

**ANNUAL REPORT 2019 ON NORDIC MINING’S MINERAL DEPOSITS;  
EXPLORATION RESULTS, MINERAL RESOURCES AND MINERAL RESERVES**

**Introduction**

Nordic Mining ASA reports on the Group’s mineral projects on an annual basis. The Nordic Mining Group's ("Nordic Mining" or "the Group") operations currently comprise the following main companies with its respective mineral projects:

1. Nordic Rutile AS (100%): Engebø rutile and garnet deposit in Naustdal municipality in Norway
2. Nordic Quartz AS (100%): Kvinnherad quartz deposit in Kvinnherad municipality in Norway

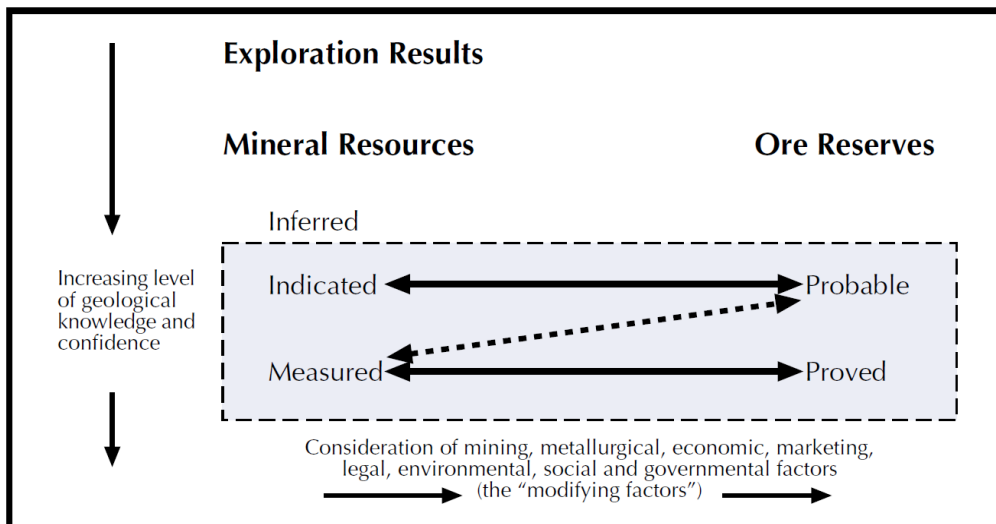
This report (the "Report") sets out the details of the Group's exploration results/prospects, mineral resources and, where applicable, ore reserves in connection with the mineral projects. The Report is updated as per 10 September 2019.

In addition, Nordic Mining has a shareholding of approximately 18.5% in Keliber Oy ("Keliber") in Finland. The investment in Keliber is now classified as a Financial Asset Measured at Fair Value Through Profit and Loss under IFRS 9 ("FVTPL Method"). Keliber has several spodumene pegmatite deposits (lithium) in the Ostrobothnia region in Finland. For information of Keliber’s mineral resources and ore reserves, please see Keliber’s webpage: [www.keliber.fi](http://www.keliber.fi).

Nordic Mining reports in accordance with the JORC Code 2012. For more information about the JORC Code, please see [http://www.jorc.org/docs/jorc\\_code2012.pdf](http://www.jorc.org/docs/jorc_code2012.pdf).

The JORC Code reporting standard differentiates between three different *Mineral Resource* classes: Measured, Indicated and Inferred, depending on the level of geological knowledge and confidence. A mineral deposit may also be classified into Proven and Probable *Ore Reserve* categories based on considerations of so called "modifying factors" such as mining, market, economy and environment. Classification of Ore Reserves is only defined by studies at prefeasibility and feasibility level that includes application of "modifying factors". Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The figure below gives an overview of the JORC Code classification system and the relation between exploration results, Mineral Resources and Ore Reserves.



Please note that estimates described in section 2.5 of this Report are not in accordance with the JORC Code or estimations recognised by the JORC Code.

## 1. Nordic Rutile AS - Engebø rutile and garnet deposit

### 1.1 General

In 2006, Nordic Mining acquired 100% of ConocoPhillips Investments Norge AS' interest in the Engebø deposit in Naustdal municipality in Sogn og Fjordane County in Norway. The Engebø deposit is internationally recognized as a significant rutile and garnet deposit.

Two minerals, rutile (TiO<sub>2</sub>) and garnet, will be produced from Engebø. Rutile is a titanium feedstock, primarily used in the production of titanium pigment, titanium metal and welding rods. The Engebø garnet, which is almandine, is used commercially in the abrasives and waterjet cutting industries.

The deposit is situated in a sparsely populated part of western Norway next to an existing deep water, ice free port. The port is situated in a fjord adjacent to the North Sea, providing efficient and environmentally friendly shipping to Europe, North America and other regions. The mild coastal climate enables uninterrupted mining and processing operations throughout the year.

The regulatory setting for the Engebø project is driven by two key legislative requirements, namely the discharge permit and the zoning plan (planning permit). Both permits have been fully granted by Norwegian authorities, without further possibility for appeal.

Nordic Mining's wholly owned subsidiary Nordic Rutile AS holds the following Extraction Permits for the Engebø deposit:

Identification number	Name of area	Duration (extensions can be granted)
Extraction Permit no. FU-1/1997 VB	Engebøfjellet 1	23 October 2027
Extraction Permit no. FU-2/1997 VB	Engebøfjellet 2	23 October 2027
Extraction Permit no. FU-3/1997 VB	Engebøfjellet 3	23 October 2027
Extraction Permit no. FU-4/1997 VB	Engebøfjellet 4	23 October 2027
Extraction Permit no. FU-5/1997 VB	Engebøfjellet 5	23 October 2027
Extraction Permit no. FU-6/1997 VB	Engebøfjellet 6	23 October 2027
Extraction Permit no. FU-7/1997 VB	Engebøfjellet 7	23 October 2027
Extraction Permit no. FU-8/1997 VB	Engebøfjellet 8	23 October 2027
Extraction Permit no. FU-9/1997 VB	Engebøfjellet 9	23 October 2027

A prefeasibility study for the Engebø project was published in October 2017. The business case developed for the project is based on two product revenue streams from a 1.5 Mtpa mining and processing operation, with open pit mining in the first years. Development of the underground mine will enable underground production to take over from the open pit. In the prefeasibility study, the Life of Mine in accordance with the JORC Code runs for 29 years; 16 years in the open pit followed by 13 years underground.

The definitive feasibility study for the project is ongoing. At the date of this Report, the mining optimization work has been completed and a potential to significantly increase the mineable ore volume has been identified. Strategic scheduling and stockpiling of ore resources will be applied to optimize the mining operation. The updated operating plan reduces the amount of waste rock and extends the open pit period by minimum 5 years compared to the prefeasibility study.

Reports/sources of information referred in this Report are available at Nordic Mining's webpage [www.nordicmining.com](http://www.nordicmining.com).

### 1.2 Engebø geology

The Engebø deposit is one of the world's highest-grade rutile deposits and is unique due to its substantial content of garnet. With negligible contents of radioactive elements and heavy metals, the deposit is a clean source of high-grade and high-quality titanium and garnet minerals. Unlike most rutile deposits, the Engebø rutile is contained in a hard-rock ore, a massive body of eclogite.

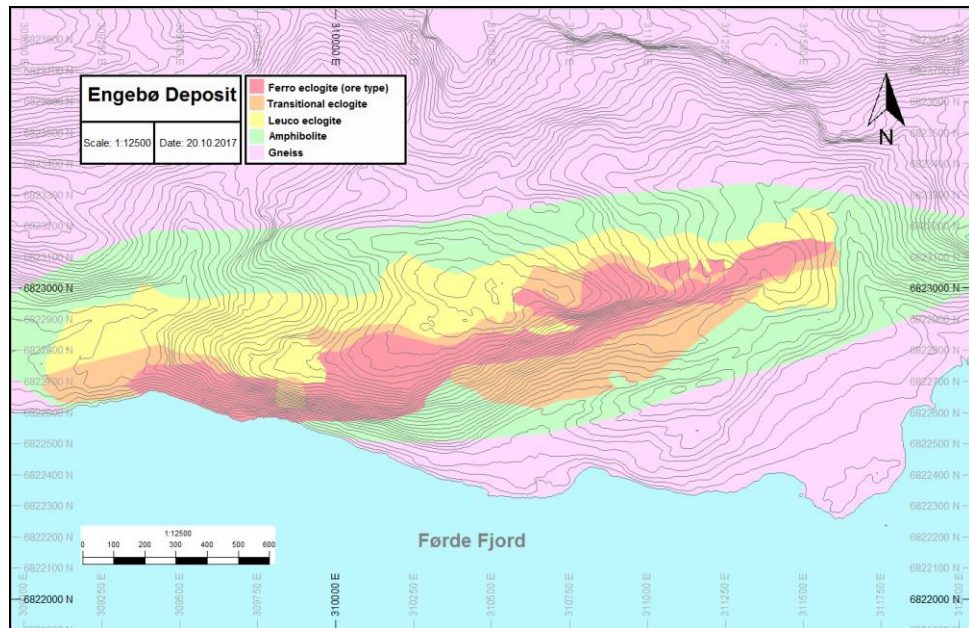
The deposit forms a 2.5 km long east-west trending lens that runs parallel with the Førde Fjord and the ridge, Engebøfjellet (Norwegian for Engebø Mountain). The deposit dips steeply towards the north

with a dip of 60° to 85° degrees. Structural studies reveal many episodes of complex major folding and development of foliation.

Geological investigations have determined that the eclogite can be subdivided into three different types, based on appearance and titanium content:

- Ferro-eclogite; dark and massive appearance, generally >3% TiO<sub>2</sub>
- Transitional-eclogite; intermediate dark, generally 2 to 3% TiO<sub>2</sub>
- Leuco-eclogite; light coloured and foliated, generally <2% TiO<sub>2</sub>.

The contacts between the eclogite types are gradational, moving from ferro- to transitional- and leuco-eclogite. The figure below shows the relationship between the different eclogite types.



The main titanium bearing mineral is rutile. Only around 5% of the titanium is found as ilmenite, and the presence of titanite/sphene is negligible. The mineral assemblage gives the rock a characteristic green and red colour.

In general, the eclogite contains around 45% almandine type garnet. The garnet content decreases gradually with the TiO<sub>2</sub> grade. Other major minerals present in the ore are pyroxene and amphibole.

### 1.3 Engebø drilling

DuPont/Conoco carried out an extensive drilling campaign between 1995 and 1997. In total, more than 15,000m were drilled in 49 drill holes. The drill cores from the DuPont/Conoco drilling program are stored at the Geological Survey of Norway's storage center at Løkken.

In 2016, Nordic Mining initiated a new drilling campaign. The drilling included recovery of 6,348m of drill cores, collection of 77 surface samples and outcrop mapping. The cores were logged and sampled at Nordic Mining's core storage facility in Naustdal. 1,517 whole rock chemical analyzes (XRF) and 336 rutile specific analyzes (ME-ICP41) were carried out by ALS Minerals in Sweden. QEMSCAN was carried out by SGS Canada on 68 samples to investigate mineralogical, textural and petro-graphical variations within the deposit. Garnet was successfully quantified by correlating QEMSCAN data with iron content from chemical assays.

As part of the drilling program, historical datasets were re-assessed and old drill cores were re-logged and re-analyzed. The results show a good correlation between new and historical data and thereby fully validate the historical datasets.

The principal reasons for the 2016 drilling included:

- To provide a better coverage of sample data in the prospective open pit area, and thereby achieve at least an Indicated Resource category for the majority of the ore in this area
- To provide a bank of recent data which would help verify the 1997 drill hole data
- To provide samples for metallurgical testing in the potential open pit area
- To provide geotechnical samples and data to assist with selection of mine and slope design parameters
- To provide extensive additional data for assessment of garnet and different mineralisation qualities.

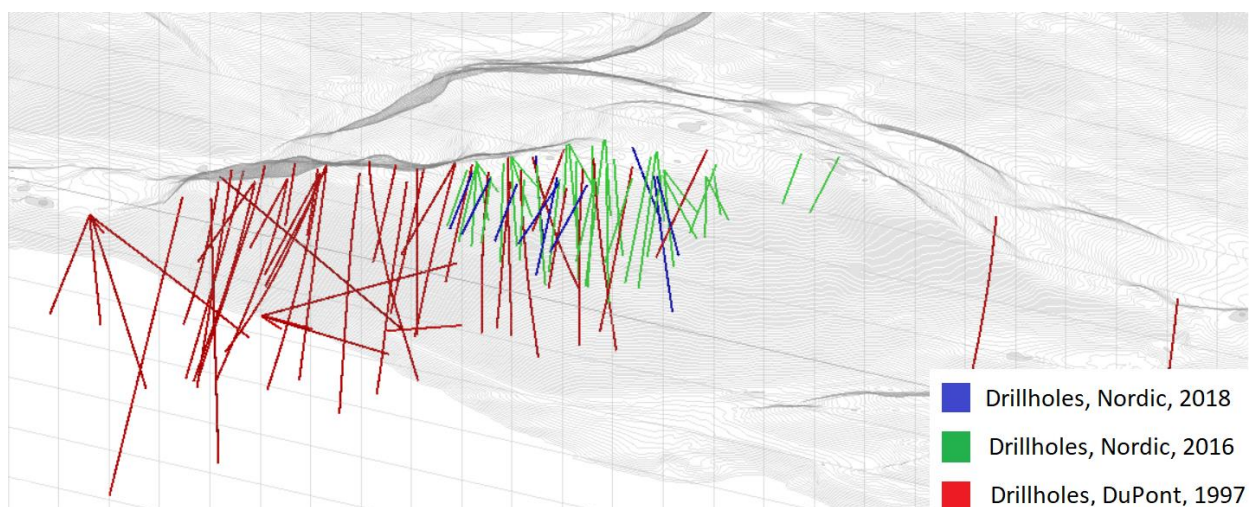
In January/February 2018, Nordic Mining carried out a limited drilling program at Engebø. In total, 1,581m was drilled in 10 drill holes. The aim of the drilling was to increase the knowledge of the ore body and the geotechnical conditions in the open pit. The international mining consultancy company SRK was contracted for geotechnical, hydrogeological and structural logging and modelling based on drill hole data. SRK has presented recommendations on slope angles and stability conditions for the open pit and underground infrastructure. The resource and pit stability assessments will form a basis for the final open pit design and mine schedule, assessing ore and waste rock tonnages from the open pit mining operation, as an integrated part of the definitive feasibility study. The definitive feasibility study is scheduled for completion in the fourth quarter of 2019.

The table below provides a summary of all diamond drilling carried out at Engebø both by DuPont/Conoco and Nordic Mining.

**Summary of Drilling Campaigns**

Drilling Campaign	Drillholes	Length (m)	Average Length/hole (m)
1997 DuPont/Conoco	49	15,198	310
2016 Nordic Mining	38	6,348	167
2018 Nordic Mining	10	1,581	158

The figure below illustrates the historic drilling by DuPont (shown in red), and the 2016 (shown in green) and 2018 drilling (shown in blue) by Nordic Mining. The historic drilling was concentrated in the western part of the deposit while the 2016 and 2018 drilling was centered in the planned open pit area located in the central part of the deposit.



## 1.4 Mineral resource estimates

In 2008, Nordic Mining assigned the independent Qualified Person, Adam Wheeler, to make an updated resource estimation for the Engebø deposit in accordance with the guidelines of the JORC Code. The first resource estimates were published in a scoping study.

The mineral resource estimates were updated in 2016 and June 2018 by Mr. Wheeler following completion of respective diamond drilling programs. The estimates have improved and increased substantially over the years and in 2016 and 2018 also enabled a qualified quantification of the garnet.

The 2016 resource estimates are published in a separate geological report for the deposit and in the prefeasibility study where also ore reserve estimates have been provided. Both reports are available on Nordic Mining's webpage [www.nordicmining.com](http://www.nordicmining.com). The 2018 resource estimates were published in a stock exchange notice and is also available on the company's webpage.

The tables below show the most recent (2018) resource estimates for 3% and 2% TiO<sub>2</sub> cut-off, respectively.

**2018 Mineral Resource Estimate (3% TiO<sub>2</sub> Cut-off)**

TiO <sub>2</sub> Cut-off	Classification	Tonnes (Mt)	Total TiO <sub>2</sub> (%)	Garnet (%)
3%	Measured	22	3.95	44.9
	Indicated	75	3.85	44.2
	<b>Total – Measured and Indicated</b>	<b>98</b>	<b>3.87</b>	<b>44.4</b>
	Inferred	132	3.82	42.5

**2018 Mineral Resource Estimate (2% TiO<sub>2</sub> Cut-off)**

TiO <sub>2</sub> Cut-off	Classification	Tonnes (Mt)	Total TiO <sub>2</sub> (%)	Garnet (%)
2%	Measured	30	3.61	43.5
	Indicated	102	3.49	42.8
	<b>Total – Measured and Indicated</b>	<b>132</b>	<b>3.51</b>	<b>42.9</b>
	Inferred	256	3.15	40.1

The mineral resource estimates were completed by Competent Person Adam Wheeler, corresponding to the guidelines of the JORC Code (2012 edition). The 2%/3% cut-off grades mean that only ore with TiO<sub>2</sub> content of 2%/3% or more is included in the resource estimates. The resource below sea level has been restricted by a boundary no closer than 50m to the edge of the fjord. The above mineral resources are inclusive of ore reserves.

A third-party independent review of the mineral resource estimate was carried out by SRK Consulting (UK) Limited (SRK) in December 2016. SRK concluded that the mineral resource estimate did not contain any fatal flaws and that the geological model produced was fit for prefeasibility level purpose. The 2018 estimates are based on the 2016 modelling and estimations.

The Engebø resource remains open to the East, West and at depth. The substantial resource in the Inferred category represents an upside to the resource base.

## 1.5 Ore reserve estimates

The ore reserve estimates were published in the Engebø prefeasibility study in October 2017. The basis for the ore reserve estimates were the 2016 mineral resource estimates. The ore reserve estimates were defined with a 3% cut-off. Revised ore reserve estimates based on the 2018 mineral resource estimates will be published in the definitive feasibility study which is scheduled for completion in the fourth quarter of 2019.

The ore reserve for the prefeasibility study mine plan was estimated and qualified by Mr. Wheeler. The Ore Reserve Statement is presented in the table below. The reserve estimation was carried out using Datamine and DESWIK software.

**2017 Ore Reserve Statement**

Ore Type	Proven Reserves			Probable Reserves		
	M Tonnes	TiO <sub>2</sub> %	Garnet %	M Tonnes	TiO <sub>2</sub> %	Garnet %
Ferro Ore - Open Pit	8.519	3.87	43.8	13.826	3.54	41.8
Ferro Ore - Underground	1.675	3.49	37.8	17.876	3.21	37.8
Ferro Ore - Total	10.194	3.81	43.4	31.702	3.35	39.5

The basis of conversion of mineral resources to ore reserves is as follows:

- Ore reserve estimate is as of 30 September 2017
- Only measured and indicated resources are used to determine reserves; all inferred resources within the mineable envelope have been classified as waste
- Open pit mining is carried out for the first 16 years; thereafter the mining method is bulk underground mining (long hole open stoping)
- The open pit mine design is based on the recommendations of the geotechnical consultants for all pit design parameters
- The underground mine design is based on recommendations of the geotechnical consultants, assuming 100m long stopes, 45m wide and 60m high, with continuous pillars 20m wide between stopes and sills 15m thick above and below the stopes
- The garnet grades as reported above are not used to determine the final product volumes for garnet. Instead, a yield approach considered more applicable for determining recoveries of a bulk mineral such as garnet is applied. The yield approach assumed a yield of 17.5% garnet for ferro ore
- A rutile recovery of 58.5% is assumed
- A cut-off of 3% on TiO<sub>2</sub> is applied to ferro ore
- Ore losses of 5% is assumed throughout the mine plan
- Dilution of 4% for open pit and 6% for underground is applied with a dilution grade of 0% for rutile and garnet

## 1.6 Exploration results in 2019

No resource mapping or drilling has been carried out so far in 2019.

## 2. Nordic Quartz AS - Kvinnherad quartz deposit

### 2.1 General

Nordic Mining's exclusive rights for investigation and development of the Kvinnherad quartz deposit expired in April 2019. Nordic Mining continues a constructive dialogue with the landowners and is proceeding commercial dialogues to establish a broader basis for progressing the project.

The information below summarizes previous exploration work and assessments.

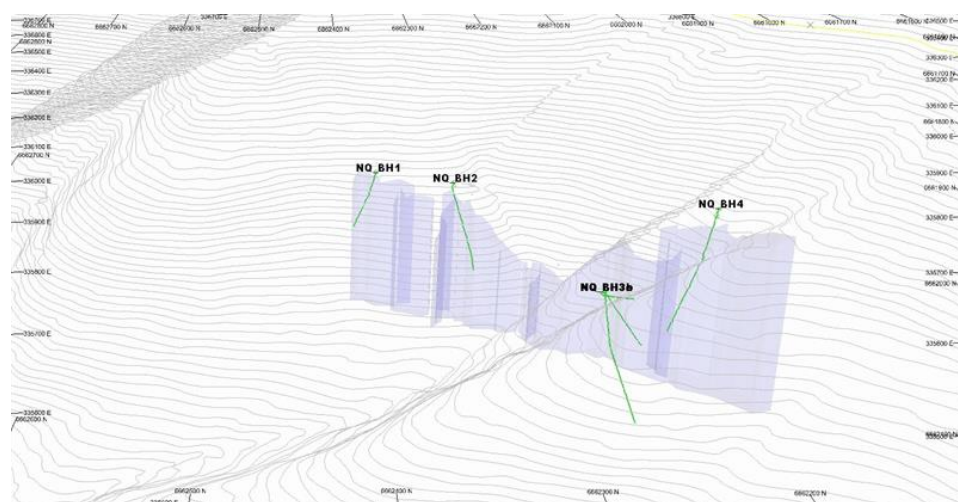
The Kvinnherad quartz deposit is an approximately 600m long hydrothermal quartz vein and on average 15-20m wide. Process testing has demonstrated that high purity quartz products (HPQ) can be made from surface samples as well as drill core samples.

### 2.2 Exploration

The Kvinnherad deposit consists of hydrothermal quartz situated in Proterozoic basement rocks south of the Hardanger Fault Zone. The quartz vein is exposed on the surface and detailed mapping was carried out in 2011.

A magnetic survey was carried out by Geovista AB in 2012 to get a better confidence for the size and geometry of the vein. The geophysical data indicated a continuation of the vein to at least 150 meters depth. A further extension of the vein down to 300 meters depth was indicated in the data.

In 2015 a drilling program was carried out. 6 drill holes were drilled across the deposit as shown in the figure below. All holes were logged, sampled and analyzed by ICP-MS to investigate impurity content of the quartz vein. Massive quartz was found in all drill holes and confirmed the vertical extension of the quartz vein.



### 2.3 Mineral resource estimates

An independent assessment of the Kvinnherad hydrothermal quartz deposit estimated the total contained quartz in the deposit. The Competent Person responsible for the assessments and resource statement is Lars-Åke Claesson, a titled European Geologist in accordance with the Federation of European Geologists.

A resource estimation report was compiled by B.Sc. Johan Camitz, designated by the Fennoscandian Review Board ("FRB"). Mr. Camitz has carried out the technical estimations and modeling of the quartz deposit in collaboration with Mr. Claesson. The report follows the FRB-standard based on "The International Template for public reporting of exploration results, mineral resources and mineral reserves, July 2006", issued by The Committee for Mineral Reserves International Reporting

Standards (“CRISCO”). The Australasian JORC Code recognizes resource estimations according to the CRISCO template.

Three zones of quartz have been specified with increasing amount of quartz; transition zone, semi-massive zone and massive quartz zone. The tables below show the overall estimated resource tonnage and quartz contained in the deposit.

Resource estimates		
Resource class	Quartz vein tonnage	Quartz content
Indicated	2 947 644	65%
Inferred	1 340 615	66%

The estimations are based on the results from the core drilling in fall 2015 and information from previous exploration work. A model of the quartz deposit has been developed according to international standards and practice.

#### **2.4 Mineral analysis and processing tests**

Analysis show the quartz from the Kvinnherad deposit is of very high purity. Advanced processing tests show that the impurity level can be reduced by physical and chemical processing to a level of the best products in the market, comparable with the Iota 4 and Iota 6 high-purity quartz (“HPQ”) products.

HPQ is quartz which is extremely pure, with low level of contaminating elements such as alkalis, iron and heavy metals ( $\text{SiO}_2 > 99.99\%$ ). HPQ is used in various high-tech applications. There is a growing demand for HPQ in industry applications such as semiconductors, telecommunication, optics, electronics and solar silicon. The HPQ world market is currently limited in volume, but with high value.

Nordic Mining has carried out comprehensive analysis and an advanced processing test program at Dorfner Anzaplan’s laboratory in Germany. A suitable processing route for the quartz has been developed. To confirm that high quality products could be obtained from a larger part of the deposit four samples of 250 to 1,000 kg have been blasted from different locations across the vein. Homogeneity of the quartz has been confirmed by processing of all samples to high quality products both in terms of impurity levels and glass quality.

#### **2.5 Exploration results in 2019**

No resource mapping or drilling has been carried out so far in 2019.