

MEMORANDUM

TO: M. O. Hampton
FROM: P. M. Pettigrew
DATE: February 10, 1972
SUBJECT: COMPARISON OF PREDICTED AND ACTUAL ORE GRADE AND
TONNAGE - FURTHER COMMENTS

For the present study only tonnage blocks 100% completed and ranging from 3870 to 4100 were considered. The predicted tonnages used were based on ore reserve figures* (per tonnage block) and in some cases on a replanimetering of ore outlines (½ bench) revised by J. Gondi and more recently by the writer. The actual tonnages used were based on a planimetering of all ore mined and/or drilled on the above-mentioned benches using ore contacts interpreted by the writer (based both on assays and pit mapping). It was assumed that all ore was mined out at the full-bench thickness (35' or 40').

All predicted grades used were based on F. P. Forrest's revised D.D.H. assay data and the actual grades were determined from an averaging of blast hole assays.

Weighted average Pb and Zn assays were determined for each tonnage block and bench and some consideration was given to Pb/Zn ratios both within tonnage blocks and between benches.

* Ore reserves as "published" refer to 3990 as being the highest bench. Figures quoted below for 4030, 4065 and 4100 are based on revised ½ bench outlines (before mining) and have been planimetered for this report.

Results:

1. Considering ore mined on benches 3870 to 4030 inclusive, there was a gain of 1.9% in tonnage over the predicted figure while a grade of 11.5% Pb + Zn was mined out as against a grade of 12.5% which was predicted. The benches above 4030 experienced very drastic losses to the extent that the ore mined on benches 3870 to 4100 inclusive lost 9.2% of the predicted tonnage with a drop in grade from 12.3% to 11.3% for the tonnage blocks considered including, in all cases above, the ore outside the predicted ½ bench areas.

<u>Bench</u>		<u>Tons</u>	$\frac{A-P}{P} \times \frac{100}{1}$	<u>Pb</u>	<u>Zn</u>	<u>Comb.</u>	<u>Pb/Zn</u>
3870	Predicted	197,300	- 4.0 %	4.9	8.1	13.0	0.60
	Actual	189,400		4.0	5.9	9.9	0.68
3910	Predicted	573,600	- 13.0%	6.4	7.4	13.8	0.86
	Actual	499,000		4.6	6.8	11.4	0.68
3950	Predicted	679,200	+ 21.4%	4.9	6.9	11.8	0.71
	Actual	824,000		4.9	6.7	11.6	0.73
3990	Predicted	843,600	+ 11.9%	5.8	7.3	13.1	0.79
	Actual	943,800		4.9	7.1	12.0	0.69
4030	Predicted	562,700	- 19.2%	5.3	7.7	13.0	0.69
	Actual	454,500		4.5	6.8	11.3	0.66
4065	Predicted	437,100	- 47.8%	3.9	5.9	9.8	0.66
	Actual	228,300		3.9	6.0	9.9	0.65
4100	Predicted	365,400	- 49.7%	5.3	8.2	13.5	0.65
	Actual	183,700		2.8	5.7	8.5	0.49
TOTALS							
to 4030	Predicted	2,856,400	+ 1.9 %	5.5	7.0	12.5	0.79
	Actual	2,910,700		4.7	6.8	11.5	0.69
to 4100	Predicted	3,658,900	- 9.2 %	5.3	7.0	12.3	0.76
	Actual	3,322,700 ^{PL}		4.6	6.7	11.3	0.69

The table above demonstrates that, apart from benches 4065 and 4100, there are compensatory losses and gains in tonnage between benches resulting from fairly local fluctuations in the ore/waste contact from D.D.H. to D.D.H. in the cross-sections used for estimation of $\frac{1}{2}$ and full-bench contacts on bench plans. One of the most significant variations seems to have taken place on 3910, 3950 and 3990 benches as a result of doming in an area of interference between F_3 and F_4 fold generations.

Attempts at correlating actual and predicted tonnages beyond the very general framework of the table above do not seem fruitful at this stage.

2. Graph 1 is a reproduction of F. P. Forrest's Graph IV (see his memo dated August 18, 1971) and compares (as it does) ore blast hole combined (Pb + Zn) assays with revised diamond drill hole combined (Pb + Zn) assays. Using his error envelopes, the writer has included only those tonnage block assays related to the present study. The error percentages have been revised using a weighting of each point plotted in terms of the tonnage it represents.

As can be seen, the trend described by F. P. Forrest is still applicable. Although the upper-bench grade predictions tend to be less reliable than the lower-bench grade predictions and there is an improving trend downwards, it must be pointed out that there seems to be a similar trend upwards from the bottom of the ore body. This seems to be a reasonable quality for a presumably stratiform deposit, and is demonstrated by the two 3870 readings: that reported in the 78% error envelope is, in fact, from a tonnage block analogous to 4100. This trend will have to be tested out as further data comes to light on 3870.

3. As Pb and Zn production considered individually is of some economic significance, the writer also decided to consider Pb/Zn ratios in the present study. Average values for the benches were given in the table above.

Graph 2 compares predicted and actual ratios per tonnage block and shows the weighted average - derived values per bench. A trend is difficult to discern among the tonnage block data and is obscured even further in comparing one bench to another because of ore gained outside the $\frac{1}{2}$ bench area and therefore outside the area of influence of the D.D.H.'s.

In Graph 3 the predicted Pb/Zn ratio is compared with the deviation between it and the actual ratio. The error envelopes drawn on this graph indicate that for predicted values lying between 0.61 and 0.78 there is reasonable agreement with values above and below becoming increasingly suspect.

It may be worth noting here that the two very high values (1.23 on 3910 and 1.35 on 4065) are largely due to the two D.D.H.'s in question (65-11 and 66-44) striking 5' intersections of galena-rich sulphides ($Zn < 0.5\%$).

There is no change in reliability of ratio prediction from bench to bench in any direction and it does not seem to be dependent on grade (either predicted or actual).

Conclusions:

Within the framework of this study it would appear that in the bulk of the portion of #1 ore body mined so far there is an averaging trend and that tonnage estimates are reliable in the overall context but that there is a tendency for grade to be overestimated by about 8% of the predicted value, the error being greater in Pb prediction than in Zn prediction.

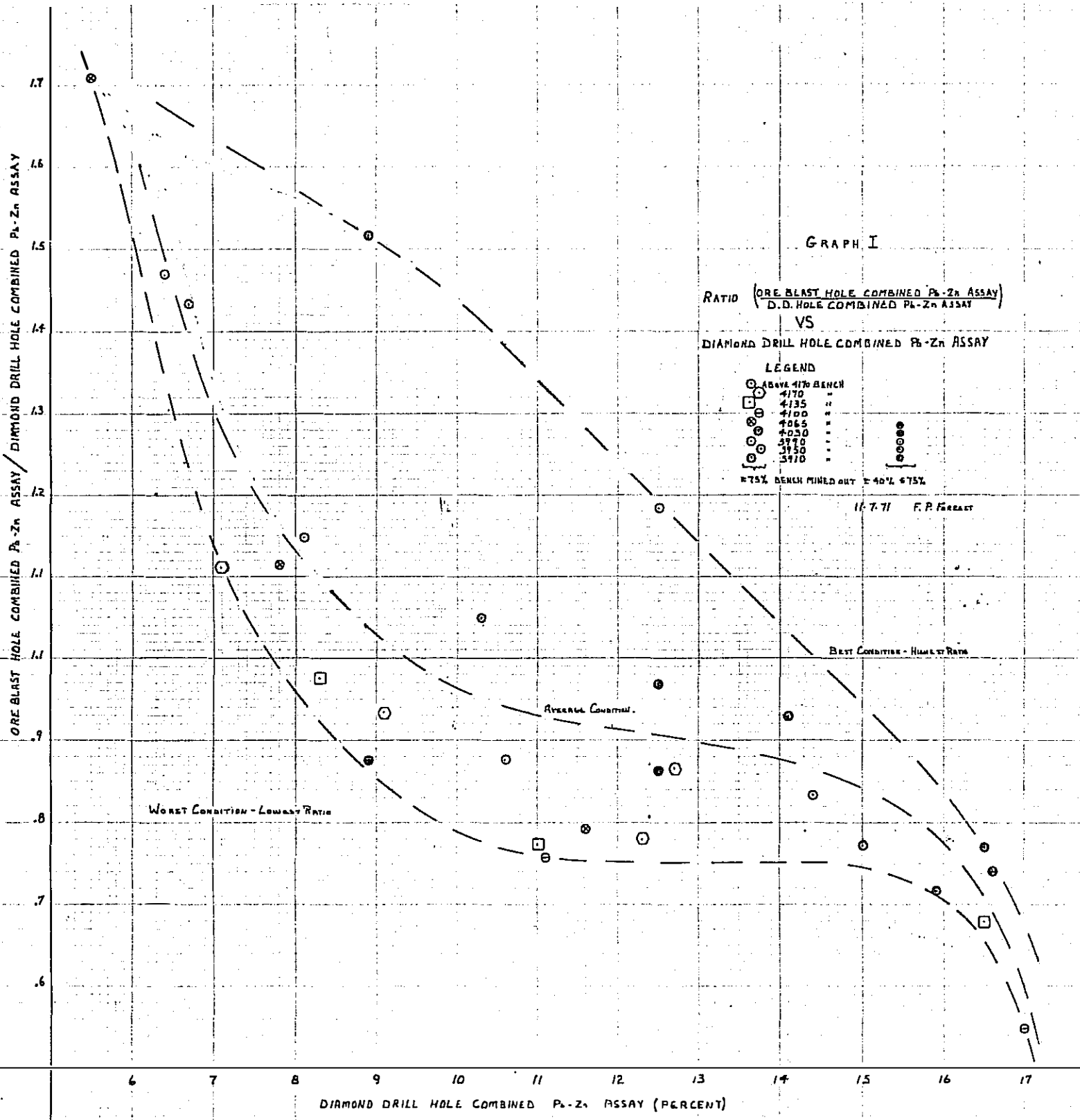
It is intended that a further report will be made on tonnage reliability in higher benches and recommendations on how better predictions could be made for the rest of zone #1 and for zone #3.



P. M. Pettigrew
Ore Control Geologist

PMP/mm

Attachments: Graph 1
 Graph 2
 Graph 3



GRAPH II

RATIO $\left(\frac{\text{ORE BLAST HOLE COMBINED Pb-Zn ASSAY}}{\text{REVISED D.D.H. COMBINED Pb-Zn ASSAY}} \right)$

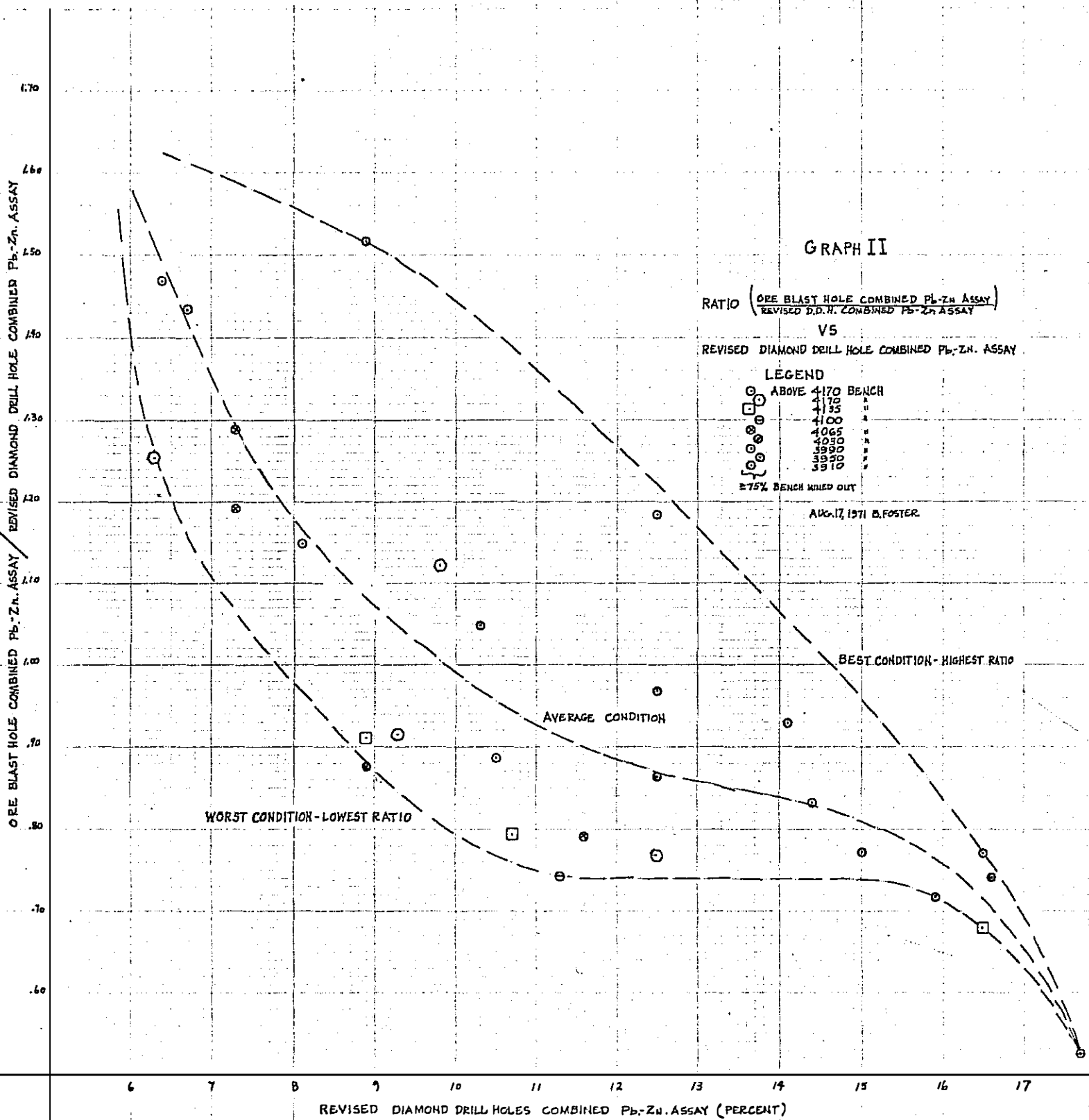
VS

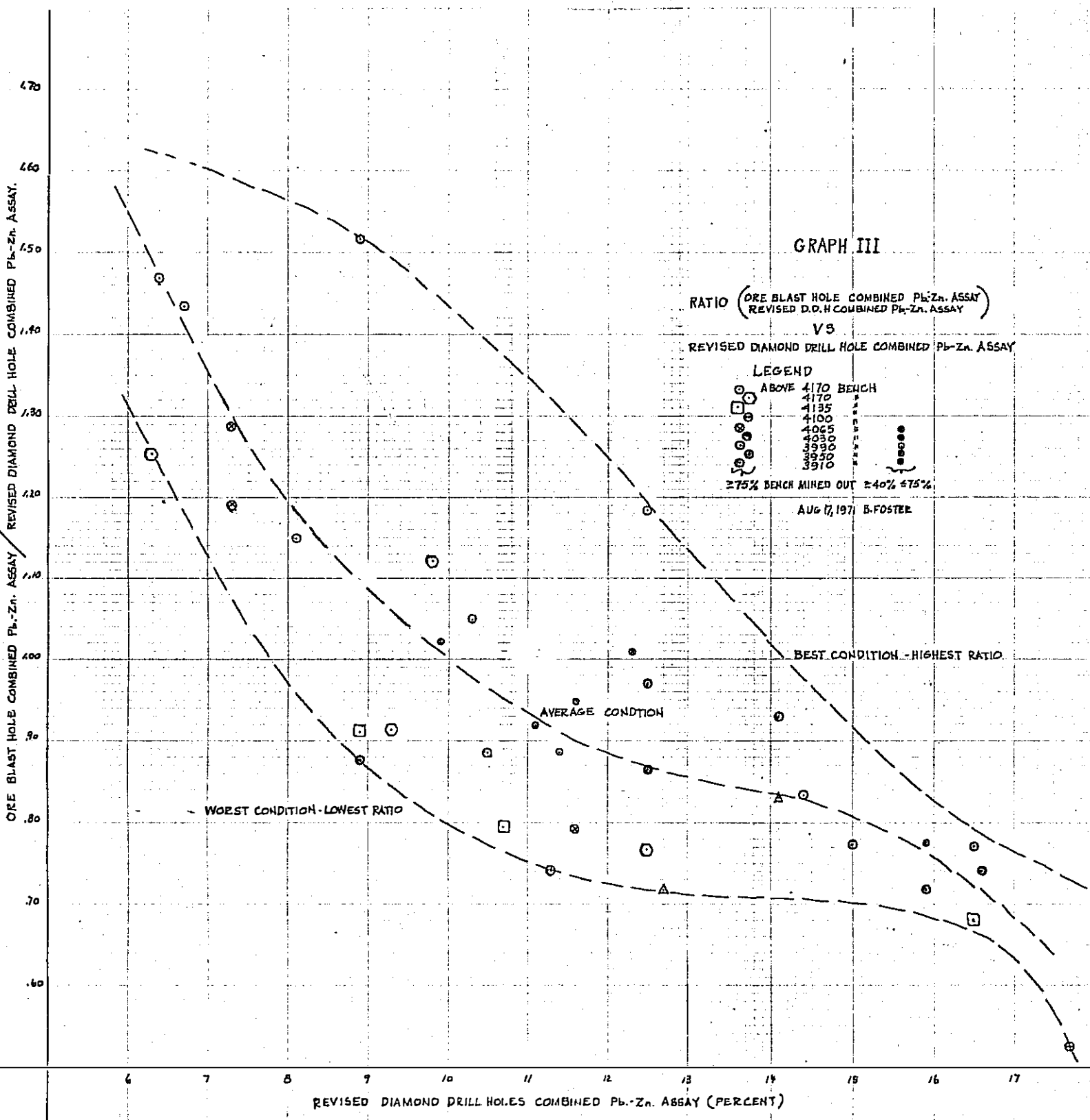
REVISED DIAMOND DRILL HOLE COMBINED Pb-Zn. ASSAY

LEGEND

- ABOVE 4170 BENCH
- 4170
- 4135
- 4100
- 4065
- 4030
- 3990
- 3950
- 3910
- 75% BENCH MINED OUT

AUG. 17, 1971 B. FOSTER.





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