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**Technical report:** 

**Skiftesmyr - Mineral resource estimate** 

October 2013

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# 1 Summary

At the request of Metal Prospecting AS (MetPro), Norway, GeoVista AB has carried out a National Instrument 43-101 compliant resource estimation for MetPros Skiftesmyr copper-zinc (silver-gold) deposit in the municipality of Grong, central Norway.

The scope of work includes a review of the geology, mineralization model and exploration programs. Drillhole data compilation and quality assurance/quality control (QA/QC) protocols which form the foundation for the resource estimate were also reviewed in detail.

# 1.1 Property description

The Skiftesmyr deposit lies within an area of approximately 0.5 by 0.5 km in size, all within an exploration license held directly by MetPro.

The general strike direction of the deposits is approximately N65°E, and the dip is approximately 70° to the northwest.

### 1.2 Location

The Skiftesmyr exploration permit is situated in the Grong VMS District, Grong municipality, County of Nord-Trøndelag, central Norway (figure 4). The exploration permit is owned 100% by MetPro (table 4). The community of Grong, which is also the administrative centre of the municipality, is located 13.5 km west of Skiftesmyr.

### 1.3 Ownership

The Skiftesmyr deposit is fully located within MetPros exploration permit Skiftesmyr, with an accumulated area of 1000 hectares. The permit is fully owned by MetPro and valid until March 19, 2017. Exploration permits in Norway are normally valid seven years. They can be extended for a maximum of three additional years.

The holder of an exploration license has the right to apply for an exploitation license, provided he can show the Directorate of Mining that they have a viable project as well as an Environmental Permit.

### 1.4 Geology and Mineralization

The Scandinavian Caledonides occupies the majority of Norway. The orogeny is built up by a number of thrust sheets which were emplaced during a continent-continent collision.

The Grong District is located in the Caledonides in central Norway. The district covers approximately 3,000 km<sup>2</sup> and is bordered by the Grong-Olden window, comprised of Precambrian intrusives to the south, the Namsen River to the west, Sweden in the east and Lake Namsvatnet and Borgefjell National Park in the north. The Grong District is composed of thrust sheets from The Køli Nappe in the Upper Allochthon. The thrust sheets are divided into The Gjersvik Group and the Limingen Group. The Gjersvik and Limingen Group are comprised of metavolcanics, metasediments and Mid-Ordovician intrusives. The rocks are often strongly folded and deformed. Banded iron formations occur in places giving good marker horizons in large parts of the Grong District. Faulting is abundant in the area. Larger thrust faults strike roughly SW-NE while smaller faults occur in two principal strike directions, ~N-S and ~E-W.



The south western part of the Grong District where Skiftesmyr is located consists of rocks from both Gjersvik Group and the Limingen Group (Figure 7.3). The rocks from the Gjersvik Group in the area are comprised of granodioritic and gabbroic intrusions as well as greenstones and felsic/mafic tuffites. The Limingen Group occurs south of the Gjersvik Group and is composed of greenstones, greenschists, tuffites, calcareous tuffites/phyllites and minor granodioritic and gabbroic intrusions.

The Skiftesmyr mineralization lies in the southern part of the Gjersvik Group as a wedge of mafic and felsic volcanics/tuffs surrounded by granodioritic intrusions. The majority of the area is covered by thin overburden or bogs. The volcanic rocks have gone through Upper Greenschist to Lower Amphibolite facies metamorphism. They show varying degrees of shearing and foliation intensity due to four deformation events.

Skiftesmyr has been interpreted as being a stratabound volcanic massive sulphide (VMS) deposit, and consists of folded layers of massive sulphides, dominated by pyrite with alternating amounts of chalcopyrite, sphalerite and minor amounts of pyrrhotite. Trace amounts of gold and silver occur, as well as in larger concentrations in areas.

# 1.5 Exploration and Data Compilation

Despite the historically advanced stage of exploration of the Skiftesmyr deposit, MetPro has carried out additional exploration work. This includes helicopter bourne geophysical surveys, trenching over the outcropping mineralization, geological mapping and sampling.

MetPro has compiled an extensive database of available historical exploration information and data and incorporated it into their current exploration programs.

### **1.6 Mineral Resource Estimate**

The mineral resource model has been prepared to a high industry standard. The mineralization was modelled in three dimensions and statistical analysis was carried out. The resource has been categorised following the definitions and guidelines of the CIM codes.

### **1.7** Exploration potential

The general exploration potential in the Skiftesmyr area is considered to be good, in particular to further increase the tonnage by stepping out from the identified mineralization.

A further potential lies in the evaluation of the other deposits in the area.

#### **1.8 Conclusions and Recommendations**

The project as is shows a reasonably sized mineral resource of copper and zinc, with potential for additional credits for siver and gold. It is recommended that MetPro re-assay those historical pulps so as to be able to evaluate these additional credits. It is also recommended that MetPro investigates possible extensions of the mineralization on strike and at depth.



# 2 Introduction

At the request of Metal Prospecting AS, GeoVista AB has carried out a National Instrument 43-101 compliant resource estimation for MetPro's Skiftesmyr copper-zinc-(silver-gold) deposit in the municipality of Grong, Norway.

## 2.1 Terms of reference

The authors' scope of work involved a detailed technical review of the resource estimate for compliance with National Instrument 43-101 and the CIM standards and definitions, and includes a review of the geology, mineralization model and exploration programs, including data compilation, quality assurance/quality control (QA/QC) protocols, which form the basis for the resource estimate.

## 2.2 Purpose of the report

The purpose of this report is to present an independent and compliant estimate of the mineral resources for the Skiftesmyr copper-zinc-(silver-gold) deposit and to advance the feasibility of the project. The report also includes a review of the reliability and quality of sampling data upon which the estimate is based, as well as recommendations for further development of the project.

The authors' report serves as an independent report prepared by a Qualified Person as defined in the Canadian National Instrument 43-101 and the companion policy 43-101CP.

The definitions of the measured, indicated and inferred resources, as used by the author, conform to the definitions and guidelines of the CIM (Canadian Institute for Mining, Metallurgy and petroleum) codes.

By reason of his education, past relevant experience and affiliation and accreditation by foreign professional associations recognized under National Instrument 43-101, Mr. Thomas Lindholm, fulfills the requirements of a Qualified Person for conducting a technical review for the purposes of NI 43-101.

# **3** Source of information and reliance on other experts

The principal source of information used to prepare this report has been historical, filed reports from Direktoratet for Mineralforvaltning (Norwegian Mining Inspectorate). Apart from historical reports, geological and geophysical information has been gathered and evaluated by employees of MetPro.

### 3.1 Data gathering and site visit

This Technical Report is based on information collected by the author during a site visit on October 25<sup>th</sup> and 26<sup>th</sup>, 2010, later supplemented by MetPro staff.

The site visit was conducted together with MetPro staff. During the visit both the site of Skiftesmyr and Godejord were visited. A large number of drill hole casings were seen on both sites and a handful were selected for location check with handheld GPS, the variations in location was found to be within a few meters, which can be attributed to the precision in the handheld GPS.

No independent samples were taken during the site visit.



In summary, the author had the required level of access to MetPro's staff to undertake further clarification, inquiry or analysis, as required, of the technical information and data provided for this review.

## 3.2 Disclaimer

This report, entitled Technical Report, Skiftesmyr - Mineral Resource Estimate, dated October 25, 2013 was prepared by the author GeoVista AB, on behalf of Metal Prospecting AS (MetPro).

The opinions and conclusions presented in this report are based largely on information and technical reports provided to the Author prior to the site visit and data electronically transferred to the Author by MetPro. Some of the data used in this report were not within the control of the Author or MetPro. It is believed by the Author that the information and resource estimates contained herein are reliable under the conditions and subject to the qualifications set forth in this report. The Author confirms that standard engineering practices have been used by MetPro in conducting the exploration programs. The Author has reviewed the data provided by MetPro, and finds that it conforms to professional engineering standards and is therefore acceptable for use in generating the resource estimates shown in this report; however, no expressed or implied warranties regarding the accuracy of the data used in this report supplied to the Author is made. A legal due diligence review of ownership or property boundaries is beyond the scope of this review.

The type of work conducted and presented in this report, is by nature strictly an estimate. Thus, any decision made based on this information is solely on the client's responsibility. It is incumbent upon the client to check and approve the data and results delivered, and as soon as possible notify GeoVista AB of any complaints or remarks.

# 4 Property description and location

The Skiftesmyr exploration permit is situated in the Grong VMS District, Grong municipality, County of Nord-Trøndelag, central Norway (figure 4). The exploration permit is owned 100% by MetPro (table 4). The community of Grong, which is also the administrative centre of the municipality, is located 13.5 km west of Skiftesmyr. The area has ranging topographic relief with both dense and thin vegetation, smaller bogs and lakes. The river Sanddøla has its course 3 km south of Skiftesmyr. Both Sanddøla and the smaller river Møkkelvasselva north of Skiftesmyr runs westwards and drains out in Namsen, which is one of the famous salmon rivers in Norway.

The Skiftesmyr deposit got its name from the bog covering a major part of the deposit.

The exploration permit of Skiftesmyr is located on two different private properties, where the border basically follows the mineralization's footwall. This should not lead to future conflicts since Skiftesmyr is dipping away from this border in a north-western direction. The relation with the two landowners is presently good.





Figure 4: Location of the Skiftesmyr exploration permit in Grong municipality, Central Norway.

Table 4: Information on the Skiftesmyr exploration permit.

County	Municipality	Permit	Official ID	Area km <sup>2</sup>	Valid from	Valid to
Nord-Trøndelag	Grong	Skiftesmyr	0050/2010-TB	10.00	19.03.2010	19.03.2017

# 5 Accessibility, climate, local resources, infrastructure and physiography

### 5.1 Accessibility

The local community centre, Grong, is situated at the European highway E6, with a road distance of approximately 25 km away from Skiftesmyr. There is a direct connection (mainly gravel road)



from E6 into the Skiftesmyr property. This road is used for forestry as well as by hunters and cabin owners.

Grong has a train station along the main north Norwegian railway from Trondheim to Bodø, mainly parallel to E6. There is also an old station in Gartland (out of service) close to the entranceroad to Skiftesmyr. The closest city providing an airport and a sea harbour (all-year ice free) is Namsos, which is located 70 km from Skiftesmyr. There is also an old railway line connecting Grong with Namsos, which was in use for personal transport until 1978 and partly for carriage of freight until 1998. Norway's third largest city, Trondheim, is located within driving distance along E6 (200 km).

### 5.2 Climate

The area, basically within a cold Nordic climate-zone, is influenced by both the maritime and the mountainous inland climates. The mild gulf-stream can bring high precipitation levels while the Scandinavian inland-climate results in long and cold winters. The last year the range of monthly precipitation varied from 22 to 275 mm and temperatures between -30° and +25°C (weather station Gartland).

The long winter can shorten field campaigns to a certain level, while the operating season of a mine should not be affected besides intense maintenance like defrosting and snow-clearing.

### 5.3 Local resources

The local community has got a relatively high unemployment rate. There appears to be a wide interest in the establishment of a big employeer and thus the potential of acquiring motivated workers. On the other hand, there is a lack of well-trained experienced mining personnel all over Norway.

#### 5.4 Infrastructure

The electrical power needed for mining and milling operations can be provided from the main power line about 1 km away from Skiftesmyr. Furthermore there is a small hydropower plant at the river alongside the gravel road into Skiftesmyr. Also the water supply is easily accessible from several nearby lakes.

#### 5.5 Physiography

The exploration permit is located in a mountainous landscape with a rough morphology. The elevation in the property area varies between 150 and 400m above sea level.

The area holds a vegetation of mixed pine and birch forest (mid-boreal) with broad bogs and with transition to so-called Scandinavian Mountain Birch forest at higher altitude.

# 6 History

The Grong District has hosted several VMS mines throughout the years. The last to close were the Joma Mine and the Gjersvik mine, both owned by Grong Gruber AS. Production stopped in 1998 at both mines and up to that date a total of 11.3 Mt and 0.45 Mt respectively of poly-metallic ore had been mined. Apart from old mines the area hosts abundant mineralization. Skiftesmyr was discovered in 1903 although very little work was performed until 1971 (bv-4575, 1997).



# 6.1 **Previous mapping**

Regional geological maps over the area have been published by the Geological Survey of Norway, NGU. Publications include a black and white version of map sheet Grong, 1:50 000 (1987), a more detailed map in scale 1:20 000 (1992) and in 1996 a more regional map in scale 1:75 000. It is reported that Grong Gruber AS performed geological mapping over the Skiftesmyr area in the 1970's although no maps have been found. In 1996 Braddick Resources Ltd performed, through Geologiske Tjenester AS, a detailed 1:5 000 geological mapping of the Skiftesmyr mineralization (bv-4575, 1997).

## 6.2 **Previous geochemical surveys**

In 1971-1973 NGU performed an extensive stream sediment sampling campaign in the Grong area resulting in 14 000 samples which were assayed for Cu, Pb, Zn and Ni. Additional samples were collected during the 1980's which, together with bulked samples from the 70's campaign, was analysed for 30 elements in the 1990's. Some selected samples were also assayed for gold (bv-4575, 1997, and references therein).

## 6.3 Previous geophysical surveys

#### 6.3.1 Airborne geophysical surveys

NGU has performed regional airborne geophysical surveys over the area. In 1989 an airborne EM survey was carried out with 250 m line spacing with unkown ground clearance. A second regional survey was performed during 1993-1994 including TMI, EM, VLF and Radiometrics with 100 m line spacing with unknown ground clearance. From this survey geophysical maps were published but no report with interpretations (bv-4575, 1997, and references therein).

#### 6.3.2 Ground geophysical surveys, Skiftesmyr

In 1970 ground magnetic and Self Potential (SP) surveys was carried out over the Skiftesmyr deposit by NGU. NGU followed up the results with a TURAM survey performed in 1973-1974 with a follow up downhole Charged Potential (CP) survey in 1974. A second CP survey was carried out by NGU in 1975 (bv-5771, 1975, and references therein) and a third downhole CP survey in 1977 (bv-5767, 1978). Grong Gruber AS performed a trial survey with downhole VLF in 1978. The survey was deemed a success, the method worked well for downhole geophysics and the results were used to direct further diamond drilling (bv-6843, 1978).

In 1991 Norsulfid AS performed CP surveys, both downhole and on ground as well as a TURAM survey east of the known mineralization (bv-2386, 1991; bv-2387, 1991; bv-1383, 1992). The CP surveys performed in 1991 were followed up in 1992 when Norsulfid AS contracted Soumen Malmi OY to perform a Slingram and ground magnetic survey. The Slingram system used was a MaxMin with 20 m station spacing and 50 m line spacing. Three frequencies was used, 110 Hz, 1760 Hz and 7040 Hz. The magnetic survey was conducted with a Scintrex IGS-2 unit. The station spacing was 5 m and the line spacing 50 m (bv-5262, 1992).

# 6.4 Previous diamond drilling

Several diamond drilling campaigns on Skiftesmyr has taken place. Drilling has been performed by Grong Gruber AS and Norsulfid AS on and around the mineralization. The first campaign started in the 1970's. Both companies used drilling equipment producing a 36 mm core.



#### 6.4.1 Previous diamond drilling, Skiftesmyr

In 1973 the first hole was drilled by Grong Gruber AS which intersected a 7.5 m wide massive sulphide body. In 1974 an additional 14 holes were drilled. Seven of these holes intercepted the main mineralization while three holes were drilled along an EM anomaly north of the deposit. One hole was drilled east of the mineralization while the remaining three holes were drilled west of it. In 1975 five more holes were drilled, one hole was to explore the mineralization at depth, intersecting a 4.9 meter massive mineralization approximately 400 meters below surface. In total 3 809 meters were drilled during this period (bv-4575, 1997; bv-6842, 1977; bv-5652, 1975; bv-2890, 1974).

In 1978-1979 Grong Gruber AS performed a second diamond drill campaign. Five holes were drilled, four of them on the main mineralization and one exploration hole. In total 1 228.5 meters were drilled (bv-7067, 1979; bv-18, 1978).

In 1991 Norsulfid AS initiated a drilling campaign lasting until 1992. During the first year a total of 21 holes were drilled totalling 4 019.2 meters. In the second year a total of 2 428 meters divided over 18 holes were drilled. During this two year period, 39 holes were drilled both in the main mineralization and exploration holes. (bv-3977, 1993; bv-1383, 1992; bv-2402, 1992).

Over the period from 1973-1992 a total of 64 holes were drilled totalling 11 484.7 meters on or near the main mineralization. Partial and whole cores from 57 holes are stored at the Norwegian National Core Storage in Løkken.

#### 6.4.2 Historical deviation measurements

From Grong Gruber AS's drill campaign in 1973-1975, four of the holes were deviation surveyed by Devico using a Multishot instrument. Measurements were performed every ten meter down the holes. From the drill campaign in 1978-1979 three of the five holes were deviation surveyed by Devico. The instrument used was an Eastman Multiple Shot Survey Instrument Type DT. The instrument uses a compass to read bearing and an inclinometer to measure dip. Measurements were taken every ten meters down the holes (bv-6903, 1979; bv-6902, 1978; bv-6870, 1975; bv-6901, 1974).

From Norsulfid AS's drill campaign in 1991-1992, deviation surveys were performed by Devico on 31 of the 33 holes. The same instrument used in the 1970's was used for the surveys in the 90's and every ten meters down the holes a new measurement was taken (bv-2880, 1991; bv-2881, 1992).

### 6.5 Previous trenching

In 1996 Geologiske Tjenester AS executed a trenching program over Skiftesmyr on behalf of Braddick Resources Ltd. Five trenches was dug with an excavator in Skiftesmyr following the main mineralized trend. Subsequent sampling of the trenches indicated that either the mineralization is weak at the surface or the trenches were not properly positioned or surface weathering has leached the economic commodities at surface (bv-4575, 1997).

### 6.6 Previous metallurgical work

In 1977 NGU and Outokumpu OY, on behalf of Grong Gruber AS, performed flotation tests, microscope studies and grinding tests on the Skiftesmyr mineralization to determine the liberation properties of the mineralization and recovery level. The microscopic study showed that



the chalcopyrite and sphalerite occurs as fairly coarse free grains in pyrite grain boundaries. Two samples were ground into 55% -45  $\mu$ m and the fraction -125+90  $\mu$ m was sifted out. A grain analysis was performed on this fraction with a liberation result of 73.7 ± 2.3 % chalcopyrite and 72.6 ± 2.7 % sphalerite for the first sample. The second sample had a somewhat higher degree of liberation, 78.9 ± 2.1 % chalcopyrite and 81.4 ± 2.5 % sphalerite.

The flotation test was performed on 2.2 kg bulk sample with mineralized rock from 4 different drill holes. The sample was ground to 55% -45  $\mu$ m. The main objective of the flotation was to find out the distribution of silver in the different concentrates produced. The results showed that 50-60 g/t Ag was distributed in the copper concentrate and 40-50 g/t in the zinc concentrate. This corresponds to ~30 % and ~20 % respectively hence ~50 % of the silver was lost in the pyrite concentrate and tailings.

Copper flotation was done in four stages with 10 g/t KAX reagent in every stage. The pH was kept at a steady 11.5. The zinc flotation was done in three stages with an additional scavenger stage. In every stage 400 g/t copper sulphate and 20 g/t KAX was added. The pH was kept steady at 12.0. After the zinc scavenger an additional 50 g/t KAX was added to produce a pyrite concentrate. (bv-4640, App. 2a, 1997). The net results from the flotation test can be found in table 6.6a.

	Weight		Cu %	Zn %		Fe %		Ag ppm	
Product	%	Assay	Distrib.	Assay	Distrib.	Assay	Distrib.	Assay	Distrib.
Cu conc.	5.2	19.6	85.6	3.9	11.7	32.6	4.5	61	27.8
Zn conc.	4.7	2.3	9.3	31.2	86.5	21.2	2.8	42	17.3
Zn scav.	1.6	0.95	1.3	1.34	1.3	42.1	1.8	47	6.6
Pyrite conc.	22.1	0.03	0.5	0.01	0.1	47.1	27.8	7	13.5
Tailings	66.4	0.06	3.3	<0.01	<.04	35.5	63.1	6	34.8
Feed	100	1.19	100	1.78	100	37.4	100	12	100

Table 6.6a: Net results from a flotation test of the Skiftesmyr mineralization in 1977 by NGU and Outokumpu Oy on
behalf of Grong Gruber AS.

In 1996 Lakefield Research Limited was contracted by Braddick Resources Ltd to perform flotation tests on samples from the Skiftesmyr mineralization. The main objective was to attain three concentrates (Zn, Cu and Fe) and determine the metal distribution in the different concentrates. Due to oxidation of the ground material, optimization in subsequent tests was not possible. In total, eight tests were performed on 4 samples before oxidation made the flotation tests unusable. Below are the tests with the best results described.

A 22.5 kg sample (SKM-2) from Skiftesmyr was ground to  $K_{80}$  = 50-55 µm together with lime and other depressants. No copper aeration after grinding was performed. In the copper flotation a combination of A3418 and R208 collectors were used giving a rougher recovery of 85.4 %. Sodium sulphite was added in the two first stages to depress iron. The result was a copper concentrate grade of 24.7 % Cu with a recovery of 82.3 %. In cleaner 3 and 4 a mix of ZnSO4 and NaCN to depress zinc was used which resulted in substantial copper loss and only marginal zinc depression.



In the zinc rougher a weaker collector (R208) in larger amounts was used combined with longer flotation time and higher pH. The rougher recovery was 91.5 %. In the cleaners sodium sulphite and high pH was used to depress iron. The results were a zinc concentrate grade of 56.4 % Zn with a recovery at 86.8 % (bv-4640, App. 3, 1997). The net results of the test can be found in table 6.6.2.

Sample		SKM-2				
		Assay	Distrib.			
Head	Cu %	0.97				
	Zn %	1.9				
	Au g/t	0.38				
	Ag g/t	22.5				
	Pb %	0.052				
Copper	Cu %	22.4	83.8			
concentrate	Zn %	4.89	8.5			
	Au g/t	3.73	35.4			
	Ag g/t	137	21.9			
	Pb %	0.15	10			
Zinc	Zn %	56.4	76.3			
concentrate	Cu %	1.45	4.2			
	Au g/t	1.42	10.4			
	Ag g/t	66	8.2			
	Pb %	0.21	11			
Iron	Fe %	45.1	81.6			
concentrate	Cu %	0.13	7.9			
	Zn %	0.11	3.4			
	Au g/t	0.24	39.1			
	Ag g/t	12.8	35.2			
	Pb %	0.037	45.8			

 Table 6.6b: Net results from flotation trial of SKM-2 from the Skiftesmyr mineralization in 1996 by Lakefield Research

 Ltd on behalf of Braddick Resources Ltd.

# 6.7 Historical resource calculations (non NI43-101 compliant)

The first resource estimation for Skiftesmyr was performed by Grong Gruber AS in 1977. It resulted in a geological resource of 3.5 Mt at 1.16 % Cu and 1.79 % Zn using the polygonal method. After the initial resource estimation, infill drilling was performed. Based on the new infill drilling, in 1992 Norsulfid AS did both an in-situ and a mineable resource estimation including consideration to dilution and losses to pillars left for support. A combination of open-pit and



underground mining were planned. They used the polygonal or "profile method". This resource estimation was used by Braddick Resources Ltd in 1996 for their pre-feasibility study. The mineable ore, with dilution and pillars included, was estimated to 2,684,000 tonnes at 1.08 % Cu, 1.63 % Zn, 8.65 ppm Ag, 0.31 ppm Au and 34.6 % S with a 1 % 1992 Cu equivalent cut-off. Results of the in-situ resource estimations are presented in table 6.7 (bv-2882, 1992; bv-4640, 1997).

Skiftesmyr in-situ ore resource at 1 % 1992 Cu equivalent cut-off										
	Ore intersection	Cu	Zn	Ag	Au	Sp	Area	Width	Tonnage	
Profile	(m)	%	%	ppm	ppm	grav	m <sup>2</sup>	(m)	(t)	S %
Y-5150	13.25	1.08	3.04	10.33	0.28	4.00	1125	50	225,255	35.2
Y-5100	33.33	1.26	2.07			4.32	3230	50	697,826	
Y-5050	21.40	1.30	1.89	12.81	0.36	4.19	1344	50	281,383	36.8
Y-5000	50.65	1.11	1.70			4.05	3212	50	650,487	36.3
Y-4950	16.30	1.40	1.30	12.81	0.33	4.27	921	50	196,578	37.7
Y-4900	5.64	1.07	1.08			4.32	402	50	86,875	43.4
Y-4850	32.70	1.29	1.67	11.13	0.38	4.33	2274	50	491,952	40.7
Y-4800	12.55	1.46	1.38	14.56	0.40	3.79	613	50	116,114	32.4
Sum	185.82	1.23	1.86	11.37	0.35	4.19	13121	400	2,746,470	37.52
Skiftesmy	r in-situ ore resource a	t 2 % 1	992 Cu	equivale	nt cut-off	:				
	Ore intersection	Cu	Zn	Ag	Au	Sp	Area	Width	Tonnage	
Profile	(m)	%	%	ppm	ppm	grav	m²	(m)	(t)	
Y-5150	7.80	1.25	3.90	12.69	0.21	4.32	505	50	109,051	
Y-5100	26.85	1.32	2.23			4.39	2705	50	594,146	
Y-5050	14.80	1.30	2.10	11.09	0.36	4.51	920	50	206,551	
Y-5000	28.27	1.36	1.94			4.32	1954	50	421,755	
Y-4950	6.60	1.66	1.39	14.28	0.35	4.36	351	50	76,596	
Y-4900										
Y-4850	19.40	1.48	1.91	12.90	0.42	4.29	1351	50	289,817	
Y-4800	6.60	1.81	1.25	18.74	0.49	3.86	319	50	61,500	
Sum	110.32	1.38	2.13	12.99	0.37	4.34	8105	350	1,759,416	

Table 6.7: Non NI43-101 compliant resource estimation for Skiftesmyr, performed by Norsulfid AS in 1992.

# 7 Geological setting and mineralization

### 7.1 Tectonic evolution of the Scandinavian Caledonides

After the formation of the super continent Rodinia ~900 Ma years ago, a ~300 Ma period of sedimentation in rift related basins took place. The rifting culminated ~600 Ma ago, expressed as abundant dolerite dyke swarms, and is suggested to be the initiation of the breakup of Rodinia. The breakup resulted in two new continents being formed, Baltica and Laurentia. Continued rifting developed into ocean floor spreading and gave rise to the lapetus Ocean, separating Baltica from Laurentia. At ~540 Ma ocean floor spreading halted and a converging movement was initiated. The convergence leads to the collision between Laurentia and Baltica at ~425 Ma



resulting in a Himalayan type orogeny. Sheets from the Laurentian shield, the lapetus Ocean and the margin of Baltica were thrust from west/northwest on to the Baltic platform. An extensional collapse occurred at ~400 Ma in the western part of the orogeny. During the Mesozoic, the Atlantic Ocean started forming dividing the Caledonian orogeny into its present day expression, occurring in North America, Greenland and Scandinavia (Gee et al. 2010; Thelander, 2009; Korja et al. 2008; Grenne et al. 1999).

### 7.2 Regional geology

The Scandinavian Caledonides occupies the majority of Norway. The orogeny is built up by a number of thrust sheets which were emplaced during a continent-continent collision. Figure 7.2a shows the general geology and figure 7.2b a cross section over the central part of the Caledonides. A tectonostratigraphic division with five units containing several nappes is generally used to describe the thrust sheets: the Uppermost Allochthon, the Upper Allochthon, the Middle Allochthon, the Lower Allochthon and the Parautochthon/Autochthon. The two first mentioned units are considered exotic terranes, derived from the continent of Laurentia and the lapetus Ocean respectively. The other three units are derived from the continent of Baltica (Thelander, 2009).

The Uppermost Allochthon contains medium- high grade metamorphosed schists, carbonate rocks, volcanics and granites derived from Laurentia. The Upper Allochthon is comprised of the Køli nappes. The Køli nappes are derived from the Iapetus Ocean and are composed of low-high grade metamorphic island-arc related rocks e.g. metavolcanics, metasediments and ophiolites. The Middle Allochthon is composed of the Seve and Særv nappes derived from the outer margin of the Baltic shield. The major rock types in the Særv Nappes are medium-high grade metamorphosed sandstones and abundant dolerite dyke swarms. The Seve Nappes are composed of three general units, amphibolite-eclogite facies sandstones, granulite facies migmatites and paragneisses and the uppermost unit composed of amphibolites and minor metasedimentary rocks. The Lower Allochthon is derived from the margin and the platform of the Baltic shield and comprises low grade metamorphosed sandstones, quartzites, greywackes, alum shales and limestones. The Parautochthon/Autochthon consists of metasediments unconformably overlying the Precambrian basement (Gee et al. 2010; Thelander, 2009; Korja et al. 2008).





Figure 7.2a: Geology over the Scandinavian Caledonides (Gee et al. 2010). Norway is dominated by the Uppermost, Upper and Middle Allochthon.







### 7.3 Local geology and structure

The Grong District is located in the Caledonides in central Norway. The district covers approximately 3,000 km<sup>2</sup> and is bordered by the Grong-Olden window, comprised of Precambrian intrusives to the south, the Namsen River to the west, Sweden in the east and Lake Namsvatnet and Borgefjell National Park in the north. The Grong District is composed of thrust sheets from The Køli Nappe in the Upper Allochthon. The thrust sheets are divided into The Gjersvik Group and the Limingen Group. The Gjersvik and Limingen Group are comprised of metavolcanics, metasediments and Mid-Ordovician intrusives. The rocks are often strongly folded and deformed. Banded iron formations occur in places giving good marker horizons in large parts of the Grong District. Faulting is abundant in the area. Larger thrust faults strike roughly SW-NE while smaller faults occur in two principal strike directions, ~N-S and ~E-W.

The south western part of the Grong District where Skiftesmyr is located consists of rocks from both Gjersvik Group and the Limingen Group (Figure 7.3). The rocks from the Gjersvik Group in the area are comprised of granodioritic and gabbroic intrusions as well as greenstones and felsic/mafic tuffites. The Limingen Group occurs south of the Gjersvik Group and is composed of greenstones, greenschists, tuffites, calcareous tuffites/phyllites and minor granodioritic and gabbroic intrusions.

In some parts of the area, both the Gjersvik Group and the Limingen Group display inverted stratigraphy. This is due to regional folds transecting the area. The rocks of intrusive origin have sub-vertical contacts to the volcanics and are in some places sub parallel to foliation, although cutting relationships are clear in other places. A ductile shear zone appears just south of the main mineralization in Skiftesmyr. It starts out with an E-W strike and turns more towards N-S in the eastern part of the mineralization. The contact between the Gjersvik Group and the Limingen Group to the south are manifested by mylonites in an E-W trending thrust fault. The Limingen Group display penetrative foliation in all rock types, sub parallel to primary layering. A dextral movement for this phase of deformation has been suggested. The general strike direction is E-W with a northerly dip. An E-W trending thrust faults marks the contact between the Limingen Group and the Group and the Group.

Late and post-Caledonian structures occur throughout the area. Reactivation of older faults in chlorite schists took place with a sinistral sense of shear as well as newly formed faults. Folds and imbrication formed during this deformation event also indicates a compressive component. The newly formed faults display two conjugate sets. Accompanying these faults are cataclastic rocks and micro breccias. The sinistral movement is estimated to 300 m in the eastern part of the Limingen Group (bv-4575, 1997; bv-4640, App. 1, 1997; NGU 95.063, 1995; NGU 92.311, 1993).





#### Figure 7.3: Geological map over the Skiftesmyr exploration permit. Geological data from NGU.

### 7.4 Skiftesmyr geology and structure

The Skiftesmyr mineralization lies in the southern part of the Gjersvik Group as a wedge of mafic and felsic volcanics/tuffs surrounded by granodioritic intrusions. The majority of the area is covered by thin overburden or bogs. The volcanic rocks have gone through Upper Greenschist to Lower Amphibolite facies metamorphism. They show varying degrees of shearing and foliation intensity due to four deformation events.

#### 7.4.1 Skiftesmyr geology

A simplified sequence of the main mineralization consists of three main geological rock units (fig 7.4.1a). Stratigraphically below the footwall is a chlorite, epidote and carbonate rich mafic volcanite containing smaller amounts of disseminated sulphides (pyrite and pyrrhotite), displaying pillow structures in places. This unit is in contact with the immediate footwall composed of a



keratophyre, at first with albite-chlorite alteration that grades into a quartz-sericite-talc and albite altered variation with varying quantities of chlorite and sulphides. This intensely altered rock can be followed to the east and later north and is interpreted as the feeder zone to the massive sulphide mineralization. The hanging wall is composed of mafic and felsic tuffs, which are partly fine-laminated and contain disseminated sulphides (pyrite and pyrrhotite). The mafic tuffs grade into intermediate tuffs in places. Intermediate rocks of lava/intrusive character also occur in the hanging wall as well as thinner bands of unaltered keratophyres. Stratigraphically above the hanging wall the chlorite, epidote and carbonate mafic volcanic appears again, indicating a repetition of the stratigraphy. A magnetite bearing laminated mafic tuff acts as a good marker horizon and can be traced throughout the area.

On a more local scale it is clear that there are somewhat different stratigraphy in the western and the eastern part of the mineralization. This is probably due to asymmetry caused by the sulphide mound at formation. When moving up in stratigraphy from the mineralized horizon the stratigraphy becomes more uniform (Figure 7.4.1b).

Figure 7.4.1a: Vertical section over the central part of the Skiftesmyr deposit. Greenschist facies alteration is not plotted.







#### Figure 7.4.1b: Stratigraphic columns over the western and eastern part of the mineralization.

#### 7.4.2 Skiftesmyr structure

Skiftesmyr has been affected by four deformation events all related to compressional pure shear during the Caledonian orogeny. This has produced a very complex structural history of the mineralization (Figure 7.4.2). The structural history of Skiftesmyr is in many ways similar to the structural history of the Joma deposit. Both deposit have four phases of deformation with D2 occurring during peak metamorphic conditions and F3 which display chevron like folds. One fundamental difference between the two deposits is that in Joma it appears that the mineralization has been pulled apart creating boudins of the massive sulphide (bv-5264, 1986) while in Skiftesmyr the mineralization has been pushed together, evident from the stacking and thickening of the massive sulphide.

The first deformation, D1, is a low temperature thrust related event creating isoclinal folding sub parallel to S0. There is also evidence of small scale fault propagation folds during D1. Today the folds are expressed as small amplitude and short wavelength folds in the range of 20-30 m and 5-15 m respectively. No S1 have been identified. The importance of isoclinal F1 folds is due to the stacking of the sulphide horizon in places, increasing the width of the mineralization.

D2 deformation occurred during peak metamorphic conditions. Ductile folding as well as the creation of a S2 penetrative foliation took place. S2 is today the primary fabric in the area. F2 folds are a tight fault bend fold type with migration of sulphides towards the fold noses creating zones with thicker massive sulphide mineralization. The folds are expressed as small amplitudes and short wavelengths in the range of 10-30 m for both.

D3 is today expressed as large, regional fairly tight chevron type folds with wavelength and amplitude in the 0.5-1 km scale. Parasitic folding along the limbs is common. S3 is expressed as a radially spaced cleavage, indicated from its varying dip direction, visible in some parts of the area.



D4 is the latest major deformational event Skiftesmyr has undergone. D4 is expressed as large open folds with long wavelengths and potentially large amplitude (km scale). F4 fold axes show a uniform trend and plunge, 310/65-75°, throughout the area. No S4 fabric has been identified.

The relation between the different fold phases is of importance for ore modelling and upcoming exploration. F4 fold axes are as expected uniform with a trend/plunge of 310/65-75°. F3 bends around the open F4 fold axes but the general direction of F3 fold axes is towards ENE with a plunge of 70-75°. The relation of F2 to F3 and F4 is however more complicated. The mineralization at Skiftesmyr is located on the southern limb of an overturned F3 syncline, dipping towards north, and the extent of the known mineralization does not cut the F3 fold axial plane leaving only F4 to affect F2. The eastern part of the mineralization occurs on the eastern limb of an F4 anticline. The trend and plunge of F2 fold axes here are relatively uniform, trending towards NW with a dip of 70°. When F2 cuts the F4 anticline to the west, the trend of the F2 fold axes changes a few degrees towards west while the plunge changes to 75°. When F2 cuts the F4 syncline in the east end, the trend changes to W with a plunge of 78°. When F2 cuts the F3 syncline to the north the fold axis trend changes to W with a plunge of 65-70°. The trend and plunge of F1 fold axes is as expected most complex. Depending on where you are relative the three later fold phases the trend varies between NE-NW-W-SW and S and the plunge ranges from 45-80°.

D3 and D4 have caused the regional expression of the rocks in the area. The interference of D3 and D4 do not show the same behavior as any end member of fold patterns. Most likely the pattern is associated with a variation of the  $2-0_1$  family of folds. Due to the regional interference patterns, favourable stratigraphy can show up in several places in the area.

Just south of the mineralization a fault is located. The fault is interpreted to have formed between D3 and D4 due to D4 kinking the strike of the fault. The known mineralization is dipping away from the fault and should not be affected by the fault at depth.





Figure 7.4.2: Four phases of folding in the Skiftesmyr area creating very complex structural relationships.

#### 7.5 Deposit types

Skiftesmyr has been interpreted as being a stratabound volcanic massive sulphide (VMS) deposit. A VMS is formed on the ocean floor where metal bearing hot fluids escape the crust. This occurs exclusively in areas with volcanic and tectonic activity. The hot fluids percolate through the surrounding rocks and sediments, dissolving metals on their way. The fluids circulate in hydrothermal cells driven by the heat of an underlying magma chamber and are expelled to the ocean floor through conduits. When the hot fluids interact with cold seawater the metals are precipitated in mounds on the ocean floor, or just below it, often with a clear zonation between the different sulphides. The deposition of metals occurs during the waning stages of volcanism. Most often the footwall is composed of a volcanic rock that undergoes intense alteration where the fluids emanate from the crust. The hanging wall can be composed of volcanics or sediments. If additional volcanic cycles occur, the hanging wall will be composed of volcanic rocks and often there is a second ore horizon related to the waning stages of the subsequent volcanism. A sedimentary hanging wall would indicate that a longer period without volcanic activity has occurred and enough time has passed for considerable sedimentary material to accumulate (bv-4640, 1997).

#### 7.5.1 Regional deposits

Apart from abundant sub-economic mineralization in the Grong District, mining has been performed on three major deposits; Skorovas , Joma and the Gjersvik mine. All three deposits were mined during the 1900's with Joma and Gjersvik being the last ones to close in 1998.



**The Skorovas mine** was mined underground by Elkem AS and was in production from 1952 to 1984. The commodities in the VMS deposit are strongly zoned giving two different types of ore. The first ore type is composed of massive pyrite and was mined for production of sulphuric acid. A total of 3.9 Mt of pyrite was mined from 1952 to 1976. The second ore type is composed of chalcopyrite and sphalerite occurring in massive pyrite. From 1976 to closure at 1984, 1.7 Mt of copper and zinc ore was produced with an annual average grade at 1.14 % Cu and 2.71 % Zn. The grand total of ore mined up to closure was 5.6 Mt. The deposit still contains 1.3 Mt (non NI43-101 compliant) copper and zinc ore.

The deposit is located in the Gjersvik Group, part of the Køli nappe. The main ore body (pyrite) lies in a sequence of mixed mafic and minor felsic metavolcanics at the contact of two larger volcanic units. The foot wall is composed of Fe-Ti ferrobasaltic flows with an immature Island-Arc affinity. This unit is strongly quartz-chlorite and quartz-albite-sericite altered where the feeder zone to the mineralization was located. The hanging wall to the main ore body is composed of a mixed sequence of differentiated metabasalts, basaltic andesites and andesites. The upper part of this volcanic sequence is composed of massive felsic flows/intrusives and explosive breccias and tuffs. In this part of the volcanic sequence several smaller Cu and Zn rich ores are present with a quartzalbite and quartz-sericite altered feeder zone within the felsic volcanics. Present above the hanging wall sequence is a primitive Ca-Mg rich metabasaltic unit with minor felsic extrusives/intrusives.

Three main phases of deformation has been recognized which have caused the complex appearance of lensoid en echelon type ore bodies. The ore bodies are in total 200 m wide, up to 50 m thick and 800 m long. The ore lenses are oriented in a direction N-S to NE-SW. Limited remobilization of the ore commodities are often related to D3 structures (Forekomst 1740-007 www.ngu.no).

**The Joma mine** has been operated by both Norsulfid AS and Grong Gruber AS. Test mining on the VMS deposit started in 1969 and full production was commenced in 1972 and stopped in 1998. During the 29 years of mining a total of 11.45 Mt at 1.49 % Cu and 1.45 % Zn was produced. An in situ reserve of 11 Mt of pyrite are present but was never recovered due to being sub-economic (Forekomst 1739-039 www.ngu.no).

The deposit lies within the Røyrvik Group in the Leipikvatnet nappe which is part of the larger Køli nappe complex. The Leipikvatnet nappe is over thrust by the Gjersvik Group (nappe) in the western parts. The stratigraphic sequence in and around the Joma mine is inverted due to folding and has been subjected to Upper Greenschist facies metamorphism. Stratigraphically below the ore is a sequence of basaltic flows and intrusives as well as minor pillow basalts. The intrusive are generally coarser grained and show a sharper contact to surrounding rock. Intensely altered xenoliths of the basaltic flows are common in the intrusive bodies. Some thicker zones of hydrothermal alteration cuts through the sequence and is interpreted as the feeder zone to the mineralization. The next sequence upwards in the stratigraphy is the immediate foot wall. It is composed of pillow basalt and pillow breccias. Interlayered with the basalts are quartzitic exhalites with thin bands of pyrrhotite. Alteration intensity varies and increases dramatically towards the ore horizon. Quartz-albite alteration is the most prominent close to the ore while quartz-albite-sericite alteration is present more distally. The stratigraphic hanging wall sequence is composed of two units. The stratigraphically lowest is a pillow basalt with pillow breccias while



the second is a layered to laminated mafic tuff. The pillow lavas in the hanging wall are finer grained and lighter in colour than the pillow basalts in the foot wall (bv-5265, 1986).

The deposit has undergone four phases of deformation where D2 and D3 are the most prominent. During D2 the stratigraphy was strongly sheared and folded into isoclinal recumbent folds that today have a fold axis trending NNW-SSE in the area. During D3 large open folds were formed with a fold axis trending SW-NE. It is in the core of a D3 synform where the Joma mine is located. D4 deformation is limited to small brittle faults and conjugate folds close to the Gjersvik nappe thrust contact (bv-5264, 1986).

**The Gjersvik mine** was in production from 1993 to 1998 under Grong Gruber AS's management. It is a copper-zinc dominated VMS deposit and a non NI43-101 compliant resource estimate indicated 1.6 Mt with 1.71 % Cu and 1.03 % Zn. During the active mining period a total of 514.6 Kt of ore grading 1.77 % Cu and 0.79 % Zn was produced (bv-4624, 1998).

The deposit is located in the Gjersvik Group which is part of the large Køli nappe. The main lithologies are metavolcanics and meta-intrusives. The main ore body occurs in a sequence of keratophyre and pyroclastic rocks. Immediately below the ore body these rocks are intensely silica-sericite-carbonate-chlorite altered and defines the feeder zone to the mineralization. Stratigraphically below the keratophyre-pyroclastic sequence a dark coloured greenstone is present. It is usually fine grained and displays varying schistosity. Pillow structures are well developed in places. The chemical composition displays an undifferentiated tholeiitic magma source. This rock type is slightly magnetic which makes it more easily distinguishable from the paler greenstone occurring in the stratigraphic hanging wall. The paler colour is due to the rock being more carbonate rich. Pillows in this unit are less developed and do not occur as frequent as in the dark greenstone. The chemical composition of the pale greenstone indicates a more mature tholeiitic magma source. In between the two greenstone units a magnetite bearing quartzitic exhalite occur in places. Two types of meta-intrusive rocks have been recognize; Trondhjemite and gabbro. The intrusions are most often occurring within the dark greenstone sequence, except for one gabbroic pulse that cuts through all sequences in the mine. In the mine area the intrusive bodies are of limited extent and rarely exceed a 5 m thickness. (bv-6832, 1991).

The mineralization is located in a southerly dipping synform, probably of D3 age. Foliation in the area is caused by the D2 deformation event.

#### 7.6 Mineralization

The mineralization in Skiftesmyr consists of folded layers of massive sulphides, dominated by pyrite with alternating amounts of chalcopyrite, sphalerite and minor amounts of pyrrhotite. Trace amounts of gold and silver occur as well as in larger concentrations in areas. A potential zonation of gold and silver have not been studied as of yet. Thicker mineralization parts occur down plunge of F2 and to some extent down plunge of F1. A zonation between chalcopyrite and sphalerite is discernible with more chalcopyrite in the upper and the east part of the mineralization. The mineralization is imbedded in a quartz-sericite, albite rich rock with variable quantities of chlorite, which is intensively altered, folded and schistose. Towards the footwall and the hanging wall the rock is more compact and the mineralization occurs as veins and as disseminated sulphides in the foot and hanging wall. The massive sulphide are composed of medium-grained pyrite with a diameter of <1-5mm with well-developed grain boundaries where both chalcopyrite and sphalerite are situated. The main gangue minerals are quartz, chlorite and



calcite (bv-4640, App. 1, 1997). The varying thickness of the mineralization is due to F1 and F2 folds. F2 appears to have a bigger effect on mineralization width than F1 (Fig 7.6).



Figure 7.6: Long section over the Skiftesmyr mineralization. Width of mineralization appears to be related to F1 and F2 folds.

# 8 Exploration

### 8.1 Trenching

During the field season in 2011, 14 trenches in Skiftesmyr were excavated with the aim to verify ore width and historical assay results. Only 11 trenches in Skiftesmyr were mapped and sampled. The trenches were dug using an excavator and the surfaces cleaned with pressurized water. After cleaning, a meter grid was drawn onto the bedrock. Channel samples were cut perpendicular to foliation.

In Skiftesmyr the position of the trenches was based on geophysical surveys (TURAM) from 1973 and the Slingram survey in 1992 (by Grong Gruber AS and Norsulfid AS respectively). The trenches in Skiftesmyr were mapped in detail and continuous channel sampling was undertaken resulting in 165 one meter samples. Samples for a mineralogical study were also collected. Two TURAM anomalies, indicating two mineralized horizons, were explored. Due to marshy terrain some



planned trenches had to be abandoned before reaching the mineralized horizon. A few trenches got partially water filled and no channel samples from those particular areas could be extracted. Most trenches displayed badly weathered massive sulphides with white Zn oxide and abundant rusty pyrite. Analysis of the samples showed that the ore grade horizon was either missed or the weathering caused the top surface to be leached of the economic commodities.

The Skiftesmyr trenches were during the summer of 2013 re-mapped. Some of the trenches (15, 17 and 18) had previously not been mapped and sampled due to lack of time. These trenches were however mapped during this mapping campaign. The re-mapping involved detailed structural measurements and re-classification of some of the rock units. Representative samples of each lithology were taken from each trench. Some parts of the trenches have over the time become more filled with water and were therefore not possible to re-map.

## 8.2 Geophysics

In late 2011 MetPro performed an airborne TEM and magnetic survey through SkyTEM ApS. The survey was carried out in N-S directed flight lines with 200 m spacing. Tie lines were flown in an E-W direction with 1200 m spacing. The flight altitude was planned to 30-40 m above ground but due to rough topography the resulting mean flight altitude was 61.9 m. Inversion of the TEM measurements was performed by SkyTEM (Figure 8.2a) and the resulting products were composed of 30 EM anomaly maps corresponding to different depths and vertical sections for all flight lines. The magnetic survey was presented in both TMI (Figure 8.2b) and RMF maps. Additionally, a Digital Elevation Model was prepared by SkyTEM from the survey. All original measurement data was also delivered. Projection used during the survey was WGS 84 UTM Zone 33, Northern Hemisphere.





*Figure 8.2a: Mid channel EM response from the SkyTEM airborne survey 2011 with geology underlay.* 





Figure 8.2b: Airborne TMI map from the SkyTEM survey 2011 with geology underlay.

# 8.3 Prospecting

During the summer of 2012 a regional prospecting campaign was executed by MetPro. 25 samples were collected from surficial sulphide mineralization in the Skiftesmyr area. Four of the samples showed elevated Cu, Zn and Au grades.

# 8.4 Geological Mapping

More detailed geological mapping of the Skiftesmyr area was conducted in the summer of 2013 by MetPro. The aim was to get a good understanding of the complex structure in the area. Approximately 110 outcrops were located and further investigated. On each outcrop lithological observations were documented, and if possible structural measurements and lithological samples were taken. The focus area was around the main and known mineralization. Further mapping was however also conducted north west of the main mineralization, around a second smaller geophysical anomaly which can be seen in figure 8.2a. From the second anomaly massive sulphide outcrops were located. Samples were taken and are waiting to be sent for analysis. The main object for the mapping was to further understand the structural and stratigraphic relationship between the different units.



# 9 Sample preparation, Analyses and Security

MetPro only used ALS Chemex for analysis of the samples. The samples were transported by car by MetPro's own employee directly to ALS prep lab in Piteå and sent further to ALS Vancouver, B.C. for analysis.

# 9.1 Sample Preparation

The samples were first prepared at ALS preparation lab in Piteå, Sweden.

The samples were

- Logged into the tracking system
- Crushed to 70% less than 2 mm
- Split sample using a riffle splitter (250g)
- Pulverize split to more than 85% passing 75 microns
- The pulps were then sent to ALS in Vancouver for analysis

The pulps and rejects were sent back to MetPro.

#### 9.2 Analysis

The analytical package ME-ICP61 (33 elements by four acid ICP-AES) was chosen. Gold was analysed by fire assay (Au-AA23) and Cu, Zn and Pb over 1% were analysed with Cu-OG62, Zn-OG62 and Pb-OG62 respectively.

### 9.3 Quality Assurance and Quality Control Procedure

MetPro sent samples for analysis in 2011, 2012 and 2013. In 2011, 195 samples (including 29 blanks, standards and duplicates) were sent from the Skiftesmyr channel sample campaign. All of the samples were sealed in sample bags directly in field with label tags provided by ALS Chemex, Piteå, Sweden. The next sampling campaign in 2012 involved the re-assaying of old pulps from previous drilling (1970s-1990s), in total 122 pulps out of 1077 (approximately 11%) were sent for analysis. The samples were collected and prepared in Mo I Rana, Norway. At the latest sampling campaign 67 drill core samples together with 3 grab samples were analysed. The 67 ¼ drill core samples were taken from old Skiftesmyr drill cores (BH 102, 108 and 141) and the 3 grab samples were collected during 2012 field season. 10 of these samples were control samples. The drill core was sawed to ¼ core samples at the Løkken logging facility in Norway. The grab samples were directly put in samples bags with tags and sealed. All of the samples were transported by car directly to ALS prep lab in Piteå.

#### 9.3.1 Analytical Standards

MetPro have used two different certified standards, one in 2011 (CDN-ME-11) and the second in 2013 (CDN-FCM-7). Both certified standards were obtained from CDN Resources Laboratories Ltd., Canada. In figure 9.3a-j the results from the analytical standards are shown. In total 7 standard samples were included in the sampling of 2011. Of those 7 samples, only 4 Cu and 1 Au standard were analysed. 5 standard samples were analysed in the sampling program from 2013. The results show good quality, with the exception of 2 Zn and 1 Ag result, from 2011, which fall under respectively over the limits provided by CDN Resources. Only one Pb sample deviate from the standard used in 2013.





*Figure 9.3.1a: Cu measured versus certified grade for standard material of the 2011 program.* 

Figure 9.3.1b: Zn measured versus certified grade for standard material of the 2011 program.







*Figure 9.3.1c: Pb measured versus certified grade for standard material of the 2011 program.* 

Figure 9.3.1d: Ag measured versus certified grade for standard material of the 2011 program.







*Figure 9.3.1e: Au measured versus certified grade for standard material of the 2011 program.* 

Figure 9.3.1f: Cu measured versus certified grade for standard material of the 2011 program.







*Figure 9.3.1g: Zn measured versus certified grade for standard material of the 2013 program.* 

Figure 9.3.1h: Pb measured versus certified grade for standard material of the 2013 program.







Figure 9.3.1i: Ag measured versus certified grade for standard material of the 2013 program.

Figure 9.3.1j: Au measured versus certified grade for standard material of the 2013 program.



#### 9.3.2 Analytical Blanks

A total of 8 blanks were sampled in 2011 and 5 in 2013. At both times the blanks was pure quartzite from a quarry on Sandhornøya in Gildeskål, Norway. The result shows that the blanks contained varying amounts of Cu, Zn and Pb, figure 9.3.2a-c. All of the analytical results are higher than the detection limit, with the exception of Ag and Au. Au only has one sample that is higher than the detection limit and Ag has none. In the results from 2013 higher values of Cu, Zn and Pb were detected. It is however, considered to be more likely that the high values from 2013 are cause by laboratory issues rather than sampling, since high sample values precede the blanks



affected. The result is however inconsistent and the blanks appear to hold metal concentrations above detection limit. It is recommended that MetPro use a different source for blank material in the future.

Figure 9.3.2a: Cu analytical results for blanks from 2011 and 2013. Blanks analysed in 2013 are highlighted with the black box. The detection limit for Cu is 1 ppm.



Figure 9.3.2b: Zn analytical results for blanks from 2011 and 2013. Blanks analysed in 2013 are highlighted with the black box. The detection limit for Zn is 2 ppm.







Figure 9.3.2c: Pb analytical results for blanks from 2011 and 2013. Blanks analysed in 2013 are highlighted with the black box. The detection limit for Pb is 2 ppm.

#### 9.3.3 Field Duplicates

Field duplicates were only taken from the channel sample program in 2011. A total of 20 duplicates were taken. The duplicates were sampled immediately parallel to the original sample. The result show good correlation between the originals and duplicates, as seen in figure 9.3.3a-e. Only a few points representing Ag is displayed because most of the samples were under the detection limit.









*Figure 9.3.3b: Field duplicates for Zn from the 2011 channel sample program.* 

*Figure 9.3.3c: Field duplicates for Pb from the 2011 channel sample program.* 







*Figure 9.3.3d: Field duplicates for Ag from the 2011 channel sample program.* 

Figure 9.3.3e: Field duplicates for Au from the 2011 channel sample program.



#### 9.3.4 Pulp Duplicates

In 2012 MetPro re-assayed old pulp from previous drilling made by Grong Gruber AS and Norsulfid AS in the 1970s to 1990s. The correlation between the old and new assays are very good, figure 9.3.4a-c. Further discussion about these will be done under chapter 10.





*Figure 9.3.4a: Pulp duplicates from previous drilling in the 1970s to 1990s, re-assayed in 2012.* 

*Figure 9.3.4b: Pulp duplicates from previous drilling in the 1970s to 1990s, re-assayed in 2012.* 







*Figure 9.3.4c: Pulp duplicates from previous drilling in the 1970s to 1990s, re-assayed in 2012.* 

#### 9.3.5 Drill core Duplicates

In 2013 three of the historical drill cores were re-logged and some section re-assayed. 57 ¼ drill core samples were analysed from 3 different drill cores (BH 102, 108 and 141). The historical data is plotted against analysed data from 2013, figure 9.3.5a-c. Cu and Zn show good correlation, but not Pb where the R<sup>2</sup> value is only 0.7244. This could be due to the fact that Pb is not common in the Skiftesmyr mineralization and unevenly distributed.

Figure 9.3.5a: Drill core duplicates from previous drilling in the 1970s to 1990s, re-assayed 2013, Cu (%)







Figure 9.3.5b: Drill core duplicates from previous drilling in the 1970s to 1990s, re-assayed 2013, Zn (%)

Figure 9.3.5c: Drill core duplicates from previous drilling in the 1970s to 1990s, re-assayed 2013, Pb (%)





## 9.4 Bulk Density Determination

An accurate assignment of specific gravity for all its parts is imperative for the correct estimation of mineral resources in all polymetallic deposits.

Of the historical assay sections, some 712 have had the density determined. All such samples were determined by the use of the Archimedes method, first weighing the samples suspended in air then suspended in water.

In addition, 57 of the recent check assay samples, taken from quarter drill core, has been subjected to density determination, these were carried out by ALS, using method OA-GRA08, which in effect is the Archimedes method.

The Skiftesmyr Deposit appears relatively simple in terms of Sulphide mineralogy. A review of the ICP results confirm that the massive sulphides commonly contains samples with up to 50% Sulphur, with variable Copper and Zinc. The results further indicate that the deposit contains very high Iron, reported in the core logs as dominantly Pyrite with minor Pyrrhotite; with low levels of lead and very low levels of As, Sb, Te.

A review of SG needs to take into account, principally, variations in Pyrite, Chalcopyrite and Sphalerite. Galena is a minor contributor and can easily be estimated but its impact is neglible. Pyrrhotite is also a minor contributor but is far more difficult to separate from the ICP data alone and has thus not been estimated. Pyrrhotite will be reported as pyrite in this estimate.

A correlation between density and the contents of Fe, Zn and Cu was thus established, permitting the assignment of densities to non-surveyed sections.





*Figure 9.4: Specific gravity as a function of contents of Fe, Cu and Zn.* 

# 10 Data verification

As part of the verification program, MetPro re-assayed 122 pulp samples from 31 different drill holes (DDH 101-113, 120, 123, 126-137, 139, 141-142, 151-152) from the historical Skiftesmyr drill core. In total 1077 different assay results are available from the Norwegian Mining Inspectorate. MetPro tested approximately 11% of those to confirm the assay values. The historical assays were sampled and analyzed by Grong Gruber AS or Norsulfid AS. The re-assaying performed by MetPro was analyzed by ALS. The results can be seen in figure 9.3.4a-c. The result show very good correlation between the old and new analytical results.

11 of the samples analyzed in 2012 and 2013 from historical drill core overlap each other giving MetPro historical analysis to compare with both pulp- and drill core duplicates. The correlation between the three different analytical results can be seen in figure 10a-c. The result show good correlation, except for the first sample.

In chapter 9 a more detailed overview of the QAQC is presented, in which standards, blanks and duplicates are examined with more detail.



The author is of the opinion that the exploration database is appropriate for the purpose of estimating mineral resources.



Figure 10a: Comparison between historical Cu assay results with re-assayed pulps and drill core duplicates from 2012 and 2013

Figure 10b: Comparison between historical Zn assay results with re-assayed pulps and drill core duplicates from 2012 and 2013







Figure 10c: Comparison between historical Pb assay results with re-assayed pulps and drill core duplicates from 2012 and 2013

# 11 Mineral resource estimate

A resource estimate for the Skiftesmyr deposit was constructed using geologic and assay information from 64 drill holes. The focus in this section of the report is on the methodology for estimating the Copper and Zinc resource though Silver and Gold are also estimated, but with a lower degree of confidence. Primary or raw assay data were composited, using the specific gravity as a weighing factor, and were analyzed to determine their basic statistical and geostatistical properties. This information has been used in several modeling algorithms which have been compared and checked for validity. The final resource has been categorized into indicated and inferred, compliant with the CIM standards and definitions.

The mineral resource presented in this section of the report was estimated by MSc. Thomas Lindholm, Fellow of the AusIMM, Senior Mining Engineer of GeoVista AB, following the definitions and guidelines of the CIM codes. Mr. Lindholm is a Qualified Person as defined in National Instrument 43-101 on the basis of his training and experience in the exploration, mining and estimation of mineral resources of Iron ore, base metals and gold.

### **11.1 Geological model**

The mineralization has been interpreted from structures observed in a series of exploration trenches on surface as well as from those observed in drillcore. A wireframe model was constructed down to a maximum vertical depth of 300m. The zone of mineralization is approximately 425m long with a N65°E strike direction and dips 70° towards the northwest. The thickness varies from approximately 1 m up to 20 m. The thickest parts appear where the mineralization is repeated due to folding. The average thickness is 6-7 m. A 3D rendering of the mineralization is presented in Figure 11.1.





Figure 11.1: Wireframe model of the Skiftesmyr deposit.

## 11.2 Basic statistics

Basic statistics were calculated for all four modelled elements Ag, Au, Cu and Zn, for samples from within the interpreted mineralised zone. The results are presented in Table 11.1.

		No. Samples	Maximum	Minimum	Mean	Std. Dev.
	Raw	_			•	•
Ag [g/t]	samples	150	52.6	0	9.8	7.0
	Composites <sup>*</sup>	172	24.3	0	3.0	5.1
	Blocks	10367	16.0	0	2.2	3.6
	Raw					
Au [g/t]	samples	146	2.4	0	0.3	0.3
	Composites <sup>*</sup>	172	0.8	0	0.1	0.2
	Blocks	10367	0.7	0	0.1	0.1
	Raw					
Cu [%]	samples	364	4.2	0	1.0	0.7
	Composites	172	3.2	0.06	1.0	0.5
	Blocks	10367	2.1	0.11	1.0	0.3
	Raw					
Zn [%]	samples	364	5.1	0	1.3	1.0
	Composites	172	4.0	0.06	1.3	0.8
	Blocks	10367	3.4	0.1	1.4	0.6

Table 11.1: Basic statistical parameters for raw assays, composites and blocks.

\* Includes approximately 210 non-assayed sections set to 0



## **11.3** Raw assay intervals

Samples were selected from inside the mineralised zone. All further studies were carried out using only those samples.

The samples vary in length from 0.05 up to 5.63m, with an average of 0.95m, 82.4% of the sections are 1m or shorter.

## 11.4 Top cutting

The typical distribution for base and precious metals is log-normal, this necessitates a top-cutting of values so as not to produce biased estimates.

After studying their respective distributions it was determined that Cu should be cut back to 2.1% and Zn to 3.4% respectively. No top-cutting was, however, applied to the grades of Ag and Au, their distributions were severely affected (cut-back) by the dilution with 0 grade for non-assayed sections.

#### 11.5 Compositing

The average sample length is 0.95m. It was decided to composite all the samples to an equal length of 2m. Compositing is the first process in the estimation of grades, it is essential to check that the composited mean does not differ significantly from that of the raw data.

The density was used as a weighing factor in the compositing process to better give a true representation of the grades.

We see that the mean grades for Cu and Zn are similar (figure 11.2 and 11.3) throughout the process, whereas the grades for Ag and Au drops (figure 11.4 and 11.5) from raw data to composites, the latter due to the inclusion of approximately 210 sections set to 0 grade.





Figure 11.2: The distribution of Zn in 2m composites.





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Figure 11.4: The distribution of Ag in 2m composites.

Figure 11.5: The distribution of Au in 2m composites.





# **11.6 Grade interpolation method**

No reasonable variography could be developed due to the sample distribution and the undulating nature of the deposit. Inverse distance interpolation was instead considered appropriate, to better honour local grade variation, the power of five was selected.

### **11.7** Estimation parameters and search distances

The search ellipses were oriented along the strike and dip of the mineralization, at N65°E/70°NW. In the absence of variography, on which to determine the search parameters, the authors' experience was used in the selection. Search radius for the first pass of interpolation was set to 30m, with a minimum of 4 composites from at least 2 drillholes. The radius was gradually increased for each consecutive pass of interpolation. Details of search parameters are given in Table 11.2

	Search radius	Minimum no. samples	Maximum no. samples	Maximum no. per hole
Pass 1	30	4	15	2
Pass 2	60	4	15	2
Pass 3	90	4	15	2
Pass 4	150	1	15	

#### Table 11.2: Search parameters for block interpolation.

#### 11.8 Block model

The block model for Skiftesmyr uses regularly shaped block measuring 10 \* 2 \* 10 m (length \* width \* height), sub-blocking down to ¼ side length has been used. These block dimensions are considered to be the most appropriate, considering the morphology of the mineralization and the density of information from diamond drilling. The block model is rotated to the same strike as the mineralization.

Block grades were interpolated for the parent block and carried over to sub-blocks.

Grades were interpolated for Ag, Au, Cu, Zn and specific gravity, SG, the latter possible since all assay sections had a density assigned to them.

The block model has been cut against the elevation model describing the topography.

### **11.9** Block model validation

The block model has been validated visually on sections, by comparing grades of interpolated blocks with those of nearlying composites. The distribution of grades in composites and blocks respectively has also been compared and found to be reasonable.



## 11.10 Mineral resource classification

Mineral resources were estimated following the CIM standards and definitions. The mineral resources estimated for the Skiftesmyr deposit are summarised in Table 11.3.

#### **11.10.1 Measured Mineral Resources**

No part of the Skiftesmyr deposit has been classified as having measured mineral resources.

#### 11.10.2 Indicated Mineral Resources

Indicated Mineral resources are defined as those that are investigated with diamond drilling of a density of at the most 50\*50m.

#### **11.10.3 Inferred Mineral Resources**

Inferred Mineral resources are defined as those that are investigated with a drilling density greater than 50\*50m but less than 50\*100m.

The distribution of Indicated and Inferred Resources respectively is shown in Figure 11.6. The grade tonnage distribution for Cu is shown in Figure 11.7.

250Z

Figure 11.6: Block model classes and drillholes, Purple=Indicated, Blue=Inferred, view from southeast.





#### Figure 11.7: Grade tonnage distribution for Cu [%].

#### **11.11** Mineral resource estimate

The mineral resources are current on October 25<sup>th</sup>, 2013.

GeoVista has considered the technical and economic criteria used to calculate a reasonable mineral resource cut-off for reporting. A cut-off should be used to define the parts of the mineralization which can be expected to be extracted at a profit. Cut-off is dependent on mining methods as well as grade distribution, recoveries, costs and metal prices. As a reasonable lower block cut-off for this resource estimate a grade of 0.5 % Cu has been selected.

It is the opinion of the Qualified Person, as well as that of the Company, that the used cut-off is relevant for the mineralization. The CIM definition requires that there are "reasonable prospects for economic extraction".

The Indicated mineral resources at Skiftesmyr thus total 3.51 Mtonnes with 1.0 % Cu, 1.5 % Zn, 0.1 g/t Au and 2.5 g/t Ag. The inferred resources total 0.57 Mtonnes with 1.0 % Cu, 1.6 % Zn, 0.1 g/t Au and 2.7 g/t Ag. Results are presented in table 11.3.



Resource category	Tonnage (Mtonnes)	Cu [%]	Zn [%]	Au [g/t	Ag [g/t]
Indicated	3.51	1.0	1.5	0.1	2.5
Inferred	0.57	1.0	1.6	0.1	2.7

 Table 11.3: The mineral resources at Skiftesmyr on October 25th, 2013, reported at a 0.5% Cu cut-off.

#### **11.12** Mineral resource discussion

It is clear that the interpolated grades of Ag and Au in the block model are severely affected by the strict application of substituting the assays in non-assayed sections with the grade 0. The histograms shown in Figures 11.4 and 11.5 indicate that the population as a whole would result in significantly higher grades, 0.3 g/t for Au and 9 g/t for Ag respectively. These numbers are consistent with earlier, non NI43-101 compliant estimates, but should only be seen as indicative of the potential of the deposit.

The graph presented in figure 11.8 further strengthens this argument, the correlation between Au and Cu is good, and an average grade for the deposit of just over 1% Cu indicates a grade of Au of approximately 0.3 g/t. Re-assaying of the 210 samples within the wireframe that lack assays for Ag and Au is recommended to resolve this and permit a proper estimation to be carried out.



#### Figure 11.8: Au versus Cu for Skiftesmyr, n=314.

### **12** Mineral reserve estimates

Since no pre-feasibility or feasibility study has been completed to date on the Skiftesmyr deposit, no conversion of Resources to Reserves can be done at this stage.



# 13 Mining methods

MetPro is inclined to use Cut & Fill with waste rock backfill due to the complexity of the ore body. However MetPro has not conducted a detailed evaluation of mining method. Below is an excerpt from Braddick Resources LTD's pre-feasibility (bv-4640, 1997) with their planned mining approach.

"Access to the mineralized zone will be by way of a 650 meter long tunnel, 5m wide x 4m high, commencing at the 160meter level (above sea level) and declining at a slope of 25% (14 degrees) to Sea Level elevation. This places the major part of the ore body above the Decline, requiring a Ramp to access the ore zones. Exploration of the ore zones will take place via two drifts (sub-levels) places in the mineralization and following the strike of it, allowing the rock/ore structures to be geologically mapped and further diamond drilling of the ore zone to depth.

Mining of the ore will be by long-hole blasting from sub-level drifts put into the ore zones and drifting along the mineralized zone. Assuming an average ore width of 3 meters, a single blast of an ore block 30 meters high, 3 meters wide and 5 meters deep will provide required tonnage, based on an ore weight (in place) of 4 tonnes per cubic meter (high s.g. due to +60% sulphide content). Since the ore body is steeply dipping (approx. 65 degrees), it is planned to blast the ore down to lower level where a 7 cubic yard LHD Loader will load it onto a 30 tonne Underground Truck for transporting to the Jaw Crusher, located underground near Access Tunnel. A second truck with capacity of 15 tones and using two "containers" will handle development ore and waste produced from Ramp and Sub-level Drift installation. A second LHD with 2.5 cubic yard bucket will work on Ramp and Sub-level Drift installation, loading into the Container tuck. Production drilling will be by an electric-hydraulic Self-propelled Long-hole Drill designed to work in a 3 meter high drift and capable of drilling 89 mm holes to a 250 meter depth. Drift drilling will use a conventional two-boom mobile electric-hydraulic Drill Jumbo. Blasting for production and development shall use ANFO loaded via a pneumatic Pot carried to the location by one of the LHD Loaders.

Ore shall be trucked to a Jaw Crusher having a capacity of 75 tonnes per hour at a closed-side setting of 51mm. A feeder Grizzly shall feed the ore to the crusher. Discharge from the crusher will be conveyed to a Haulage Conveyor located in the 650 meter long Access Tunnel, by which the ore will be brought to surface and into the Mill, feeding directly into the Cone crusher. "

# 14 Recovery methods

MetPro has not evaluated any recovery methods as of yet. The following section is an excerpt from the pre-feasibility study commissioned by Braddick Resources Ltd in 1996 (bv-4640, 1997).

"The ore consisting of mainly pyrite, chalcopyrite and sphalerite, will be wet ground to liberation size and subjected to differential flotation under conditions similar to those used in the testing by Lakefield Research" (Chapter 6.6, this report).

"The mill equipment is conventional and has been sourced from both new and used equipment suppliers in Canada and the United States". "Sizing of equipment allowed for small future increases in production rates where possible. For instance the Cone Crusher was sized with a 150 HP motor to yield a 110 tonne/hour capacity. By installing a larger motor and a different bowl, through-put capacity can be increased by 10-15%".



"The Cone Crusher, fed with 50 mm ore size from the underground Jaw crusher, will easily crush the daily mill feed requirements of 1030 tonnes per day". "The Cone Crusher product is planned to be 12 mm in size and will be stored in a bin with 2000 tonnes in capacity from which it will be drawn by a feeder conveyor at the required feed rate controlled by a belt scale, feeding into the 3 m diameter x 4.25 m long Ball Mill. Grinding in the Ball Mill with 75 mm steel balls will provide the proper feed size to the flotation circuit. Classification of the Ball Mill discharge will be by a single 500 mm hydrocyclone capable of processing a 250 % circulating load using a 5x5 SRL Pump".

"The Rougher and Scavenger flotation will require 56 Denver DR100 cells (each 2.8 m<sup>3</sup>) for both the Copper and Zinc flotation stages. The upgrading of the concentrates by refloating in cleaner cells will use 14 of the smaller Denver DR18SP. Internal pumping of the various flotation products will require 12 1.5x1.25 SRL Pumps. Final tailings will be pumped to the tailing disposal area by a 5x5 SRL Pump. The final concentrate products will be pumped into separate 7m diameter thickeners for each of the Copper and Zinc concentrates from which they will be pumped at 65% solids to the separate Drum Filters each having a filter area of 14 m<sup>2</sup>". "The Zinc concentrate will require further dewatering using a rotary kiln-type dryer".

# **15 Project infrastructure**

MetPro has not evaluated the infrastructure as of yet. Below is an excerpt from Braddick Resources Ltd's pre-feasibilit study from 1996 (bv-4640, 1997).

"The structure housing the crushing, grinding, flotation and dewatering sections is unique and has been chosen for its ease in both assembling and disassembling, requiring only 60 days to erect without the need for large foundations. The Pre-fabricated structure consists of Aluminum structures supporting a PVC Membrane that has been designated to include 8 inches of insulation and withstand winds of 125-130 miles per hour. Snow load problems are minimal as the Membrane is very slippery, with the structure sloping at 26 degrees off horizontal. The structure has a completely unsupported span of 40 meters and covers a length of 87 meters. Built in Canada and used in artic conditions, this type of structure provides a less expensive building than a conventional steel column and I-beam structure. The main drawback is the fact that the frame cannot be used to support a Bridge Crane commonly found in conventional mill buildings. In this instance, it is anticipated that once the heavy equipment is in place using hired mobile cranes, motor or liners etc. can be easily moved by smaller mobile cranes hired for the occasional heavy lift. Otherwise, winches and come-alongs will be used by maintenance crew in their regular work to move heavy parts. Piping will be supported from the floor where required and power cables will be accessed from floor trenches. Motor control centers will be located adjacent the equipment they serve and shall be fully enclosed. There will be 6 man-doors for worker access and 6 roll-up (insulated) bay-doors for equipment access. Similar structures will be used for each of the warehouse and maintenance shop facilities. A simple concrete pad is all that is required for these buildings.

Tailing disposal will take place adjacent the Skiftesmyr Mine, using two small lakes designated by Outokumpu in their 1992 study as being suitable. It is planned that the first lake will be dammed to provide sufficient capacity for the first half of the mine life. The diversion of a small creek around the lake will be necessary".



# 16 Market studies and contracts

No current studies exist in terms of marketing the potential products.

# 17 Environmental studies, permitting and social or community impact

Braddick resources Ltd made plans for the location and handling of tailings in their pre-feasibility study, these could be applied by MetPro. The following is stated in Braddick Resources pre-feasibility: "Tailing disposal will take place adjacent the Skiftesmyr Mine, using two small lakes designated by Outokumpu in their 1992 study as being suitable. It is planned that the first lake will be dammed to provide sufficient capacity for the first half of the mine life. The diversion of a small creek around the lake will be necessary (Bv-4640, 1997)".

The area has to be reclaimed when mining activities have ceased, all constructions have to be demolished down to surface level and remediated with topsoil and grass. Contaminated soil has to be replaced with uncontaminated soil. The contaminated soil together with anything that might produce Acid Mine Drainage will be placed back into the mine. The waste rock pile may contain a maximum of 5% pyrite (Bv-4640, 1997).

The Norwegian directorate of mining may require a financial security for the remediation and reclamation of the mine site and will in some cases request a deposition payment. The financial security will take into consideration the complexity of the extraction operation, the type of matter, the potential threat of pollution, whether operations will involve underground mining or opencast mining, the location, local conditions etc. The directory also states that the financial security *"shall take such a form that it will not become part of the bankruptcy estate in the event of the operating party's bankruptcy"*. The financial security should be sufficient enough to cover the operating party's safety and remediation and reclamation costs (Mineral Act regulations, 2010).

If a deposit payment is required, the amount and time of payment will be decided by the Directorate of Mining. The Directorate also controls the usage of the deposition and may set conditions (Mineral Act regulations, 2010).

The company is required to ensure that the area concerned is properly remediated and cleaned up both during and after the mining activity has ended. A final date for when the clean-up and remediation have to be completed may be determined by the Directorate of Mining (Mining Act, 2010).

# 18 Capital and operating costs

No current estimate of capital and operating costs exists.

# **19** Economic analysis

No current economic analys exists.



# 20 Adjacent properties

The Skiftesmyr exploration permit containing the mineralization dealt with in this report, are located in a cluster of permits owned 100 % by MetPro (figure 20). Skiftesmyr is the most central exploration permit. A summary of MetPro's exploration permits in the area can be seen in table 20.





#### Table 20: Summary over MetPro's adjacent exploration permits.

County	Municipality	Permit	Official ID	Area km²	Valid from	Valid to
Nord-Trøndelag	Grong	Godejord	0051/2010-TB	10.00	19.03.2010	19.03.2017
Nord-Trøndelag	Grong	Finnbu	0223-1/2010	10.00	19.01.2011	19.01.2018
Nord-Trøndelag	Grong	Tølløvsetran	0607-1/2012	10.00	26.03.2012	26.03.2019
Nord-Trøndelag	Grong	Storlisetran	0608-1/2012	9.42	26.03.2012	26.03.2019
Nord-Trøndelag	Grong	Nyneset	0609-1/2012	7.44	26.03.2012	26.03.2019
Nord-Trøndelag	Grong	Rabalskheia	0610-1/2012	7.79	26.03.2012	26.03.2019
Nord-Trøndelag	Grong	Tømmerås	0172-1/2013	7.79	05.06.2013	05.06.2020
Nord-Trøndelag	Grong	Tømmerås Væst	0171-1/2013	7.68	05.06.2013	05.06.2020
Nord-Trøndelag	Grong	Leikhaugen	0170-1/2013	7.62	05.06.2013	05.06.2020

# 20.1 Tømmerås Væst, Tømmerås, Leikhaugen and Rabalskheia exploration permits

The four westernmost of MetPro's exploration permits cover an area comprised of metamorphosed arkosic sandstones and sandstones. The rocks belong to a separate thrust sheet



relative the rest of MetPro's Grong District exploration permits. The thrust sheet in the west has undergone Upper Amphibolite facies metamorphism differentiating it from the remainder of MetPro's exploration permits in the area that have undergone Upper Greenschist to Lower Amphibolite facies metamorphism.

Rabalskheia have similar lithologies as Skiftesmyr but the western portion of the permit covers the western thrust sheet. Within Rabalskheia, The Rosset mineralization is located. The earliest report from the mineralization is dated to 1861. During that time test mining for pyrite took place. In 1970 the Norwegian geological survey took 40 samples and re-assayed old mineralized waste piles. The Cu, Zn and Ag grades varied between 0.14-8.58 %, 0.89-13.2 % and 24-851 ppm respectively (bv-6979, 1972). Based on the promising analytical results, several geophysical surveys were conducted over the deposit and in 1973 NGU drilled three vertical diamond drill holes. Two of the holes hit mineralization, the first with a 2.75 m section at 0.7 % Cu and 2.7 % Zn, the second with a 4.5 m section at 0.4 % Cu and 1.8 % Zn (bv-7064, 1977). In 1976, Grong Gruber AS, followed up NGU's work and drilled an additional 7 holes. Six of the holes showed small sections with elevated or good Cu and Zn grades (bv-7064, 1977).

To date, all exploration except for a minor geophysical survey and some prospecting in the permits Tømmerås and Tømmerås Væst, have been performed over the Rosset mineralization. Two grab samples from the Tømmerås exploration permit contained elevated gold grades of 1.7 and 0.6 ppm Au respectively (NGU 92.284, 1993). Tømmerås, Tømmerås Vest, Leikhaugen and the western part of Rabalskheia cover the same stratigraphic horizon where the Rosset mineralization is located.

# 20.2 Tølløvsetran exploration permit

The exploration permit of Tølløvsetran covers the same stratigraphic sequence as Skiftesmyr. Exploration in the area has been sparse although a regional VLF survey was conducted in 1974-1975 by NGU. The eastern part of the permit is also covered by TURAM measurements. From the TURAM survey several anomalies were distinguished and diamond drilled in 1975 by NGU. Four holes totaling 370 m were drilled on separate anomalies. One of the holes hit a pyrite bearing keratophyre, similar to the foot wall in Skiftesmyr, which explains one TURAM anomaly. The other three holes did not hit anything which could explain the anomalies (bv-7063, 1976).

### 20.3 Godejord exploration permit

The mineralization in Godejord is covered by MetPro's Godejord exploration permit. The mineralization has a historical resource of 250-300 Kton with average grades at 0.6 % Cu, 4.2 % Zn, 0.1 % Pb, 15 ppm Ag and 0.4 ppm Au. The resource estimation was performed by NGU in 1996. Braddick Resources Ltd's pre-feasibility study from 1996 covered both the mineralizations in Skiftesmyr and in Godejord.

The mineralization was found in the early 1900's but the majority of work has been performed in 1970-1997. Companies involved in Godejord over the time are NGU, Grong Gruber AS, Norsulfid AS, Geologiske Tjenester AS, Braddick Resources Ltd and Baltic Resources Ltd. Several geophysical surveys have been conducted and 34 diamond drill holes have been drilled totaling 6,370 m. Metallurgical testing of the ore was conducted for the 1996 pre-feasibility study with positive results.



The mineralization is located in the Limingen Group of rocks which encompasses tuffs, phyllites, mica schists, quartzites and greenstones. Recent geophysical surveys by MetPro indicate a large prospective area around the mineralization. The mineralization itself is of a more disseminated character where only the core of the main mineralization is massive. The disseminated sulphides occur as breccia infill. The mineralization in disseminated character can be tracked at km-scale along strike and is still open at depth (bv-4639, 1998; bv-4575, 1997; NGU 96.024, 1996; bv-4640, App. 1, 1997; bv-2882, 1992; bv-2887, 1992).

### 20.4 Storlisetran and Nyneset exploration permits

Storlisetran covers the northern part of the Limingen Groups stratigraphy. Historical exploration in Storlisetran is limited to regional geophysics and stream sediment sampling. Anomalous gold grades in stream sediment sampling were followed up with a short diamond drill hole in 1990. A nine meter section with elevated gold grades was encountered. No follow up work was performed (bv-2389, 1991; bv-2393, 1991). A small pyrite mineralization is located in the south west corner of the permit. NGU reports that some activities took place on the pyrite mineralization in 1970 but was abandoned (Forekomst 1742-023, www.ngu.no).

The exploration permit Nyneset covers the same stratigraphic sequence as the Godejord mineralization. A known copper mineralization, Broka, is present in Nyneset where insufficient exploration has been performed (pers. com. Haugen A, 2013). Regional stream sediment sampling and a regional VLF survey in the second half of the 1970's was performed by NGU. A combined VLF and stream sediment anomaly pointed towards the mineralization. In 1980 a single trench was excavated over the km long VLF anomaly. Zones with elevated Cu grades were encountered in the trench. In 1984 a second trench was excavated approximately 100 m east from the first trench along the VLF anomaly. A five meter zone with disseminated chalcopyrite and malachite was encountered. The end of the Cu-mineralization has not been defined, the trench was too short. A number of grab samples was collected. Max Cu grade from grab samples from the trench was 0.47 %. No further exploration has been performed. (bv-6851, 1985; bv-7068, 1981).

### 20.5 Finnbu exploration permit

The Finnbu exploration permits are located farthest to the east of MetPro's VMS exploration permits in the SW Grong District. A mineralization discovered in the early 1900's is present within the permit. The known size is, according to NGU, in the range of 100 000's of tons with copper and zinc being the main commodities (Forekomst 1742-013, <u>www.ngu.no</u>). Test mining of a planned 250 000 tons was initiated in 1915 based on five diamond drill holes in 1914, but was a few year later stopped. The amount of ore produced, if any, is not known at this point (bv-4523, 1915). Several geophysical surveys has been carried out in 1973-1978 including VLF, magnetometry, CP and TURAM. In addition to the holes drilled in the early 1900's, 25 more were drilled in 1974-1985. 16 of the holes hit mineralization with the best intersections of 3.49 m at 0.27 % Cu and 4.5 % Zn, 2.59 m at 0.27 % Cu and 5.2 % Zn and a 2.95 m section at 0.33 % Cu and 5.22 % Zn (bv-3997, 1994; bv-5343, 1985; bv-19, 1979).

# 21 Other relevant data and information

The socio-economic impact of a future development of the Skiftesmyr deposit will be noticeable in the Grong municipality, that today lives with a considerable unemployment ratio. The local support is good, so far.



# 22 Interpretation and conclusions

The deposit as such shows a reasonable sized mineral resource of Cu and Zn, with good possibilities for Ag and Au credits. As interpreted, the deposit remains open at depth and on strike. The continuation of the structure that hosts the mineralization is not investigated in detail, however, conductors have been indicated by geophysical surveys.

# 23 Recommendations

The deposit is still open at depth and along strike. The deepest intercept holds a 4.55 m section with "ore grade". As a first measure the depth continuation should be tested secondly the possible continuation along strike. A drill program totaling 2,500m is considered sufficient for this activity. It is budgeted to cost NOK 4 millon or approximately 493,000 Euro, all inclusive.

As to provide better data on all elements of potential economic interest it is recommended to reanalyze old pulp or core. The first order of priority is given to those samples that fall within the interpreted mineralization that currently lack assays for Ag and Au, but potentially all samples available would merit from modern multi-element analysis combined with Ag and Au. The reassay campaign is budgeted to NOK 60,000, or approximately 7,400 Euro.



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# 25 Certificate of qualified person

I, Thomas Lindholm, M.Sc., as the principal author of this report entitled "Technical Report: Skiftesmyr - Mineral Resource estimate" prepared for Metal Prospecting AS and dated October 25, 2013, do hereby certify that:

- 1. I am a Senior Mining Engineer at GeoVista AB, Luleå, Sweden.
- 2. I am a graduate of Luleå University of Technology, Luleå Sweden, in 1982 with a Master of Science degree in Exploration and Mining Engineering.
- 3. I am a Fellow of the Australasian Institure of Mining and Metallurgy, AusIMM (# 230476). I have worked as an engineer in mineral exploration and mining for 31 years since my graduation.
- 4. My relevant experience for the purpose of the Technical Report is:
  - Mineral Resource estimation work and reporting on numerous mining and exploration projects.
  - Exploration geologist on a variety of gold and base metal projects in Sweden, Finland, Norway, South and Central America.
- 5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a recognized foreign professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI43-101.
- 6. I visited the Skiftesmyr property on October 25-26, 2010.
- 7. I am responsible for the preparation of all items related to the mineral resource estimate of the Technical Report, the other sections related to background information have been prepared under my supervision.
- 8. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
- 9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
- 10. As of the effective date of this Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Dated this 25<sup>th</sup> day of October, 2013

~ 00

Thomas Lindholm, M.Sc., FAusIMM