THE FEN RARE EARTH ELEMENT DEPOSIT, ULEFOSS, SOUTH NORWAY

Executive summary regarding deposit significance

Compiled and prepared by 21st NORTH, Svendborg 6th of June 2014 in commission for REE Minerals, Norway

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The Significance of the Fen Rare Earth Element Deposit
Executive Summary

There are a number of important parameters which demonstrate that the Fen rare earth element (REE) deposit is significant and will support a long, economically viable mine life and a stable REE supply to the end-user market:

- **Excellent infrastructure:** the Fen deposit is hosted by the Fen carbonatite complex located in the Nome municipality of southern Norway, 3km east of the town of Ulefoss. The deposit area is intersected by the national highway E36 providing very easy access to all parts of the complex as well as being part of a superior infrastructural and logistical set-up with close connections to local industrial sites, port facilities, airports and regional railways. These factors will significantly reduce mining costs.
- **Significant volumes:** based on current drilling, the Fen deposit hosts a volume of more than 900,000 tons of rare earth oxides (REO). Although further drilling is required, there is already very strong evidence to suggest that the Fen deposit may host as much as 2 million tons of REO within the present exploitation license. Hence, the Fen carbonatite is among the largest in the world and the largest in-situ source of REEs in Europe.
- **Homogenous nature:** the Fen deposit comprises an exceptionally large and homogenous body of REE with low stripping ratio readily accessible for bulk mining. This will lower the amount of tightly spaced drilling in the resource definition stage, which is typical of vein type deposits, and will reduce exploration/mining costs.
- **Favourable distribution of critical REEs important to the competitiveness of Europe's economy and climate change targets:** the Fen deposit exhibits a favourable distribution of critical rare earth oxides (CREO) comparable to other world class carbonatite deposits. CREOs are used in applications such as battery alloys and permanent magnets that are considered the most dominant growth drivers in future clean-energy economy.
- **Favourable REE mineralisation leading to cost-effective and low-risk processing:** due to the coarse texture of the REE-mineralogy the ore is likely to be amenable to conventional extractive processes such optical sorting and gravity methodology. Metallurgical test work by REE Minerals has demonstrated that it is possible to liberate and concentrate the rare earth minerals significantly prior to flotation and acid leaching. In addition, preliminary froth flotation tests show that the ore responds very well to flotation with high recoveries. The current results indicate that it is possible to upgrade the ore significantly and separate a substantial volume of waste rock into tailings <u>prior</u> to the more expensive stages of the processing route, which will reduce metallurgical and processing costs.
- **Similar to other world class deposits which are being developed or mined:** from a geological and mineralogical point of view, the Fen deposit is similar to a number of world class REE deposits, which are currently exploited in Australia, China and the USA. These

deposits account for 95% of all REEs utilized today and have a favourable ore composition with a well-established and proven processing route. The Fen deposit will be able to benefit from this knowledge as the development of the specific processing route will require significantly lower challenges and metallurgical costs than more exotic mineral compositions found in REE deposits elsewhere.

Diamond drilling within REE Minerals´ Fen exploitation license, March 2014.

The significance of the Fen Carbonatite Complex
Technical summary

This report summarizes the current exploration status of the Fen REE deposit, Ulefoss, Norway and evaluates a set of important parameters, which are all critical in regards to the deposits significance and in turn the economics of a mine. Subjects considered important include: *Geological setting and genesis, mineralogy and REE distribution, resources and potential resources, metallurgy, infrastructure and logistics.*

Mineral deposit data throughout this summary are given in terms of rare-earth oxide (REO) equivalents including the following industrial definitions:

- LREO = La, Ce, Pr Nd and Sm (RE_2O_3).
- HREO = Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu and Y (RE_2O_3 – Yttrium included although not being a "true rare earth element".
- CREO = Nd, Eu, Tb, Dy and Y (RE_2O_3).

Geological setting and genesis

- The Fen Carbonatite Complex is genetically similar to world class deposits such as Mt. Pass, Bayan Obo and other advanced REE carbonatite deposits.
- On a global scale mineral deposits associated with carbonatites or weathered carbonatites by far account for the greatest production of REE´s whereas the more complex mineral composition of HREE-enriched alkaline granite deposits poses significantly greater metallurgical challenges inducing serious costs on the projects.

Mineralogy and REE distribution

- Favourable mineralogy comprising synchesite-parisite-bastnaesite (referred to as bastnaesite group) and low-thorium monazite. These minerals accounts for 95% of all REE´s utilized today and have a well proven and documented processing route as opposed to more exotic REE bearing minerals typical of alkaline granite REE deposits.
- The relative distribution of CREO´s (Nd, Dy, Eu, Tb and Y oxide) in the Fen complex is comparable to other world class carbonatite deposits that are either active mines or at feasibility stage, whereas the in-situ content of CREO´s is among the highest in the world due to the large REE resource within the Fen carbonatite complex.

- Total relative CREO (Re_2O_3) distribution = 19,70%.

- Nd_2O_3 = 17,72%, Dy_2O_3 = 0,30%, Eu_2O_3 = 0,49%, Tb_2O_3 = 0,08% and Y_2O_3 = 1,11%

Resources and potential resources

- The Fen deposit comprises an exceptional large and homogeneous body of carbonatite with low stripping ratio readily accessible for bulk mining
- Based on current drilling within REE Minerals exploitation license an inferred resource of 84Mt with an average grade of 1.08% TREO (0.8% TREO cut-off) has been outlined in April 2014. The deposit is still open-ended in all directions and tentative estimates indicate that a resource of c. 200Mt within REE Minerals' current exploitation area is to be considered likely
- High-grade intersections up to 4,49% TREO over 11,60 meters encountered during drilling campaign in February-March 2014
- The total contained REO content of the present resource includes >900,000 tons including 180,000 tons of critical REO content (Pr, Nd, Tb, Dy, Eu and Y) with considerable up-side tonnage potential. This makes the Fen carbonatite complex the largest in-situ source of REE´s in Europe and one of the largest carbonatite resources in the world.

Metallurgy

- Preliminary metallurgical test work completed in 2013 has outlined a processing route using low-cost optical sorting and gravity methodology in order to produce a pre-concentrate of >4% TREO using a mass pull of 20-25% with a recovery of 65% of the ore feed
- The ore responds very well to flotation with high recoveries (80% using a mass pull of 24%) and upgrades of 4-6 times the ore feed indicating that the REE concentrate subjected to roasting and acid leaching would grade c. 20% TREO
- Additional metallurgical test work in 2014 will focus on improving the preliminary results

Infrastructure and logistics

- Infrastructure is second to none with a regional highway cross-cutting the deposit area and near-by industrial site for final leaching and upgrading of ore. Only one hour of transportation to nearest port facilities and airport by highway
- Gentle topography comprising agricultural farmlands and open forest
- Mining friendly and supportive local community. Stable political climate

Project description

1. The Fen Carbonatite Complex

The Fen REE deposit is hosted by the Fen Carbonatite Complex, one of the first recognized carbonatites in the world, and the type locality for a large number of rock types and alteration types, which are used to characterize carbonatites throughout the world.

The Fen carbonatite complex is a roughly circular body being more than three kilometres in diameter. Contrary to many other carbonatites where the resource is defined by narrow mineralized veins, the Fen complex consists of massive continuous carbonatite with extensive areas of relatively homogeneous REE mineralisation with little to no waste rock. Gravimetric studies have indicated that the complex may be as deep as 10 kilometres. The Fen carbonatite was previously mined for iron (1657-1927) and niobium (1953-1965). The REE potential was recognized early on by the Norwegian Geological Survey and historic work includes regional airborne radiometric surveys, diamond drilling and metallurgical test work on selected parts of the property from the 1960´s to the 1980´s.

REE Minerals initiated exploration work in the eastern part of the Fen complex in 2011. The company has completed systematic ground radiometric and –magnetic surveys, MMI profile sampling, surface rock sampling and microprobe work during 2011 and 2012, which justified diamond drill campaigns in 2012 and 2014 on the property. Metallurgical test work was initiated in 2012 and is still ongoing. In 2014 REE Minerals was awarded an exploitation permit covering three areas by the Mineral Directory of Norway.

On a global scale deposits associated with carbonatites or weathered carbonatites by far account for the greatest production of REE´s compared to other deposit types. Important current mining operations include the Bayan Obo deposit in Inner Mongolia (China), the Sulphide Queen carbonatite of the Mountain Pass district, (California) and the Central Lanthanide and Duncan deposits of Mount Weld (Australia). Several other significant carbonatite deposits occur throughout the world but apart from the Fen Carbonatite Complex no significant carbonate hosted REE deposit exists in Europe. For that reason alone the Fen deposit is considered to be of great strategic importance to the technical industry in Europe.

2. Location and infrastructure

The Fen REE deposit is located in the Nome municipality of southern Norway, three kilometers east of the town of Ulefoss. The deposit is intersected by the national highway E36, which connects with the larger cities Skien (25 km) and Larvik (70 km) to the southeast providing very easy access to all parts of the complex with only one hour of transportation time by highway to the port facilities of Larvik. The capital Oslo is located to the northeast of Fen (130 km). The nearest railhead is located at Skien, which connects with Larvik and Oslo on the south coast of Norway along highway E18. The closest airport is located at Sandefjord 75 km southeast of Fen.

The topography within the exploitation license area is mostly flat consisting of farmland and forest, which provides excessive space for construction of production plants, settling tanks and administration/accommodation buildings. A large freshwater resource occurs at the edge of the carbonatite at the "Norsjø" lake. Furthermore, one of Norway's largest industrial sites is located within 20 minutes of the deposit area at Porsgrunn providing an ideal and environmentally sound location for the final stages of metallurgy and processing of the ore.

The carbonatite is for most parts exposed at surface within the entire complex (low stripping ratio), although part of REE Minerals exploitation license is covered by marine clays locally up to tens of meters thick (the Fensmyra area).

All the above criteria are extremely important in the production stage and will reduce infrastructural costs significantly in terms of road construction, port facilities and clearing/stripping the property.

3. Mineralogy and REE distribution

Rare-earth mineral deposits are often characterized as being either LREE-rich or HREE-rich resources. Such designations are somewhat simplistic when delving into the potential value and utility of specific projects. It is the distribution or varying proportions of the individual fifteen REEs in any given deposit, which determines the overall potential value of individual REE projects.

There is a wide range of parameters that can be used to evaluate the potential of any given rare-earth mineral resource. Two of the more commonly used metrics are:

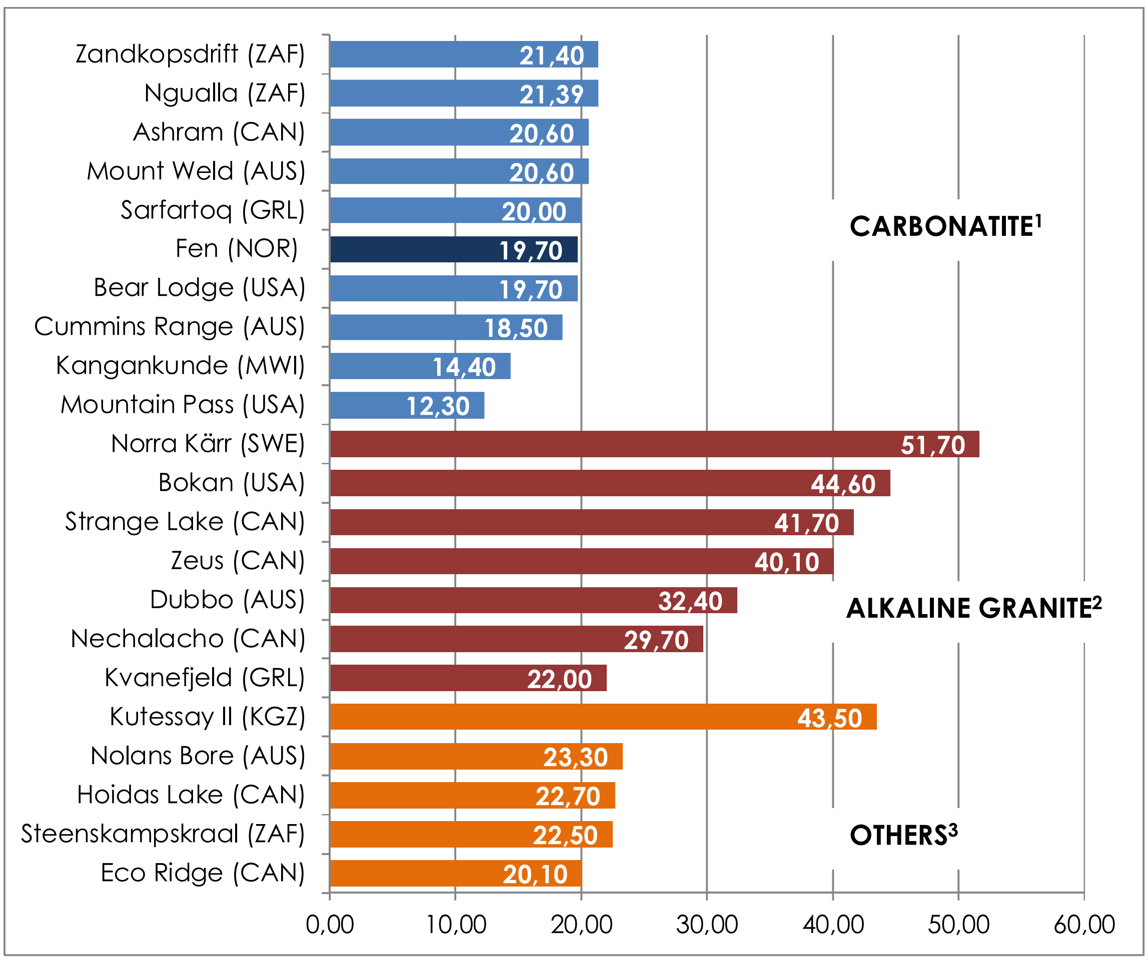
- The **in-situ quantity** of specific REOs of the overall mineral resource.
- The **relative physical distribution** of specific REOs as a fraction of TREOs (frequently used to show the distribution of CREOs or HREOs as a fraction of TREOs present)

An important caveat to comparing projects using these metrics is that they do NOT take into account a wide range of other critical parameters such as costs of production, total size of mineral resource, processing recovery rates and other project-related parameters such as required infrastructure, logistics, environmental impact, waste disposal and so on. Ultimately, the successful commercialization of any project despite in-situ grade, composition and tonnage relies on addressing a simple, universal question that is not unique to the rare-earths sector - namely, will the project make money?

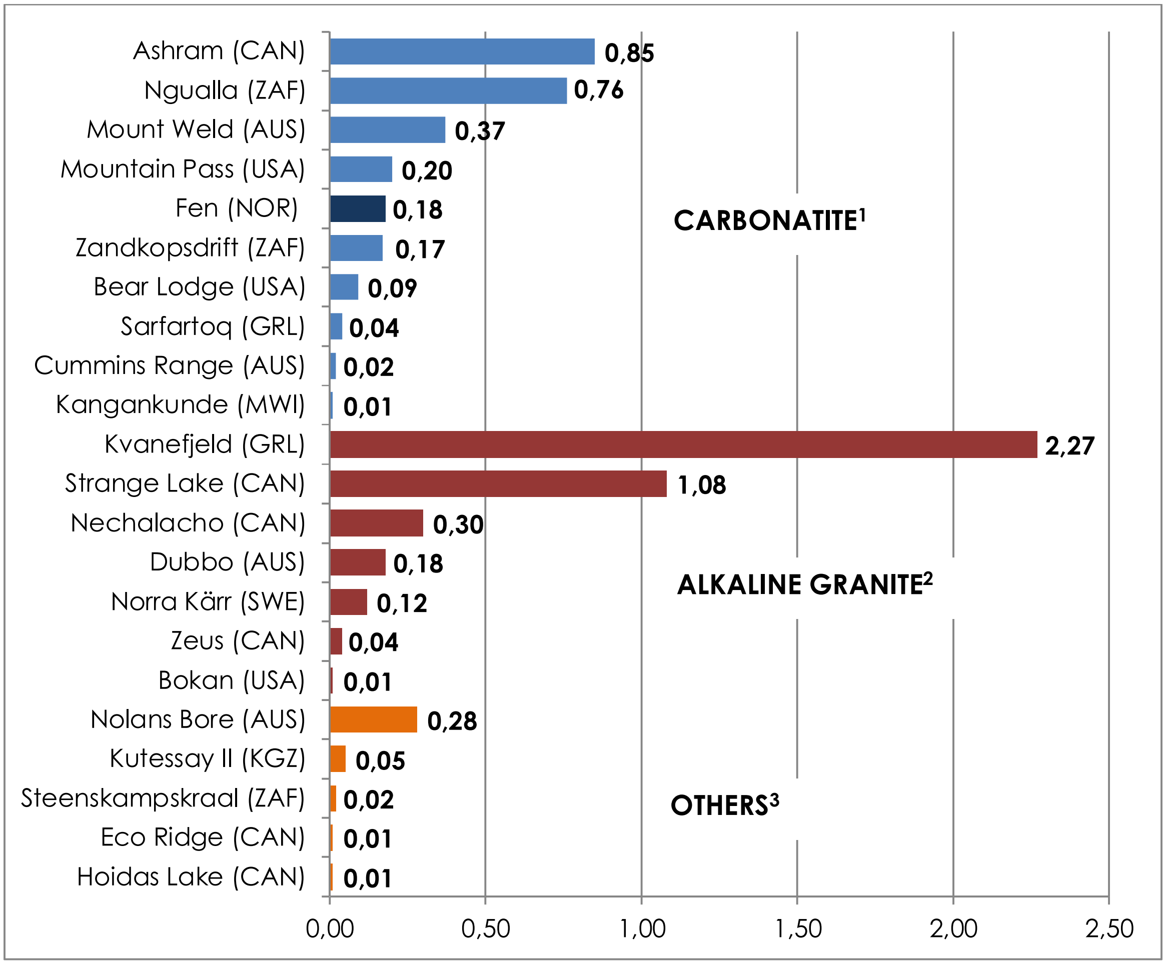
The REE´s of the Fen Carbonatite Complex are almost entirely hosted by synchesite-parisite of the bastnaesite group and low-thorium monazite. Bastnaesite and monazite are by far the two most historically important minerals with regards to REE production. <u>To date, 95% of all utilized REE´s come from these two minerals alone</u>. This is a very important fact and the majority of current mines such as Bayan Obo, Mt. Pass, Mt. Weld and Steenskampskraal all exploit these minerals, which have proven to be the most easily liberated and processed source of REE´s. Although complicated, the metallurgical processing route for the bastnaesite group and monazite is well established and poses significantly lesser challenges than more exotic minerals (typical of alkaline

HREE-enriched granite deposits) as the latter generally require very complex and expensive processing routes inducing serious costs on the projects.

Carbonatites are characterized by being highly enriched in the LREE´s compared to HREE´s. This is a feature of all carbonatites although the relative distribution of the different elements varies. The Fen Carbonatite Complex exhibits a favourable distribution of REE´s with relative concentrations of Nd, Tb, Dy, Eu and Y comparable to other world class carbonatite deposits (some of which are currently being mined). These elements are generally referred to as critical rare earth oxides (CREO) and are used in applications such as battery alloys and magnets that are considered the most dominant growth drivers in the future clean-tech economy. The more common elements such as cerium and lanthanum are influenced by the fact that global production generally exceeds demand and are therefore less valuable and sought after.



Relative physical distribution of CREO´s (percentage of Nd, Tb, Dy, Eu and Y as Re_2O_3 oxides vs TREO) within the world´s most advanced REE projects outside of China. [1]Carbonatite (blue) – LREE enriched carbonatite or supergene carbonatite associated deposit. [2]Alkaline granite (red) – HREE enriched granite or associated intrusive deposits. [3]Others (orange) – vein type or sedimentary deposit of various type.



Total contained CREO´s (Nd, Tb, Dy, Eu and Y in million tonnes) within the world´s most advanced REE projects outside of China. Notice that the numbers may be subject to change depending on cut-off grades and/or updated resource estimates, which will most likely be the case at Fen as a result of additional drilling. [1]Carbonatite (blue) – LREE enriched carbonatite or supergene carbonatite associated deposit. [2]Alkaline granite (red) – HREE enriched granite or associated intrusive deposits. [3]Others (orange) – vein type or sedimentary REE deposit of various type.

4. Metallurgy

In 2012-2013 REE Minerals conducted a preliminary metallurgical study on representative drill core sections from the Fen complex. Finding the most cost-effective processing route is by far the single handed most important and critical parameter of any rare earth deposit and it has with regards to the development of the Fen deposit been essential to develop a flow sheet that could upgrade the ore significantly prior to flotation and acid leaching. Deposits which require flotation and leaching of the majority or entire raw ore feed will inarguably be very expensive to operate despite having a higher ore grade than the Fen carbonatite.

With an average in-situ ore grade of >1% TREO it has been critical to REE Minerals to upgrade the ore effectively and at low costs prior to any flotation or acid leaching. Metallurgical test work completed in 2013 has demonstrated that it is possible to liberate and concentrate rare earth-bearing mineral phases from the major gangue minerals in the Fen carbonatite complex. Due to the texture of the REE-mineralogy the ore has proven amenable to conventional extractive processes including optical sorting and gravity methodology using a relatively coarse grind size. Preliminary test work has produced a low-cost and economically feasible pre-concentrate of >4% average TREO with a recovery of 65% TREO and a mass pull of 20-25%. Additional test work in 2014 will aim at increasing these results by having additional processing runs and cleaning stages.

In addition, a series of froth flotation tests showed that the ore responds very well to flotation with recoveries up to 80% using a mass pull of 24% causing upgrade of the ore feed by 4-6 times. The sums of results suggests that a REE concentrate subjected to roasting and leaching would grade c. 20% TREO using a very low mass pull. Additional metallurgical test work in 2014 will focus on improving the preliminary flotation results.

5. Resources and potential resources

Although only drill tested by 15 diamond holes combined with surface channel sampling covering an area of roughly 750 x 300 m, the Fen carbonatite complex beyond doubt hosts a very large resource of REE´s. Carbonatite comprises more than 95% of the drill tested area and deeper holes has demonstrated that the mineralisation continues to minimum 300 meters depth, being open ended in all directions. The present exploration work strongly indicates that the deposit is extremely homogeneous and does not require expensive tightly spaced drilling, which is typical of vein type deposits. In addition, drill interceptions grading up to 4,49% TREO over 11,6 meters has demonstrated that higher grade bodies occur within the "background" mineralisation.

Based on the current drilling a preliminary inferred resource estimate of 84Mt with an average grade of 1.08% TREO (0.8% TREO cut-off) has been constructed. However large untested areas with carbonatite (only surface sampled) hosts additional resources occur outside of this shell. Hence, the present exploration area alone comprises c. 660.000 tons of carbonatite per vertical meter, which, given an average grade of 1% TREO totals a hypothetical in-situ volume of almost 2 mill tons of rare earth oxides calculated to a depth of 300 meters below surface.

An additional amount of infill drilling and delineation is required in order to increase and upgrade the resources to higher confidence categories in compliance with 43-101 or JORC standards, but the remarking homogeneous and consistent nature of the carbonatite and the associated REE mineralisation presents strong evidence for the Fen carbonatite complex to host a very large and significant source of REE´s comparable in size to some of the largest carbonatite complexes and REE deposits in the world.

Appendix A

List of technical reports and summaries

Wardell Armstrong Int., March 2013: Scoping test work on samples of REE mineralisation from the Fen carbonatite complex, South Norway.

21st NORTH, September 2013: Thorium in Tailings and Ore Concentrates.

21st NORTH, August 2013*:* Results and conclusions from metallurgical test work 2012-2013.

21st NORTH, August 2013*:* 3D-modelling of inferred REE-resource based on 2012 exploration drilling incl. proposed drilling program for further resource definition.

Wardell Armstrong Int., November 2012*:* Scoping test work on samples of REE mineralisation from the Fen carbonatite complex, South Norway.

21st NORTH, October 2012: Resultater og konklusjoner fra innledende revidert QEMSCAN analyse (Q1-Q5) (Norwegian)

Helford Geoscience LLP., September 2012*:* QEMSCAN mineralogy study – REE deposit.

21st NORTH, August 2012*:* Discrimination of REE-populations by the use of factor analysis.

21st NORTH, August 2012*:* Reviewing bore hole statistics and spatial dependence.

21st NORTH, August 2012: Bore hole statistics and testing for spatial dependence.

21st NORTH, June 2012*:* Exploration drilling, March 2012.

21st NORTH, June 2012*:* Calculation of fundamental sampling error (FSE) for specific Fen ore types and protocol for selection of sample material for QEMSCAN analysis.

21st NORTH, October 2011*:* Results from field work – phase 1+2 2011.

21st NORTH October 2011*:* Results and conclusions from preliminary microscope and microprobe studies.

21st NORTH, September 2011*:* Results of a mobile metal ion survey, 2011.

21st NORTH, May 2011*:* Summary of historic work and data.

21st NORTH, May 2011*:* Gamma spectral survey 2011.