

Company Announcement, May 15th, 2019

Kvanefjeld Optimised Feasibility Update: Rare Earth Recoveries Increased, Operating Costs Reduced

Highlights:

- **8% increase in rare earth recoveries to 94% within the refinery circuit (expressed as rare earth oxide equivalent, compared to the 2016 Feasibility Study calculation “FS”)**
- **US\$31M per annum increase in revenue at current rare earth prices**
- **40% reduction in annual operating costs (compared to FS)**
- **Unit costs reduced to <US\$4/kg of rare earth oxide, net of by-product credits**
- **Outcomes position Kvanefjeld as one of the lowest-cost, highest margin undeveloped rare earth projects globally**

Dr John Mair, Managing Director commented:

“Recoveries and operating costs have now been finalised for the optimised Kvanefjeld Feasibility Study, and the results are exceptional. The low operating costs reflect the large output and simple, highly-efficient processing that are key project advantages.

Substantial improvements to flotation performance result in a higher-grade, lower volume mineral concentrate, reducing the scale of the refinery circuit. This is complemented by further simplifications to the refinery circuit, reduced reagent consumption, and improved rare earth recoveries.

The improvements are the result of customised metallurgical program led by our major shareholder Shenghe Resources and have the project on track to be a high output, low cost producer of rare earths, over an initial 37-year mine life. We anticipate updates on the optimised capital costs in the coming weeks.

The case continues to strengthen for Kvanefjeld to be developed as a major supplier of magnet metals – critical to the electrification of transport systems, wind energy, and green technologies.”

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Greenland Minerals Ltd ('GML' or 'the Company') is pleased to update on the performance of the optimised rare earth refinery circuit for the Kvanefjeld Project, and the positive economic implications. Through 2017-2018, GML undertook an extensive metallurgical optimisation program with leading rare earth company and major shareholder Shenghe Resources Holding Co Ltd (Shenghe).

In early 2018, the Company outlined the development of an enhanced leaching method to simplify the refinery circuit and reduce capital and operating costs (Company announcement, January 15th, 2018). Continued development of the refinery circuit through 2018 has confirmed excellent rare earth recoveries of 94% - an 8% increase over recoveries considered in the 2016 Feasibility Study. Recovery improvements are across the light and heavy rare earths elements.

The increased recoveries will result in the production of 32,000 tpa rare earth oxide (REO), at a processing rate of 3Mtpa - the rate adopted in the 2016 Feasibility Study.

The results are significant and have Kvanefjeld positioned as the lowest-cost undeveloped ASX-listed rare earth project. This has been achievable due to the unique nature of the Kvanefjeld ore minerals, which can be concentrated effectively through flotation, then refined with a single stage atmospheric leach circuit. This represents a simpler path to rare earth production without the complex high-temperature, chemically-aggressive mineral cracking stages that are required for common rare earth ore minerals.

The Kvanefjeld Project is underpinned by the world's largest code-compliant rare earth resource, and is favourably located in southern Greenland, with year-round direct shipping access to the project area.

Background

The Kvanefjeld Feasibility study, released in 2016, drew on extensive metallurgical test work including pilot plant operations. The outcomes demonstrate the potential for the Kvanefjeld Project to be developed as a large scale, low cost producer of rare earths, and attracted the interest of Shenghe who recognised a collective of strong attributes and moved to become the Company's largest shareholder.

In early 2017 GML and Shenghe established a Technical Committee to plan and oversee a series of metallurgical test work programs to optimise the Kvanefjeld process flowsheet. The basis of the flowsheet had already been developed, and the work programs aimed to improve the performance of both the concentrator and refinery circuits, in order to establish the best cost structure and thereby maximise the projects potential.

Test work was conducted in both Australia and China, with technical outcomes summarised in a series of Company announcements, inclusive of JORC Table 1 details (December 20, 2017; January 15, 2018; July 11, 2018; January 10, 2019).

The improved rare earth recoveries increase the projected output of commercially important rare earths to:

- **Neodymium oxide** **4,260 tpa**
- **Praseodymium oxide** **1,420 tpa**
- **Dysprosium oxide** **270 tpa**
- **Terbium oxide** **45 tpa**

Average annual by-product output includes:

- **Uranium oxide** **451 tpa**
- **Zinc concentrate** **6,060 tpa**
- **Fluorspar** **12,417 tpa**

(prices assumed for by-product credits: U₃O₈ US\$40/lb, zinc concentrate US\$1000/t, fluorspar US\$400/t)

The increase in rare earth recoveries is primarily due to the design of a single leach stage, which results in fewer solid/liquid separation stages. Each solid/liquid separation stage results in minor rare earth losses.

The increase in rare earth recoveries leads to a direct increase in revenue. At current rare earth prices (source: Association of China Rare Earth Industry), the project revenue is increased by 8%, which will significantly improve financial returns, and position the project as a dominant producer at the low end of the production cost-curve. The improved performance is being incorporated into an optimised feasibility study which will be provided to the market in the coming weeks.

The metallurgical improvements also flow through to operating cost reductions compared to the 2016 Feasibility Study, which estimated industry competitive operating costs of US\$ 8.50/kg of REO inclusive of by-product credits. Kvanefjeld's improved metallurgical performance results in a reduction in operating costs to <US\$4/kg REO (inclusive of by-product credits). This operating cost is industry leading amongst ASX-listed companies with advanced, undeveloped, rare earth projects, and will have the project optimally placed at the low end of the production cost-curve.

Using current spot prices for REO's as of May 10 2019, the basket price for project intermediate product is **\$13.23/kg REO**. This basket price has been calculated using REE data from ACREI – the Association of China Rare Earth Industry. ACREI post daily prices in RMB for all REE which have been converted to USD at the daily prevailing exchange rate.

Using GML's forecast REE prices, the basket price for project intermediate product is **\$19.55/kg REO**. This basket price has been calculated using REE data from ACREI and independent industry consultant Adamas Intelligence. Forecast prices for the "magnet metals" – Nd, Pr, Tb and Dy – have been taken from the latest industry report prepared by Adamas Intelligence and, for all other REE, the current spot prices have been used in the calculation. The demand outlook for magnet metals continues to strengthen, driven by the transition to electric cars and continued expansion of wind-power, with significant new rare earth supply required.

The improved rare earth recoveries and reduced production costs reflect the inherent advantages of the Kvanefjeld Project with the unique, non-refractory minerals providing a simpler, and lower-cost path to rare earth production.

Kvanefjeld is well-positioned to be a significant contributor to global rare earth supply for an initial 37 year period, based on a 108Mt ore reserve. Notably, the ore reserve represents just 11% of the project's mineral resource estimate.

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Multi-Element Resources Classification, Tonnage and Grade										Contained Metal				
Cut-off	Classification	M tonnes	TREO ²	U ₃ O ₈	LREO	HREO	REO	Y ₂ O ₃	Zn	TREO	HREO	Y ₂ O ₃	U ₃ O ₈	Zn
(U ₃ O ₈ ppm) ¹		Mt	ppm	ppm	ppm	ppm	ppm	ppm	ppm	Mt	Mt	Mt	M lbs	Mt
Kvanefjeld - February 2015														
150	Measured	143	12,100	303	10,700	432	11,100	978	2,370	1.72	0.06	0.14	95.21	0.34
150	Indicated	308	11,100	253	9,800	411	10,200	899	2,290	3.42	0.13	0.28	171.97	0.71
150	Inferred	222	10,000	205	8,800	365	9,200	793	2,180	2.22	0.08	0.18	100.45	0.48
150	Total	673	10,900	248	9,600	400	10,000	881	2,270	7.34	0.27	0.59	368.02	1.53
200	Measured	111	12,900	341	11,400	454	11,800	1,048	2,460	1.43	0.05	0.12	83.19	0.27
200	Indicated	172	12,300	318	10,900	416	11,300	970	2,510	2.11	0.07	0.17	120.44	0.43
200	Inferred	86	10,900	256	9,700	339	10,000	804	2,500	0.94	0.03	0.07	48.55	0.22
200	Total	368	12,100	310	10,700	409	11,200	955	2,490	4.46	0.15	0.35	251.83	0.92
250	Measured	93	13,300	363	11,800	474	12,200	1,105	2,480	1.24	0.04	0.10	74.56	0.23
250	Indicated	134	12,800	345	11,300	437	11,700	1,027	2,520	1.72	0.06	0.14	101.92	0.34
250	Inferred	34	12,000	306	10,800	356	11,100	869	2,650	0.41	0.01	0.03	22.91	0.09
250	Total	261	12,900	346	11,400	440	11,800	1,034	2,520	3.37	0.11	0.27	199.18	0.66
300	Measured	78	13,700	379	12,000	493	12,500	1,153	2,500	1.07	0.04	0.09	65.39	0.20
300	Indicated	100	13,300	368	11,700	465	12,200	1,095	2,540	1.34	0.05	0.11	81.52	0.26
300	Inferred	15	13,200	353	11,800	391	12,200	955	2,620	0.20	0.01	0.01	11.96	0.04
300	Total	194	13,400	371	11,900	471	12,300	1,107	2,530	2.60	0.09	0.21	158.77	0.49
350	Measured	54	14,100	403	12,400	518	12,900	1,219	2,550	0.76	0.03	0.07	47.59	0.14
350	Indicated	63	13,900	394	12,200	505	12,700	1,191	2,580	0.87	0.03	0.07	54.30	0.16
350	Inferred	6	13,900	392	12,500	424	12,900	1,037	2,650	0.09	0.00	0.01	5.51	0.02
350	Total	122	14,000	398	12,300	506	12,800	1,195	2,570	1.71	0.06	0.15	107.45	0.31

Multi-Element Resources Classification, Tonnage and Grade

Contained Metal

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Cut-off (U ₃ O ₈ ppm) ¹	Classification	M tonnes Mt	TREO ² ppm	U ₃ O ₈ ppm	LREO ppm	HREO ppm	REO ppm	Y ₂ O ₃ ppm	Zn ppm	TREO Mt	HREO Mt	Y ₂ O ₃ Mt	U ₃ O ₈ M lbs	Zn Mt
Sørensen - March 2012														
150	Inferred	242	11,000	304	9,700	398	10,100	895	2,602	2.67	0.10	0.22	162.18	0.63
200	Inferred	186	11,600	344	10,200	399	10,600	932	2,802	2.15	0.07	0.17	141.28	0.52
250	Inferred	148	11,800	375	10,500	407	10,900	961	2,932	1.75	0.06	0.14	122.55	0.43
300	Inferred	119	12,100	400	10,700	414	11,100	983	3,023	1.44	0.05	0.12	105.23	0.36
350	Inferred	92	12,400	422	11,000	422	11,400	1,004	3,080	1.14	0.04	0.09	85.48	0.28
Zone 3 - May 2012														
150	Inferred	95	11,600	300	10,200	396	10,600	971	2,768	1.11	0.04	0.09	63.00	0.26
200	Inferred	89	11,700	310	10,300	400	10,700	989	2,806	1.03	0.04	0.09	60.00	0.25
250	Inferred	71	11,900	330	10,500	410	10,900	1,026	2,902	0.84	0.03	0.07	51.00	0.20
300	Inferred	47	12,400	358	10,900	433	11,300	1,087	3,008	0.58	0.02	0.05	37.00	0.14
350	Inferred	24	13,000	392	11,400	471	11,900	1,184	3,043	0.31	0.01	0.03	21.00	0.07
All Deposits – Grand Total														
150	Measured	143	12,100	303	10,700	432	11,100	978	2,370	1.72	0.06	0.14	95.21	0.34
150	Indicated	308	11,100	253	9,800	411	10,200	899	2,290	3.42	0.13	0.28	171.97	0.71
150	Inferred	559	10,700	264	9,400	384	9,800	867	2,463	6.00	0.22	0.49	325.66	1.38
150	Grand Total	1010	11,000	266	9,700	399	10,100	893	2,397	11.14	0.40	0.90	592.84	2.42

¹There is greater coverage of assays for uranium than other elements owing to historic spectral assays. U₃O₈ has therefore been used to define the cutoff grades to maximise the confidence in the resource calculations.

²Total Rare Earth Oxide (TREO) refers to the rare earth elements in the lanthanide series plus yttrium.

Note: Figures quoted may not sum due to rounding.

Kvanefjeld Ore Reserves Estimate – April 2015

Class	Inventory (Mt)	TREO (ppm)	LREO (ppm)	HREO (ppm)	Y ₂ O ₃ (ppm)	U ₃ O ₈ (ppm)	Zn (ppm)
Proven	43	14,700	13,000	500	1,113	352	2,700
Probable	64	14,000	12,500	490	1,122	368	2,500
Total	108	14,300	12,700	495	1,118	362	2,600

ABOUT GREENLAND MINERALS LTD.

Greenland Minerals Ltd (ASX: GGG) is an exploration and development company focused on developing high-quality mineral projects in Greenland. The Company's flagship project is the Kvanefjeld Rare Earth Project (rare earth elements, uranium, zinc). A pre-feasibility study was finalised in 2012, and a comprehensive feasibility study was completed in 2015 and updated following pilot plant operations in 2016. The studies highlight the potential to develop Kvanefjeld as a long-life, low cost, and large-scale producer of rare earth elements; key enablers to the electrification of transport systems.

GML is working closely with major shareholder and strategic partner Shenghe Resources Holding Co Ltd to develop Kvanefjeld as a cornerstone of future rare earth supply. An exploitation (mining) license application for the initial development strategy has been undergoing review by the Greenland Government through the latter part of 2016 and through 2017.

In 2017-18, GML continues to undertake technical work programs with Shenghe Resources Holding Co Ltd that aim to improve the metallurgical performance, simplify the development strategy and infrastructure footprint in Greenland, enhance the cost-structure, and ensure that Kvanefjeld is aligned with downstream processing. In addition, the Company continues its focus on working closely with Greenland's regulatory bodies on the processing of the mining license application and maintaining regular stakeholder updates.

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Greenland Minerals Ltd will continue to advance the Kvanefjeld project in a manner that is in accord with both Greenlandic Government and local community expectations and looks forward to being part of continued stakeholder discussions on the social and economic benefits associated with the development of the Kvanefjeld Project.

Competent Person Statement – Mineral Resources Ore Reserves and Metallurgy

The information in this report that relates to Mineral Resources is based on information compiled by Mr Robin Simpson, a Competent Person who is a Member of the Australian Institute of Geoscientists. Mr Simpson is employed by SRK Consulting (UK) Ltd ("SRK") and was engaged by Greenland Minerals Ltd on the basis of SRK's normal professional daily rates. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence. Mr Simpson 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'. Robin Simpson consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

The information in the statement that relates to the Ore Reserves Estimate is based on work completed or accepted by Mr Damien Krebs of Greenland Minerals Ltd and Mr Scott McEwing of SRK Consulting (Australasia) Pty Ltd. The information in this report that relates to metallurgy is based on information compiled by Damien Krebs.

Damien Krebs is a Member of The Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the type of metallurgy and scale of project under consideration, and to the activity he is undertaking, to qualify as Competent Persons in terms of The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 edition). The Competent Persons consent to the inclusion of such information in this report in the form and context in which it appears.

Scott McEwing is a Fellow and Chartered Professional of The Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration, and to the activity he is undertaking, to qualify as Competent Persons in terms of The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 edition). The Competent Persons consent to the inclusion of such information in this report in the form and context in which it appears.

The mineral resource estimate for the Kvanefjeld Project was updated and released in a Company Announcement on February 12th, 2015. The ore reserve estimate was released in a Company Announcement on June 3rd, 2015. There have been no material changes to the resource estimate, or ore reserve since the release of these announcements

Appendix 1. Kvanefjeld Project, JORC 2012 Table 1.

The following section is provided to ensure compliance with the JORC (2012) requirements for the reporting of exploration results

Section 1: Sampling Techniques and Data

Criteria	JORC Code Explanation	Commentary
Sampling Techniques	<i>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 down hole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.</i>	The rock material used for the test work was stockpiled rock extracted from an exploratory adit that runs through the Kvanefjeld mineral resource for approximately 950m. Rock extracted from the adit is stored in series of stockpiles below the adit entrance. Three stockpiles were selected as being representative based on geochemical evaluation, and a 34 tonne bulk sample was collected. A 200 kg sub-sample from the bulk sample was used for this specific test work program.
Sampling Techniques Continued	<i>Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.</i>	The geochemistry and metallurgical behaviour of the bulk sample used is well understood. The bulk sample material has been used for both laboratory bench-scale test work and pilot plant work performed in 2012 and 2015 respectively. The metallurgical behaviour of the bulk sample is consistent with that sourced from drill cores.
	<i>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. '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 (e.g. submarine nodules) may warrant disclosure of detailed information.</i>	The samples were produced with small scale mining, from a horizontal adit. The horizontal adit was undertaken to produce mine like samples. These samples are logged with horizontal depth and have all been sampled for chemical assay. The location and geochemistry of the adit samples were correlated with the geochemistry from exploration drill cores to ensure representivity.
Drilling Techniques	<i>Drill type (e.g. core, reverse circulation, 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.).</i>	No drilling performed specific to this work.
Drill sample recovery	<i>Method of recording and assessing core and chip sample recoveries and results assessed.</i>	No drilling performed specific to this work.
	<i>Measures taken to maximise sample recovery and ensure representative nature of the samples.</i>	No drilling performed specific to this work.
	<i>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.</i>	No drilling performed specific to this work.

Logging	<i>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.</i>	No drilling performed specific to this work.
	<i>Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.</i>	No drilling performed specific to this work.
	<i>The total length and percentage of the relevant intersections logged.</i>	No drilling performed specific to this work.
Sub-sampling techniques and sample preparation	<i>If core, whether cut or sawn and whether quarter, half or all core taken.</i>	No drilling performed specific to this work.
	<i>If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.</i>	Dry crushed and rotary split suing a mechanical splitter.
	<i>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</i>	No drilling performed specific to this work.
	<i>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</i>	All samples were crushed to minus 3 mm before being split out with a rotary sampling device. No grab samples or large rock samples were taken.
	<i>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.</i>	Previous metallurgical test work has been performed on the ore samples to demonstrate their behaviour was representative.
	<i>Whether sample sizes are appropriate to the grain size of the material being sampled.</i>	The grain size of the target value mineral is 75 micometers on average. The ore provides was all crushed to minus 3 mm prior to sub-sampling using a mechanical splitter to produce the delivered sample.
Quality of assay data and laboratory tests	<i>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.</i>	The test work was performed at ALS and SGS Laboratories in Perth. Both are independent laboratories with in-house analytical facilities. The concentrates used were assayed with sodium peroxide fusion, three acid digest and ICP-MS. Metals in solution were assayed by ICP-OES or ICP -MS. Fluoride assays were by ion selective probe. Concentrate samples used in the testwork were generated from continuous pilot plant programs. The bulk concentrate had been homogenised and split into representative subsamples (rotary splitter) prior to storage in ~5 kg lots.
	<i>For geophysical tools, spectrometers, handheld XRF</i>	No site geophysical tools used.

	<p><i>instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.</i></p> <p><i>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.</i></p>	<p>ALS and SGS have their own internal quality control procedures to allow them to be a certified ISO laboratory for exploration as well as metallurgical assays. All metallurgical tests undergo elemental reconciliation to determine a calculated head assay which is required to agree to +/- 10% of the assayed head for the result to be accepted as satisfactory.</p>
Verification of Sampling and Assaying	<i>The verification of significant intersections by either independent or alternative company personnel.</i>	No drilling performed specific to this work.
	<i>The use of twinned holes.</i>	No drilling performed specific to this work.
	<i>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.</i>	No drilling performed specific to this work.
	<i>Discuss any adjustment to assay data.</i>	No drilling performed specific to this work.
Location of data points	<i>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.</i>	No drilling performed specific to this work.
	<i>Specification of the grid system used.</i>	No drilling performed specific to this work.
	<i>Quality and adequacy of topographic control.</i>	No drilling performed specific to this work.
Data spacing and distribution	<i>Data spacing for reporting of Exploration Results.</i>	No drilling performed specific to this work.
	<i>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.</i>	No drilling performed specific to this work.
	<i>Whether sample compositing has been applied.</i>	No drilling performed specific to this work.
Orientation of data in relation to geological structure	<i>Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.</i>	No drilling performed specific to this work.

	<i>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.</i>	No drilling performed specific to this work.
<i>Sample Security</i>	<i>The measures taken to ensure sample security.</i>	The chain of custody of the samples was managed by GMEL. Samples are stored in a registered facility operated by GMEL in Perth Western Australia.
<i>Audits or Reviews</i>	<i>The results of any audits or reviews of sampling techniques and data.</i>	No additional audits were completed other than the routine quality control tests with standards at the laboratory.