ALVALADE JV OPPORTUNITY – FAST TRACK FROM BROWNFIELDS EXPLORATION TO DEVELOPMENT IN A 50+ MILLION TONNE COPPER-ZINC DISTRICT IN THE IBERIAN PYRITE BELT, PORTUGAL

(Internal report for use by Avrupa Minerals – not to be publicly distributed)

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Executive Summary

- The Alvalade exploration license is held by Avrupa Minerals through its wholly-owned subsidiary, MAEPA, Lda. It covers northern extensions of two major mineral trends in the Portuguese portion of the Iberian Pyrite Belt – Neves Corvo and Aljustrel-São Domingos.
- The newly-defined Caveira-Lousal-Sesmarias District is fully contained within the Alvalade license.
- Historic, *non NI43-101 compliant,* resource estimates of more than 50 million metric tonnes combined of copper-zinc-lead-iron sulfides have been corroborated by several independent researchers since 2011.
- There may still be up to 30-35 million metric tonnes of massive sulfide resources remaining *in situ* within sight of the historic Lousal Mine headframe.
- The Sesmarias discovery made by Avrupa Minerals is possibly a faulted-away extension of the Lousal orebody.
- Avrupa Minerals developed a new geo-structural exploration model that, to date, has resulted in the Sesmarias and Monte da Bela Vista discoveries.
- Recent scout and vector drilling (2012-2015) by Avrupa Minerals indicates potential for more stockwork and massive sulfide mineralization at Sesmarias, Lousal, Monte da Bela Vista, and Caveira. Valid drill-ready targets are available at all four locations.
- Neves Corvo produced 116,000 metric tonnes of copper and zinc in 2016
- Aljustrel produced 28,000 metric tonnes of copper in 2016
- Further exploration is warranted in green/brownfields areas along all mineral trends on the Alvalade license.

Alvalade Property and the Caveira-Lousal-Sesmarias District, Portugal

Introduction

The Alvalade property (red outline) covers 902 km^2 and is located within the Iberian Pyrite Belt of southern Portugal. The northwest quadrant of this property contains the Caveira-Lousal-Sesmarias District (CLS), which is an agglomeration of two historic mines (Caveira and Lousal) and the 2014 Sesmarias discovery by the Avrupa Minerals' Portuguese subsidiary, MAEPA Lda.

The Iberian Pyrite Belt can be further subdivided into three major Trends (from north to south):

- Rio Tinto Trend (orange)
- Aljustrel – São Domingos Trend (blue)
- Neves Corvo Trend (gray)

The break in the Rio Tinto Trend is occupied by the Ossa Morena Zone. This Zone is different both geologically and in mineral endowment from the Iberian Pyrite Belt. It is known for its mafic intrusive rocks and related IOCG mineralization.

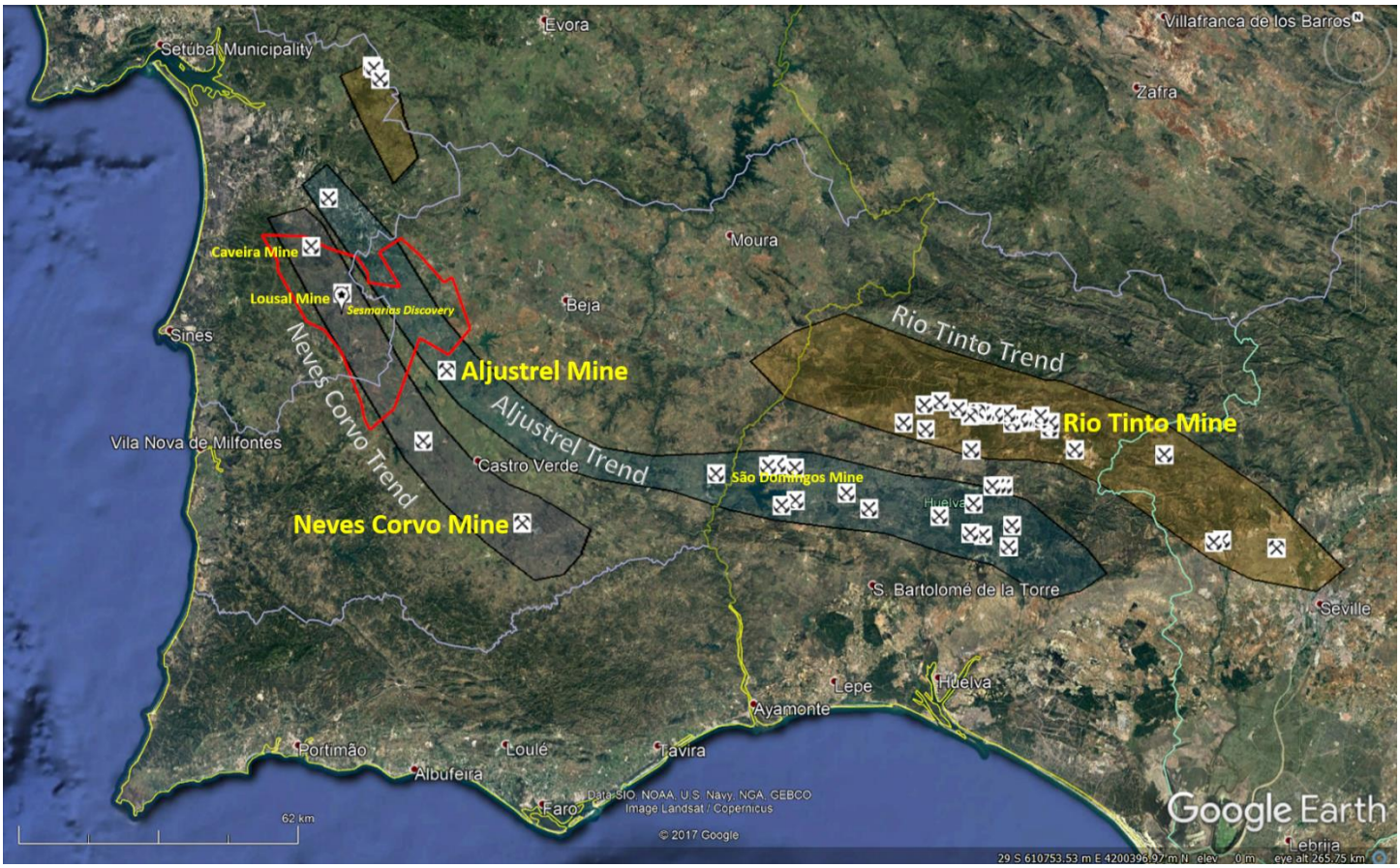

Figure 1. Map of the Alvalade license on Google Earth. Note Caveira-Lousal-Sesmarias District are located along the northern end of the Neves Corvo Trend (gray highlight).

History

During ancient times, the Iberian Pyrite Belt was intensively mined for precious and base metals, especially by the Romans. From the fall of the Roman Empire to the nineteenth century, mining declined precipitously, and many of the ancient mines were lost to history. However, by the nineteenth century, several former Roman mines were rediscovered and put back into production. During this period, the primary commodities mined were iron and sulfur. Only within the last 30-40 years, with the re-evaluation and re-start of Aljustrel and the discovery of Neves Corvo, has the region undergone a step change in the view of deposit economics, with the mining focus returning to base and precious metals.

Table 1 Comparison of ore and metal tonnages (mined + reserves) in the massive sulphide provinces of Australia, Canada, and the Iberian Peninsula (for Australia data mainly from Green 1990; Large 1992; Barley 1992; Berry et al. 1992; for Canada data mainly from Franklin and Thorpe 1982; Chartrand and Cattalani 1990; Kerr and Gibson 1993; Barret and MacLean 1994; for Iberia see Table 2)

Country	*n*	Size (Mt)	Cu (Mt)	Pb (Mt)	Zn (Mt)	Ag (t)	Au (t)
Australia (Archean to Permian)	30	334.9	4.2	4.1	12.8	13447	578
Mount Read Belt-Tasmania (Cambrian)	6	148.6	1.5	2.5	6.1	7423	156
Canada (Superior Province – Archean)	87	769.0	11.8	0.6	25.9	28359	712
Abitibi (Archean)	40	500.3	9.9	0.4	18.2	20919	656
Rouyn-Noranda + Val d'Or (Archean)	20	394.3	5.8	0.0	6.2	5590	596
Iberian Peninsula (Pyrite Belt) (Devonian to Carboniferous)	85	1765.0	14.6	13.0	34.9	46188	887
Neves Corvo	1	261.5	3.44	0.6	3.74	2977	

n = number of deposits

The table above is from Leistel et al., 1998, and shows the importance of the Iberian Pyrite Belt on a global scale. While the overall Pyrite Belt mineralization is generally lower grade compared to other VMS districts, the Iberian Pyrite Belt *dwarfs all other VMS Districts worldwide,* both in size and the amount of contained metals.

Aljustrel compared to the Caveira-Lousal-Sesmarias District

A good analogue for the Caveira-Lousal-Sesmarias District is the Aljustrel Mine which has a nearly identical history: ancient mining followed by modern exploitation for iron and sulfur, beginning in the middle-late 19th century and continuing through the latter half of the 20th century, and then followed by closure around 1990.

Due to the era that these mines initiated production, modern exploration drilling campaigns and methods were not undertaken until the 1950's which led to some discoveries. The first geophysical surveys were done in the 1960's and 1970's which made further, generally deeper, and blind discoveries.

The market for pyrite collapsed during the late 1980's (see the Wardell Armstrong International Limited Technical Report for Lundin Mining, October 2007,) and many mines, including Lousal, closed. A few, such as Aljustrel, attempted to mine the base and precious metal ores. From September 1991 to March 1993, the mill at Aljustrel operated but then shut down due to operational difficulties and low metals prices.

The real story is what happened next: for 14 years, the Aljustrel Mine sat idle, even though intermittent drilling and technical studies continued.

- In 1993, an economic and technical study produced by Robertson Research Minerals Limited indicated that the mine could operate profitably.
- An October 1998 prefeasibility study was positive.
- Exploration drilling from June 1998 to May 2000.
- EuroZinc acquired the Aljustrel complex in 2001.
- In 2004, an updated feasibility study was released.
- Underground drilling for metallurgical test work in 2005.
- Lundin took over EuroZinc in October 2006.
- December 2007 production restarted.

In that 14-year period, from 1993 to 2007, the mine metamorphosed from a defunct pyrite producer to a world class polymetallic deposit. Local Portuguese miner, Almina – Minas do Alentejo S.A., purchased Aljustrel in 2009 and further invested into the mine turning it into a major copper producer.

Today, the Caveira-Lousal-Sesmarias District is where Aljustrel was in 1993. Production stopped at Caveira in the late 1960's and at Lousal in 1988. Sesmarias is a recent discovery with only scout drilling completed on the potential orebody. Data are extremely limited, especially for Caveira, and somewhat less so for Lousal. Sesmarias, even with the limited

drilling completed on the deposit, is reasonably well constrained geologically. The discovery is the result of the application of a newly-developed high-quality, geo-structural exploration model for the Pyrite Belt. Further discoveries are anticipated through the utilization of the Avrupa exploration model.

Note that all resources and speculative tonnage estimates are not NI43-101 compliant, and should be used for information purposes only.

The full size of the Caveira-Lousal-Sesmarias District (CLS) is currently unknown, but it is interpreted to be very large. Currently there are three known deposits with indications of other areas of mineralization occurring along trend. Galley et al, (2005) break out VMS deposits by tonnages, and the CLS District currently places in the bottom third of their "Very Large" Category (50-99 Mt; the "Giant" Category is 100-149 Mt). The closest deposits that compare in size are Tambo Grande 1, Peru (56.2 Mt) and Geco, Canada (58.4 Mt). However, if the potential size of the District is reached or exceeded, then the closest comparisons are: Heath Steele, Canada (69.9 Mt) and Los Frailes, Spain (70 Mt).

Deposit	Known Size (Mt)	Potential Size (Mt)
Caveira	4.1	10
Lousal	51.3	51.3
Sesmarias	2.2	10.3
Total	**57.6**	**71.6**

Table 2. Size potential for deposits in CLS district. Non NI43-101 compliant

Lousal Mine

"If we do not find any reserves of normal pyrite, which is not even excluded, I see the future of Lousal largely based on "poor" minerals. The very limited reserves of normal pyrites and the possible future of these "poor ores", make me insist on the urgency of our efforts on research both from the point of view of prospection and from the methods of concentration of minerals, mining, etc."

G. K. Strauss in 1968 noting (translated from French) that the Mine must move toward processing polymetallic ore.

History

Lousal had been exploited during the Roman period. The slag heaps, along with outcropping gossans, were re-discovered in 1882. Small-scale, intermittent production began in 1900, and in 1928, the ownership changed. The mine was modernized and principally produced pyrite for sulfuric acid from that date until its closure in 1988. As of 2017, the mine site has been turned into a museum and is run by a foundation. Avrupa Minerals, via its wholly owned Portuguese subsidiary, MAEPA Lda., now owns the mineral rights to the Lousal area.

The Lousal Mine was exploited for low sulfur pyrite; and clearly NOT for its base and precious metal content. This is interpreted in part, as due to the inability to mill and float very fine-grained sulfide ores. In the 1960's and into the 1980's, the technology for floating and concentrating copper-lead-zinc-rich, fine-grained pyritic ores was in its early stages. It was not until the 1990's that technology was developed (e.g., Isa Mill) that would allow these types of ores to be processed into high-grade concentrates.

The first modern exploration at the mine (as noted by Strauss, 1968) was undertaken in May 1962, resulting in the discovery of: "*Antonio, NW, Jose Extreme South lenses, some other small mineralization's (a total of well over 1.5 Mt!), and we also recognized the importance of diabase mineralization between the 160 and 380 levels (several million tonnes)*."

Toward the end of the mining, the technical staff began to look for other opportunities to keep the mine open. One of these was processing sulfides for base and precious metals.

Resources

Strauss and Madel, 1974 noted that: "*in the Lousal mine, whilst 18 different pyrite ore lenses being worked range in size from 100,000 to more than 3 million tons each, all show the same mineralogical composition although with changing proportions of the predominant ore minerals: pyrite, chalcopyrite, sphalerite, galena and gangue... the average chemical composition of the run of mine ore is 45% S, 39% Fe, 0.7% Cu, 0.8% Pb, and 1.4% Zn (citing Matzke 1971).*"

Leistel et al in 1998, estimated a global resource of 50 Mt grading 0.7% Cu, 0.8% Pb, and 1.4% Zn (citing Strauss and Gray, 1984 and Thadeu, 1989: see discussion below). The mineralization is dominated by pyrite with varying but subordinate amounts of chalcopyrite, galena, sphalerite, pyrrhotite, marcasite, bournonite, tetrahedrite, cobaltite, safflorite, and native gold.

The table below is extracted and adapted from the MSc. thesis of Ana Fernandes, 2011, who citing Strauss, 1970 and Matos and Olivera, 2003: provided the dimensions of the main lenses worked at the Lousal Mine. This author has added in the Estimated Width (estimated from the levels where the lens was observed) and Metric Tonnes columns. A specific gravity of 4.4 kg/m^3 was used. This number was an average of massive sulfide specific gravity taken from the October 2007 Technical Report for Lundin Mining on Neves Corvo by Wardell Armstrong International Limited. The tonnage returned via this exercise confirms the reported estimates of 50 Mt at Lousal, however the reader is cautioned that *these numbers are not NI43-101 compliant.*

Ore Body	Length (m) Max.	Max. Thick. (m)	Est. Width (m)	Tonnes (S.G., 4.4)	Shape	Remarks
Sul	100	14	55	338,800	Lenticular	Mined to the 45m level (Luís shaft)
Extremo Sul	100	14	45	277,200	Lenticular	Mined to the 30m level (Valdemar Shaft)
Central	140	25	70	1,078,000	Lenticular	Open pitted to 45m depth and pinches out 15m deeper
Oeste	70	12	70	258,720	Lenticular	Mined from surface to 60m level (Miguel Shaft and Corta Nova)
Miguel	30	8	115	121,440	Cylinder	Mined from 45 to 160m levels (Miguel Shaft and Corta Nova)
José	280	40	375	18,480,000	Lenticular	Mined from 85 to 460m levels (I and II Shafts)
José Sul	70	16	295	1,453,760	Cylinder	Recognised from 85 to 380m levels (II Shaft)
Fernando	420	26	400	19,219,200	Planar	Mined from 60 to 460m levels. At depth bifurcates into 2 lenses: 1ª Veia and 2º Veia
Mina Nova	80	20	110	774,400	??	Recognized from 190 to 300m levels: footwall of Fernando lens
Veia Nova	110	10	120	580,800	Planar and Cylindrical	Recognized from 260 to 380m levels
Norte	170	22	380	6,253,280		Mined from surface to 380m level (I and II Shafts)
Norte-Leste	40	10	40	70,400		Recognized from 220 and 260m levels
Norte Fundo	130	12	120	823,680		Recognized at 380m level
António	150	10	240	1,584,000		Recognized at level 260m
Total Estimated Tonnage				**51,313,680**		

Table 3. Estimated pre-mining global resources at Lousal. Non NI43-101 compliant.

Grades

According to the 1967 Annual Mine Report, the Mine classified sulfides into four categories:

- Pyrites
- Assafrões (Assafrãos): which are defined as concentrations of pyrite, poor in sulfur, that are intercalated with schists containing elevated percentages of silica. They are gradational into more massive silica-poor pyrite.
- Secondary Mineralization: fault-filling sulfides characterized by the presence of the mineral bournonite.
- Diabase Mineralization: is described as forming relatively large masses. This mineralization type is assumed to have a different origin from the exploitable pyrite masses. Characterized by altered diabase (mineralogy not described) and the presence of pyrrhotite.

They further divided the Pyrites into three categories:

- Pyrite with low percentages of chalcopyrite
- Cupriferous pyrite
- Complex Ore: pyrite occurring with “relatively elevated” amounts of Cu, Pb, and Zn.

As the figure at the right indicates (the assays are from three exploration holes done in the early 1970’s on the 460 Level), the ore is quite variable within the mining area. High-quality ore would be classified under pyrite but with “low” amounts of Cu, Pb, and Zn as the mine was after high sulfur and iron. Assay data on the old level maps indicates that the Mine routinely assayed for S, Fe, and Cu but no other elements.

This strongly suggests that the global resource grades provided by Leistel et al 1998, are probably biased low against Cu, Pb, and Zn, as the miners would have not assayed for these elements (e.g., old stope maps with assays for only Cu, Fe, and S). In addition, there were few precious metals assays.

Effectively, there has been little modern exploration completed at Lousal, and no directed compilation of old data until this report. This strongly suggests the presence of a “forgotten” 20-30 million metric tonnes of polymetallic sulfide material in close proximity to the old Lousal Mine. Furthermore, the exploration model built by the Avrupa team suggests the potential exists for yet-to-be discovered lenses of massive sulfide mineralization within sight of the historic Lousal headframe.

0,00 a 2,71 m - Assafrão (S - 29,02 %; Cu - 1,68 %; Pb - vest; Zn 0,16 %)
2,71 a 22,20m - Xistos pretos clorfticos

	S	Cu	Fe	Pb	Zn
22,20 a 29,70 - Pirite	43,07	0,70	39,77	0,37	0,86
29,70 a 62,50 - Pirite	46,88	0,66	42,09	1,47	3,20
62,50 a 72,00 - Assafrão	9,83	0,94	32,88	1,87	0,16
72,00 a 77,90 - Pirite	38,91	2,15	35,59	3,59	7,04
77,90 a 79,00 - Xistos pretos clorfticos					
79,00 a 79,50 - Pirite	43,28	0,50	37,79	1,06	3,01
79,50 a 80,00 - Xistos pretos clorfticos (muito fracturados)					

TERRENO :	S	Cu	Fe	Pb	Zn
0,00 a 7,20 m - Assafrão	30,91	0,66	32,67	nada	0,34
7,20 a 34,35 m - Xistos pretos clorfticos					
34,35 a 48,45 m - Pirite	44,05	0,66	40,77	0,72	3,06
48,45 a 80,60 m - Pirite	38,64	0,66	39,67	0,64	1,16
80,60 a 82,75 m - Tufo silicioso	10,37	0,21	9,88	vest.	vest.
82,75 a 113,50 m - Pirite	39,32	1,23	40,09	0,61	0,98
113,50 a 123,00 m - Pirite	34,35	1,77	35,66	0,80	1,89
123,00 a 126,20 m - Xistos pretos clorfticos					

Terreno :	S	Cu	Fe	Pb	Zn
0,00 a 6,35 m - Assafrão	27,52	0,38	-	-	-
6,35 a 15,50 m - Xistos pretos clorfticos					
15,50 a 22,90 m - Assafrão	24,48	0,23	-	-	-
22,90 a 32,30 m - Tufo silicioso					
32,30 a 51,10 m - Pirite	40,48	1,85	-	-	-
51,10 a 54,20 m - Xistos pretos clorfticos					
54,20 a 55,55 m - Pirite	47,90	0,63	-	-	-
55,55 a 66,30 m - Tufo silicioso com disseminações de sulfuretos					
66,30 a 68,70 m - Xistos pretos clorfticos.					

Figure 2. Representative grade information at Lousal.

Precious metals

Gold and silver have long been known to be elevated in this type of deposit (see the table from Leistel et al., 1998). The Romans, in particular, wanted these deposits for their silver content and after the Second Punic War, the preponderance of the silver used in their coinage came from Iberia (Westner, et al, 2017). De Olivera, et al (2013) studied two deep exploration holes drilled by Lundin at Lousal (LS08001 and LS08002) for gold, as some of the assays indicated elevated gold values (e.g., LS08001 from 732-734m that returned 13.35 ppm Au). The anomalous zone was spatially located near a quartz filled shear and has a Co-Bi correlation with the gold. They concluded that the gold had been remobilized due to tectonic activity, post formation of the massive sulfides.

This author finds it curious that the diabase mineralization observed by the Mine Geologists during the latter part of the twentieth century, and in the more recent observations by de Olivera, et al, are both described as a separate mineralizing event from the massive sulfides. This suggests that a second possibly auriferous event overprints the Lousal Deposit (perhaps similar to Rio Narcea in Spain where skarn is overprinted by an epithermal event). By implication, the diabase pyrrhotite mineralization may be very significant from both a base and precious metals perspective.

As far as this author can tell, this type of mineralization has never been adequately tested. Therefore, it provides a valid target for further exploration.

Production

Between 1946 and 1953; 1,580,462 tonnes were extracted. From the 1960's to the early 1970's the annual production was on the order of 230,000 to 250,000 tonnes per annum at an average grade of 45% S and 0.7% Cu. This author has done a back-of-the-envelope calculation using the above numbers, and assuming 340 days per year worked, starting with 250 tonnes per day production from 1900 until 1929; then from 1929 until 1945, 446 tonnes per day; then from 1946 to 1953, 675 tonnes per day; and finally, from 1953 to 1988 production averages 696 tonnes per day.

These numbers provide a total estimate of what was mined as approximately 15.1 million metric tonnes, although it is possible the amount mined could range up to 20 million metric tonnes. Still, this leaves a potential of between 30 and 35 Mt *remaining* in situ. Given a conversion factor of 70 percent of resources can be converted to reserves, 21 Mt to 24.5 Mt could potentially become reserves. Subtract 25 percent for dilution and pillars, the total *starting* tonnage is between 15 and 18 Mt, without any new discoveries.

The total depth of the workings went to the 500m level with the last underground drilling done on the 460 level.

Caveira Mine

History

Located about 11 km to the northwest of the Lousal Mine, it also was worked during the Roman period. The mine area was re-discovered in 1854 due to the wide area of the extensive slag piles and two outcropping gossans.

According to Matos et al, 2008 (citing Cabral et al, 1889):

"Roman mining remains consisted of several shafts and large volume of slag deposits (300,000 Mt estimated). Both isolated exploration shafts and twin shafts were also mentioned, especially from areas with underground waters.

Three mine water discharge galleries were found, one of them 1 km long. The main Roman mining areas were obliterated by the 19th century open pit. [In] Despite of this, the Caveira mine today is one of the best IPB sites to observe Roman mining works. Slag deposits, more than 10 tunnels (<1m^2 section), and at least one mine chamber located at the Salvador open pit can still be seen."

Caveira was intermittently exploited from 1863 until 1919. A large mine fire occurred between 1880 and 1883 due to spontaneous combustion of pyrite. Between 1936 and the late 1960's the mine was modernized and exploited principally for pyrite to make sulfuric acid (Mateus et al, 2008).

Resource

The Romans exploited outcropping oxidized mineralization estimated to average 4.5 g/t Au, 45-300 ppm Ag, and <10% Cu (Mateus et al, 2008).

In the nineteenth and twentieth centuries, a total of seven lenses were exploited by various operators: Antonio, Augusto, Canal, Esperanza, Federico, Pero-Cuco, and Salvador via six shafts: Luisa, Helena, Nova Era, and Caveira (three shafts)

Strauss about Caveira in 1968 after the mine had closed:

"As we have already mentioned, we must not lose sight of the Caveira mine. The research which has cost us so much at this mine is not yet complete, and we do not know whether there are reserves to guarantee or if there is no ore left.

For the moment, we estimate the reserves known to Caveira, as about 500,000 tons, between them a considerable quantity of complex ore, at the Louise Shaft, we have between the Lenses Canal, Augusto, Antonio and Federico, from the 55 to 105, 150, and 200m levels, about 280,000 tons of recognized reserves, with about 30-48% S, 0.2-0.6% Cu, 2.4-8.7% Pb, 2.8-13.5% Zn. The lenses seem to close towards the depths. At Helena Shaft, we have between the Salvador and Esperanza lenses, from the 80 to 110 and 150m levels, about 250,000 tons of recognized reserves, with about 40-42% S, 0.4-0.5% Cu, 1.5-1.7 % Pb, 2.0-2.7% Zn. In the deeper stretches these masses do not yet close. Their continuation towards the depth is therefore very possible.

… Caveira already has reserves for a modest but profitable exploitation of 200 t/day for 10 years! Caveira therefore deserves our attention for further exploration and possible reopening."

At this point in our research and modeling we do not have any further information, including any underground drill data, level maps, etc. While Avrupa has collar and survey data for the surface drill holes, most of the lengths of these holes

were never assayed or the data is missing. A single plan map showing tinted orebody shapes by level was used to make a three-dimensional model of the known (as of this point) ore bodies.

Effectively, no modern exploration or work has been done at this mine site. The Avrupa exploration model suggests potential for further lenses of massive sulfide mineralization within sight of the historic Caveira Mine complex, based on understanding of the sub-surface paleo-structural pattern, new interpretation of the stratigraphy and where the mineral deposits can/will occur, and surface geochemistry and geology.

Production

Production was small (estimated to be 5,000 tons Cu concentrate at 70-80% Cu for the period of 1907-1916). Between 1936 and the late 1960's the mine had an annual production of less than 100,000 tons (Mateus et al, 2008).

A published estimate of Roman production based upon the slag heap estimates by Matos et al, 2008 indicates the ancient production was 730 Kt. A best estimate of the total production at Caveira over the last 2,000 years suggests that is was approximately 3.57 Mt (possibly ranging to 5.0 Mt). 2.84 Mt was from 19th and 20th century production with the remaining 0.73 Mt belonging to the Roman period.

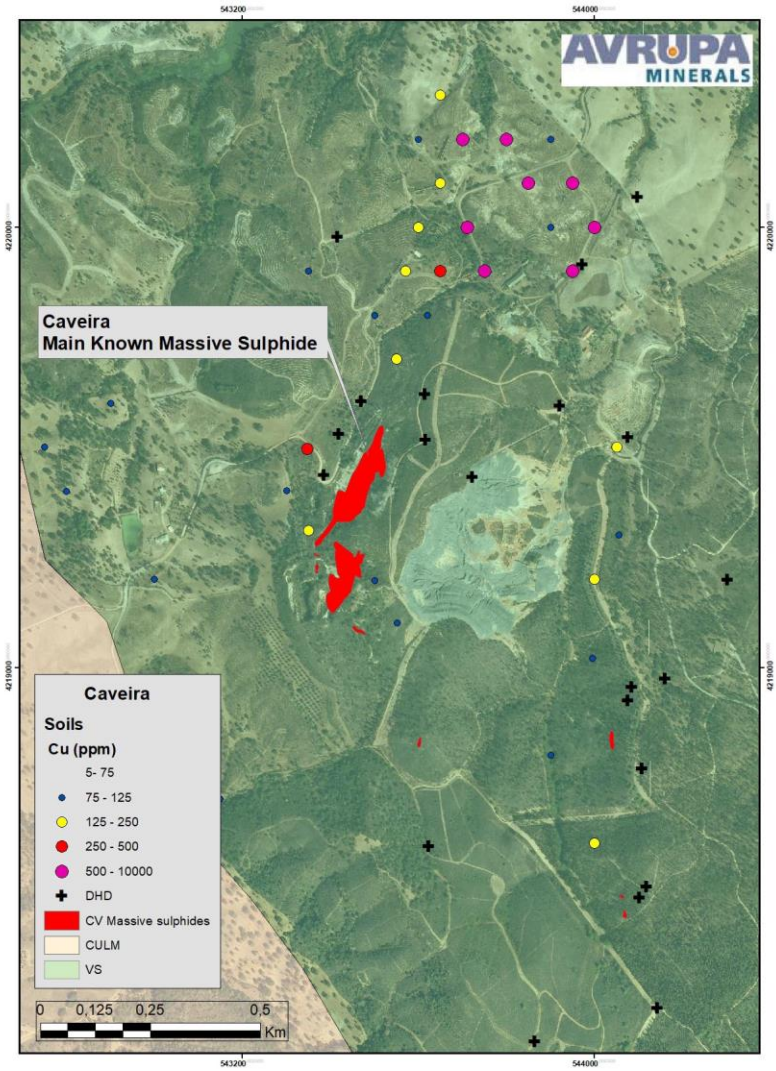

Figure 3. Plan view of the Caveira orebody. Note the possibility of northerly extension of mineralization, as Illustrated by copper-in-soils anomalism. First review of historic data also suggests the possibility of further mineralization on the east limb of the Caveira Mine syncline.

Sesmarias Discovery

History

The Sesmarias deposit (discovery hole: SES002) was discovered in early 2014 using a new geologic model based upon a detailed knowledge of the geology, geochemistry, and structure. Intermittent intercepts of massive sulfide material occurred subsequently over a 2,000-meter strike length in favorable VS host rocks. Drilling was not systematic along the full length and pierced the favorable target areas inconsistently between 100 meters to 300 meters below the surface.

Size

Five drill holes intersected the SES010 mineral body. It appears to be a steeply dipping lens open along strike to the north, but closed off to the south, west and east. The current exploration model suggests that the orebody is cut-off at depth but this concept has not been drill tested. The known mineralized dimensions are 297m strike length, an estimated thickness of 12m, and width of 140m. Using a specific gravity of 4.4 kg/m^3, the tonnage is calculated to be roughly 2.2 Mt.

Exploration Potential

If a speculative exercise were done where the strike length increased to 650m and the width to 300m (as suggested by mise a la masse geophysical surveys), keeping all other variables the same, the potential tonnage could be up to 10.3 Mt.

Strike length of the Sesmarias mineral prospect is approximately 2,000 meters. While additional lenses have not yet been identified, indications of further mineralized lenses appear along the entire strike length, based on limited exploratory drilling.

Avrupa has identified at least four further drill targets in addition to downdip, depth targets along the strike of the prospect.

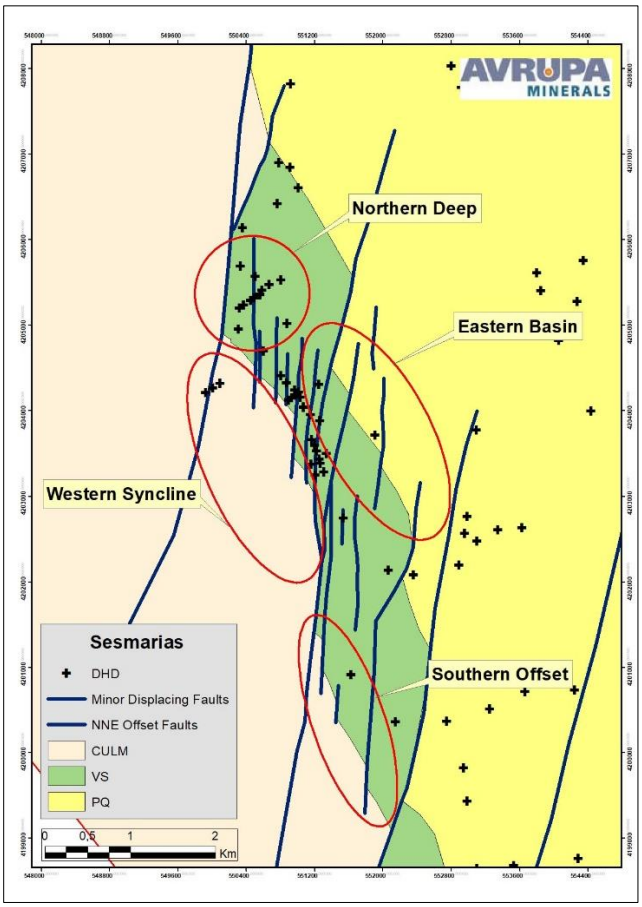

Figure 4. Summary of main drilling targets at Sesmarias, beyond the downdip drill targets along the whole strike length of the Sesmarias prospect area.

- Eastern Basin – Off-hole EM conductor suggests steeply dipping massive sulfide target.
- Southern Offset – The displacement of the SES010 massive sulfide body; target constrained geologically by previous drilling.
- Western Syncline – Structural and geophysical target; western limb of Sesmarias anticline rolls over into a syncline under younger rocks and further to the west an anticline which is "exposed" by magnetic anomaly: thus a repeat of mineralized section.
- Northern Deep – Historic drilling along a NE-SW fence shows increasing thickness and grade of semi-massive to massive sulfide material at depth; known sulfides lie in proper stratigraphic horizon, but have never been tested at depth.

Monte da Bela Vista Stockwork

Description

Located approximately 2 km north of the Lousal Mine, Avrupa discovered a zone of stockwork Cu-Zn-Pb-Au-Ag mineralization. In addition to several historic drill holes in the area, Avrupa drilled seven exploration core holes, defining a strike length of stockwork mineralization of over 1.5 km. The zone is open to the north and west, and in between the wide-spaced drilling, leaving plenty of room for discovering massive sulfide mineralization within sight of the Lousal headframe.

The figure below gives a simple view of the anomalous copper-in-soils geochemistry and how it relates to targeting of potential massive sulfide bodies.

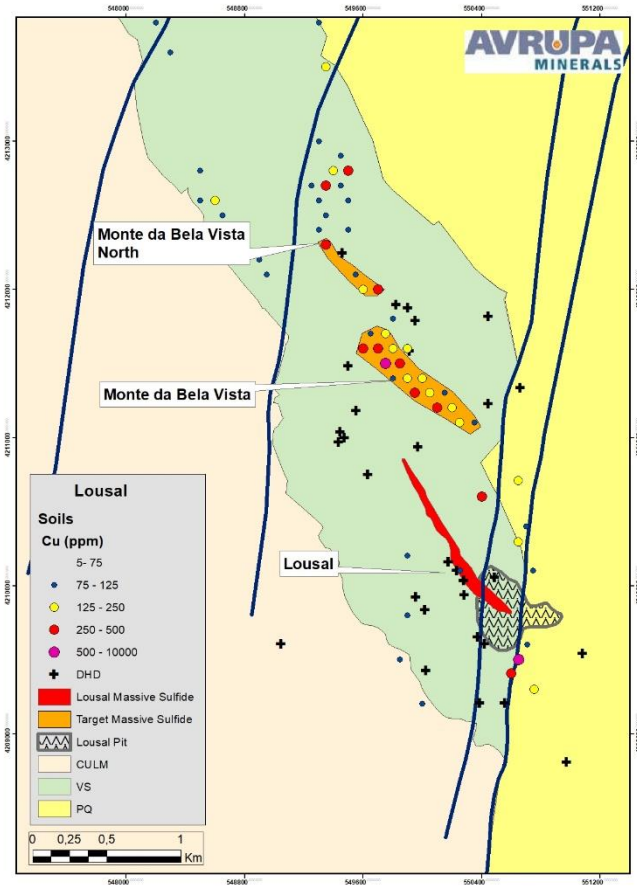

Figure 5. Summary of the main drilling targets at Monte da Bela Vista. Note that the primary targets, as outlined by soil geochemistry, lie within large areas of no previous drilling.

Exploration on the Neves Corvo Mineral Trend

After five years of exploration in the Portuguese Pyrite Belt, Avrupa constructed a multi-disciplinary exploration model based on re-processing and re-interpreting over 500 square kilometers of magnetometry and gravity surveys, re-logging and sampling of over 55,000 meters of historic core drilling, mapping of all Devonian age volcano-sedimentary (VS) and phyllite-quartzite (PQ) massive sulfide target rocks outcropping on the license, use of geochemistry (historic and our own surveys), lithogeochemical studies, vein paragenesis studies, use of ferricrete indicators, and a total re-interpretation of subsurface stratigraphy and structure. Avrupa drilled over 20,000 meters in 50+ diamond drill holes with previous partner assistance.

With this information and input from geologists, geological and mining engineers, the geo-structural model is capable of application anywhere in the Portuguese Pyrite Belt, and will lead the program to add further tonnes of sulfide mineralization in the CLS District, and further discovery of massive sulfide and stockwork mineral deposits on the Alvalade license.

<u>Caveira-Monte da Bela Vista-Lousal-Sesmarias (20 km strike length on Neves Corvo Trend)</u>

Soils

The entire area of outcropping Paleozoic rocks (Caveira to Lousal) on the Neves Corvo Trend has been mapped and soil sampled using both traditional wet chemistry and more recently, handheld XRF. The XRF copper and zinc values respond with a similar magnitude to the geochemistry, and the general targeting trend is continuous and readily visible. The areas not sampled along the Neves Corvo Trend to the southern border of the license have up to 150 meters of Tertiary unconsolidated sediments covering them.

It is clear, that further targeting is necessary on the trend between Caveira and Lousal. Here again, the Avrupa exploration model suggests that potential exists for further lenses of massive sulfide mineralization between the two past-producing mines.

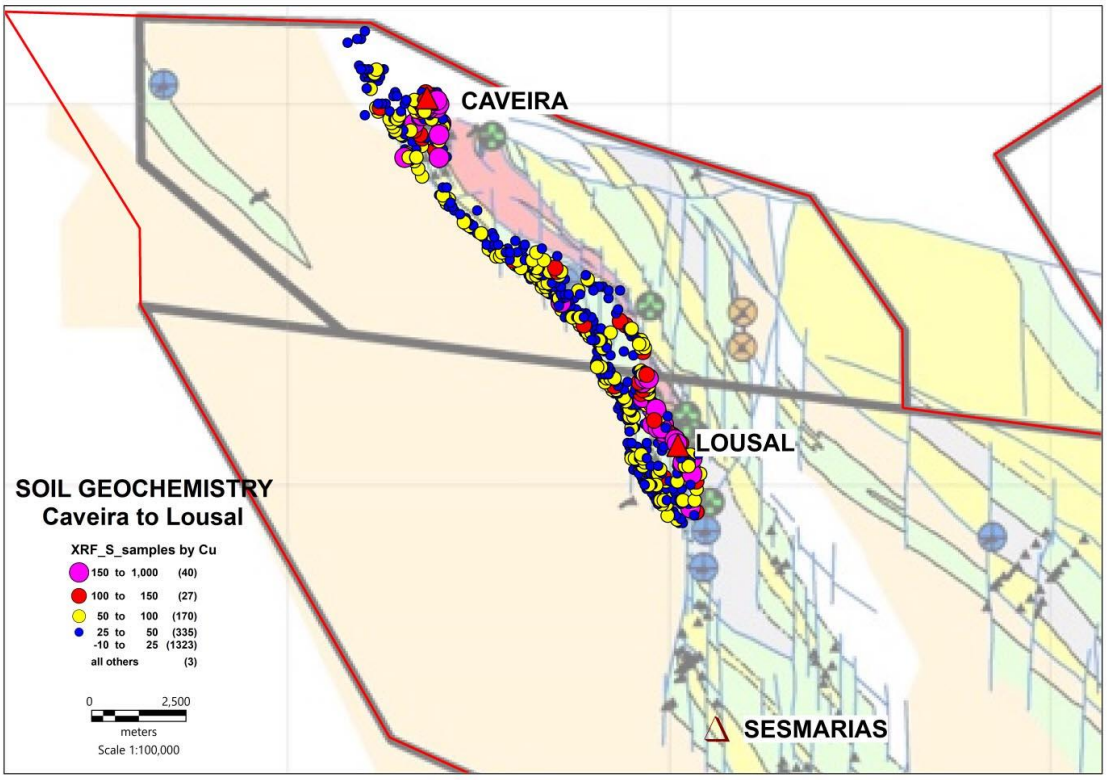

Figure 6. XRF Copper in soil samples – Caveira to Lousal trend.

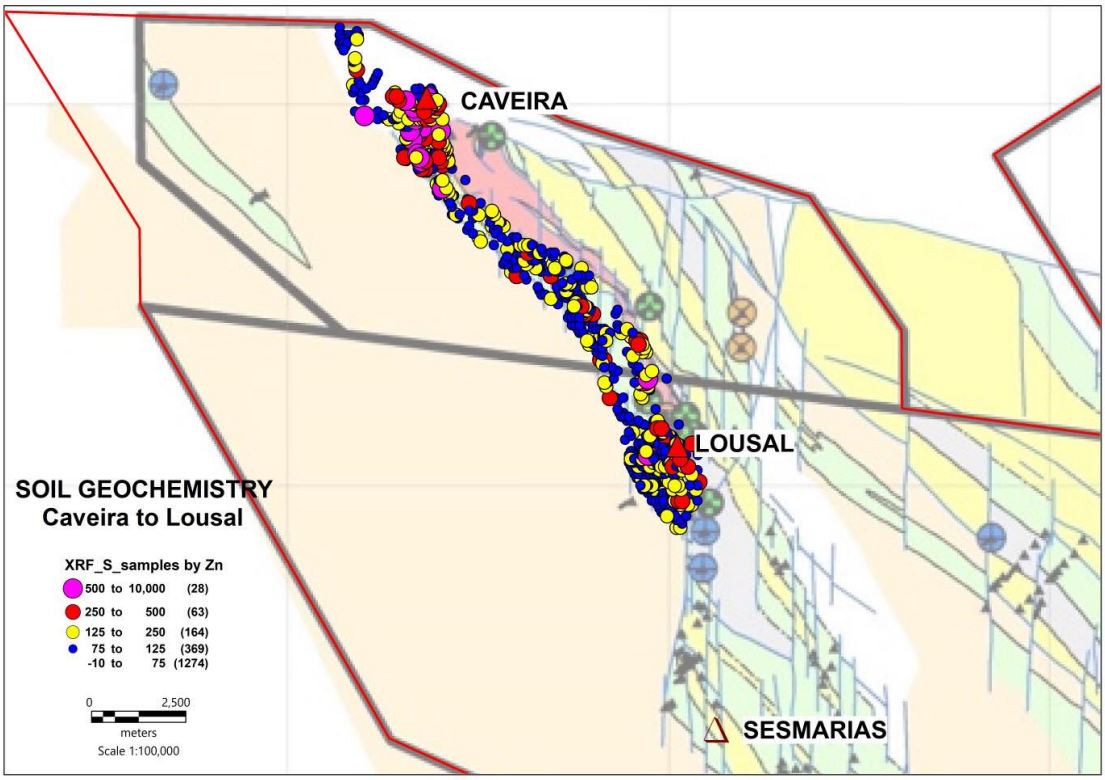

Figure 7. XRF Zinc in soil samples – Caveira to Lousal trend.

Drilling

Avrupa drilled several scout exploration drill holes between the Caveira Mine and Monte da Bela Vista. The results of the drilling at the Cabeça Gorda and Azinheira dos Barros targets identified sulfide mineralization in the target stratigraphy, and confirmed that there are further opportunities for potential massive sulfide mineralization between the two historic mines. Follow-up targeting, then drilling, will be necessary to advance the discovery possibilities.

<u>Sesmarias-Aldeia dos Elvas (license border -- 25 km strike length on Neves Corvo Trend)</u>

Targeting

Using historic geophysics, re-logging of historic core, and its geo-structural exploration model, Avrupa identified several other paleo basins (mineral traps) where potential massive sulfide mineralization may exist. The Company completed scout exploration drilling in the Pombal and Aldeia dos Elvas target areas, and further identified high-quality massive sulfide targets in both areas. Other target areas exist along the Neves Corvo Trend, but the Company has not yet drilled in these basins. A list follows Figure 6.

Further exploration potential also exists on the Aljustrel and São Domingos Mineral Trends within the Alvalade license, but little work has been done on either one of them by Avrupa/MAEPA. Historic drilling in the Furadoro basin on the Aljustrel Trend intersected disseminated copper mineralization and copper-bearing veins in several locations, but drilling was widespread, leaving room for further exploration.

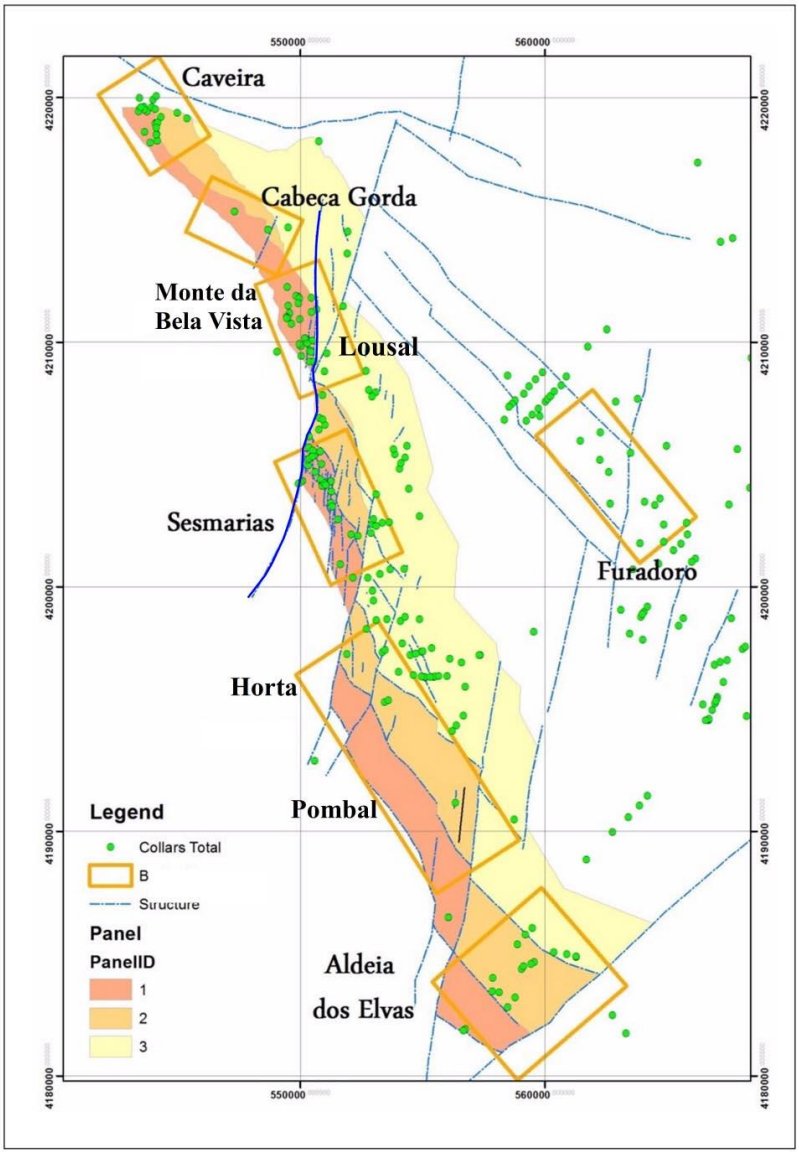

Figure 6. High priority exploration target areas along the Neves Corvo and Aljustrel Trends in the Alvalade license. Note the highlighted fault that separates and offsets Sesmarias from Lousal. It is highly important to note that the most productive panel of VS rocks in the Neves Corvo Trend is the westernmost panel (hosts Caveira and Lousal and Sesmarias). **However, this is the least explored panel in the Neves Trend on the Alvalade license.**

- Cabeça Gorda area: One drill hole; target volcano-sedimentary (VS) stratigraphy intercepted; sulfides present.
- Azinheira dos Barros area: Three scout drill holes; target VS encountered; sulfides present; geological and geochemical vectoring suggests several other drill targets.
- Monte da Bela Vista area: Seven holes drilled; structure complicated, but suggests targets for massive sulfide presence; locally anomalous Cu, Zn, Ag, and Au present over intervals of up to 10 meters.
- Sesmarias area: Four drill-ready targets off the main 2000-meter known trend; fifth set of targets are downdip targets along the entire 2000-meter strike length of the discovery zone.
- Sesmarias South area: One scout drill hole intersected disseminated sulfide mineralization at the exact target stratigraphy in unexplored VS panel; exploration vectoring techniques will identify detailed drill targets in this area.
- Horta area (northern part of Pombal): No drilling yet; proper VS panel identified from re-processing and re-interpretation of historic geophysical surveys; vector drilling necessary to determine further potential.

- Pombal area: Five scout vectoring holes drilled; target stratigraphy intersected in un-explored VS panel; geochemical vectoring and presence of veining positive; sulfide mineralization encountered; very strong target for new discovery.
- Aldeia dos Elvas area: Reconnaissance drill testing early in Avrupa project history indicates target stratigraphy is present, but needs to be re-drilled in the un-explored VS panel to the west. Anomalous gold at surface in this western panel.

Conclusions

The Iberian Pyrite Belt in Portugal is under explored and, in large part, covered by Tertiary sediments. While it is normally conceived as a single entity, it is actually comprised of three sub-belts, or mineral trends. The Caveira-Lousal-Sesmarias District is part of the southernmost trend, which in Portugal is anchored by Neves Corvo. Each of the mineral trends contains a world-class mine (in either Spain or Portugal, or both).

The Caveira-Lousal-Sesmarias District by itself is known to have a minimum of 50 Mt and has not been explored in detail. Limited modern exploration within the District indicates excellent potential to:

- Increase the known base metal resources in the District, within sight of headframes at Lousal and Caveira;
- Rebuild the old mines and re-start production from *in situ* sulfide resources, augmented by newly-discovered mineralization;
- Make further discoveries, as evidenced by the recent discovery of the Sesmarias deposit and Monte da Bela Vista prospect.

Both Neves Corvo and Sesmarias were greenfields discoveries beneath Tertiary cover. Limited windows into the Paleozoic rocks exist in this area and based upon the density of deposits in Spain, it is highly probable that a well-funded and sustained exploration program should be highly successful in finding a large (50 mt) deposit or better.

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