

M E M O R A N D U M

TO: M.O. Hampton
FROM: F.P. Forrest
DATE: August 18, 1971
SUBJECT: COMPARISON OF PREDICTED AND ACTUAL
ORE GRADE AND TONNAGE

CONCLUSION:

An analysis of the available diamond drill hole and ore blast hole data within respective ore blocks suggests the following conclusions:

On the average, better ore grades will be mined for ore blocks predicted with less than the average pit grade (approximately 10% combined Pb-Zn) and lower ore grades will be mined for ore blocks predicted with greater than the average pit grade.

The correlation of actual ore mined to the predicted grade can be estimated by the equation $y = 0.36x + 6.36$ where y represents the actual grade mined and x represents the predicted grade. The range of error for various degrees of confidence are shown in the text of this report. Ore blocks on the higher benches (4065 and above) tend to be below the average curve and the converse is true for the blocks in the lower benches. This allows one to generalize that better agreement between mined and predicted grade will be obtained within the heart of the orebody than at its periphery. Overweighting of lower values is suggested by the fact that 44% of the total number of samples were obtained from the 4065 bench or above, while this portion of the pit only represents 26% of the total production to July 31, 1971.

The data available for tonnages mined above the 4065 level shows that, with limited ore remaining, only 59% of the predicted ore reserve (1967) was mined.

RECOMMENDATIONS:

Further methods of analysis should be pursued to obtain better reliability. Radial continuity of values could be checked. It has been suggested that a method of contouring equal values and aerial averaging be compared to the ore blast hole data. Other standard methods could be compared.

The reliability of the correlation equation should be appreciated.

The pit progress and ore blast hole data collection and recording system should be revised and maintained.

The comparison of diamond drill hole and ore blast hole data should be up-dated periodically.

Tonnage comparisons should be made regularly.

DISCUSSION:

The study required the compilation of ore blast hole data, ore reserve data, and mined tonnages.

The collection of blast hole data was the most time consuming as it required searching through numerous sources of information. This resulted in the establishment of a defined ore blast hole collection and recording system as documented in my memorandum to you dated July 27, 1971. The data was compiled such that all ore blast hole data within each ore block on each bench was listed on ore block comparison sheets. Block totals and averages were determined. Ore holes which fell outside ore blocks were compiled on separate sheets to be later included with all other information for the bench totals and averages.

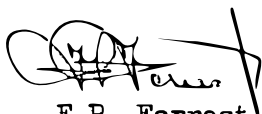
The ore reserve data was obtained from original bench plans with revisions for benches 3990 and below, dated July 15, 1970. Selected diamond drill holes were revised to conform to the present bench analysis procedure.

A compilation of pit ore removal was made from the muck sheets and the 1969 planning file.

A data comparison table of ore reserve and ore blast hole assay data was made for ore zones on reserve blocks with over 75% mined out and for 40% to 75% mined out. These values were plotted for comparative purposes. Graph I shows the ratio of ore blast hole combined Pb-Zn assay to the diamond drill hole combined Pb-Zn assay plotted against the diamond drill hole reserve calculation data for ore zones in reserve blocks with greater than 75% mined out. Graph II shows the ratio of the

ore blast hole combined Pb-Zn assay to the revised diamond drill hole combined Pb-Zn assay plotted against the revised diamond drill hole combined Pb-Zn assay. Very little change was apparent between the two graphs. Graph III shows the same data as Graph II but includes all the data for ore zones in reserve blocks for over 40% mined out. The greater than 40% and less than 75% ore zone data corresponds closely to that of the greater than 75% ore zone data and was thus considered representative for further use. Graph IV shows the ore blast hole data plotted against the revised diamond drill hole data for all ore zones having greater than 40% of the ore zone mined out. An average straight line relationship was established on graph IV and the respective error envelopes developed for four sample grouping percentages to establish prediction confidence levels. The results were tabulated. (The phrase, ore zone in reserve blocks, is used because some earlier work shows an ore block extending beyond a later determination of the half bench outline or extending beyond a known ore/waste contact. This allows additional samples to be included in this analysis.)

Data was tabulated for bench tonnage and grade comparisons. With limited ore remaining above the 4065 level, only 59% of the predicted ore reserve has been mined due to the irregularity of the higher zone. For this portion of the pit the predicted combined Pb-Zn assay was 10.5% compared to the mined value of 9.2%.



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- Attachments
Calculations
Graph I
" II
" III
" IV
Data

FPF/abc

CALCULATIONS:

AVERAGE GRADE CURVE

$$y = mx + b$$

$$m = \frac{11.0 - 9.0}{13.0 - 7.4} \\ = 2.0/5.6$$

$$x = 10.0$$

$$y = 9.93 \quad 9.93 = 2.0/5.6 (10.0) + b$$

$$b = 9.93 - 3.57 \\ = 6.36$$

$$\underline{\underline{y = 0.36x + 6.36}}$$

check; $x = 13.0$

$$y = 11.0$$

$$11.0 = 2.0/5.6 (13.0) + 6.36 \\ = 4.64 + 6.36$$

$$11.0 = 11.0$$

ERROR RANGE	(1) 38% of Samples	± 0.54	or	± 0.5
	(2) 51% of Samples	± 0.81	or	± 0.8
	(3) 87% of Samples	± 2.05	or	± 2.1
	(4) 95% of Samples	± 3.96	or	± 4.0

DATA SIGNIFICANT TO ONE DECIMAL PLACE