Rapport

GeoDE Consult AS
Geologi- og miljørådgivning

Prosjekt:	**Nussir ASA**
Tema:	**Potential for mine water contamination after cessation of mining at Nussir**
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Sammendrag

Nussir ASA planlegger oppstart av gruvevirksomhet i Kvalsund kommune i Finnmark med sikte på å utvinne kobber fra malmforekomstene Nussir og Ulveryggen. For å forutsi vannkvalitet på framtidig avrenning etter endte gruvedrift er flere faktorer vurdert. En har sett på både geologi, mineralogi, geokjemi, hydrogeologi, klimaforhold og vannanalyser. I tillegg har en gjennomgått gruveplaner og deponeringsplaner for gråberg, og historikk fra tidligere gruvedrift i området. En har også sett på tilsvarende malmforekomster og gruver i andre deler av verden for å få et godt grunnlag for å gi en vurdering vedrørende forventet kvalitet på framtidig avrenning.

Malmsonen og sidebergarter i forekomstene inneholder mye dolomitt og kalkspat. Disse karbonatmineralene har en buffereffekt på pH i avrenningen og vil dermed hindre at det oppstår sur avrenning. Sulfidmineralene i malmsonen er dominert av kobbermineralene bornitt og kobberglans. Forskning viser at disse kobbermineralene oksiderer sakte. Tidligere testing av bufferegenskaper og potensiale for syredannelse (acid-base accounting) på en avgangsprøve ga resultat som viser at prøven er basisk og dermed ikke vil forårsake sur gruveavrenning. Utlekkingstester ga lite utløsning av kobber eller andre metaller. Tidligere prøvetaking av drenering fra både nedlagte gruver i Ulveryggen og elver og bekker i området, viste nøytral pH og noe kobber. Erfaringer fra tilsvarende kobberdistrikt i verden, som Kupferschiefer og Central African Copperbelt, tilsier at det sjelden forekommer sur avrenning. Basert på tilgjengelige data er det forventet at vann som drenerer etter endt gruvedrift vil ha nøytral pH, og inneholde lave konsentrasjoner av kobber. Nussir ASAs valgte gruvedriftsmetoder vil etter all sannsynlighet også begrense utslipp av kobber. Dette inkluderer blant annet underjordsdrift i en relativt tynn malmsone og tilbakefylling av gråberg i hulrom. Gruven vil dessuten bli fylt av grunnvann etter endt driftsperiode, noe som vil hindre oksydasjon av sulfider.

Abstract

Nussir ASA is planning the mining of copper deposits in the Nussir and Ulveryggen ore bodies in Kvalsund municipality, Finnmark. In order to classify and predict the type of mine water after cessation of mining at Nussir several factors have been considered. These factors include geology, mineralogy, geochemistry, hydrogeology, climate, historical information, baseline data, mining and mineral waste plans, and analogies from similar mine areas.

Abundant calcite and dolomite minerals are found in the ore zone and wall rocks. These carbonate minerals have a buffering effect and would prevent the generation of acid mine drainage. Sulfides in the deposits are dominated by the copper minerals bornite and chalcocite. These sulfides are documented to be resistance to oxidation. Acid-base accounting results conducted on a tailings sample indicate that mine waste will not generate acid rock drainage. Leach testing showed that very little copper was leached from the sample.

Investigations of other analogous sediment-hosted copper district such as Kupferschiefer and Central African Copperbelt show that acid mine drainage is rare. Baseline geochemical studies of drainage from the historical workings at Ulveryggen and creeks and rivers in the area show neutral pH and low concentrations of copper. It is therefore predicted that a neutral drainage with minor copper concentrations can be generated after cessation of mining. The geometry of the ore bodies, good mining practices, and good mineral waste management will limit the amount of copper sulfides that will remain after mining and be exposed to oxidation and leaching. Filling of the mine workings with groundwater after closure will most likely also mitigate the release of copper by reducing the potential for oxidation of copper sulfides.

1. Background

Nussir ASA is planning the mining of copper deposits in the Nussir and Ulveryggen ore bodies, in Kvalsund municipality, Finnmark. The mine will be underground workings, with both reuse and backfilling of rock overburden. Tailings will be deposited in the permitted submarine tailings impoundment.

After cessation of any mining activity there is a potential for the release of contaminated mine waters. This report evaluates the available data and plans from Nussir and predicts that general quality of mine water drainage. This report does not entail the submarine tailings impoundment.

An overview of the Nussir and Ulveryggen area is shown in Figure 1.

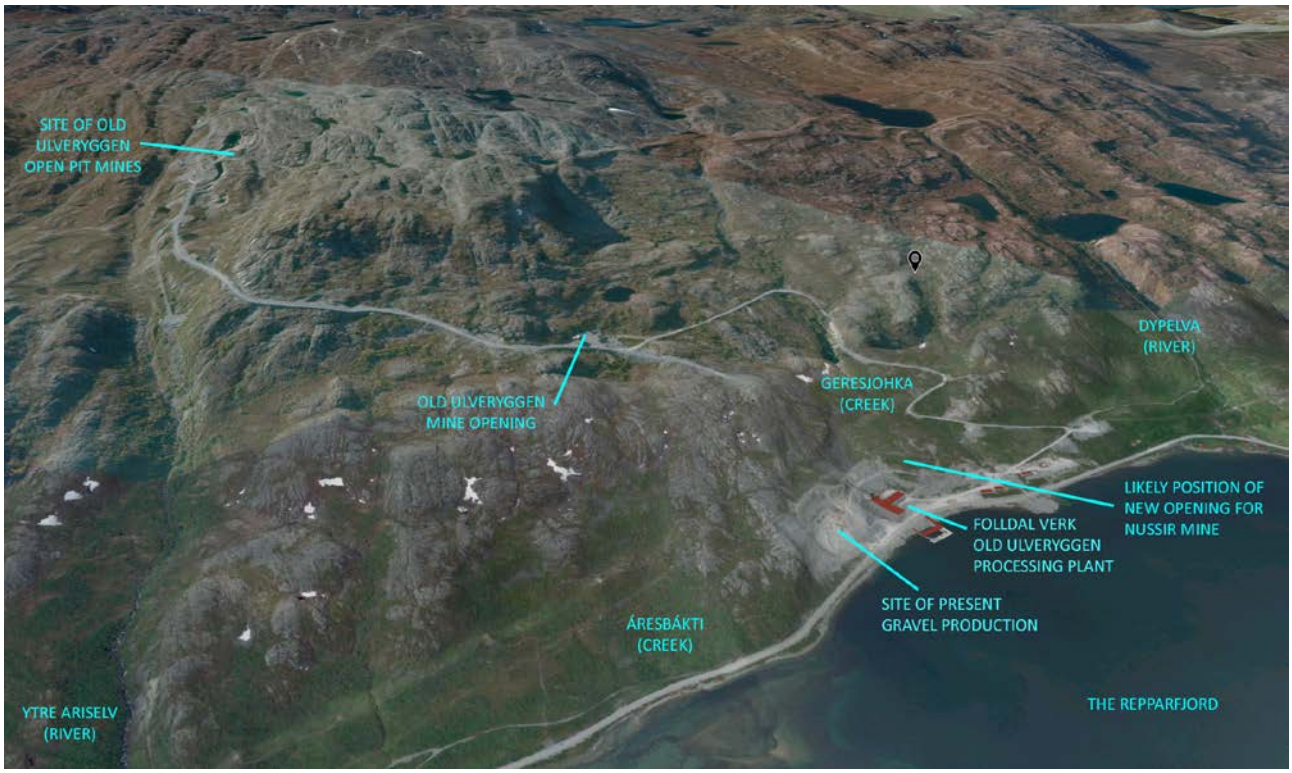

Figure 1: Overview of the Nussir and Ulveryggen mine area

2. Important factors resulting in mine water contamination

Waters draining from mine areas are generally divided into three groups:

1) Acid mine drainage (AMD) or acid rock drainage (ARD), and
2) Contaminated neutral drainage (CND)
3) Non-contaminated drainage

The type of drainage is mostly dependent on geology and mineralogy of the ore zone. Other significant factors include climate, hydrogeological conditions, and the mining techniques and mine rock disposal techniques.

Acid mine drainage is considered to be the most severe, and can result in significant impacts to the aquatic environments if not properly managed. It is caused by oxidation of sulfide-rich ores, and the generation of acidic waters that mobilize large amounts of metals. The presence of large amounts of pyrite and pyrrhotite mineralization is typical for mines with this drainage phenomenon. This type of drainage is common in Norway, especially among the numerous abandoned mines of the Caledonide copper-zinc massive sulfide deposits. This includes for example, the abandoned mines at Røros, Folldal, Løkken and Sultitjelma.

Because not all mines are known to generate AMD, the term ”contaminated neutral drainage” has been recently brought into use, in order to describe a neutral drainage that may contain variable amounts of metals. The character of this drainage is dependent on the type of ore deposit and amount and type of sulfides and carbonate rocks present in the ore or overburden rocks. This can include a variety of mines, from deposits with very small concentrations of sulfides with varying amounts of carbonates, to sulfide-rich mines with abundant carbonates present. The environmental consequences of this type of drainage have generally significantly less environmental consequences than acid mine drainage.

Mine waters with no significant contamination can be the result of ore types, or mineralogical effects. An example of this type of mine drainage could be iron oxide ores.

In order to classify and predict the type of mine water at Nussir several factors have been considered, include geology, mineralogy, geochemistry, hydrogeology, climate, historical information, baseline data, mine and mineral waste plans, and analogies from similar mine areas.

3. Description of wall rock geology

The geology of the area is composed of Precambrian metamorphosed volcanic and sedimentary rocks. Description of the geology and mineralogy is base on Nussir ASA documents by Blomquist and Martinsen.

In the Nussir ore zone, metamorphosed shale, sandstone and dolomite host mineralization in the deposit. Main minerals include dolomite, quartz, plagioclase, mica and K-feldspar in the western part of the deposit. Towards the east eastern part the main minerals are similar, except that calcite replaces dolomite.

The presence of dolomite ($CaMg[CO_3]_2$) and calcite ($CaCO_3$) are significant, as both minerals are very good pH buffers.

Above the Nussir ore zone in the ”hanging wall”, the geology is composed of metamorphosed volcanic rocks including tuffs and pyroclastic rocks, formed by volcanic ash and fragments from volcanic eruptions. Below the ore zone in the ”footwall” the geology is composed on metamorphosed conglomerates and sandstones.

In the Ulveryggen deposit the main minerals in the ore zone are quartz and plagioclase.

4. Description of ore mineralization

Copper mineralization at Nussir and Ulveryggen is dominated by bornite, chalcocite and chalcopyrite. The mineralization for the subareas at Nussir are shown in Table 1. Aside from copper sulfide mineralization other sulfide mineralization is rare. Local mineralization described includes pyrite (FeS_2), molybdenite (MoS_2) and cinnabar (HgS).

Table 1: Dominating copper ore minerals in the Nussir and Ulveryggen ore deposits.

		Nussir (east)	Nussir (west)	Ulveryggen
Bornite	Cu_5FeS_4	X	X	X
Chalcocite	Cu_2S	X	<<	X
Chalcopyrite	$CuFeS_2$	<<	X	X
Covellite	CuS	<<	<<	<<
Wittichenite	Cu_3BiS_3	<<	<<	<<
Digenite	Cu_9S	<<	<<	<<
Malachite	$Cu_3(CO_3)_2(OH)_2$	<<	<<	<<

X Major ore minerals
<< Accessory (minor) ore minerals

Different sulfide minerals are found to oxidize and generate acids at varying rates. Chopard et al., 2015, found, based on sulfur releases, that oxidation rates could be rated for the following sulfide minerals starting with the minerals with the highest oxidation potential:

> Gersdorffite > pyrrhotite > pyrite > fahlore > covellite > sphalerite-Fe > chalcopyrite > sphalerite > galena > stibnite > chalcocite > bornite

Because the dominating copper minerals at Nussir and Ulveryggen occurs as bornite, chalcocite and chalcopyrite, the mineralization is considered to be more resistant to oxidation, and have slower oxidation rates than ores dominated by pyrite and pyrrhotite.

Mineralized outcrops on the surface at Nussir and Ulveryggen have malachite ($Cu_3[CO_3]_2[OH]_2$) mineralization. Malachite is typically found as a secondary mineralization around copper deposits that contain carbonate rocks.

5. Geochemistry: modified acid-base accounting and leach testing

Modified acid-base accounting and leach testing have been conducted by SGS Mineral Services on a tailing sample designated as ”F12 Comb Tls” (Combined Nussir Tails (N-NE) from F12) (Appendix A). The main geochemical composition is presented in Table 2. The modified acid-base accounting (ABA) results are presented in Table 3. Leach tests are shown in Table 4 and 5.

The geochemical and ABA analyses show that the sample has a relatively high CaO / CaO_3 content of 16,5 and 18,5%, while the sulfur content is very low (S% = 0,011). The paste pH of the sample shows that the sample is basic.

The NP and AP data from Nussir give a net neutralizing potential (Net NP) of 311. A net neutralizing potential greater than 20 is generally considered to not be acid generating (Fey, 2003). The neutralization potential ratio (NPR) for the Nussir sample is 1004. A NPR less than 1 is considered acid generating. In British Columbia a NPR >4 is considered to be non-acid generating (Price and Errington, 1994). The Norwegian Environmental Authorities recognize a NPR >3 to be buffered, and therefore non-acid generating (NGI, 2015).

The results clearly show that the tailings sample will not generate acid. However, the tailings sample represents waste material from the ore zone, after a copper sulfide removal that will be deposited in the approved submarine tailings impoundment. Although the sample is not directly representative of the wall rocks and waste rocks that will remain in the mine area, it is considered a good reference to the remaining wall rocks that will be sulfide-poor and carbonate-rich.

Table 2: XRF analyses of main ions in sample ”F12 Comb Tls” (Kleiv, 2011)

Parameter	**Concentration (%)**
SiO_2	48,8
Al_2O_3	9,41
Fe_2O_3	2,41
MgO	2,27
CaO	16,5
Na_2O	1,62
K_2O	3,49
TiO_2	0,32
P_2O_5	0,09
MnO	0,41
Cr_2O_5	0,03
V_2O_5	0,01
LOI[1]	13,8
Sum	99,1

Table 3: Modified Acid Base Accounting data for sample ”F12 Comb Tls”

Parameter	**Unit**	**Result**
Paste pH	Units	9,38
NP (Neutralization potential)	t $CaCO_3$/1000t	311
AP (Acid potential)	t $CaCO_3$/1000t	0,31
Net NP(NNP / net neutralization potential)	t $CaCO_3$/1000t	311
NP/AP (NPR / Neutralization potential ratio)	ratio	1004
S	%	0,011
C	%	3,75
CO_3	%	18,5

Leach testing was conducted (Table 4 and 5) and showed very little release of heavy metals. Iversen and Aanes (2011) describe the release of copper by the leach tests as very limited. Christensen et al. (2011) suggest that nickel may also be released. However, the data shown in this report do not support this.

It should be noted that leaching was conducted on an unoxidized tailings sample, and results can only be used as a guideline for predicting drainage from future mine workings.

[1] Loss on ignition3,42

Table 4: Leach tests from sample ”F12 Comb Tls”: Compliance test for leaching of granular waste materials and sludges, and Synthetic Precipitation Leaching Procedure (Iversen and Aanes, 2011).

Constituent	Cumulative Amount Leached (mg/kg)	Synthetic Precipitation Leaching Procedure (mg/l)
Initial pH	5,77	4,19
Final pH	9,70	4,17
TDS	1057	
F	<0,7	
Cl	<5,3	
SO4	58,4	
Hg	<0,001	<0,0001
Ag	<0,0001	<0,00001
Al	2,50	0,0155
As	0,08	0,0003
Ba	3,42	0,0966
Be	<0,0002	<0,00002
B	0,36	0,0625
Bi	<0,0001	<0,00001
Ca	67,3	0,27
Cd	0,00004	0,000009
Co	0,0002	0,000022
Cr	<0,005	<0,0005
Cu	0,007	0,0006
Fe	<0,02	<0,002
K	64,2	0,104
Li	<1,0	<0,001
Mg	6,90	0,021
Mn	0,04	0,00063
Mo	0,01	0,00001
Na	18,0	0,97
Ni	0,004	0,0001
P	<0,09	<0,009
Pb	<0,0002	0,00008
Sb	0,005	<0,0002
Se	<0,01	<0,001
Si	24,0	0,17
Sn	0,0008	0,00006
Sr	0,73	0,0049
Th	<0,00004	<0,000004
Ti	0,005	0,0002
Tl	<0,10	<0,00002
U	0,007	0,000004
V	0,022	0,00007
W	<0,0004	<0,00003
Y	0,0001	0,000005
Zn	<0,01	0,044
Y	0,0003	0,00015

6. Historical workings and present operations at Ulveryggen

Water quality is affected by historical copper workings at Ulveryggen mine that was in operation by Folldal Verk between 1972 and 1978. The mining resulted in a series of open pits, rock waste piles, and drainage adit (Figure 2). Pit lakes have developed in the pits, and no iron oxide precipitation is observed that is common in areas with acid rock drainage.

Finnmark Gjenvinning AS has operated at the Ulveryggen site since 2005. They have handled drill cuttings from offshore operations, and filled these in one of the abandoned pits at Ulveryggen. This activity will be stopped in 2017. Data from the drainage of this operation has been reported to the environmental authorities in Finnmark County.

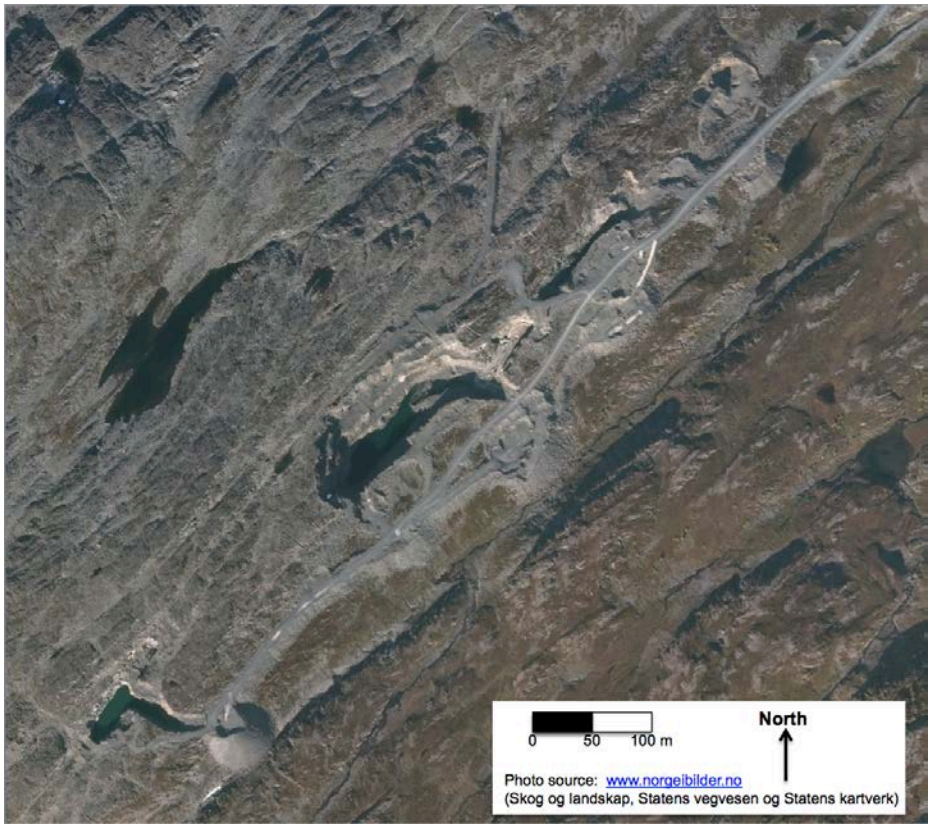

Figure 2: Areal photo of the abandoned Ulveryggen mine area. (www.norgeibilder.no)

7. Freshwater baseline studies

Baseline sampling was conducted in 2010 by NIVA for drainages near the Ulveryggen and Nussir areas (Aanes et al., 2011).

Drainage from the Ulveryggen area drains to Repparfjorden via the two streams, Ytre Ariselv river and a drainage adit that enters Aresbakti creek (Figure 1). Dypelvas river and Geresjohka creek are not affected by drainage from Ulveryggen, and the samples here represent natural background concentrations.

Results from selected analyses are shown in Table 6. These results show a neutral pH and high calcium content. Concentrations of copper and other heavy metals are low. Drainage at station 6 showed elevated copper concentrations (118 µg/l). This is the drainage from the open pits at Ulveryggen that passes through the underground tunnel before it enters the Aresbakti creek. The source of this copper is likely to be mainly due to historic mining, and partly due to natural background levels, and possibly due to the storage of drill cuttings operated by Finnmark Gjenvinning AS.

Future drainage from the Nussir mine would flow to small creeks or directly to Repparfjord via a constructed drainage system. No mine drainage would enter Repparfjordelva river or another river with a significant fish population.

Table 6: Drainage from the Ulveryggen area and selected baseline stations (Aanes et al., 2011)

Parameter	unit	Geresjoka Station 2 by fjord	Geresjoka Station 4 (upstream)	Aresbakti Station 6 by fjord	Ytre Ariselva Station 7 by fjord	Dypelva Station 1 by fjord	EU Priority substance[2] (AA EQS)[3]
pH		6,93	6,79	7,20	7,01	7,48	
Conductivity	mS/m	2,80	3,66	8,32	3,41	6,31	
Alkalinity	mmol/l	0,141	0,156	0,326	0,176	0,474	
SO_4	mg/l	1,49	0,68	8,06	2,07	1,30	
Ca	mg/l	1,71	1,62	6,91	2,46	7,30	
Mg	mg/l	0,57	0,8	1,15	0,64	1,00	
Al	µg/l	12,9	96,7	30,3	6,30	4,62	
Fe	µg/l	<10	43	53	<10	40	
Cu	**µg/l**	**2,15**	**3,41**	**118**	**3,14**	**0,46**	
Zn	µg/l	2,0	1,6	4,6	1,6	1,8	
Cd	µg/l	<0,005	<0,005	0,010	<0,005	<0,005	0,08
Pb	µg/l	0,007	0,020	0,029	<0,005	<0,005	1,2
Mn	µg/l	0,34	6,76	67,1	0,35	1,50	
Ni	µg/l	0,34	1,4	0,78	0,18	0,10	4
Co	µg/l	0,010	0,239	0,274	0,010	0,008	
Cr	µg/l	0,38	1,70	0,38	0,30	0,50	
As	µg/l	<0,05	<0,05	0,08	<0,05	<0,05	
Hg	ng/l	23,5			<1,0	2,0	47
TOC	mg/l	0,65	4,60	1,50	0,55	0,86	
Tot-N	mg/l	35	126	120	36	68	

The freshwater baseline study is somewhat limited (frequency and duration) to correctly classify the chemical quality of the water in the Nussir area, with respect to reference to the Norwegian water framework directive (Vannforskriften). However, the present data show “good” chemical quality in the drainages.

Copper concentrations in background samples exceed the MAC EQS[4] guideline value set by the Norwegian Environmental Agency (2,6 µg/l) in Geresjoka (station 4), Aresbakti (station 6) and Ariselva (station 7) (Miljødirektoratet, 2014). Copper concentrations in drainage from the Repparfjord area are expected to continue to exceed the MAC EQS value both before, during and after mining is completed due to natural occurrences of copper in the area. Considering the EU priority substances, the water quality is expected to show “good” chemical quality after the cessation of mining. The ecological classification has not been considered in this present study.

8. Description of climate

The nearest weather station to Nussir is at Hammerfest. Normal temperatures at this station range between -5,1ºC in the winter to 11,1 ºC in the summer months. Normal precipitation data is not reported at this station. However, 897 mm precipitation was recorded between March 2015 to February 2016 (Yr.no, 2016).

The climate is classified in the Köppen-Geiger system as: Cool continental climate/Subarctic climate (Dfc).

[2] EU Water Framework Directive, Annex II (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy)

[3] AA EQS: Annual average – envrionmental quality standard

[4] MAC EQS: Maximum admissible concentration – environmental quality standard

9. Hydrogeology

A hydrogeological study is in progress for the Nussir area. Based on Nussir´s geological report, it is considered that groundwater is structurally controlled, and water will flow through faults and fractures (Myrvang and Mortveit Sletten, Nussir ASA internal report).

Considering the climate and surface features, it is assumed that there is a shallow groundwater table in the Nussir area. The pit lakes in the abandoned workings at Ulveryggen support this assumption (Figure 1).

10. Description of planned mine workings

The following general description of mining is gathered from the EIA (Environmental Impact Assessment) and a Nussir ASA company document by Smedberg, Lappalainen, Eriksen, Myran and Mortveit Sletten.

Mineralization at Nussir is found along a zone 9 km long and with thicknesses of less than 1 meter to 7 meters. The total depth of the mineralization and future mine is not presently known.

Underground mining methods are planned and approved in the municipal zoning plan. This will include sublevel open stoping, and result in open spaces between 2 and 5 meters wide where the ore body is removed. There would also be a series of supporting sill and rib pillars. These pillars would remain after cessation of mining and would contain remnants of the ore zone.

Underground workings would also include drift tunnels, haulage roads in the footwall rocks. In addition, at least two portals to the mine are considered, including a portal near the existing dressing plant and a portal into Dypelv valley.

After cessation of mining much of the workings are expected to refill with groundwater and thus reduce the oxidation of remaining sulfide minerals. The extent of refilling with water will depend on the level of the mine portal and plugging of workings during mine closure.

11. Description of potential waste rocks

Milling and concentration of the ore will result in the generation of tailings. These tailings will be deposited in a permitted submarine tailings impoundment, and is not considered in this evaluation.

The following general description of generation of rock waste is gathered from the EIA (Environmental Impact Assessment) and a Nussir ASA company document by Smedberg, Lappalainen, Eriksen, Myran and Mortveit Sletten.

During mining at Nussir there will be a need to remove wall rock from tunnels and around the ore zone. For access to the ore body there will be a need to remove up to 400.000 tons rock. During regular mining, it is estimated that a maximum of 300.000 ton per year will be removed. It is estimated that mining at Ulveryggen will generate 70 000 m^3 extra rock when excavating access to the deposit.

Use of this rock for production of gravel and other products is very likely as the current producers of aggregate on the site has expressed an interest to buy the waste rock for external sale. Waste rock from Ulveryggen is presently being used for gravel production near the site of the formal Folldal Verk (Figure 1).

Despite potential uses, there will be a need for temporary outdoor storage of this rock, especially during the initial mining period. At Nussir rock will be placed in the Geresjohka area. At Ulveryggen rock will be placed in areas previously used for rock waste piles.

Given that the full amount of gravel cannot be sold; after the initial mining period of 3 to 4 years there will be potential for backfilling mine voids in areas where the practice is considered safe and where it doesn't hinder the access to potential future mining.

Waste rocks will be composed of metamorphosed volcanic and sedimentary rocks. The sulfide content is expected to be very low and carbonate content is expected to be high. Drainage from waste rock piles at Ulveryggen show that there is no acid rock drainage associated with these.

12. Analogies

The Nussir deposit is compared with other sediment-hosted copper deposits such as the Kupferschiefer in Poland and the Central African Copperbelt in Zambia and Congo.

The USGS has described environmental consequences of these sediment-hosted copper deposits such:

> *Potential for acid drainage and dissolved metals associated with these deposits is minimized by low pyrite and chalcopyrite contents and by widespread presence of carbonate minerals in ore and waste rock* (Lindsey et al., 2004).

Acid rock drainage in the Copperbelt in Zambia is considered rare because of the high content of carbonates, although some metals can have elevated concentrations in water (Lindahl, 2014). An environmental investigation of sulfide-rich mine tailings from the Chambishi mine located in the Copperbelt in Zambia has also concluded that there is little risk for the development of acid rock drainage (Sracek et al., 2010). This is because of the abundance of neutralizing minerals such as calcite.

13. Prediction of mine water contamination from Nussir

Based on the available information described above it is possible to predict the type of mine water that can be expected in the Nussir and Ulveryggen area.

The geology, mineralogy and available acid-base accounting showed that acid rock drainage should not occur. Because of the high amounts of carbonate (calcite and dolomite) in the surrounding geology and ore zone, the water drainage is expected to have a neutral pH. This prediction is further supported by analogies from other major sediment-hosted copper districts that show that acid rock drainage is rare because of the high carbonate contents in the rocks.

Geologic and mineralogical data indicate that metals, other than copper, are rare in the deposit. The copper mineralization is dominated by bornite and chalcocite which are known to be much more resistant than other common sulfides. Copper release can be expected, but concentrations in water will likely be very small relative to other abandoned copper mines in Norway, such as in Røros or Løkken.

Baseline studies by NIVA (Aanes et al., 2011) show that there are elevated copper concentrations in both drainages affected by historic mining at Ulveryggen (Aresbakti) as well as in nearby creeks not related to former mining in this area. Aanes et al (2011) point out that the total copper releases are low compared to other mining areas in Norway. Copper concentrations in the baseline study exceed MAC EQS.

Water drainage at Nussir and Ulveryggen is expected to have a neutral pH, yet there is a potential that water quality can be affected by the release of copper and minor amounts of other metals. With respect to the EU water directive, water is expect to have the classification “good” chemical quality, but copper is expected to continue to exceed MAC EQS.

Good mine planning at Nussir will likely mitigate the release of copper. The narrow geometry of the Nussir ore zone allows most of the copper mineralization to be removed during mining. The reuse of overburden and backfilling of rock waste in mine voids will also help to reduce copper release. With the present climatic and hydrogeological conditions in the area, the refilling of the mine with groundwater would be expected over a relatively short period of time. This refilling with groundwater will reduce the oxidation of the remaining copper sulfide minerals in the mine.

Malachite mineralization is observed on outcrops exposed to oxidation on the surface. Similar precipitation of malachite and other copper carbonate precipitation can be expected in the mine workings. This precipitation will entail copper, and hinder the release of copper to the environment.

14. Constraints of prediction

Geode Consult AS has predicted the potential for mine water prediction based on the available data and mine plans. Geode Consult has not visited the site nor collected samples for analyses.

15. References

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16. Appendices

Appendix A: SGS, Environmental Characterisation and Marine Toxicity Testing og Tailings, Kvalsund Deposit, Nussir ASA, SGS Reference No.: 12527-002