RECONCILIATION - BLASTED - MILLED

D.T.

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C U R R A G H R E S O U R C E S I N C

INTEROFFICE MEMORANDUM

FARO OFFICE

Date: October 10, 1990

TO: WM. W. DUNN
CHIEF ENGINEER

FROM: DAVE TENNEY
CHIEF GEOLOGIST

SUBJECT: **STATISTICAL ANALYSIS OF MILL HEAD GRADES AND BLASTHOLE PREDICTED CRUSHER FEED GRADE**

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Introduction:

Published Mill Head Grades for the period April 10 to July 6/90 were compared with blasthole grades for a similar period with a with a view to establishing a linear regression relationship between the two. However, the published blasthole estimate of the mill head grade is for feed to the primary crusher, and there will be a lag time before that grade gets to the end of grinding circuit where the head grade is measured by the mill (the lead rougher feed). This lag time must be established before any meaningful linear regression relationship can be established.

Method:

Six tables of data were set up each containing only two variables: the published lead rougher feed as a % Pb + Zn, and the blasthole estimated primary crusher feed also as a % Pb + Zn. The data for the mill head feed, from April 10 to July 6 inclusive, (88 values), were identical in all six tables. In Table I (zero lag time) blasthole predicted grade for April 10 was shown on the same record line as mill head grade for April 10, and so on until July 6 where again blast grade and mill grade were both those published for that same day. However, in Table #2 (not appended) blasthole grade for April 9 was shown in the same record line as mill heads from April 10 thus allowing for a one day lag time, and so on until July 6, where blast grade for July 5 is on the same record line as mill head for July 6.

In Table # 5, which allows for (a rather unreasonable) four days lag time, blasthole predicted head grade for April 6 appears on the same record line as mill head grade for April 10 at the top of the table. At the bottom of the table blasthole grade for July 6 appears on the same record line as mill head grade for July 10. The other 86 records in the table show blasthole grades displaced by four days in the same way. Similarly tables # 2,3, and 4 show lag times of 1, 2 and 3 days.

Table # 6 shows the logically ridiculous situation where feed to the primary crusher arrives at the first lead rougher cell the day before, for a lag time of minus one day. This is included so that the statistics for more reasonable situations can be compared with a situation which is patently impossible.

Linear regression analysis was run for all six tables to represent lag times from -1 to 4 days, in the hope that the correlation co-efficient for one of the days (a one day lag time seemed the obvious choice) would be significantly higher than the rest.

Results:

The attached table shows that in fact higher correlations were noted for both zero and one day lag times, no matter whether the regression line was forced through the origin or not. This suggests an actual lag time of about 1/2 day. This is in conformity with other observations which include the size and average content of the fine ore bins. The linear regression line which represents this situation the best would be the average of lag time zero and one day.

ie: y (mill head) = x (blasthole grade) * 0.476 + 4.163 (zero lag)
y = x * 0.426 + 4.575 (1 day lag)

y = x *0.451 + 4.369 (approx. 1/2 day lag)

This suggests that blasthole calculations overestimate grade if they are above 7.95% Pb + Zn. This is in fair agreement with Dagbert's correction of blasthole grade (P.45)

$$y = 0.56x + 3.2$$

based upon a geostatistical line of reasoning. The observed and the theoretical in this case seem to lend each other support.

We must consider whether these regression lines may be used to correct blasthole data to predict mill heads on a routine basis. This approach should be checked with Michel Dagbert before it is implemented, as he will almost certainly have some comments on its statistical validity.

D. Tenney.

Dave Tenney
Chief Geologist

DT:cc
cc: Gregg Jilson, Lee Pigage, M. Dagbert, C. Reed, M. Wasel, D. Basso, B. Sanden, B. Pisony, J. Vandenbroeck

LINEAR REGRESSION - MILL HEAD GRADE -vs- BLASTHOLE PREDICTED CRUSHER FEED GRADE
WITH LAG TIMES OF -1 TO +4 DAYS
D. TENNEY - OCT. 2/90

	REGRESSION NOT FORCED THRU ORIGIN						REGRESSION FORCED THRU ORIGIN		
LAG TIME	CONSTANT	X-COEFF	CORR	MEAN HEADS	MEAN BLAST	CONSTANT	X-COEFF	CORR
- 1	6.12	.236	.234	8.046	8.164	0	.9804	.9946
0	4.163	.476	.464	8.046	8.156	0	.9831	.9963
1	4.575	.426	.413	8.046	8.140	0	.9847	.9959
2	5.594	.301	.292	8.046	8.136	0	.9845	.9952
3	4.891	.265	.255	8.046	8.142	0	.9835	.9949
4	7.442	.0743	.071	8.046	8.138	0	.9828	.9937