196

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CURRENT RESERVES - P I Clarke

The reserve estimates used for mine planning in this evaluation is taken from a Cyprus Anvil Mining Corporation (CAMC) created computer model of the deposit. An analysis of the data available and the time allocated for this report showed that the last reserve estimates for use were those derived from a 'T-3' model. This is a change from the 'F-3' reserve estimates that the previous reports by Pincock, Allen and Holt have used.

The latest CAMC model 'F-4' has been constructed for approximately only the northern half of the remaining reserves and is therefore not possible to use. (Partial use of this model would have involved considerable complexity in estimating reserves and it has therefore not been used at all other than in a comparative capacity.)

The only other model available is a 'hard calculated' section model created by Dome.

The available models and their major attributes are:

F-3: Computer block model; complete remaining reserves, latest drilling included 1981; no geological control on interpolation; used by P.A.H.

T-3: Computer block model; complete remaining reserves; latest drilling included 1981; geological control on interpolation; improvement on F-3 model.

F-4: Computer block model; only southern half of remaining reserves; latest drilling included 1982; geological control on interpolation; superior modeling technique to F-3 and T-3.

DOME: 'Hard calculated' section model; complete remaining reserves; latest drilling included 1984; geological control on interpolation.

The main reason for using the T-3 model is that it is the only computer block model of the complete remaining reserves with geological control on the interpolation process.

The Dome model was not used partly because it is a section model and partly because no reserve, inventory is available by rock type and grade, by bench, by mining phase.

The main disadvantage in the use of the T-3 model is that it does not include the 1982, 1983 and 1984 drilling data. (The T-3 model is based on the same geological interpolation and data as the F-3). Given the time frame for this evaluation the T-3 reserve estimates are generally the best usable data and is considered to be reasonable to use for this evaluation.

The in-site estimates for the Faro mine are listed on Table____.

The reserve estimates adjusted for dilution losses and other factors to quote as mill feed are listed on Table ____.

TABLE

CYPRUS ANVIL FARO MINE
IN-SITU ORE RESERVES

	Tonnage	%Pb	%Zn	Ag g/MT
Geological Reserves 4.0% cut-off Pb+Zn (F-3)	33,000	3.0	4.6	36.0
Open-pit Minable reserves 4.0% cut-off Pb+Zn (T-3)	23,824	3.1	4.6	38.0
Open-pit Minable reserves 6.0% cut-off Pb+Zn (T-3)	17,222	3.5	5.2	42.0
Stockpiles				
Oxide	1,363	2.9	4.7	37.6
CFSP (Crusher feed)	22	2.2	3.3	33.0
Total of 6.0% cut-off Minable reserves and stockpiles	18,607	3.4	5.2	41.7

Minable reserves quoted in the evaluation do not include material under the main pit ramp and the north-east wall. This amounts to approximately 3-4 million tonnes of 8% lead plus zinc.

TABLE

CYPRUS ANVIL FARO MINE
MILL FEED ORE RESERVES

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT
Open-pit Minable reserves 4.0% cut-off Pb+Zn (-5% off grades) (T-3)	23,824 (23,782)	2.9 (2.9)	4.4 (4.4)	36.2 (36.3)
Open-pit Minable reserves 6.0% cut-off Pb+Zn (-5% off grades) (T-3)	17,222 (17,178)	3.3 (3.4)	4.9 (4.9)	39.9 (40.1)
Stockpiles				
Oxide	1,363	2.9	4.7	37.6
CFSP	22	2.2	3.8	33.0
Total of 6.0% cut-off Minable reserves and stockpiles	18,607	3.3	4.9	39.7

UNDERGROUND RESERVE POTENTIAL

The western portion of the remaining reserves dips out of the open-pit limits and becomes unrecoverable by surface mining due to a high stripping ratio.

This material is approximately 2 million metric tonnes and is quite high grade at 13% combined lead plus zinc and 71 g/tonne silver.

A feasibility study would be required to investigate this potential further. This reserve could be recovered by underground mining using a decline from the open-pit.

METHOD OF CALCULATION

Model T-3 Calculation Method

The drilling grid over the Faro deposit rotated 45° to North-South with section lines 140 feet directions of the orebody. Diamond drill hole (DDH) spacing varies over the deposit from a close of 140 feet to a maximum of 280 feet.

Many drill holes have been surveyed with a Sperry-Sun single shot camera to determine their down hole paths. Recovery in the mineralized zone averages around 95%. Logs have been made of lithology and structure and split core samples taken of an average, 5 feet in length.

The geological interpolation on which the T-3 model is based is not the latest geological interpolation of the deposit. CAMC has been working on this and has re-logged some sections in detail and incorporated them into the latest F-4 model. Not all DDH's have been able to be logged at this time and F-4 is incomplete so requiring the T-3 model to be used. The DDH coverage over the deposit is such that the T-3 geological interpolation should be substantially adequate for the evaluation.

The T-3 model carries six different ore rock types respective statistically determined average densities. Drill hole data is composited over 20 foot bench intervals using smaple length and density weighting. DDH composites are assigned predominant geology codes.

The interpolation method used is an elliptical ? distance squared method requiring matching of DDH composite geology codes to the blocks geology codes. The block size carried in the model is 50 feet by 50 feet by 20 feet high. For those blocks not assigned a grade in interpolation in the first pass because no matching geology codes were located, a record pass is made with relaxed matching rules in order to assign them grades.

This overall process gives a reasonably realistic assignment of grade according to ore type and is a definate improvement over the F-3 modeling processs. (the F-4 interpolation method is a further improvement on the T-3 model).

Zn general the T-3 model at this time provides the most comprehensive estimates of the remaining reserves. Grade estimates from the F-3 and T-3 models are normally reduced by 5% of their value by CAMC to compensate for historically determined differences between model predicated grades and actual production mill feed.

ACCOUNTABILITY

Comparison of the T-3 and F-3 Models

Comparison of model reserve estimates to past production data are generally the best methods of estimating the reliability of models. Since past productive data has only been compared to the F-3 model it was necessary to compare the T-3 to the F-3.

T3/F3 Comparison
Open-pit Minable reserves
6.0% cut-off Pb+ZN

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT	Pb+Zn	Metal $\times 10^3$
FI	15,641	3.46	5.17	45.9	8.63	1349.8
F-3	18,445*1	3.3	4.8	39.8	8.1	1494.0
(-5% off grade)	(18,571)					
T-3	17,222*2	3.3	4.9	39.9	8.2	1412.2
(-5% off grade)	(17,785)					
%Variance ($\frac{T3-F3}{F3} \times 100$)	-7	0	+2	0		

*1 The F-3 estimate does not include 125,000 DMT of 'unknown' tonnage.

*2 The T-3 estimate does not include 563,000 DMT of 'unknown' tonnage.

'Unknown' tonnage refers to tonnage geologically interpolated to sulphide bearng but not assigned grades in interpolation.

T3/F3 Comparison
Open-pit Minable reserves
4.0% cut-off Pb+Zn

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT	Pb+Zn	Metal X10³
FI	21,936	3.00	4.53	39.2	7.53	1651.8 -11% to F3
(-5% off grade)	25,373*3	2.9	4.4	36.4	7.3	1852.2 -6 to F3
T-3 (-5% off grades)	23,824*4	2.9	4.4	36.2	7.3	1739.2
% Variance F3 vs T-3 $\left(\frac{T3-F3}{F3} \times 100\right)$	-6	0	0	0	0	

*3 The F-3 estimate does not include 126,000 DMT of 'unknown' tonnage.

*4 The T-3 estimate does not include 563,000 DMT of 'unknown' tonnage.

In general the T-3 model estimates lower tonnage with similar or slightly higher grades.

Comparison of the F-3 Model with Past Production

The following comparison is between the F-3 model and past production for 1980 and 1981 which was mainly from the Zone 2 deposit. The Zone 2 deposit was on the margin of the main deposit and generally thinner in nature. Therefore while it is in some respects different to the main deposit it nevertheless represents the majority of production source for the two year period to shutdown.

Model F-3/1981 Production Comparison

	Tonnage	%Pb	%Zn	Ag g/MT
F-3 (unadjusted)	2931	3.0	5.1	35.1
Blastholes (BH)	2747	3.0	4.8	40.3
Metallurgical Balance (MB)	2703	2.9	4.9	34.3
% Variance F-3 vs BH $\left(\frac{F\text{-}3 - BH}{BH} \times 100\right)$	+7	0	+6	-12
% Variance F-3 vs MB $\left(\frac{F\text{-}3 - MB}{MB} \times 100\right)$	+8	+3	+4	+2

Sources of production for 1981 were from Zone 2 until May and from the main deposit for the remainder of the year.

Model F-3/1980 Production Comparison

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT
F-3 (unadjusted)	3096	3.0	4.6	43.7
Blastholes (BH)	3043	2.9	4.4	44.2
Metallurgical Balance (MB)	2825	3.0	4.5	42.5
% Variance F-3 vs BH $\left(\frac{F\text{-}3 - BH}{BH} \times 100\right)$	+2	+3	+4	-1
% Variance F3 vs MB $\left(\frac{F\text{-}3 - MB}{MB} \times 100\right)$	+10	0	+2	+3

Source of production for 1980 was mainly from Zone 2.

The F-3 production comparison shows that:

1.) The F-3 tended to overpredict tonnage.

2.) The unadjusted F-3 grades tended to be higher than blasthole and metallurgical balance grades. (During 1980 and 1981 F-3 grade estimates were reduced by 5% by CAMC before quoting them as mill feed.)

Taking the T-3 versus F-3 comparison and putting that against the F-3 versus production comparison indicates that:

1.) The T-3 predicts less tonnage than the F-3 by an amount the production comparisons show as being relatively correct.

2.) The T-3 grades are slightly above the F-3 grades. If the T-3 grades being slightly higher were reduced by 5% (as the F-3 grades were) they would compare quite well to previous production comparisons of the metallurgical balance grades.

(Undiluted in-situ blasthole grade estimates are normally higher than metallurgical balance grades which are normally the best estimate of mill feed grades having been derived from many samples taken in the mill).

This indicates that the T-3 model should not be in much error.

Comparison of T-3 Blasthole Grades in Zone I

A comparison was made between the T-3 model and an area of 450' by 400' on three benches of sulphide mineralization in the part of the main deposit already mined.

This area consisted mainly of massive sulphide mineralization and minorly of quartz sulphide mineralization. Blastholes were overlaid on the block grid used for the model, and blasthole grades within a block were combined to estimate the grade for that block. Blocks were then totalled and compared to the T-3 model estimate for the same volume. This was done for a 4.0% Pb+Zn cut-off and a 6.0%.

The tonnage factors used to estimate the blasthole tonnage were taken from statistically derived factors used in the F-3 and T-3 models. This comparison is then primarily a grade comparison of in-situ grades and not a tonnage comparison.

In-situ T-3/Blasthole Grade Comparison Zone 1
4.0% cut-off Pb+Zn

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT
T-3 (unadjusted)	1,273	2.66	4.49	-
Blastholes (BH)	1,261	2.64	4.35	-
% Variance T-3 vs BH $\left(\frac{T\text{-}3 - BH}{BH} \times 100\right)$	+1	+1	+3	-

6.0% cut-off Pb+Zn

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT
T-3 (unadjusted)	957	2.92	4.75	-
Blastholes (BH)	914	2.99	4.89	-
% Variance T-3 vs BH ($\frac{T-3 - BH}{BH}$ X100)	+5	-2	-3	-

This comparison shows that the Model T-3 grades compare very well with the blasthole calculation grades. This indicates that the T-32 grades are near correct and only need to be reduced to make allowance for mining dilution etc. before quoting as mill feed.

Comparison of F-4 and T-3

The following comparison is between the T-3 and F-4 models (the F-4 having 1982 drilling included) for the total of the earlier south to north NA, OA, PA phases at 4.0% cut-off PB+Zn. The F-4 model is constructed with improved geological interpretation and modeling technique over that used for the T-3. The 1982 drilling program consisted of 24 DDH's.

F-4/T-3 Comparison Phases NA, OA, PA
4.0% cut-off Pb+Zn

	Tonnage DMT 000's	%PB	%Zn	AG g/MT
F-4 (+5% off grades)	3940	2.7	4.4	35.4
T-3 (-5% off grades)	3945	2.6	4.1	33.7
% Variance T-3 vs F-4 ($\frac{F-4 - T-3}{T-3}$ X 100)	0	+4	+7	+5

The F-4 model estimates similar tonnage but at higher grades. This could be due to a combination of the additional 1982 drilling data, revised geological interpretation and different modelling technique. The modelling technique used by the F-4 would probably estimate higher grades than that in the T-3.

1983 Drilling

The 1983 drilling program was mainly carried out in an area to the west of the open-pit to estimate future underground potential in that area. While the 1983 program consisted of 22 DDH's it should not generally affect the open-pit reserves.

Comparsion of Dome Section Model Before and After

1984 Drilling

The 1984 drilling consisted of 28 DDH's.

Dome Model Before and After 1984 Drilling
Minable Reserves 4.0% cut-off Pb+Zn

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT
Dome Model Before 1984 drilling (DB) (unadjusted)	22,738	3.2	4.9	40.8
Dome Model After 1984 drilling (DA) (unadjusted)	22,610	3.2	4.9	41.3
% Variance $\frac{(DA - DB \times 100)}{DB}$	-1	0	0	+1

Based on this information the 1984 drilling indicates a slight decrease in tonnage with similar overall grades.

Comparison of T-3 to Latest Dome Section Model

T-3/Dome 1984 Model
Open-pit Minable Reserves 4.0% cut-off Pb+Zn

	Tonnage DMT 000's	%Pb	%Zn	Ag g/MT
T-3 (unadjusted)	23,824	3.09	4.60	38.05
Dome (D) (unadjusted)	22,610	3.16	4.93	41.3
% Variance D vs F-3 $\left(\frac{D - T\text{-}3}{T\text{-}3} \times 100\right)$	-5	+2	+7	+9

The Dome model therefore indicates a decrease in tonnage and an increase in grades.

Conclusion

To recap the following points that have been shown in this section:

1.) The F-3 model tended to overpredict tonnage.

2.) The F-3 unadjusted grades tended to estimate higher grades than production metallurgical balance grades.

3.) The T-3 moddel estimates lower tonnage than the F-3 with similar or slightly higher grades.

4.) If the T-3 tonnage estimates are not adjusted and the grades are reduced by 5% before quoting as mill feed the T-3 estimates would compare well relative to F-3 comparisons with previous production.

5.) The T-3 grades compare well to blasthole calculated grades for an area already mined in the main deposit.

6.) The F-4 model with 1982 drilling indicates no significant change in tonnage but indicates higher grades. This is due at least in part to a revised modeling technique.

7.) The 1983 drilling was generally done to the west of the open-pit and so does not affect its reserves.

8.) The 1984 drilling indicates a slight decrease in tonnage with no significant changes in overall grades.

9.) The Dome section model with all drilling included indicates a decrease in tonnage relative to the T-3 and increase in grades.

Of particular note is that the F-4 and Dome models indicate similar or less tonnage relative to the T-3 and an increase in grades. These models suggest then that there is a potential for grades to be higher than estimated by the T-3 model.

A comparison of the F-4 and Dome models to blasthole data would be worthwhile to better establish their figures. Meanwhile at least, the T-3 model seems to be the most acceptable model for use in this evaluation.