6000 1879

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	Reserve Audit of the Rosebud Deposit; Pershing County, Nevada, prepared for Hecla Mining Company, Coeur d'Alene, Idaho, December 9, 1993
AUTHOR	Stahlbush, F, Allen L
DATE OF DOC(S)	1993
MULTI_DIST Y / (N?) Additional Dist_Nos:	
QUAD_NAME	Sulphur 7½'
P_M_C_NAME (mine, claim & company names)	Rosebud Mine; Hecla Mining Co.; Rosebud Deposit; Mine Reserves Associates
COMMODITY If not obvious	gold; silver
NOTES	Geology; drill hole plan map; geology; statistics; assays; reserves; correspondence
	39 p.

Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
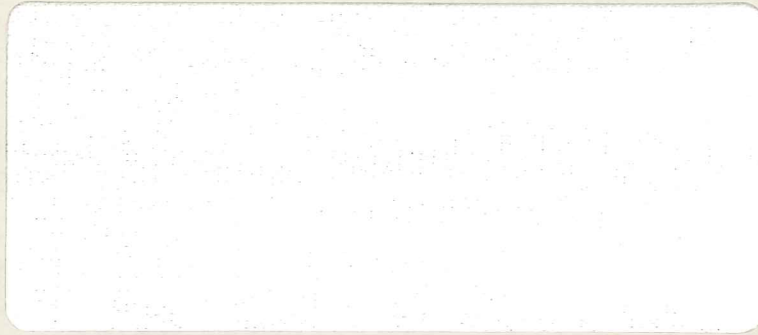the amount of pages by ~25)

SS: DP   8/1/08
Initials   Date

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Initials   Date

Revised: 1/22/08

Rosebud Reserve Audit

(Mine Reserve Associates, Dec. 1993)

6000 1879   4010

MINE RESERVES

MR
A

ASSOCIATES, INC.

RESERVE AUDIT OF THE

ROSEBUD DEPOSIT

PERSHING COUNTY, NEVADA

Prepared for

Hecla Mining Company
Coeur d'Alene, Idaho

by

Mine Reserves Associates, Inc.
Lakewood, Colorado

December 9, 1993

1.0   INTRODUCTION

During November 1993, Mine Reserves Associates Inc. (MRA) was retained by Hecla Mining Company (Hecla) to perform a reserve audit on the Rosebud deposit. This property is controlled by Equinox Resources Ltd. and the audit was done as part of Hecla's due diligence examination prior to their anticipated merger with Equinox.

The Rosebud deposit is in a volcanic hosted, epithermal gold system. Mineralization occurs in veins and veinlets which are localized by faults, shears and fracture zones. The project area is located in Pershing County, Nevada.

The reserve audit consisted of a review of data collection and analysis procedures, a detailed check and refinement of MRA's previous reserve estimation, a review of the manual reserve calculated for small ore pods within the deposit, and generation of final ore zone maps for use in engineering. A visit was made to Equinox's office in Lovelock, Nevada to gather further information on check assays and the geological interpretation of the deposit.
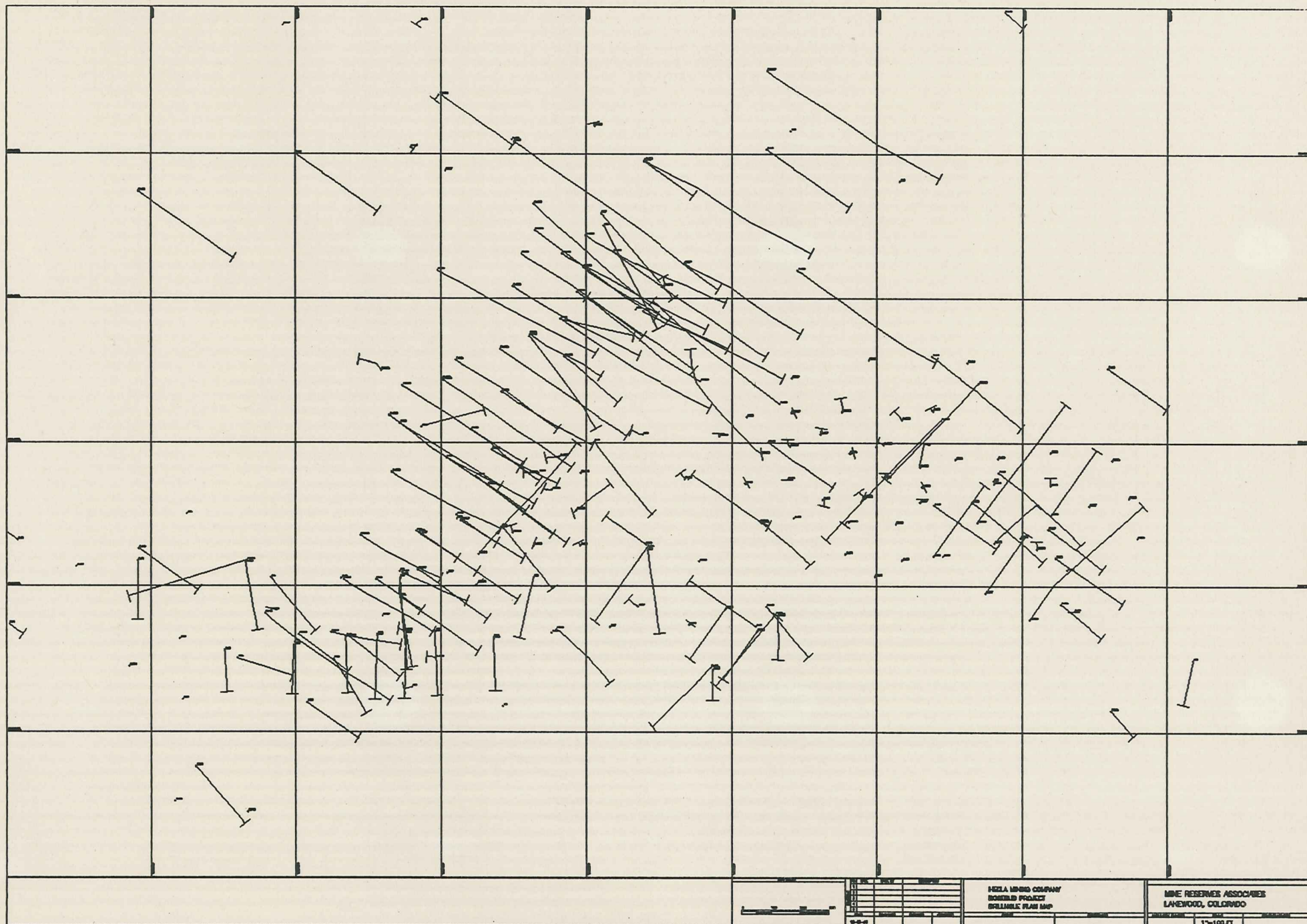
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The drillhole data were received from Hecla as a MEDSystem data file. A total of 39,359 assay intervals were contained within 310 drillholes. A combination of core and reverse circulation drilling methods were used. A drillhole plan map is shown in Figure 1.

Hecla performed an analysis of core versus reverse circulation drilling and found no substantial differences between the two. MRA reviewed this analysis and also compared data on cross sections at Equinox's office. Both types of data appear to provide good quality samples for use in reserve analysis. The reverse circulation holes were drilled by Lac when they controlled the property and used a collection scheme suitable for wet sampling.

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FIGURE 1
DRILLHOLE PLAN MAP

representative of the true deposit value. MRA also spot checked
assay certificates with the computerized data base and found no
errors in data transfer.

3.0 ZONE DELINEATION AND COMPOSITING

Previously, MRA modeled the two largest mineralized zones
within the Rosebud deposit. These were zones designated as Zone 2
and Zone 6 by Hecla. Since the previous analysis was performed
rather quickly as part of an acquisition study, MRA reviewed the
zone delineation in detail as well as the subsequent inclusion of
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A series of drillhole cross sections were plotted
perpendicular to the zone strike. These were examined to determine
whether any drillholes were excluded from the previous study that
should have been included, or visa versa.

In Zone 2, one drillhole intercept was found to have been in
error previously. Adjusting this intercept resulted in additional
low grade reserves. Also several more waste holes were included
along the perimeter of the zone (bounding holes) to prevent the
over-estimation of ore tonnage. Also in Zone 2, the area known as
the chimney was separated from the remainder of the zone for
purposes of estimation. While connected to Zone 2, it appears to
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mineralization population. A "hard" boundary was digitized around
this zone for grade and thickness estimation. It was however left
in Zone 2 for reserve reporting purposes.

In Zone 6, the previous interpretation was left mostly
unchanged with the exception of additional bounding holes in areas
that appeared to be overly extrapolated. The interior of Zone 6
was not changed.

Drillhole intercepts were composited according to underground
mining criteria. Drillhole assays were tagged with zone codes. An
assay interval of waste on the top and bottom of each zone
intercept were included to allow for dilution. A minimum grade of
.100 oz/ton gold grade with a minimum thickness of 20 feet was used
to develop ore composites.

For each composite, the zone top coordinates and elevation,
mid-point coordinates and elevation, bottom coordinates and
elevation, gold grade, silver grade, composite thickness, and true
thickness were computed. For the true thickness calculation, it
was assumed that Zones 2 and 6 are horizontal. Zone 2 and 6

composite locations are shown in Figures 2 and 3.

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The statistical analysis was not redone since the previous study resulted in good estimation parameters. A summary of the previous analysis is re-stated below.

The cumulative distributions for gold, silver, and true thickness for each zone were plotted on a lognormal scale and analyzed. Gold distributions show four distinct populations: a low grade background population, a low grade mineralized population, a higher grade mineralized population, and an extremely high grade population which may be statistical outliers. Thickness distributions show a background population of minimum mining thickness and two populations above this background.

Populations for the two zones were separated as follows:

Zone 6 - Au		Zone 2 - Au	
0.000 - 0.099	Background	0.000 - 0.099	Background
0.100 - 0.250	Low Grade	0.100 - 0.190	Low Grade
0.251 - 1.000	High Grade	0.190 - 0.700	High Grade
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Zone 6 - Thick		Zone 2 - Thick	
0.0 - 20.0	Background	0.0 - 20.0	Background
20.1 - 50.0	Low Thickness	20.1 - 50.0	Low Thickness
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Indicators were assigned to the Background-Low Grade(or Thickness) and Low Grade(or Thickness)-High Grade(or Thickness) cutoffs with a "0" given to each composite if below the cutoff and a "1" if above. Variograms were then calculated for these indicators as well as on grade and thickness.

Average variograms (non-directional) were computed because of the low number of available composites. Fitted variogram models are tabled below:
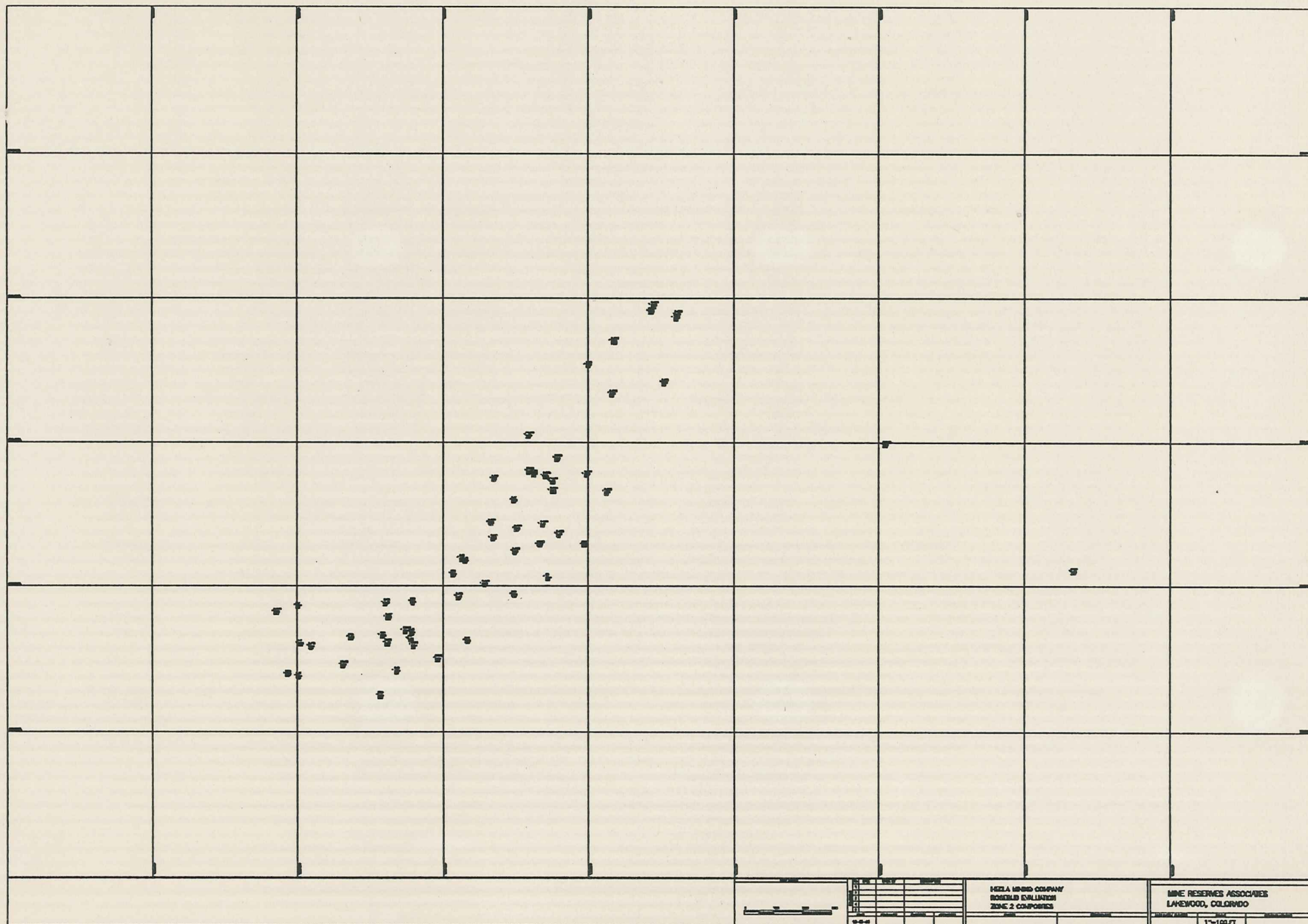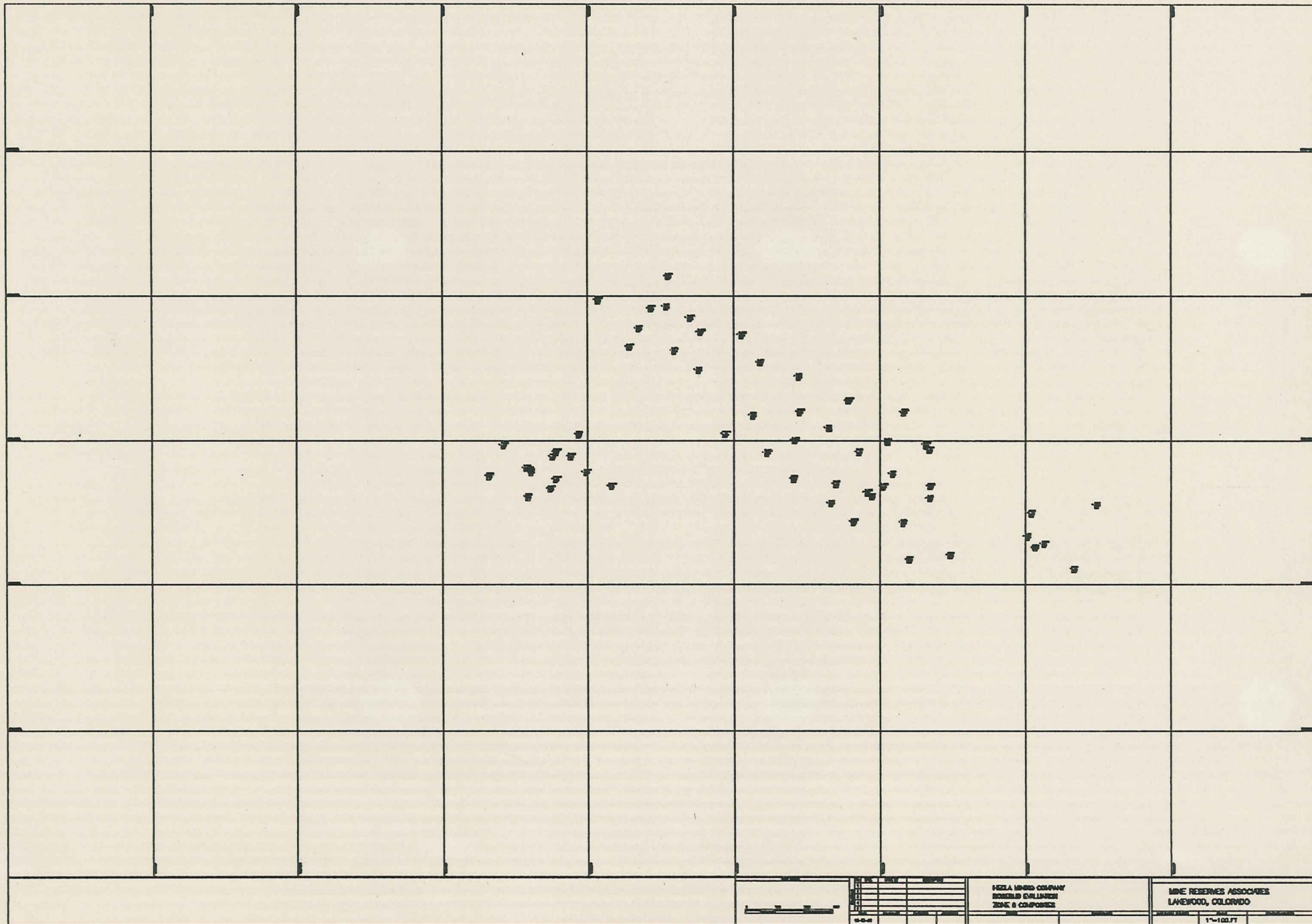
FIGURE 2
ZONE 2 COMPOSITE PLAN

FIGURE 3
ZONE 6 COMPOSITE PLAN

Zone	Type	Co	C1	Range
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2	ORK Ind(Au)	.383	1.77	185
2	Back Ind(Au)	.157	.692	173
2	Thickness	.034	.950	154
2	ORK Ind(Thick)	.028	7.80	160
2	Back Ind(Thick)	.240	.572	148
2	Ag	.019	1.39	164
6	Au	.350	.880	280
6	ORK Ind(Au)	1.35	3.94	208
6	Back Ind(Thick)	.037	.764	220
6	Thickness	84.2	628.	189
6	ORK Ind(Thick)	.050	4.15	110
6	Back Ind(Thick)	.190	1.27	280
6	Ag	.320	1.06	148

5.0 BLOCK ESTIMATION

A block size of 25 by 25 feet in the horizontal dimension was selected with a variable thickness as estimated in the vertical dimension. For gold, each of the four observed populations were estimated for each block. The background indicator was estimated by linear kriging, resulting in a percentage of block belonging to the background population. A background gold grade was also estimated by linear kriging to determine the grade of the block background percentage.

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A block average grade was then computed by weight averaging the background grade with the ORK estimate using the background block percentage. This same methodology was used for both gold and

thickness with the exception that thickness did not have any extreme value limitation.

Block silver grades were estimated with linear kriging. A minimum of 2 and a maximum of 10 composites were used for estimation within a search radius of 200 feet. Block locations for Zones 2 and 6 are shown in Figures 4 and 5 and Zone top elevations are shown in Figures 6 and 7.

6.0 RESERVES

Reserves were calculated for Zones 2 and 6 using a tonnage factor of 13.0 ft^3/ton and the estimated zone thickness per block. These reserves include dilution but do not include an underground mining recovery factor. Reserves at various cutoffs are tabled below and are shown graphically in Figures 8 through 11.
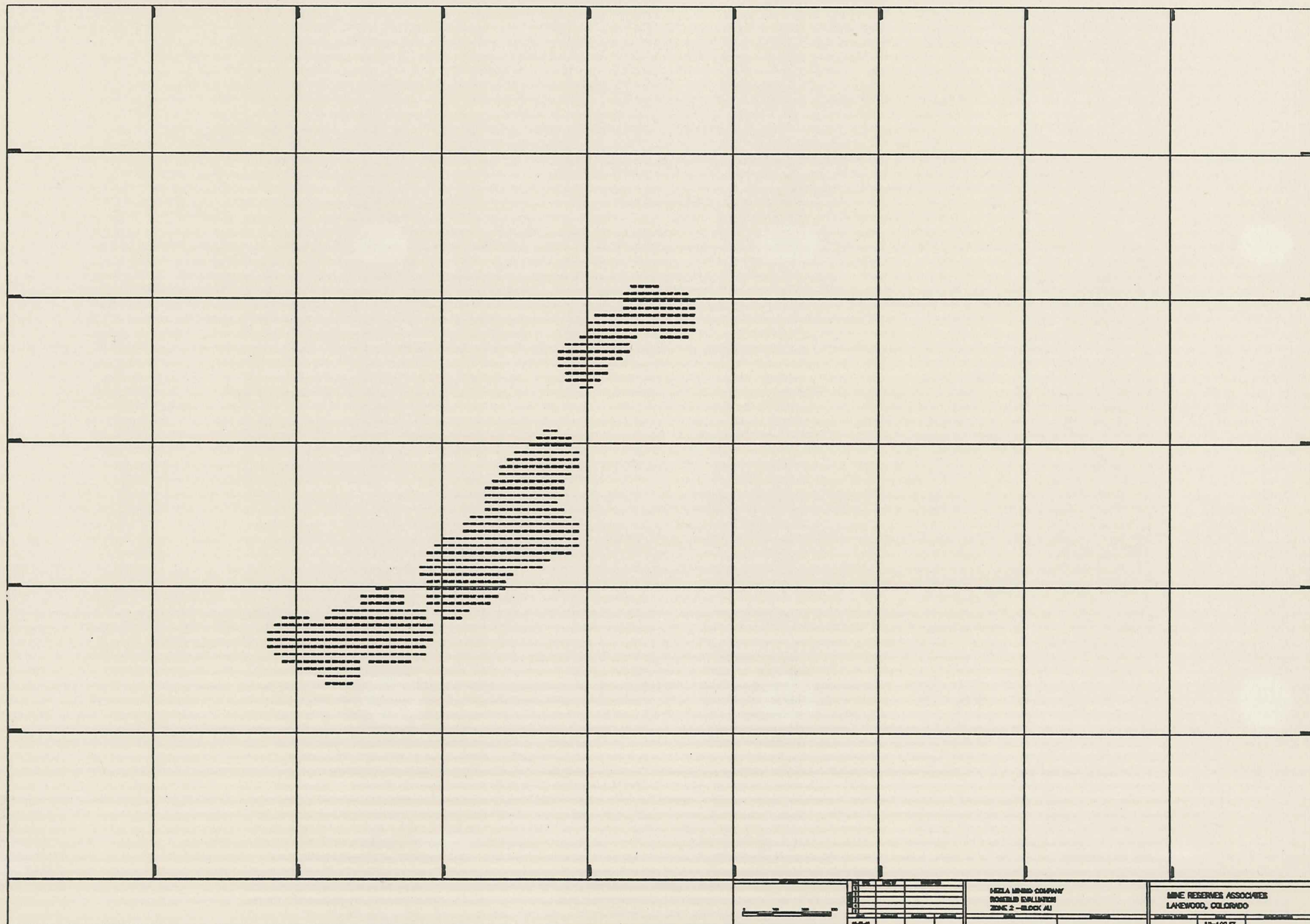
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Cutoff (Au opt)	Tons	Au (opt)	Ag (opt)
.100	852,246	.310	1.94
.150	614,553	.382	2.09
.200	489,567	.435	2.02
.250	413,932	.474	1.92
.300	321,985	.532	1.78
.350	249,077	.592	1.81
.400	194,312	.653	1.87
.450	158,010	.705	2.03
.500	131,188	.753	2.14

Zone 6 - Reserves

Cutoff (Au opt)	Tons	Au (opt)	Ag (opt)
.100	752,519	.224	1.66
.150	510,880	.271	1.79
.200	325,514	.326	1.66
.250	180,918	.411	1.38
.300	104,615	.515	1.32
.350	68,197	.618	1.28
.400	50,331	.703	1.29
.450	39,350	.780	1.33
.500	30,384	.868	1.46

MRA also reviewed the manual reserves calculated by Hecla on the smaller pods. As in the large zones, true thicknesses were calculated as the data were projected to the plane of each zone.

FIGURE 4
ZONE 2 ESTIMATED BLOCKS

FIGURE 5
ZONE 6 ESTIMATED BLOCKS

FIGURE 6
ZONE 2 ELEVATION TOP

HECLA MINING COMPANY
ROSEBUD EVALUATION
ZONE 2 — ZONE TOP

MINE RESERVES ASSOCIATES
LAKEWOOD, COLORADO

1"=100 FT
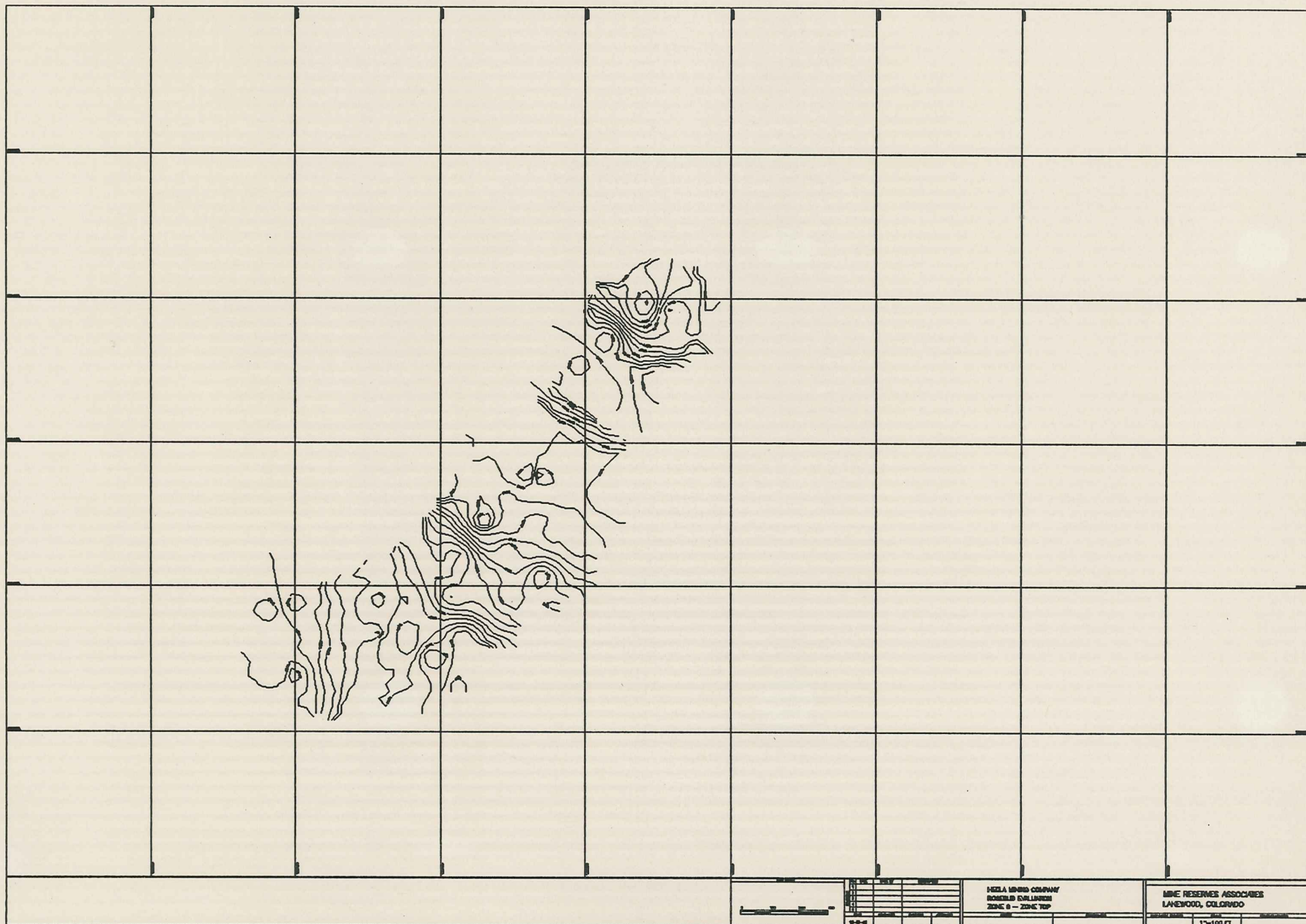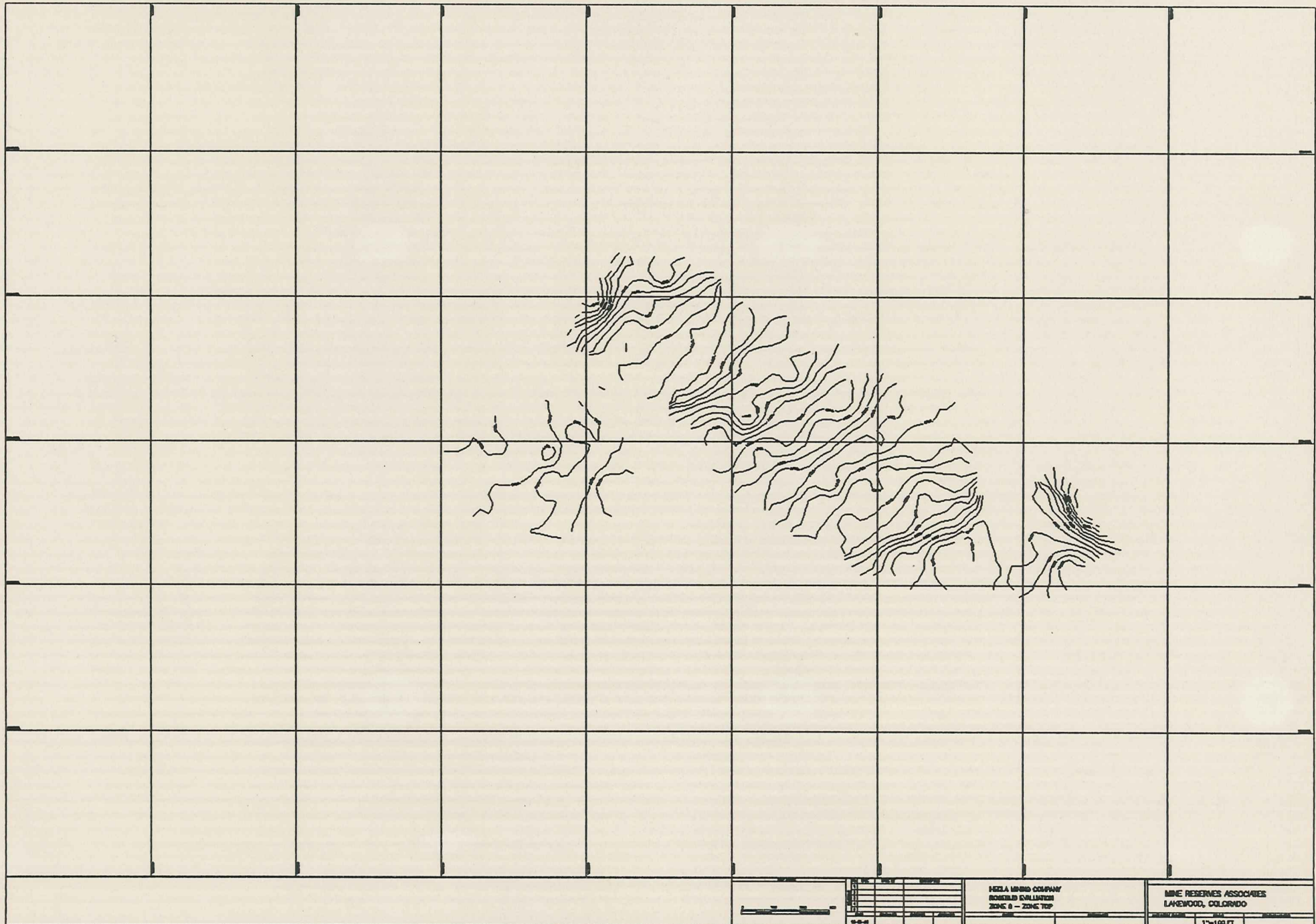
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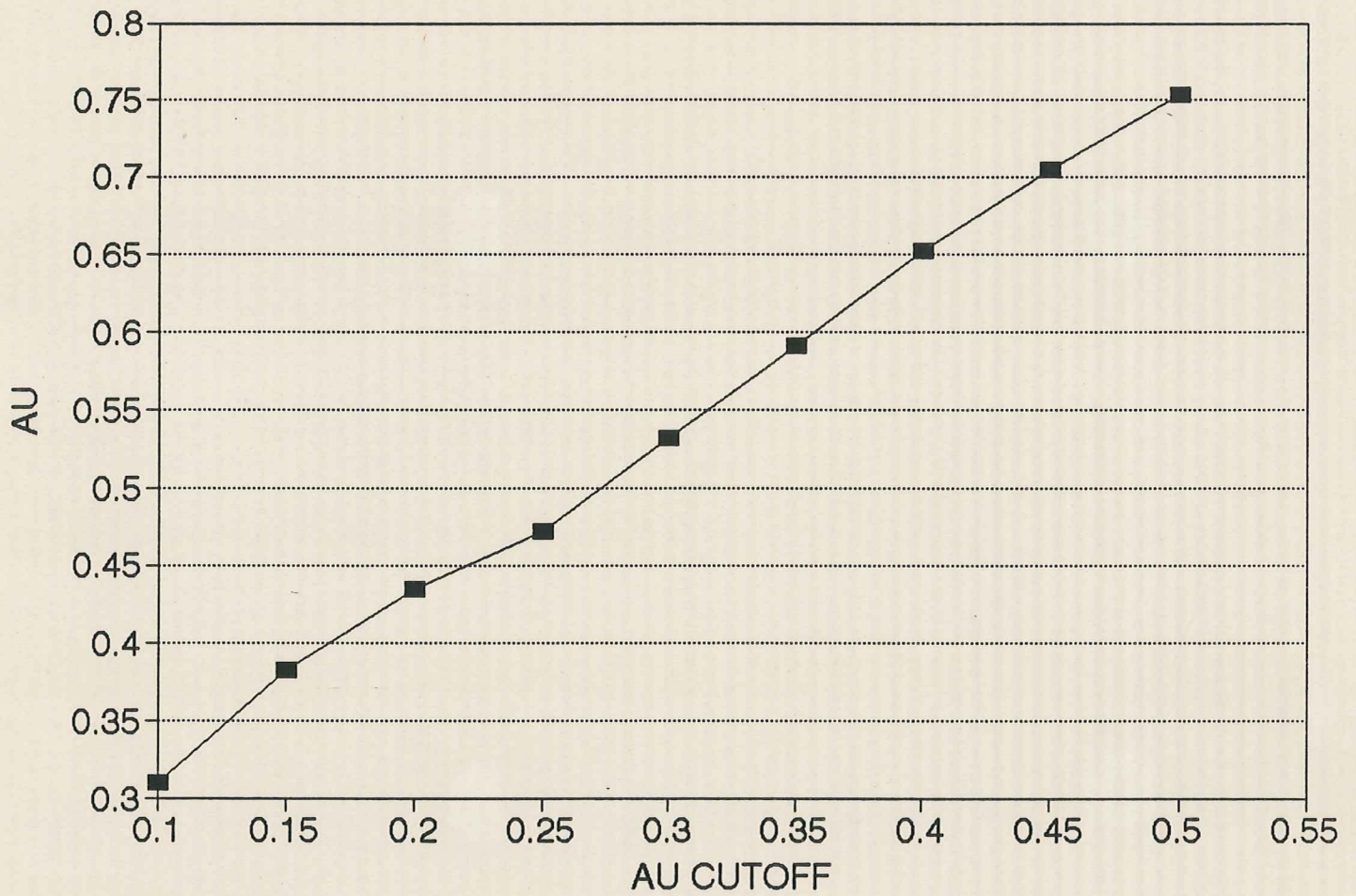## ZONE 6 ELEVATION TOP

FIGURE 8

ZONE 2 - AVERAGE AU
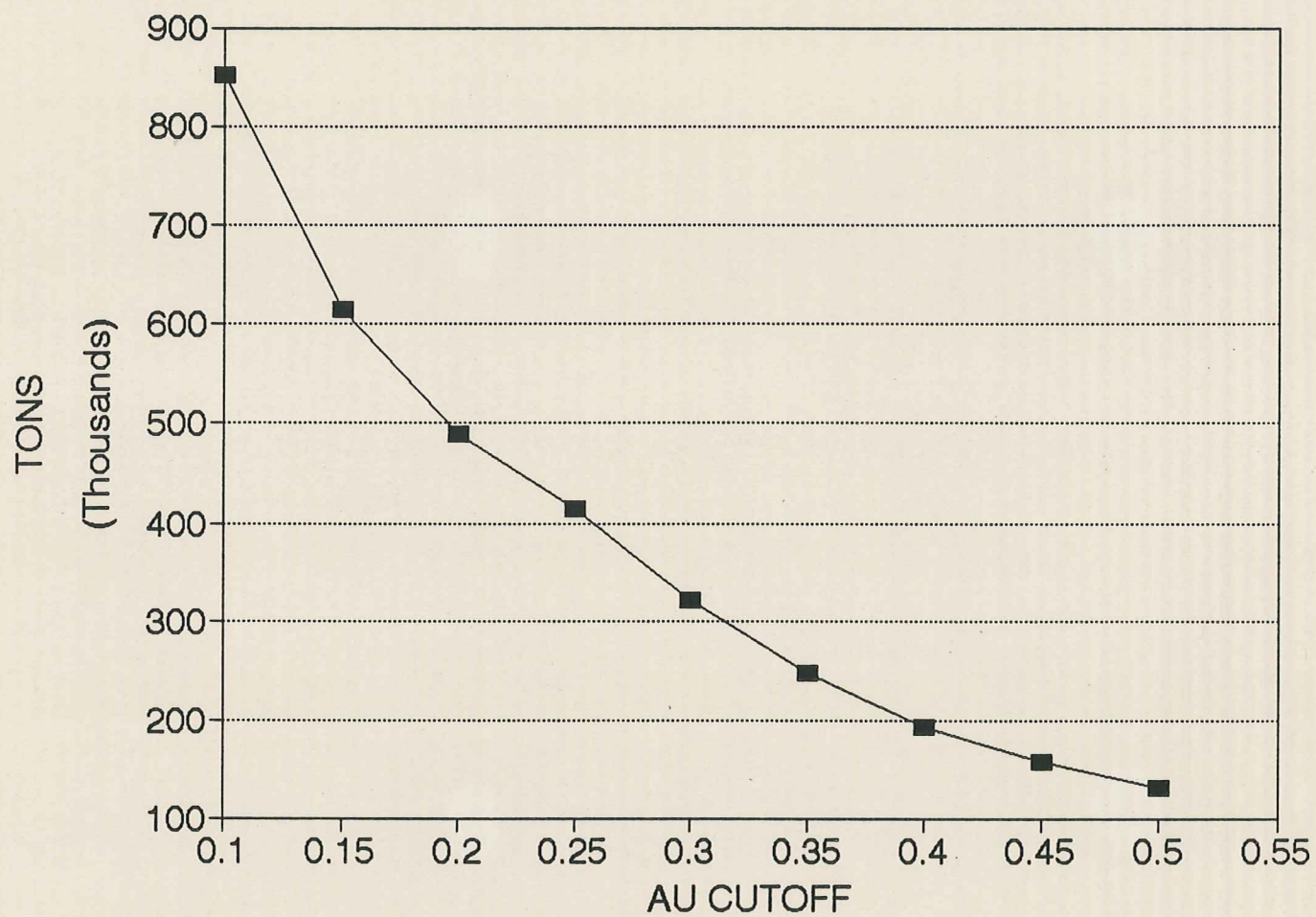
FIGURE 9

ZONE 2 - TONNAGE
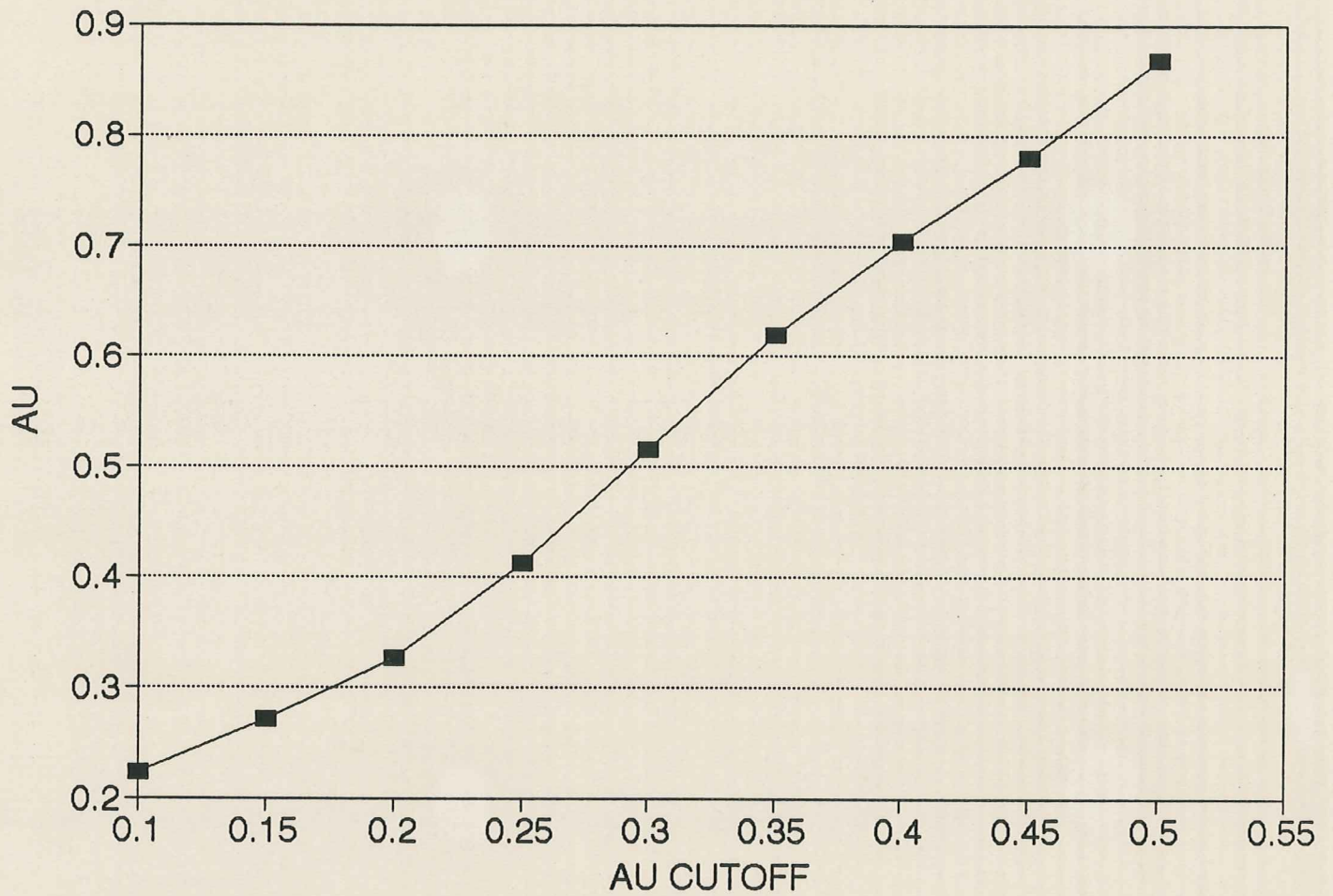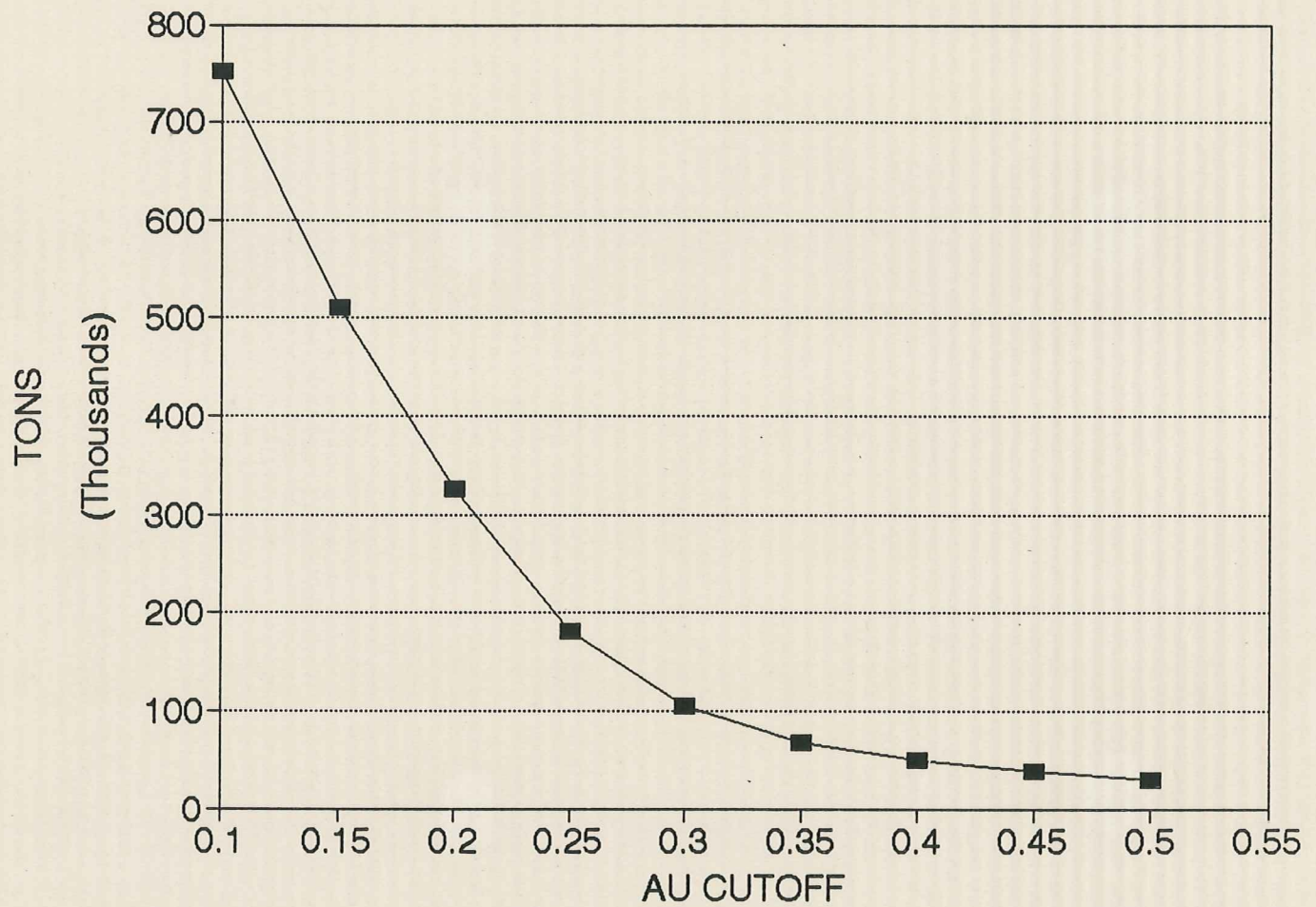
FIGURE 10

ZONE 6 - AVERAGE AU

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Polygon Reserves

Zone	Tons	Au (opt)
1	134,869	.147
3	52,691	.231
5	114,834	.245
7	77,148	.243

7.0 CONCLUSIONS AND RECOMMENDATIONS

Drillhole data collection and analysis appear to have been done conscientiously by Lac initially, and finally by Equinox who later acquired the project. Unfortunately, some of the knowledge concerning check assays seems to have left with the departure of Lac. However, examination of the data as well as old reports indicates that this should not be a problem.

The reserves were developed using industry standard methods. The same general approach was employed in both the computer and manual methods. True thicknesses were computed and the data was projected to the general plane of the zones. Projection distances as well as bounding drillholes limited the extent of estimated ore. Reserves contained within the delineated zones were developed from composites which met a minimum mining thickness as well as a minable cutoff grade. Estimated blocks within the modeled zones as well as the manually calculated blocks would meet a proven/probable classification by normal SEC requirements on reserves. This is due to:

1) The tight zonal boundary separating the mineralized zones from the weakly or non-mineralized material.

2) The inclusion of mining parameters in the compositing of drillhole data.

3) The confirmation of mineralization continuity through the geostatistical analysis and estimation of grades within the range of continuity.

Final Report

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Coeur d'Alene, Idaho

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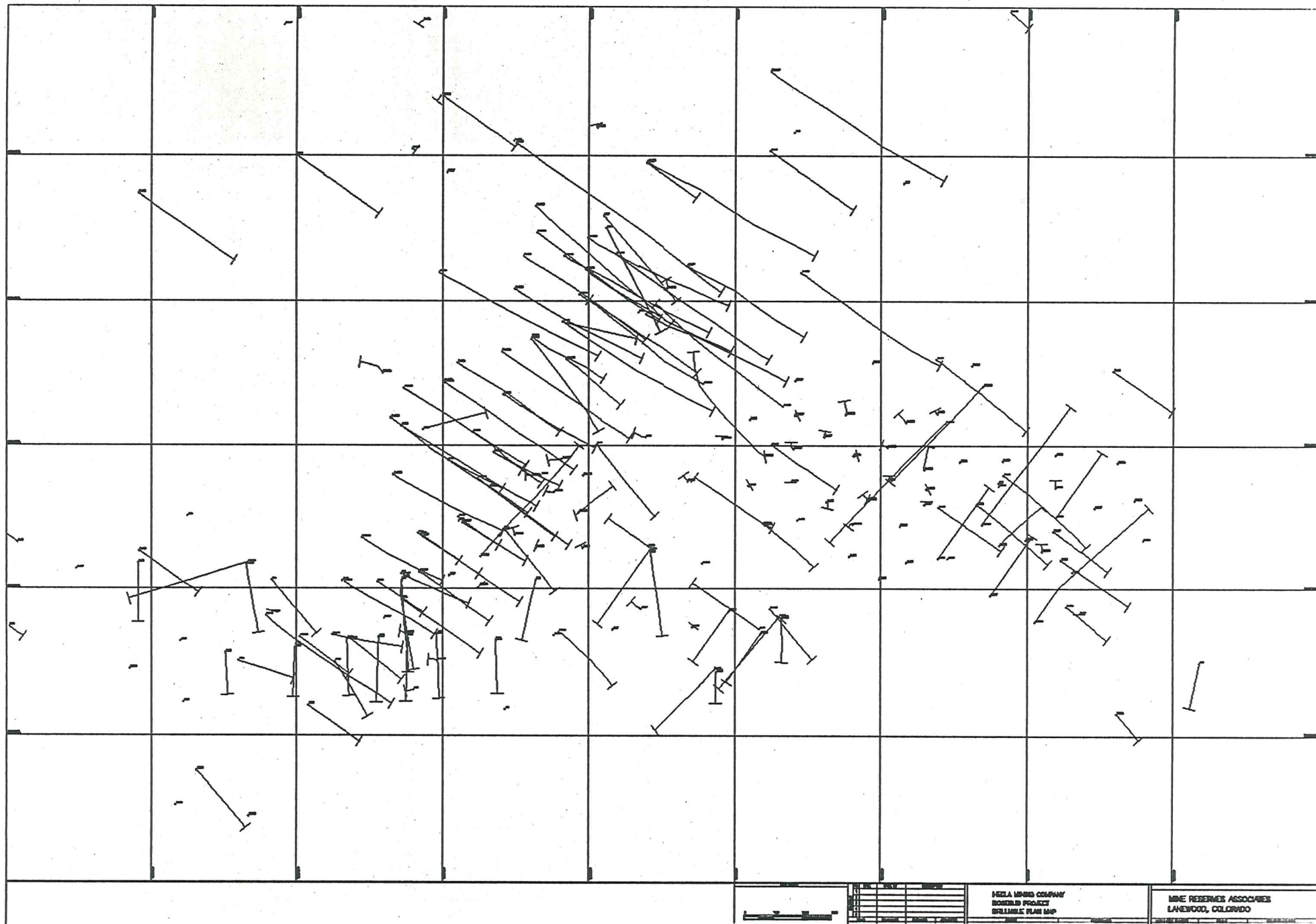
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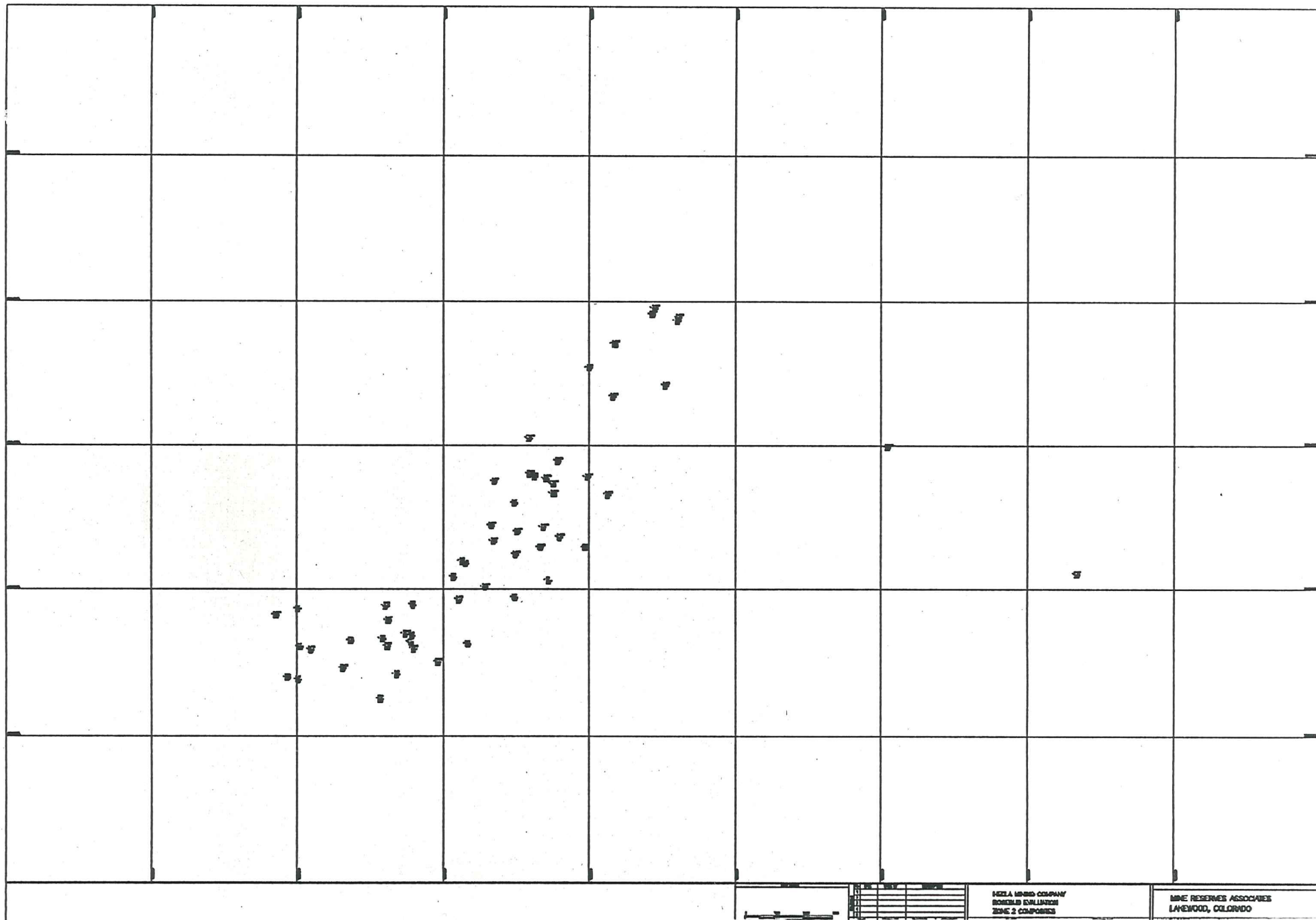
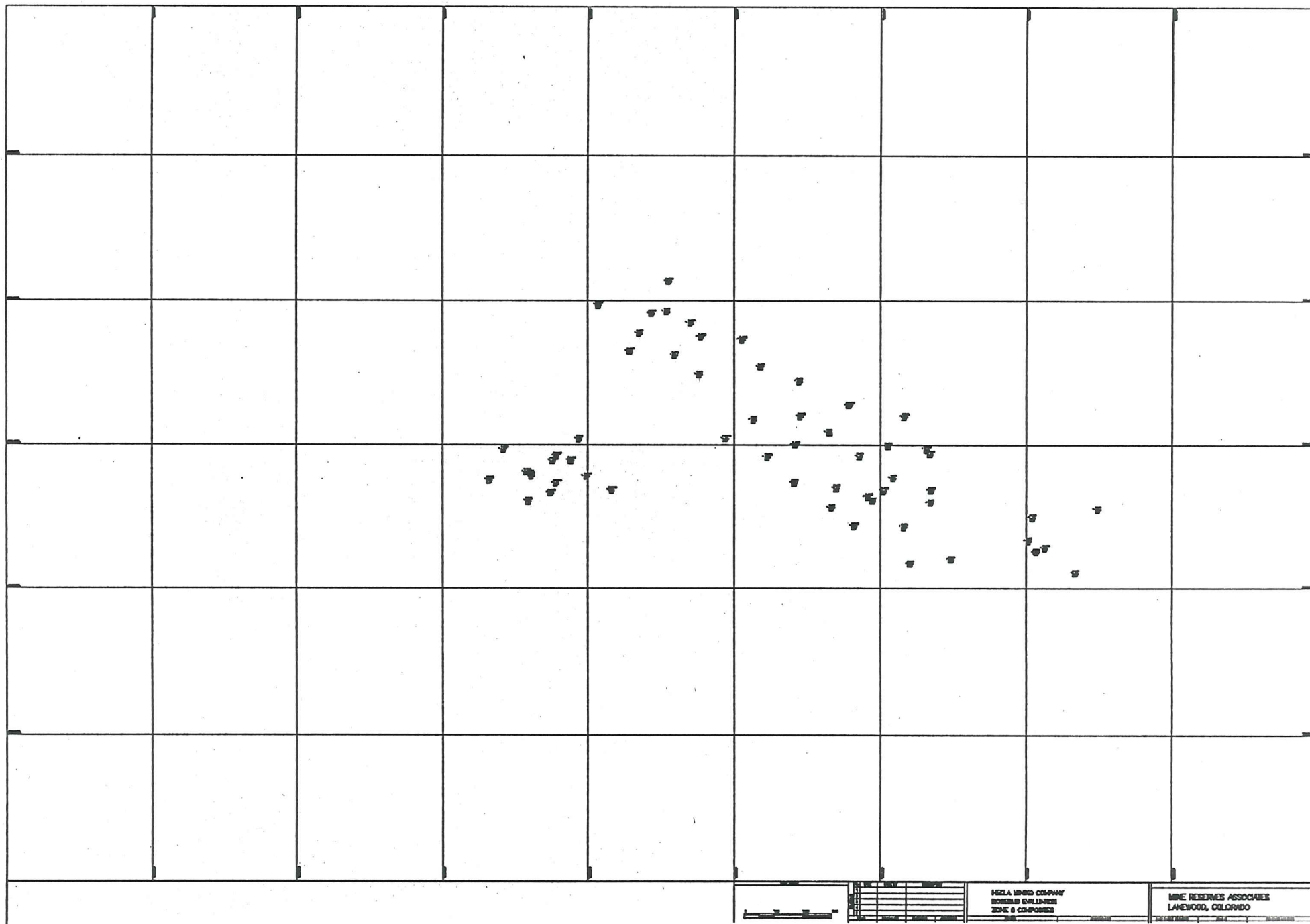FIGURE 2
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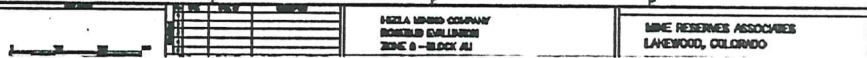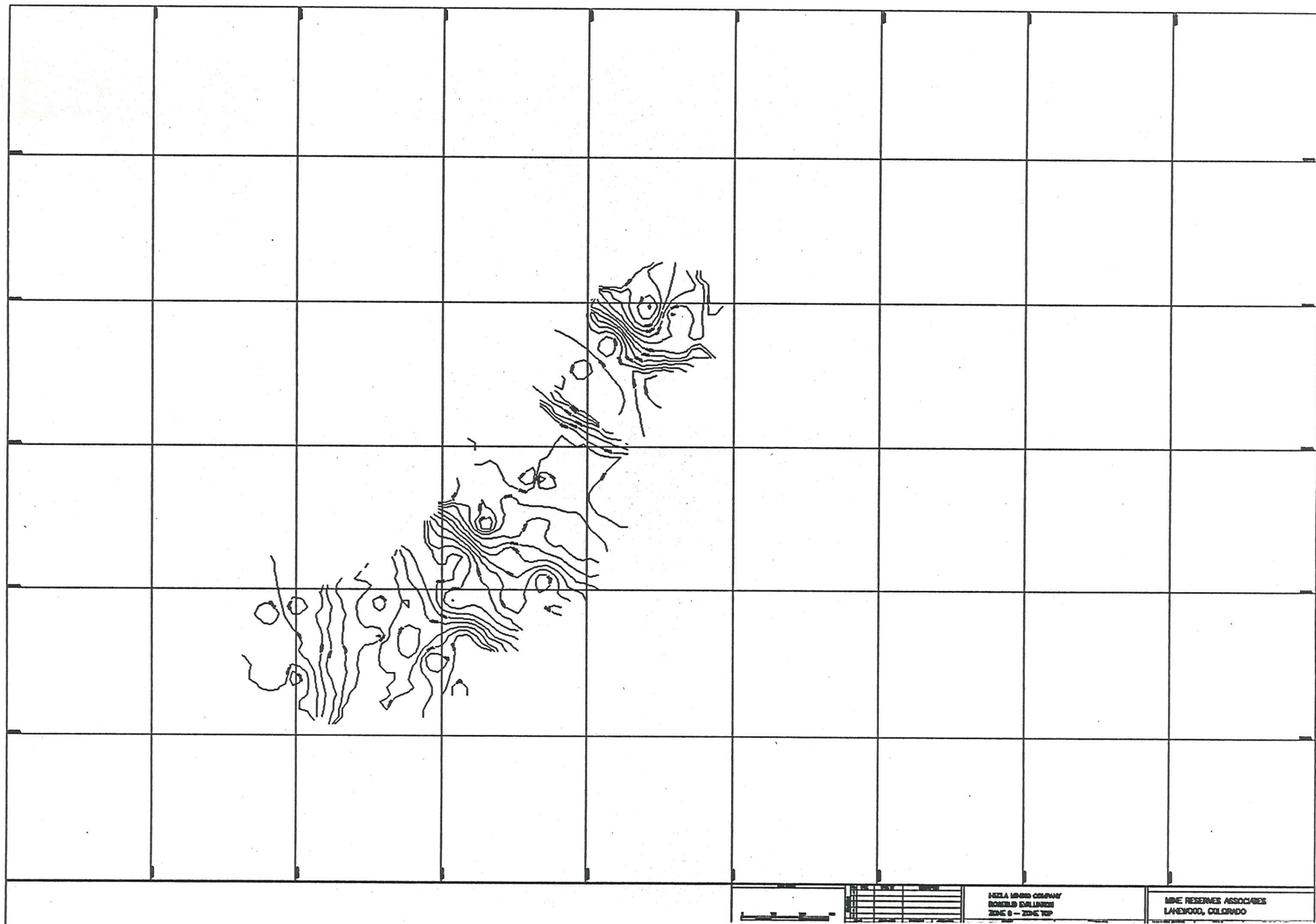
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FIGURE 5
ZONE 6 ESTIMATED BLOCKS

FIGURE 6
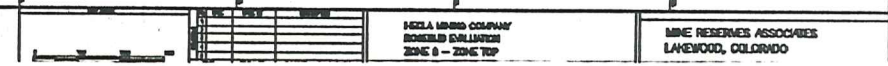## ZONE 2 ELEVATION TOP

FIGURE 7
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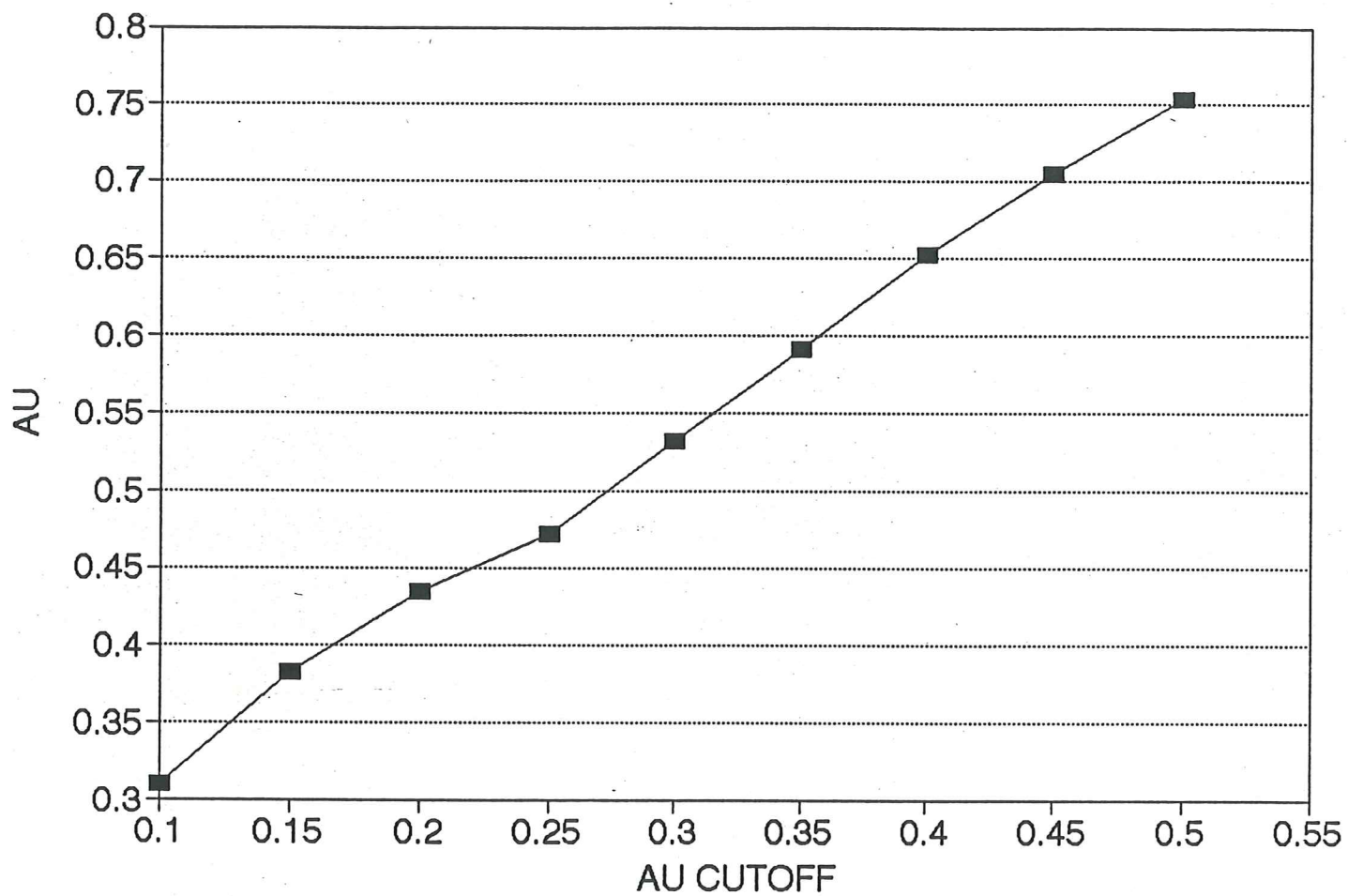
FIGURE 8

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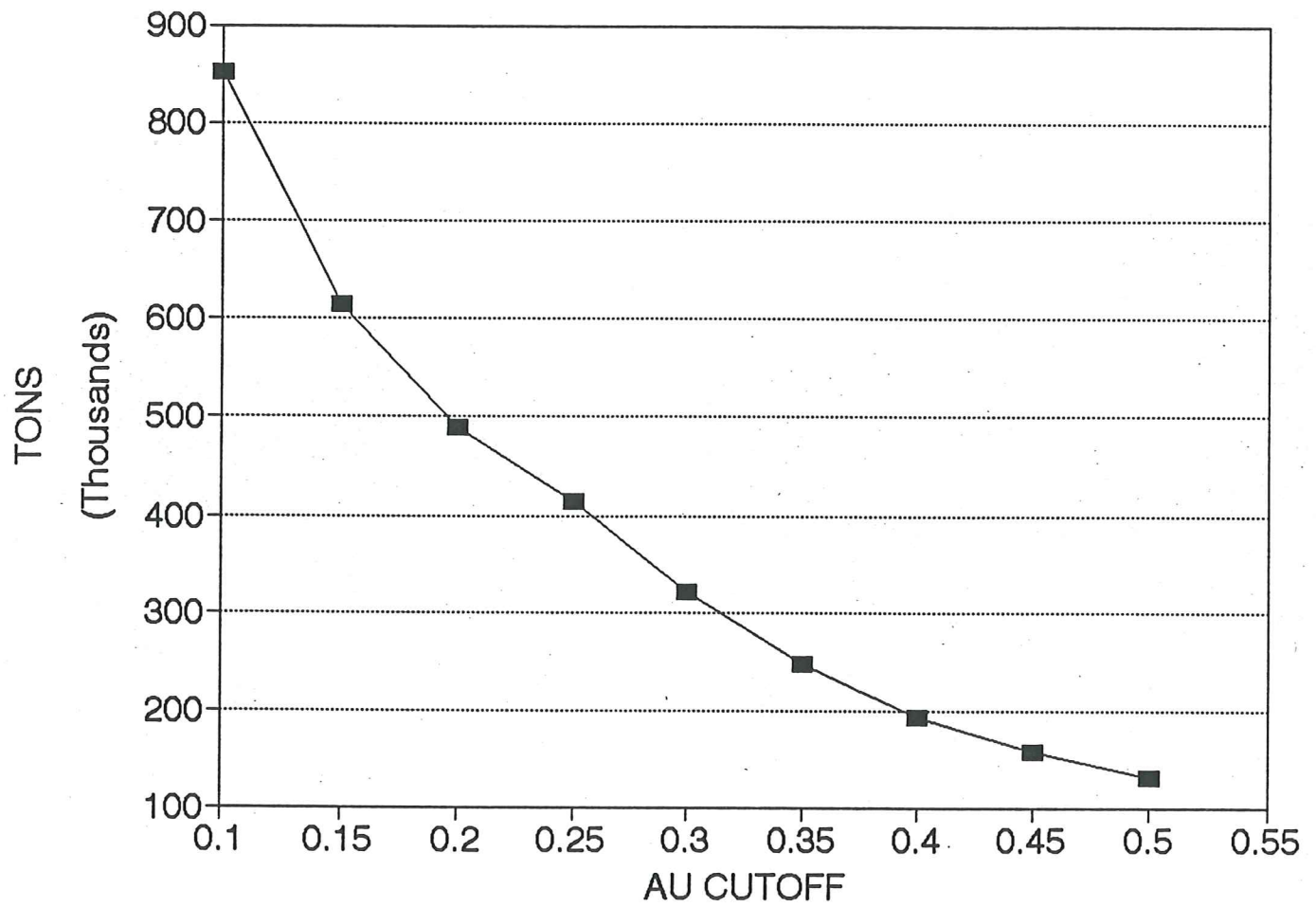
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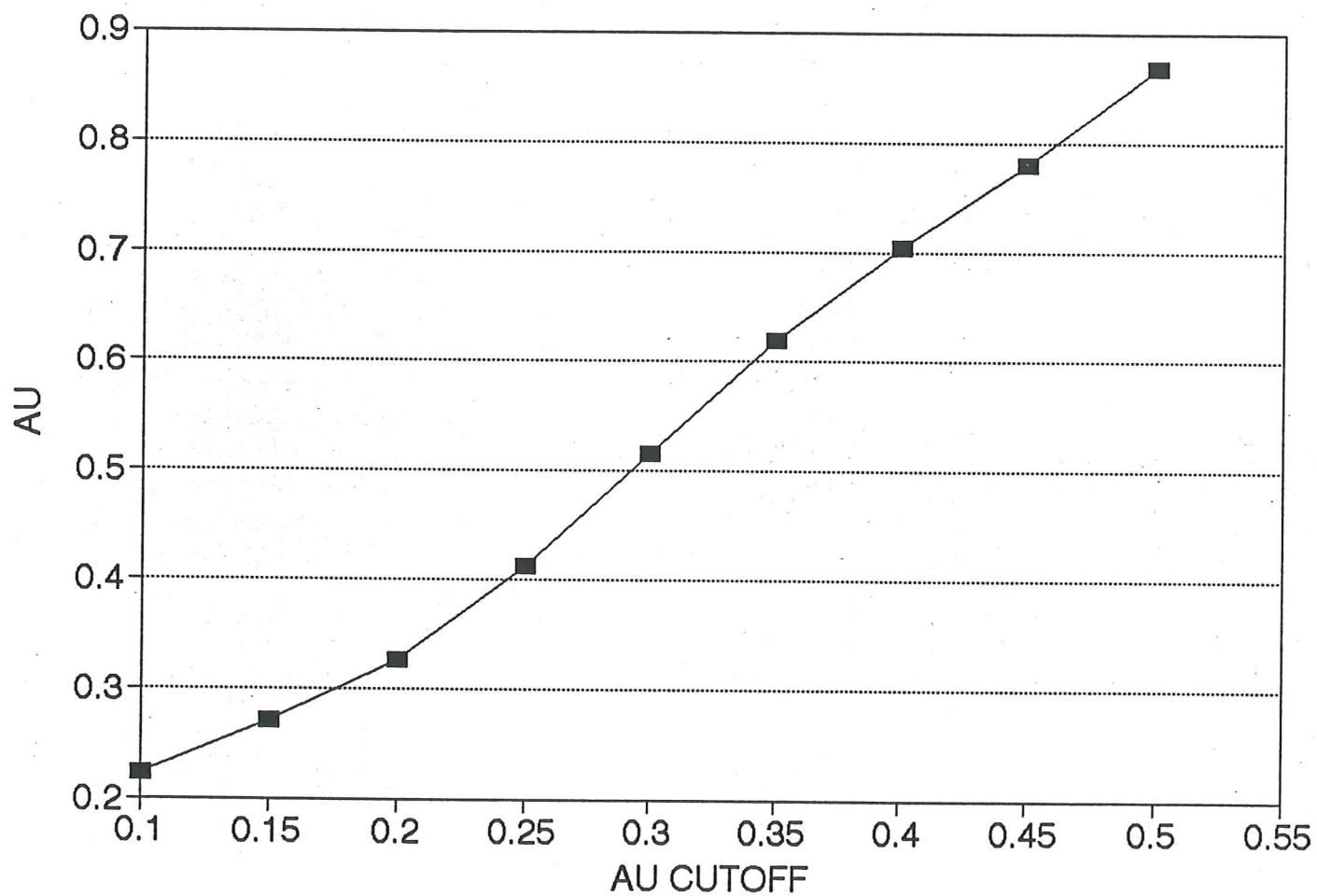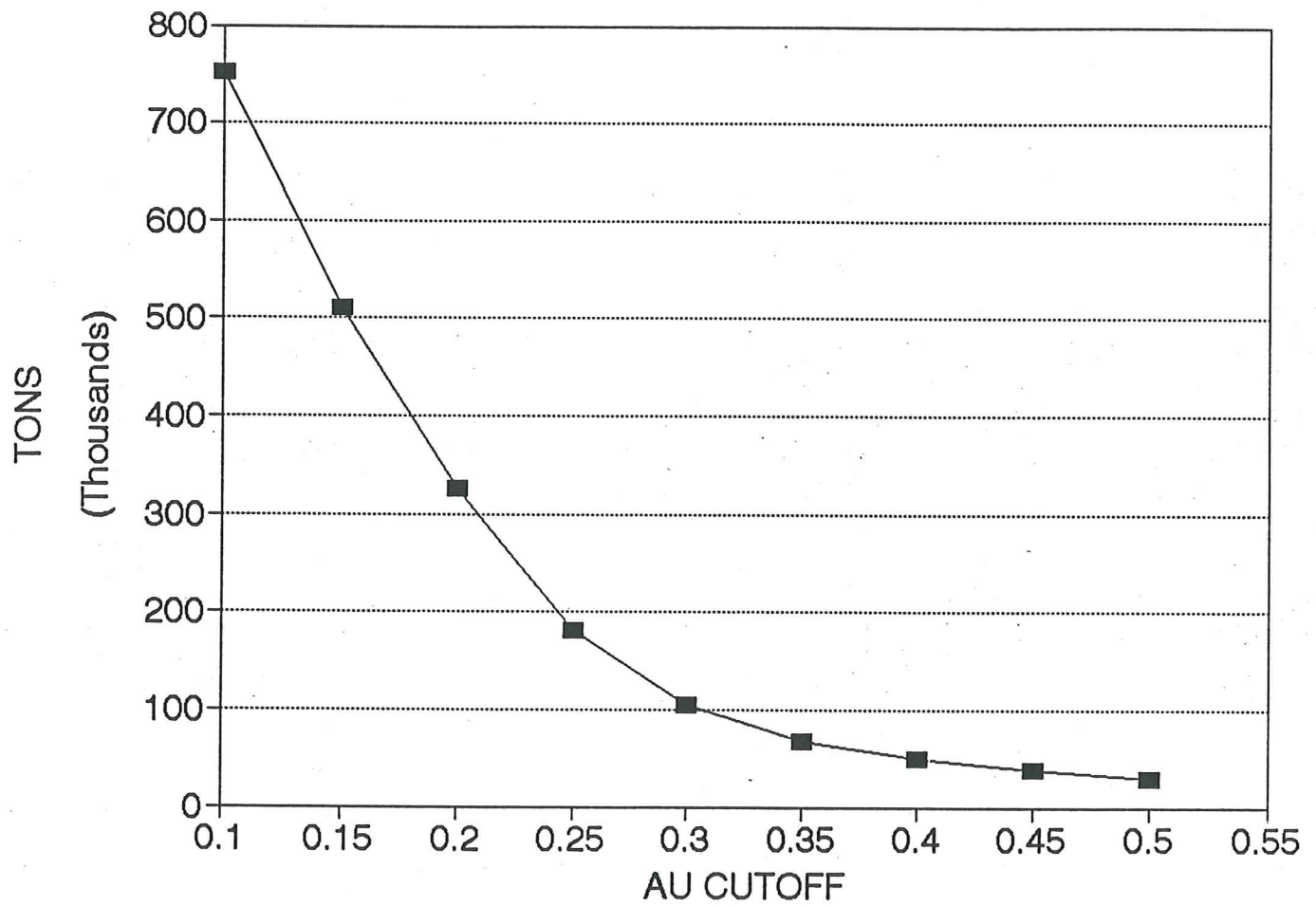
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7.0 CONCLUSIONS AND RECOMMENDATIONS

Drillhole data collection and analysis appear to have been done conscientiously by Lac initially, and finally by Equinox who later acquired the project. Unfortunately, some of the knowledge concerning check assays seems to have left with the departure of Lac. However, examination of the data as well as old reports indicates that this should not be a problem.

The reserves were developed using industry standard methods. The same general approach was employed in both the computer and manual methods. True thicknesses were computed and the data was projected to the general plane of the zones. Projection distances as well as bounding drillholes limited the extent of estimated ore. Reserves contained within the delineated zones were developed from composites which met a minimum mining thickness as well as a minable cutoff grade. Estimated blocks within the modeled zones as well as the manually calculated blocks would meet a proven/probable classification by normal SEC requirements on reserves. This is due to:

1) The tight zonal boundary separating the mineralized zones from the weakly or non-mineralized material.

2) The inclusion of mining parameters in the compositing of drillhole data.

3) The confirmation of mineralization continuity through the geostatistical analysis and estimation of grades within the range of continuity.

MINE RESERVES ASSOCIATES, INC.
2700 Youngfield Street, Suite 250
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TELECOPIER TRANSMITTAL COVER SHEET

Date: December 13, 1993

To: Fred Stahlbush

From: L.E. Allen

Number of pages (including header page): 4

If you have any questions or do not receive the total number of
pages, please call (303) 231-9446.

Special Instructions:

MR A

MINE RESERVES ASSOCIATES, INC.
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Lakewood, Colorado 80215
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MEMORANDUM

To: Fred Stahlbush
Fm: L.E. Allen
Re: Rosebud Zone 2
Date: December 12, 1993

    I broke out Zone 2 into Chimney and Non-Chimney reserves.
These are:

	Non-Chimney			Chimney		
Cutoff	Tons	Au	Ag	Tons	Au	Ag
.100	724,255	.230	1.91			
.150	486,562	.283	2.07			
.200	361,577	.321	1.98			
.250	285,942	.347	1.82			
.300	193,995	.382	1.55			
.350	121,086	.417	1.47			
.400	66,322	.448	1.37			
.450	30,019	.475	1.59			
.500	3,197	.532	2.32	127,990	.759	2.13

    As the tons above cutoff for the Chimney area does not change
in the .100 to .500 oz/ton range, this reserve was not graphed.

ZONE 2 W/O CHIMNEY AVERAGE AU
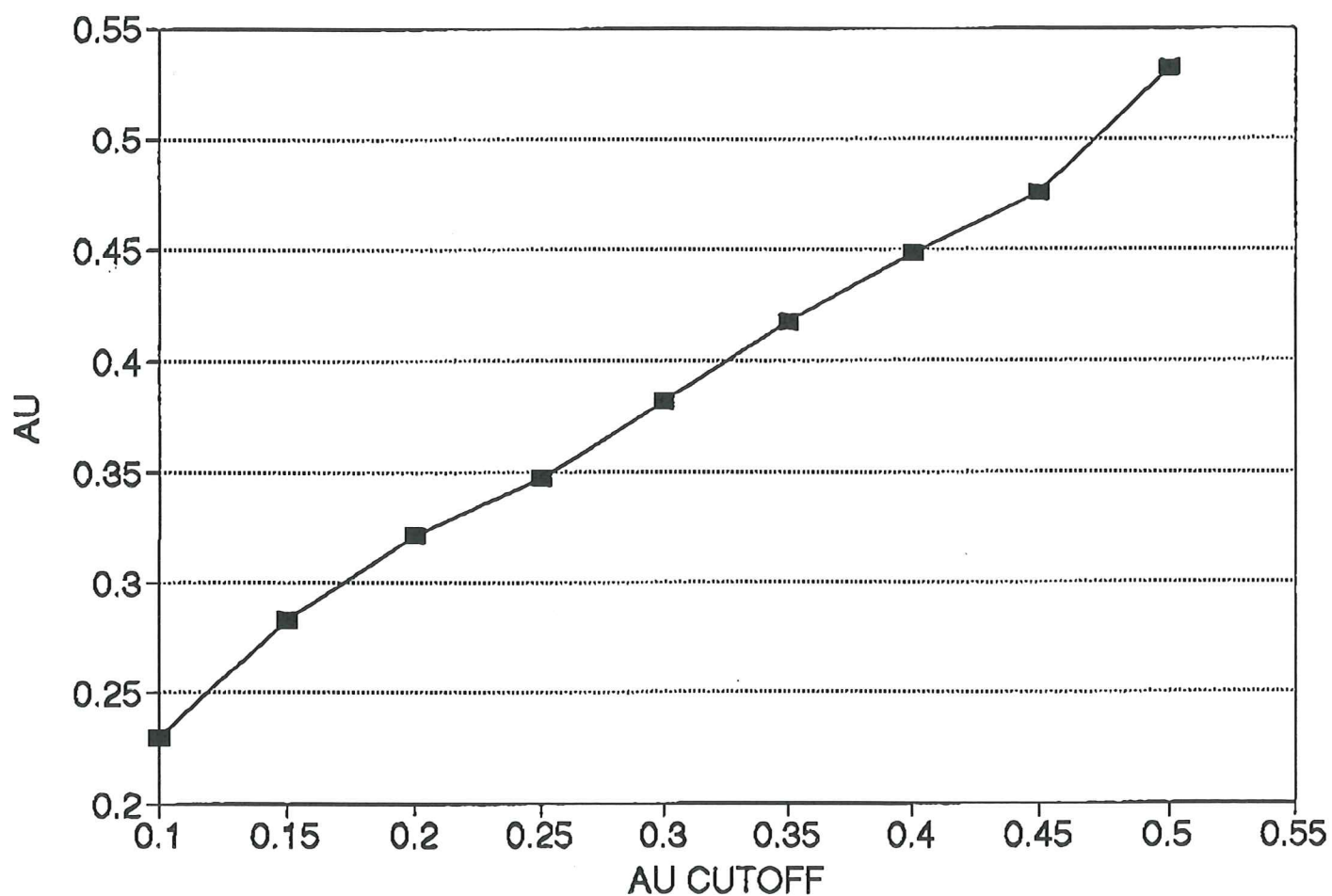
ZONE 2 W/O CHIMNEY TONNAGE

TONS (Thousands) vs AU CUTOFF

EXECUTIVE SUMMARY
MINE RESERVES ASSOCIATES INC'S REPORT
"RESERVE AUDIT OF THE ROSEBUD DEPOSIT"
DECEMBER 9, 1993

Mine Reserves Associates Inc. (MRA) estimated the main zones (Zones 2 and 6) using Outlier Restricted Kriging, a geostatistical technique developed to reduce the normal smoothing effect of linear kriging in highly skewed mineralized populations. The smaller ore grade zones were calculated manually by Hecla and diluted by a 15 percent factor. At a 0.100 oz/ton cutoff, the in-place (but diluted) reserves for Rosebud are:

Zone	Tons	Au (opt)
1	134,869	.147
2	852,246	.310
3	52,691	.231
5	114,834	.245
6	752,519	.224
7	77,148	.243
Total	1,984,407	.258

These reserves, both geostatistical and manual, were developed using industry standard methods. Sufficient caution was taken to limit the projection of drillhole values in the plane of the deposit as well as guaranteeing that the true thickness of the zone was computed from drillhole intercepts. It is MRA's opinion that the stated in-place reserves, while still to be subjected to a mining recovery, would be classified as proven/probable by normal SEC requirements. This is due to:

1) The tight zonal boundary separating the mineralized zones from the weakly or non-mineralized material.

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