstructed into continuous runs on an angle iron cradle for orientation marking. Depths are checked against the depth given on the core blocks and rod counts are routinely carried out by the drillers. Recovered core was measured and compared against driller's blocks. RC sample recoveries were visually checked for recovery, moisture and contamination. The cyclone and splitter were routinely cleaned ensuring no material build up. Assessments on the effect of recoveries were completed for the diamond and RC drilling and found that there was not likely to be any material impact or bias on the reported assay results as a result of recovery effects. The Competent Person considers that the drilling sampling recovery methods adopted were appropriate for the style of mineralisation and for reporting a Mineral Resource.
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.*	Diamond core was geologically logged using predefined lithological, mineralogical and physical characteristics (such as colour, weathering, fabric) logging codes. In addition, structural measurements of major features were collected.

Criteria	JORC Code explanation	Commentary
		RC logging was completed on one metre intervals at the rig by the geologist. Earlier drilling was logged onto paper and transferred to a digital form for loading into the drill hole database. Since early 2012 logging was completed directly onto a laptop in the field using a proprietary geological logging package with in-built validation. Logging information was reviewed by the responsible geologist prior to final load into the database. Chip trays were collected for each of the RC intervals and core trays were photographed. Geotechnical logging of all diamond core consisted of recording core recovery, RQDs, number of fractures, core state (i.e. whole, broken) and hardness. In addition, nine diamond holes (BRWD0026-0034) were drilled specifically for geotechnical purposes and were logged by both NTU geologists and external consultants. Samples were also selected for destructive testing.
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	Logging was generally qualitative in nature except for the determination of core recoveries and geotechnical criteria such as RQD and fracture frequency which was quantitative. Core photos were collected for all diamond drilling to aid geological interpretation.
	The total length and percentage of the relevant intersections logged.	All recovered intervals were geologically logged. The Competent Person considers the logging appropriate for reporting of the Mineral Resource.
Subsampling techniques and sample preparation	*If core, whether cut or sawn and whether quarter, half or all core taken.*	Diamond core was half cut using an electric core saw. Sample intervals were marked on the core by the responsible geologist considering lithological and structural features, together with indicative results from handheld XRF measurements. Core selected for duplicate analysis was further cut to quarter core with both quarters submitted individually for analysis. Where possible, core was sampled to leave the orientation line in the core tray.
	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	RC samples were collected from the full recovered interval by either riffle splitting or using a static cone splitter. The majority of samples were collected dry with a minor number being moist due to ground conditions or excessive dust suppression. Samples were split without drying.
	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	The sample preparation techniques employed for the diamond and RC samples follow industry standard practice at Genalysis Laboratory. Samples are oven dried, crushed if required and pulverised, prior to a pulp packet being removed for analysis.
	Quality control procedures adopted for all subsampling stages to maximise representivity of samples.	Field QAQC procedures included the field insertion of certified reference materials (standards) having a range of values reflecting the general spread of values observed in the mineralisation.

Criteria	JORC Code explanation	Commentary
		Drilling prior to July 2012 did not include the insertion of standards, as suitable materials were not sourced. Blanks were also inserted in the field and developed from local host rock following chemical analysis. Field duplicates were collected by either a second sample off the splitter (RC) or by quarter core samples of the original half core sample (diamond) and separate submission and analysis at the laboratory. Insertion rates targeted 1:20 for duplicates, blanks, and standards, with increased frequency in mineralised zones.
	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.	Field duplicates were regularly taken from RC samples at Wolverine. 356 duplicates were available, with a relative paired difference of 23% for Y and 12% for Ce. Similarly, duplicate analysis was performed on diamond core, where two quarter cores over the same interval were independently assayed. For diamond core samples, 367 pairs were available with a relative paired difference of 31% for Y and 17% for Ce.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	Sample sizes are considered appropriate to the grain size of the material being sampled. The Competent Person considers the sub sampling and preparation techniques appropriate for the reporting of the Mineral Resource.
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.*	Samples assayed by Genalysis for rare earth elements were fused with sodium peroxide within a nickel crucible and dissolved with hydrochloric acid for analysis. Fusion digestion ensures complete dissolution of the refractory minerals such as xenotime, which are only partially dissolved if the pulp is digested in acids. The digestion solution, suitably diluted, is analysed by ICP Mass Spectroscopy (ICP-MS) for the determination of the REE (La – Lu) plus Y, Th and U.

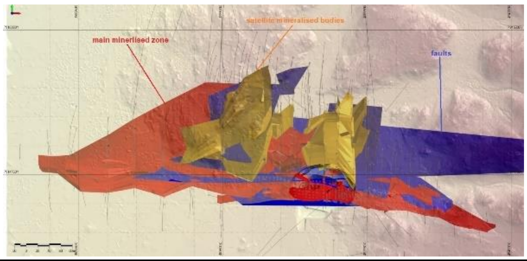
Criteria	JORC Code explanation	Commentary
	For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.	Northern Minerals extensively uses portable X-ray fluorescence (pXRF) technology. In the field a series of Niton (XL3T-950 GOLDD+) XRF handheld tools were used to assist with the identification of mineralised zones for sample collection and submission. A reading time of 30 seconds was used, with readings taken for every metre of RC drilling. Intervals for which readings returned yttrium (Y) of 200 ppm or greater were selected for analysis, as were a selection of sub 200 ppm yttrium samples. Since 2014, samples submitted for analysis at Genalysis have been analysed by pXRF following the standard laboratory preparation, i.e., drying, splitting, pulverisation. Yttrium was analysed using an Olympus InnovX Delta Premium, with a 30 second reading time. Cerium was analysed using a Niton (XL3T-950 GOLDD+), 30 second reading time. Only samples selected on the basis of pXRF or of geological interest have then been progressed to full analysis via ICP-Ms and/or ICP-OES. Where pXRF analysis were used in the Mineral Resource estimates, the final rare earth element values were assigned from the raw analysis using correlation studies upon samples for which both pXRF and ICP-MS were available. Rare Earth Oxide derived from pXRF instruments contributes less than 1% of the contained Rare Earth Oxide in the total Mineral Resource estimate.
	Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	Certified reference materials, using values across the range of mineralisation, were inserted blindly and randomly. Results highlight that sample assay values are suitably accurate and unbiased. Laboratory QAQC involves the use of internal lab standards using certified reference material, blanks, splits and replicates as part of the in-house procedures. Umpire laboratory campaigns are used to routinely conduct round robin analysis. Results of round robin analysis are acceptable. The Competent Person considers the nature and quality of assaying and laboratory procedures appropriate for reporting a Mineral Resource.
Verification of sampling and assaying	*The verification of significant intersections by either independent or alternative company personnel.*	Diamond drill core photographs have been reviewed for the recorded sample intervals. High range values are routinely resubmitted for repeat analysis with results comparing within acceptable limits.
	The use of twinned holes.	Six twinned holes, Diamond to RC, have been conducted with results being comparable and acceptable.

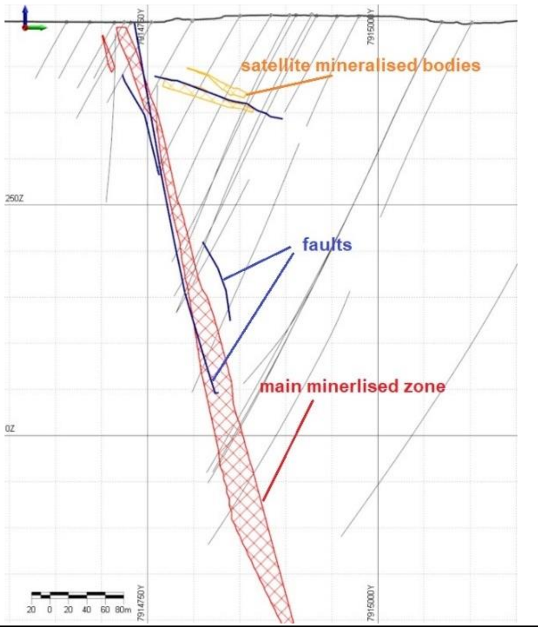
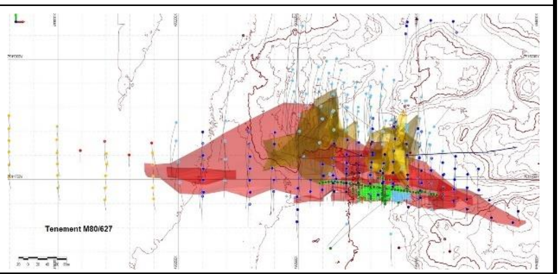
Criteria	JORC Code explanation	Commentary
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	Earlier primary data (2011) was collected using paper logs and transferred into Excel spreadsheets for transfer into the drill hole database. Since early 2012, primary data was collected into a proprietary logging package (OCRIS) with in-built validation. Details were extracted and pre-processed prior to loading. In 2011 and 2012 data was managed and stored off site using acQuire software. In 2013 Datashed was used as the database storage and management software and incorporated numerous data validation and integrity checks, using a series of defined data loading tools. Since 2013, data is stored on a SQL server by Northern Minerals subject to electronic backup.
	Discuss any adjustment to assay data.	The assay data were converted from reported elemental assays for a range of elements to the equivalent oxide compound as applicable to rare earth oxides. Oxide calculations are completed by the laboratory and checked by Northern Minerals. No issues were identified. The oxides were calculated from the element according to the following factors below: CeO_2 – 1.2284, Dy_2O_3 – 1.1477, Er_2O_3 – 1.1435, Eu_2O_3 – 1.1579, Gd_2O_3 – 1.1526, Ho_2O_3 – 1.1455, La_2O_3 – 1.1728, Lu_2O_3 – 1.1371, Nd_2O_3 – 1.1664, Pr_6O_{11} – 1.2082, Sm_2O_3 – 1.1596, Tb_4O_7 – 1.1421, Tm_2O_3 – 1.1421, Y_2O_3 – 1.2699, Yb_2O_3 – 1.1387.
Location of data points	*Accuracy and quality of surveys used to locate drillholes (collar and downhole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.*	Drill collar locations were surveyed using high accuracy GPS by a suitably qualified independent surveying contractor in 2013 and 2013 and by trained NTU staff in 2014. Down hole surveys were completed using single shot or multi shot cameras at the time of drilling with down hole gyroscopic surveys conducted at the completion of drilling. Survey accuracy of both collars and down hole is considered acceptable. The Competent Person considers a relatively high level of confidence can be placed in the location of data points.
	Specification of the grid system used.	The grid system used is MGA94 Zone 52. All reported coordinates are referenced to this grid.
	Quality and adequacy of topographic control.	Topographic control is based on Lidar survey data collected in 2013 with accuracy considered to be better than 20cm. The Competent Person considers the topography to be high quality to support a Mineral Resource estimation.
Data spacing and distribution	*Data spacing for reporting of Exploration Results.*	Drilling of the Wolverine deposit has been completed on a nominal 25 m in easting by 25 m in northing grid spacing although this increases to broader spacing at the lateral extremities of the deposit. Holes were almost routinely collared to UTM grid south at a dip of -60 degrees. The spacing of down hole intercepts of the mineralisation varies from the nominal collar spacing due to deviation of drill holes.

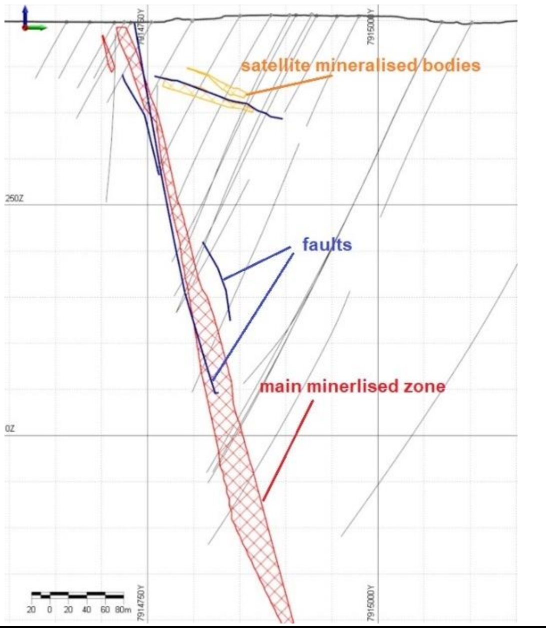
Criteria	JORC Code explanation	Commentary
		Since October 2013, casing wedge and directional drilling techniques were used for the deeper diamond drilling, and hence downhole geometries became more variable.
	Whether the data spacing, and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	The Competent Person considers the drill spacing has established good geological and grade continuity, appropriate for the reporting and classification of the Wolverine Mineral Resource.
	Whether sample compositing has been applied.	No compositing was performed on the samples prior to laboratory analysis.
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.*	The mineralisation is interpreted to be a steeply dipping, roughly planar feature striking approximately east west and dipping at 75 degrees to the north. Resource drilling is exclusively conducted at -60 degrees to the south and as such drill holes intersect the mineralisation at acceptable angles. As such the orientation of drilling is not likely to introduce a sampling bias.
	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 relationship between the drilling orientation and the orientation of key mineralised structures is unlikely to have introduced a sampling bias.
Sample security	*The measures taken to ensure sample security.*	Samples are collected on site under supervision of a responsible geologist and stored in bulk bags on site prior to transport by company truck or utility to Halls Creek commercial transport yard. The samples were stored in a secure area until loaded and delivered to Genalysis Laboratory in Perth. Laboratory dispatch sheets are completed and forwarded electronically as well as being placed within the samples transported. Dispatch sheets are compared against received samples and discrepancies reported and corrected. The Competent Person considers the chain of custody and security measure taken from the field capture to delivery to Genalysis appropriate.
Audits or reviews	*The results of any audits or reviews of sampling techniques and data.*	Internal review, by the competent person, of the data integrity and consistency of the drill hole database shows sufficient quality to support resource estimation. CSA Global completed a site review in September 2022 and considered the level of exploration completed appropriate for reporting a Mineral Resource.

Section 2: Reporting of Exploration Results

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.*	Wolverine is located wholly within Mining Lease M80/627. The tenement is located in the company's Browns Range Project approximately 150 kilometres south-east of Halls Creek and adjacent to the Northern Territory border in the Tanami Desert. The Jaru Native Title Claim is registered over the Browns Range Project area and the fully determined Tjurabalan claim is located in the south of the project area. The licence is held 100% (all mineral rights) by Northern Minerals Limited.
	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 mining lease covers 4,923.6817 hectares and was applied for on 26 November 2013. The lease was granted on 17 June 2014 with an expiry date of 16 June 2035. The Competent Person can confirm that according to Department of Mines, Industry Regulation and Safety (DMIRS) Mineral Titles Online that all rents and rates have been paid and that the tenement is in good standing. The Competent Person has not verified any potential social or environmental pediments to progressing the Project.
Exploration done by other parties	*Acknowledgment and appraisal of exploration by other parties.*	Historical interest in the exploration potential of the area was first generated by reconnaissance mapping carried out by the Bureau of Mineral Resources (BMR) in the late 1950s. The first record of commercial exploration was in the early 1960s by New Consolidated Goldfields, with the area subsequently attracting various phases of gold, base metals and uranium exploration throughout the 1970s, 1980s and 1990s, by companies such as BHP Minerals, Sigma Resources and PNC Exploration Australia Pty Ltd. No previous systematic exploration for REE mineralisation has been completed at Wolverine.
Geology	*Deposit type, geological setting and style of mineralisation.*	The Wolverine deposit is underlain by Browns Range Metamorphics which are a variable sequence of meta quartz-lithic and arkosic arenites and conglomerates with minor interbedded schists. The host rocks in the mineralised zone are silicified and brecciated along structures trending approximately east-west, and dipping steeply to the north. Hematite and sericite alteration are associated with mineralisation. The style of mineralisation is xenotime hydrothermal breccia. Xenotime is associated with varying degrees of veining and brecciation; from 1mm to 2mm crackle vein selvages to matrix infill in 5m wide zones of chaotic breccia. There are open spaced textures, vugs and minor cross-cutting quartz, pyrite and barite veins that are interpreted to post-date mineralisation.

Criteria	JORC Code explanation	Commentary
		Mineralogical examination shows the heavy rare earth mineralisation is xenotime (YPO4). The Florencite ((Nd,La,Ce)Al3(PO4)2(OH)6) - Goyazite (Sr Al3(PO4)2(OH)5.H2O) series are the only other rare earth element minerals recognised to date. The Competent Person is of the opinion that the understanding of the Wolverine geology is detailed and well established.
Drillhole information	*A summary of all information material to the understanding of the Exploration Results including a tabulation of the following information for all Material drillholes:* • *Easting and northing of the drillhole collar* • *Elevation or RL (Reduced Level – Elevation above sea level in metres) of the drillhole collar* • *Dip and azimuth of the hole* • *Downhole length and interception depth* • *Hole length.*	Exploration Results are not being reported.
	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.	Exploration Results are not being reported.
Data aggregation methods	*In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.*	Exploration Results are not being reported.
	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.	Exploration Results are not being reported.
	The assumptions used for any reporting of metal equivalent values should be clearly stated.	Exploration Results are not being reported.
Relationship between mineralisation widths and intercept lengths	*These relationships are particularly important in the reporting of Exploration Results.*	Exploration Results are not being reported.
	If the geometry of the mineralisation with respect to the drillhole angle is known, its nature should be reported.	Exploration Results are not being reported.
	If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. "downhole length, true width not known").	Exploration Results are not being reported.
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 drillhole collar locations and appropriate sectional views.*	

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.*	Exploration Results are not being reported.
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.*	Other exploration work completed is described above in "Exploration done by other parties".
Further work	*The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).*	To maximise the technical value of Wolverine, the Competent Person recommends a detailed geometallurgical data analysis be conducted with the aim of adding predictions of metallurgical response to the resource block model. The study should initially look at gaps in the data and then be followed by development of a rapid baseline geometallurgical model. The study conclusions can then be used as inputs to the process plant design and for reporting of Mineral Resources and Ore Reserves.
	Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	

Criteria	JORC Code explanation	Commentary
		

Section 3: Estimation and Reporting of Mineral Resources

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.*	2011 drilling was logged onto paper and transferred to a digital form for loading into the drill hole database. To cut validation time and errors, from 2012, logging was completed directly onto a laptop in the field using a proprietary geological logging package with in-built validation. All data transfer is electronic, with no double handling of data. Sample numbers are unique. Logging and survey information was reviewed by the responsible geologist prior to final load into the database. The data is stored in a single database for the Browns Range project.

Criteria	JORC Code explanation	Commentary
	Data validation procedures used.	The first validation starts at the field logging package during data entry. Data validations are routinely run prior to uploading of data to the database. Many check routines and rules are run to ensure referential integrity, such as overlapping intervals, repeat sample IDs, out of range density measurements, survey azimuth deviations >10 degrees, drill hole dip deviations >5 degrees, and missing samples have been developed firstly using AcQuire (2011-12) and then in Datashed (2013 onwards). Internal validations are completed when data is loaded into spatial software for geological interpretation and resource estimation. This was routinely completed for the Browns Range dataset(s). Outlier assays are routinely checked via QAQC reports automated from the database and followed up by the responsible geologist. This is completed by checking standards, blanks, and duplicate data. No significant errors were found with the data.
Site visits	*Comment on any site visits undertaken by the Competent Person and the outcome of those visits.*	The Competent Person, Maxim Seredkin, is a full time CSA Global employee and visited the Wolverine project in September 2022.
	If no site visits have been undertaken indicate why this is the case.	Not applicable.
Geological interpretation	*Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.*	The Browns Range REE mineralisation is one of only a few hydrothermal xenotime mineralisation styles documented globally. Detailed mapping, structural, alteration and mineralisation studies have been completed by NTU geologists and contracted specialists between 2011 and 2014. These data and close spaced drilling, generally <25 m, has led to a good understanding of mineralisation controls. The REE mineralisation is hosted by approximately east-west striking structures and veins, within a coarse sedimentary package on the western side of the regionally extensive Browns Range Dome. This is a feature seen within the Browns Range Mineral Resources at Wolverine, Gambit, Gambit West, Area 5, Cyclops and Banshee localities. Breccia and quartz vein structures are mappable and can be followed with confidence under transported cover using geochemistry and step-out drilling. There is associated sericite-hematite-silica alteration. The geological work is continually being refined. Currently, spectral, dating, geochemical, microprobe and fluid inclusion work are underway, coordinated by external research institutions.
	Nature of the data used and of any assumptions made.	Geological data used for interpretation was gathered from drilling with detailed geological core logging and assay data, complemented by a structural interpretation.
	The effect, if any, of alternative interpretations on Mineral Resource estimation.	The accuracy of the geological interpretation has been improved through the integration of a structural model; however, this has not materially changed the interpretation.

Criteria	JORC Code explanation	Commentary
	The use of geology in guiding and controlling Mineral Resource estimation. *The factors affecting continuity both of grade and geology.*	Geological observation has underpinned the resource estimation and geological model. Rock type, alteration style, degree of brecciation, intensity of alteration, structural measurements and geochemistry were used to define the footwall and hanging wall boundaries. The geological model was developed as an iterative process of checking against logging, photography and relogging core/rock chips as needed during interpretation. The extents of the geological model were constrained by drilling. Geological boundaries had only minimal extrapolation beyond drilling in line with the resource classifications of indicated or inferred. Key factors that are likely to affect the continuity of grade are: the inherent variability of brecciated rocks. The breccia rock characteristics can change rapidly from centimetre to metre scale, and since the deposit is structurally hosted, there is also inherent disruption of continuity by faulting at different scales.
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.*	Wolverine has a known strike length of 650 m, mineralised widths up to 30 m and a dip/plunge length of over 550 m. Within the overall mineralisation envelope, the highest grade of mineralisation occurs within a central zone of 120-250 m strike length, with REO grade generally decreasing away from this central zone.
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 Mineral Resource estimation process is summarised below:
	The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.	Previous estimation of Mineral Resources was completed in 2015. The trial pit was operated from 15 July 2017 through to 26 November 2017. Reconciliation between mined material and block model demonstrates good confidence – 2.5 rel.% difference.
	The assumptions made regarding recovery of by-products.	No assumptions have been made regarding by-products.
	Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulphur for acid mine drainage characterisation).	Uranium and Thorium were estimated
	In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.	The Wolverine block model used a parent block size of 5 m x 1 m x 5 m (East, North, RL). The chosen blocks size was based on the closest spaced drilling and to allow for adequate representation of mineralised domains on section. Due to flattening, no sub-celling was used
	Any assumptions behind modelling of selective mining units.	Not applicable

Criteria	JORC Code explanation	Commentary
	Any assumptions about correlation between variables	There is strong correlation between individual REOs in LREE: La, Ce, Pr, Nd as well as individual REOs in MREE and HREE: Y, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu. Also strong correlation between U and Y. There is no correlation between LREE and M&HREEs as well as Th with REE. Correlation analysis was used for estimation of individual REEs based on Y and Ce grades estimated by pXRF. However, the most samples were assayed by ICP-MS for all individual REEs.
	Description of how the geological interpretation was used to control the resource estimates.	Interpretation of the mineralised bodies to support the Mineral Resource estimate was completed based on the following criteria: • Breccia zones, or • Medium and heavy rare earth oxide grades (from Sm2O3 to Lu2O3 and Y2O3) > 150 ppm. A structural model prepared in 2017 by Nick Oliver was used to assist with the preparation of the mineralised interpretations as follows: • The western part of main mineralised zone is located along the sub-latitudinal Hamsters Fault (direction 1) • The eastern part of the main mineralised zone is located along the diagonal Kurtz cutoff Fault (direction 2) • The most productive central part of the main mineralised zone is controlled by intersection of the Hamsters Fault and Kurtz cutoff Fault • Satellite mineralised bodies are located along dipping Hematite Faults located north from the Main mineralised zone. The morphology of these satellite mineralised zones is similar to the Banshee deposit. Digital terrain models (DTMs) were prepared for cover sediments, and borders between oxidised, transition and fresh zones.
	Discussion of basis for using or not using grade cutting or capping.	No grade capping or cutting was used due to the reliance on the standard MIK method.
	The process of validation, the checking process used, the comparison of model data to drillhole data, and use of reconciliation data if available.	The block model grades were visually compared with the coded drillhole grades in section. The block model was also validated on screen against the geological wireframes and drillholes to check that the domain allocation was concurrent with the drillhole lithology. Another validation stage involved a comparison of the drillhole and the model statistics.

Criteria	JORC Code explanation	Commentary
		Swath plots comparing the drillhole average grades and the block model grades in slices were generated for all the estimated variables within their respective domains. The block model and drillhole grades for all domains show trends consistent with effective grade interpolation. Areas with low sample numbers generally show higher variance between model and drillhole mean grades. Reconciliation between mined material and block model show difference 1.5 rel.% for TEREO grades and 2.5 rel.% for TREO tonnage.
Moisture	*Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	The density was measured on air dried core in the field, with one in 20 samples checked externally by Genalysis Laboratory, Perth. The moisture content in mineralisation is considered low. Tonnage was estimated on a dry basis.
Cut-off parameters	*The basis of the adopted cut-off grade(s) or quality parameters applied.*	A nominal grade cut off at 0.15% TREO has been used to report the Mineral Resource at the deposit. The Competent Person considers that the Mineral Resource as reported fulfills the reasonable prospects for eventual economic extraction requirement for reporting Mineral Resources in accordance with the JORC Code.
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.*	Feasibility Study (FS) level mining studies were completed on the Wolverine resource as reported in 2015. Scenarios considered included conventional open pit only and a combination of open pit and mechanised underground mining techniques. The study concluded that the Wolverine deposit is amenable to mining methods employing a combination of open pit and underground methods. Ongoing studies have not changed the outcomes of this earlier work.
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.*	DFS level metallurgical studies were completed on the Wolverine resource in 2015. These showed the deposit is amenable to metallurgical recovery and has reasonable prospects for eventual economic extraction.

Criteria	JORC Code explanation	Commentary
Environmental 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.*	The environmental permitting process is well advanced in line with the development stage of the project. With consideration of environmental factors and assumptions, the project is considered to have reasonable prospects for eventual economic extraction.
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.*	Bulk density has been estimated from density measurements carried out on diamond core samples of variable length using the Archimedes method of dry weight versus weight in water. Field density measurements were completed as a minimum of one every two meters in diamond core, hence representatively covers the Mineral Resource Estimate.
	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.	The water immersion method, covering void spaces with clear tape, is appropriate to adequately account for porosity. Porous samples were checked by an external laboratory and were consistent with field measurements.
	Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.	Density in the Mineral Resource ranged from 2.44 (oxide) to 2.61 (fresh). Densities were set on a domain-by-domain basis.
Classification	*The basis for the classification of the Mineral Resources into varying confidence categories.*	Classification for Wolverine is based upon continuity of geology, mineralisation and grade, using drill hole spacing and quality, variography and estimation statistics.
	Whether appropriate account has been taken of all relevant factors (i.e. 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).	Appropriate account has been taken of 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 Competent Person believes that the classification applied appropriately reflects the confidence which can be assigned to the grade and tonnages estimates.
Audits or reviews	*The results of any audits or reviews of MREs.*	CSA Global completed an independent audit of the Mineral Resource in August 2022, and although no fatal flaws were reported, areas for improvement were identified. The main recommendations included: • Completing a drillhole spacing analysis study based on completed grade-control drilling results to determine an optimal exploration grid density.

Criteria	JORC Code explanation	Commentary
		• Multiple Indicated Kriging (MIK) to improve grade interpolation of CREO and HREO due to high variability, complex distribution on grade classes and top cuts which can impact Mineral Resource estimation. • Flattening of the model and composite intervals to vertical plane or a dynamic (rotating) search ellipsoid to improve the modelling of REO grade variability estimation. These recommendations have been actioned and form part of this updated Mineral Resource estimate.
Discussion of relative accuracy/ confidence	*Where appropriate a statement of the relative accuracy and confidence level in the MRE 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 available data supports a combination of Measured, Indicated and Inferred based upon the geological understanding of the deposit, geological and mineralisation continuity, drillhole spacing, search and interpolation parameters and analysis of available density information. All factors that have been considered when classifying the Mineral Resource are discussed in Sections 1, 2 and 3 of this table.
	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 levels of confidence and accuracy relate to the global estimates of grade and tonnes for the deposit.
	These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.	Available information for mined material to stockpile used for processing on trial plant. This information was used for reconciliation