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Faro Phase A report draft

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Introduction

This report summarizes the results of a sectional hand calculation of the reserves of phase A of the Faro deposit. Phase A includes most of the first years mining reserves according to the latest mining plans. The major purpose of the calculation was to report reserves by bench and by ore type in order to compare with existing reserve estimates. This is currently the only estimate that uses 1984 fill in drilling as a data source.

Other reserve estimates for the phase A area are the F3 block model that has been used for mine planning by Cyprus Anvil in the past, and the T3 model that has been used for the evaluation of the Faro mine project by Kilborn Engineering. These models are described elsewhere in detail; both are based on data collected up to and including 1981, are based on the same geologic interpretation, use the same 50'x 50'x 20' high blocks and the same bench composites. The models differ in the manner of interpolation, F3 uses no geologic control on interpolation while T3 restricts its choice of assay composites to appropriate ore types.

Methods

At the outset a strictly routine sectional calculation similar to that done for Faro by Hall and Slack in 1984 was anticipated. This method while intuitive and uncomplicated makes it very difficult to report reserves by bench and especially difficult to quote a meaningful grade for a given bench.

An alternative approach that would make it possible to report results by bench was selected, this method sacrifices some of the selectivity normally possible in a sectional calculation but because of the geometry of the deposit should nonetheless give a reasonable approximation of tonnage and grade by bench.*

The geometry of the deposit was modeled by interpretation of the relevant cross-sections. The distribution of grade rather than simply lithofacies was used as a means of correlation between drillholes. To do this each drillhole log was examined for sections that met the criteria of being over 6% Pb + Zn over 20 feet or more thickness. The results showed that the deposit generally consists of an upper and lower band of qualifying high grade mineralization separated by lower grade sulphides and/or phyllitic waste. A basal unit of low grade quartzose sulphides is generally present. The deposit was only modeled between the high grade bands and the basal zone was ignored. On each section the deposit consists of a southwest area rich in high grade sulphides and with relatively minor (but not insignificant) waste, and a thicker northeast area with three high grade bands within an overall very low grade mineralized body. The northeast portion is in the upthrown block of a major east - west trending and south dipping fault (or more likely, a set of faults) on several of the sections and in plan (Fig. 1) forms a triangular area which will be referred to as the northeast wedge. The bulk of the reserves are in the southwestern area. An important diorite dyke, apparently intruded along the fault that separates zone 3 from zone 1, trends sub-parallel to and is just northwest of section 118+000. A smaller quartz-feldspar porphyry body occurs in the northeast wedge. This interpretation has generally ignored the late stage folds that

crenulate the deposit in favor of the simpler concept of nearly flat lying ore layers largely because computations are simpler and realistic handling of the folds was not possible in the time available with the current density of drilling. These folds are present and will have to be dealt with in mining but for the purposes of reserve estimation are left to be treated in the F4 model. The effect of these folds is to introduce a great deal of uncertainty into the bench reserves without dramatically influencing the overall reserves. It is important to realize that the models to be compared to the present calculation have attempted to deal with these folds.

For the purposes of computation the overall deposit geometry and limits outlined above was superimposed on a plot of the planned mining benches. The length, in cross section, along the mid-bench line from a given drillhole half way to the next hole or to the interpreted margin of the deposit (or the phase) plus the length to the next hole or edge of deposit in the opposite direction along section was measured. Similarly the strike length northwest and southeast of the section was estimated. For most cases this strike length was half way to the next section but at the edges of the phase A pit and particularly northwest of section 118+000 a shorter length was used depending on the local geometry. The volume of a portion of the deposit on a given bench to be influenced by a given drillhole was estimated by computing the product of the cross-sectional length, the sum of the northwest and southeast strike lengths and the bench height (which in most cases was 20 feet but at the top or bottom of the deposit might be less depending on the local situation). All measurements recorded in feet and the volumes converted to cubic meters. The tonnage of these volumes was calculated by multiplying the volume by the measured pulp specific gravity. These data and calculations are given in Tables 1A to 1C. This method produces a crude approximation to the volume of the deposit. It must be borne in mind that this S.G. is always greater than the insitu rock S.G. since there is no allowance for porosity. Studies on the Anvil District deposits suggests that the overestimation of S.G. is on the order of 5% but can average as high as 10% for the more vuggy massive sulphides. This correction to tonnage is not accounted for directly in any of the mine models quoted here and is one of the major factors contributing to the various corrections that have been applied to Anvil District reserves over the years.

A set of assay (including measured pulp S.G.) composites by bench had already been generated for the interim computer model of Zone 3 (the FI model). These composites were used for this reserve estimate as well. The composites use all available drill data and are calculated by weighting assays by length of an assay interval within a given bench and the measured specific gravity of the individual assay intervals. The composites are based on the length along the drillhole and only consider the portion of the drillhole that is within sulphides, thus most composites are over a length of 20 feet but in a few inclined holes may be marginally longer and at the margins of the deposit the composites are generally shorter than 20 feet. Where internal waste is less than a bench height the waste is assigned zero assay values and these values are used to compute the composite grades. In order to avoid biasing a large volume of ore by an unusually high assay the top 5% of the assays were reduced to the 95th percentile; similarly once the composites were calculated they were rolled back to the 95th percentile. All computer based mine models of the Faro deposit follow a similar procedure. The

composite data used in this calculation is listed in Tables 1A thru 1C; a complete listing of the composites can be found in the planned documentation for the Faro interim model.

The computations were carried out on a spreadsheet that was capable of summing the tonnage of blocks above a given Pb + Zn grade and computing an average grade of this tonnage. The results of these calculations are presented in terms of cutoff grade.

Results

The result of this calculation is presented in Table 2 and compared to the results of other reserve estimates for the same volume of the deposit. On the basis of total contained metal this calculation compares favorably to the T3 model, this is due to indicating a smaller number of tonnes of higher grade. On a bench by bench basis the two estimates do not compare well; below the 3550 bench (where 74% of the tonnage is) the current estimate tends to show both a smaller tonnage of ore and a slightly smaller total contained metal content than the other models. Above that area largely in the area of the northeast wedge, there is a larger tonnage and correspondingly larger amount of contained metal.

The striking lateral zoning of the deposit is quite apparent in the cross sections. The northeast portion of the deposit poses difficult questions for the overall economics of the deposit since the cost of incremental stepouts to the northeast is high due to increasingly uncertain and likely difficult ground conditions as well as the lower slope already used there. The viability of the northeast part of the deposit is clearly a question for a pit optimization program and work is already underway that will help evaluate this area. The northwestern part of the northeast edge of the deposit (on sections 118 and 119) shows much better development of high grade zones than the sections toward the southeast. These volumes are relatively close to the present pit surface (beneath the present west ramp) and can contribute significantly to the first years production however the analogous volumes on sections 120 and 121 may not be worth extraction.

The geometry and asymmetry of grade distribution in the deposit suggested at first glance that it would be desirable to shift phase A southwest by about 200 ft (to the southwest ultimate pit limit). This appears to be reasonable in cross section from a stripping ratio and grade view but it looks to be very difficult to maintain access to a pit and may not be viable.

There is a relative abundance of phyllitic waste in the upper half of the central part of the deposit. This material is weakly mineralized and has been logged variously as 2CD, 2B6, 1D4, 2L, 1H4* or 1F; a characteristic of this material is that it contains a low but definitely unusually elevated BaO content. Much of this material appears to be an altered mafic sill, such a rock type should be expected to contain talc and this waste type may create problems in the mill. The rock will be light colored like the bleached schist surrounding the deposit and should be easily distinguished from ore. It may be necessary to take special measures to avoid milling or stockpiling this material on the 3550 through 3450 benches of phase A. Some of this rock type was included in the 2BCD ore type in the F3/T3 model thus blocks of that ore type especially if containing an elevated BaO content should be viewed with caution. This rock type will be found throughout the Zone 3 pit and

equates to the waste bands between horizons 2 and 3 in the F4 modeled part of the deposit but is thicker there.

Pyrrhotitic ore types (2H) proved to be surprisingly abundant in the upper part of the southwest portion of the deposit (particularly between long. sections 20 and 22). This ore type appears to be spatially related to the waste rocks mentioned above but reaches its maximum development a few hundred feet to the southwest. The T3/F3 models predict about 8% of the reserves in the A phase to be pyrrhotite bearing. Overall this looks reasonable but locally there will be a higher percentage (perhaps as high as 30%) particularly in the deeper benches of the southwest part of the phase. This part of phase A does not appear to be significantly different from the extended JB phase in its pyrrhotite content (nor from the remainder of Zone 3).

In summary there appears to be no indication that the previous computer models have grossly misrepresented the reserves of the A phase. There are problematic ore and waste types in the phase but they are not peculiar to this part of the deposit and the phasing does not appear to have unduly increased exposure to this material (although it would be possible to inadvertently do so). The banded and asymmetric nature of grade distribution in the deposit comes through clearly on the sections and I can only reiterate previous recommendations about the need for careful grade control and the hazards of viewing the Faro deposit as a homogenous mass of ore.

* Table 4 compares the cross-sectional areas of volumes considered to be +6% mineralization by this method with those the area interpreted using the criteria that a qualifying drillhole ore intersection must be +6% over 20' or more and these intersections are connected to define volumes of +6% ore. The grade and SG of this mineralization is expected to be higher than the average of +6% ^{bench} composites thus overall the two methods probably would compare favorably. This ^{additional sectional} calculation could be finished in a few days but I haven't been able to get enough disk space on the Computer ^{to calculate the composites} and elected to give priority to the interim Faro model.

Table 4

Comparison of Planimetered ^{cross-sectional} area of selectively defined highgrade bands with ^{cross sectional} area of bench defined rectangular ~~areas~~ ^{blocks} corresponding to composites of greater than 6% Pb+Zn

Section No.	Area (ft ²) by rectangles	Area (ft ²) by planimeter	Δ (sq ft)	Δ %
118	97280	88650	- 8630	-8.9
119	62801	49475	- 13326	-21.2
120	38400	35960	- 2440	-6.4
121	27462	25275	- 2187	-7.7
<u>Total</u>	<u>225943</u>	<u>199360</u>	<u>- 26583</u>	<u>-11.8%</u>

3650	536776		2815	537371	7777
3670	559698	5556	1661	566915	0
3690	560555	11111		571666	0
3710	572014	24870		596884	0
3730	568012	31833		599845	0
3750	530062	56870		586932	0
3770	471384	120111		591495	0
3790	405280	219648		624928	0
3810	357331	267407		624738	0
3830	407703	269424		677127	0
3850	438453	242437		680890	0
3870	51630	83111		134741	0
3890	44744	77966		122710	0
3910	37566			37566	0

8322136 1410344 514826 10247306 4457848 0

Bench	UNKN S ²		ORE		Pb	Zn	Ag	Cu
	Tons	Yds	Yds	Tons				
3750	7110	1917	—	—				
3730	—	—	6115	20916	4.00	4.82	58.4	0.11
3710	—	—	30128	102133	3.08	5.80	40.7	0.14
3690	1154	465	21988	72131	2.38	5.81	43.6	.10
3670	—	—	16351	58681	4.06	5.45	43.8	.17
3650	12571	4531	12378	44182	3.87	4.58	46.0	0.19
3630	6006	2113	40341	138622	3.31	4.85	37.0	0.13
3610	680	274	79677	256667	2.84	5.13	25.2	0.13
3590	32673	12328	34943	115346	2.84	5.73	21.7	0.11
3570	22816	7407	20032	61724	2.41	5.14	23.3	0.11
3550	6482	1852	98280	319935	3.36	5.33	41.4	0.18
3530	—	—	184233	622879	3.67	5.55	39.8	0.17
3510	—	—	201212	708199	4.01	5.75	46.4	0.17
3490	—	—	125799	454692	4.38	5.74	52.5	0.20
3470	—	—	104906	355662	4.17	5.71	53.2	0.18
3450	—	—	124984	412652	3.39	4.95	42.7	0.19
3430	5259	1852	84283	298984	2.98	4.45	31.8	0.24

94744	32779	118,5649	4,043,406	3.63	5.37	41.9	0.17
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Tons metal = 363,907

T₃ at 6.00% Phase A

3.63
5.37

9.00

A phase

Bench	comments		
3830	nothing		
3810	v. minor 117 → 118		
3790	nothing at all!		
3770	minor 117 → 118 + 3 blocks on 119 (@10%)		
3750	minor low grade 117 → 118		
Northeast Wedge	3730	NE ENDS of 117 → 120 v.v. patchy basically the upper band	
	3710	NE ENDS of 117 → 120 120 (v. patchy)	
	3690	NE ENDS of 117 → 121 (could live w/p 121)	possible one 26lk SE of dule on 117 H ₂ O
	3670	NE ENDS of 117 → 121 (could live w/p 121)	" 46lk H ₂
	3650	NE ENDS of 117 → 121	
	3630	NE ends of all sections from 117 → 122	
	3610	NE ends "	" part of wedge NE of pit minor low grade 116 @ 11% SE of E. dule at SW end
	3590	" "	" "
	3570	" "	" starting to skim top of main zone 2 blocks of H grade on 117 middle of main
	Hairpin Area Problem	3550	most sections 117 → 122 seeds of 118 → 120 still above one
3530		most sections 117-122 (seeds of 118 → 120 still above one)	hair pin on good grade!
3510		all sections have lots of one (but seeds of 119 + 120)	lots of grade under and N of hair pin
3490		all sections solid one (but for a bit of 120)	grade below hair pin when NW drops to zilch
3470		all sections 118 → 121 in solid one	some + 6% under ramp NE wedge dying; low grade
3450		"	" "
3430		"	" NE wedge basically shut but for basal band
3410	"	" "	
3390	118 on is still one but below A phase.	46 blocks of > 4% in NE wedge	
3370	118 → 124 in one but below A phase.	NE wedge basically gone.	

extended JB tonnages (3890 - 3750 incl)

① F4 model + blastholes on 3890

3890 - 3750

858, 887 SDT

Pb Zn Ag

3.8 6.1 52.4

② F3 model

1,039,950 ± SDT

extended JB ore composition from F4 model + blastholes (%)

	A	A+BCD	H+E+H	CE	EF+G
3890	18.5	44.7	-	-	55.3
3870	4.4	54	26	-	20
3850	15.4	36	55	9	9
3830	6.2	39	55	-	6
3810	6.9	52	33	-	15
3790	12.1	37	19	-	44
3770	9.3	34	31	-	35
3750	0.7	21	45	-	34

F-3

OR6 SUMMARY

1 Phase NB Wedge

6% / 0

	(7)	(8)	(9)	(10)	(11)	(12)	
bench	2A	2BCD	2EC	2EF	2H	2G	Total
3750	—	—	—	—	—	—	—
3730	—	7064 @ 9.1	—	—	—	13852 @ 10.7	20916 @ 9.8
3710	9919 @ 8.0	16278 @ 7.3	16383 @ 8.5	51623 @ 7.8	—	25165 @ 11.4	129368 @ 8.6
3690	20547 @ 9.5	—	27762 @ 7.9	27038 @ 7.9	—	20779 @ 9.1	96126 @ 8.5
3670	—	—	—	39403 @ 10.9	—	20779 @ 7.3	60182 @ 9.7
650	—	5426 @ 11.8	—	13519 @ 7.2	—	—	18945 @ 8.5
3630	11586 @ 6.7	8262 @ 8.3	7428 @ 7.1	13519 @ 9.8	—	27705 @ 8.6	68500 @ 8.3
3610	1423 @ 8.3	59825 @ 7.6	11896 @ 8.7	60835 @ 9.0	—	27705 @ 9.0	261684 @ 8.6
3590	20377 @ 7.9	59685 @ 6.6	75789 @ 9.5	27038 @ 8.1	—	—	182689 @ 8.2
	<u>73652</u>	<u>156540</u>	<u>239258</u>	<u>232975</u>	<u>—</u>	<u>135985</u>	<u>838410</u>
	8.9%	18.7%	28.5%	27.8%	0%	16.2%	

T-3

3750	—	—	—	—	—	—	—
3730	—	7064 @ 6.5	—	—	—	13852 @ 10.0	20916 @ 8.8
3710	19919 @ 10.4	5426 @ 6.3	—	51623 @ 8.0	—	25165 @ 10.0	102133 @ 8.9
370	19296 @ 8.8	—	11779 @ 8.3	20278 @ 9.2	—	20779 @ 10.0	72131 @ 9.2
3670	—	5426 @ 6.9	—	39403 @ 10.9	—	13852 @ 8.1	58681 @ 9.5
3650	—	5426 @ 8.9	—	24904 @ 8.7	—	13852 @ 7.7	44182 @ 8.4
3630	—	2836 @ 7.3	60432 @ 6.4	33797 @ 8.8	—	41557 @ 10.2	138622 @ 8.1
3610	—	81528 @ 7.1	100118 @ 7.4	47316 @ 9.4	—	27705 @ 10.2	254667 @ 8.0
3590	—	5426 @ 6.7	75789 @ 8.6	20278 @ 7.6	—	13852 @ 10.2	115346 @ 8.5
	<u>39215</u>	<u>113132</u>	<u>248118</u>	<u>237599</u>	<u>—</u>	<u>170614</u>	<u>808678</u>
	4.8%	15.0%	30.7%	29.4%	0%	21.1%	