



Company Announcement, July 18<sup>th</sup>, 2017

## **Kvanefjeld Environmental Impact Assessment Update: Solid Progress in Closing out Environmental Studies**

- **Following reviews by international expert groups in 2016, substantial progress has been made in closing out environmental studies associated with the Kvanefjeld Project**
- **Recent meetings held in Copenhagen with representatives of Greenland’s Environmental Agency for Mineral Resource Activities (EAMRA), and Danish Centre for the Environment (DCE) to work through outstanding gaps**
- **Agreement reached on many areas of the Feasibility Design, including:**
  - ✓ **Location of the tailings management facilities**
  - ✓ **Water management plan**
  - ✓ **Dust modelling methodology, which shows very low impacts from the project**
  - ✓ **Very low additional radiation exposure for the general public and workers**
  - ✓ **No notable project impacts on flora and fauna**
- **Based on recommendations from EIA reviews, work programs underway to supplement datasets and confirm the project has no significant impacts on the environment**
- **Additional work is focussed on the following areas:**
  - **Supplementary waste rock stockpile stability studies**
  - **Waste-rock stockpile design and recovery of run-off waters**
  - **Additional base line data for air quality, and radiation impacts, water flow**
- **Expert Consultancy ‘Shared Resources’ providing additional guidance to assist in benchmarking the EIA to international standards as reports are updated and finalised**

## **Kvanefjeld Project, Permitting and Approvals**

### **Background**

Through 2017, GMEL has been updating the Environmental Impact Assessment (EIA) for the Kvanefjeld Project ('Project'), following detailed reviews conducted by the Government of Greenland (GoG), and its advisory groups in 2016. Independent consultants and regulatory bodies from Canada have also been involved in the review process. This detailed review phase (also referred to as the guidance phase) is the first step in the processing of a mining license application. Based on recommendations, the impact assessments are then updated prior to public consultation.

No major environmental risks have been identified for the project, and much of the feasibility design has been accepted as appropriate and suitable for Greenlandic conditions. In order to address feedback from advisory groups, GMEL personnel have conducted a number of meetings with GoG representatives through 2017.

In early June, representatives from Greenland's EAMRA, and the DCE met with GMEL representatives in Copenhagen to address outstanding issues. The additional work programs to expand some datasets are underway, and are expected to be concluded over the next couple of months. The results will then be incorporated into the updated studies.

As the GMEL advances through the permitting process, active work programs are also underway with strategic partner Shenghe Resources Holding Co. Ltd that aim to improve the Project cost structure and ensure that the Project is effectively aligned with downstream rare earth processing.

**The Kvanefjeld Project is well-positioned to become an integral cornerstone of new global rare earth supply networks.**

Dr John Mair, GMEL Managing Director commented:

*"Through 2017 we've made a lot of progress toward closing out all environmental studies associated with Kvanefjeld. Reviews by expert consultants on behalf of the Greenland Government provided recommendations and guidance to constructively assist in presenting very robust studies. Importantly, no major issues have been identified, but our aim is to deliver high-quality assessments to support stakeholder confidence. With input from the EAMRA and DCE we planned some additional work programs, which have been implemented and are progressing well."*

### **Current Environmental Work Programs**

#### **Umineralised (Waste) Rock Dumps**

Over the initial mine-life of 37 years, the strip ratio (non-ore material to ore) for Kvanefjeld is approximately 1:1, which is considered highly favourable. During this phase of operation,

approximately 100 million tonnes of unmineralised (waste) rock will be mined and deposited on contoured dumps (see Figure 1 for location details). No issues have been identified as the majority of unmineralised rock is comprised of common igneous rock, such as basalt. However, owing to the significant volumes, GMEL has been requested to conduct further geochemical studies and investigations into the dumps.

Sample material to support these studies has been collected from drill cores stored in Greenland, and exported to laboratories for further geochemical work. SRK Consulting has been engaged to increase the design detail of the stockpiles, and to incorporate into the design the ability to capture run-off water for use in processing facilities. This will decrease the amount of water sourced from the Narsaq River thereby decreasing the environmental impact; a strategy that aligns with GMEL's agenda of continuously looking for opportunities to improve the efficiency of the Project and reduce the environmental footprint.



**Figure 1.** Overview of the Narsaq Peninsula, southern Greenland, and the Kvanefjeld Project area. Unmineralised (waste) rock is to be deposited in contoured mounds (dumps), located to the northwest of the mine area. The waste rock dumps will not be visible from the town of Narsaq, and will consist of common rock types that are widely present throughout the Project area.

All of the barren rock types which will be mined with the ore (lujvrite) are common country rocks which are already exposed at surface throughout the Project area and surrounding environment. These rocks which include basalt, anorthosite, syenite, are made up of a range of common silicate minerals with stable chemistry. There will be **no** waste rock mined with the ability to generate acid mine drainage. There is insignificant clay in the area so stability of the waste rock stockpile will be favourable.

Initial chemical stability studies on waste rock samples have shown no significant releases of fluoride, radionuclides or alkaline water, or any other elements of environmental consideration. The additional chemical stability work will add to the existing data and provide strong confidence to all stakeholders that the waste rock stockpile will be physically and chemically stable.

### **Radiation Exposure for the General Public and Workers**

As the Project will be producing uranium as one of a series of by-products, the radiation exposure for the workers and general public is a focus for local stakeholders. Extensive work conducted to date as part of the EIA has shown that very low additional radiation exposure is caused by the Project.

However, reviews by expert consultants have recommended areas where additional data could be generated to provide further rigour and confidence to understanding the impacts of radiation associated with the Project.

GMEL has engaged the independent consultant Arcadis to address a range of additional queries regarding radiation exposure for the Project. These additional issues include a study on radon gas emissions (before and during operations) and radionuclides in dust. Work conducted to date indicates that the Project will have little impact on the natural (baseline) radon gas emission levels. Additional water samples from Narsaq town and surrounding area will also be taken to broaden the radiation baseline.

### **Hydrological Modelling**

GMEL has prepared an extensive and rigorous model which examines the site hydrology during 37 years of operations, closure and post-closure for a total time period of close to 100 years. A state of the art modelling software package called 'IDEAS' (sold by Andritz Automation) was used. This allows for the creation of a dynamic model which simulates seasonal rainfall and snowmelt. IDEAS is a highly regarded software package that has been adopted by a range of multinational companies operating in the mining, pulp and paper, and tar sands industry, due to its ability to perform dynamic simulations. Dynamic simulations allow large periods of time to be modelled with changing inputs such as precipitation and snow melt. Weather extremes including a one in ten thousand year rainfall

event were studied. The results of the modelling show that the tailings can be closed safely with a wet cover.

The results of hydrologic modelling were also combined with hydrodynamic fjord modelling performed by the world leading Danish Hydraulic Institute (DHI), which again shows that the impact on the environment is not significant. Due to the comprehensive nature of the model the input parameters are still being verified by the Government of Greenland and their advisors. GMEL is also validating hydrological baseline assumptions by engaging Orbicon (Independent Danish Environmental Consultant) to perform a small field survey in the Greenland summer. This will provide further information to support the baseline site water conditions.

### **Dust Modelling**

The impact of dust generated by the Project is expected to be well below EU regulations. The Greenlandic authorities and their advisors have accepted the methodology and general inputs to the dust (air quality) modelling performed by Pacific Environment (Specialist Environmental Consultant). A number of minor queries were, however, provided on the air quality modelling which have now been addressed by GMEL and its consultants. GMEL expects the results of the dust modelling outcomes to be largely unchanged after responding to the minor queries.

### **'Shared Resources' Assisting in Aligning Studies with International Standards**

Shared Resources, a consultancy that specialises in the management of social and environmental impacts, is providing additional guidance to GMEL to ensure that the material for public consultation meets the highest possible standards. Shared Resources also has significant experience with project financing, particularly in developing world countries. This experience will inform updates to the EIA, as well as the Social Impact Assessment (SIA), and support the Company's efforts to meet the international standards required of mining project proponents by financiers.

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## ABOUT GREENLAND MINERALS AND ENERGY LTD.

Greenland Minerals and Energy Ltd (ASX: GGG) is an exploration and development company focused on developing high-quality mineral projects in Greenland. The Company's core asset is the 100%-owned Kvanefjeld Project (rare earth elements, uranium, zinc). A pre-feasibility study was finalised in 2012, and a comprehensive feasibility study was completed in May, 2015, and updated in April, 2016. The studies demonstrate the potential for a large-scale, long-life, cost-competitive, multi-element mining operation. An exploitation (mining) license application for the initial development strategy is currently being processed by the Government of Greenland and their advisory groups.

In 2017, GMEL is focussed on working closely with Greenland's regulatory bodies on the processing of the mining license application, and maintaining regular stakeholder updates. The Company is undertaking technical work programs with Shenghe Resources Holding Co. Ltd that aim to further enhance the Kvanefjeld Project, and ensure it is aligned with downstream processing to produce high-purity rare earth products for the growing international market.

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Greenland Minerals and Energy 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.

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### **Competent Person Statement – Mineral Resources and Ore Reserves**

*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 and Energy 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 and Energy Ltd and Mr Scott McEwing of SRK Consulting (Australasia) Pty Ltd.*

*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 12<sup>th</sup>, 2015. The ore reserve estimate was released in a Company Announcement on June 3<sup>rd</sup>, 2015. There have been no material changes to the resource estimate, or ore reserve since the release of these announcements.