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Mining District File Summary Sheet

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	The Wintare Company RMI Audit 1995 - Status of TWC Review of Rosebud Ore Reserves
AUTHOR	Clayton, R.; Earnest D.; Winters, H. Jr.
DATE OF DOC(S)	1995
MULTI_DIST Y / (N?) Additional Dist_Nos:	
QUAD_NAME	Sulphur 7½'
P_M_C_NAME (mine, claim & company names)	Rosebud Mine; Hecla Mining Co; Wintare Co Rosebud Project
COMMODITY If not obvious	gold; silver
NOTES	Correspondence; frequency distribution diagrams geology NOTE: Some pages have notes on back 15p

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

DB:
Initials Date

SCANNED:
Initials Date

Revised: 1/22/08

TWC: STATUS OF TWC REVIEW OF ROSEBUD ORE RESERVES 4/25/95

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April 25, 1995

MEMO TO: Ron Clayton
Hecla Mining Company
General Manager
Rosebud Project

FROM: Don Earnest
The Winters Company

SUBJECT: STATUS OF TWC REVIEW OF ROSEBUD ORE RESERVES

TWC has completed or is currently working on the following aspects of its technical review of the Rosebud Project ore reserves. This memorandum provides an update of our findings thus far and an estimate of time required to complete our work on each issue.

1) Review of Geologic Cross Sections and Level Plans

A set of geologic cross sections and level plans were provided to TWC by Wes Hanson in the form of computer plot files on 3-1/2 inch discs. The orientation of the geologic cross sections is southeast-northwest (looking northeast), the scale is 1" = 50', and the section spacing is 50 feet between -300N and 1400N. Each cross section contained drill hole traces falling within the projection limits of the section, raw gold and silver assay intervals, rock type codes, grade domain boundaries, structural zone boundaries, and existing

Apparently did not get the entire set of sections

mine workings. The level plans are at a scale of 1" = 40', and range from an elevation of 4215 to 5295 on 10-foot increments for the South, North, and East mine areas. These plans depict existing mine workings, model block centerpoints and gold and silver grades for each individual block, and grade domain boundaries.

TWC has plotted and examined the geologic cross sections provided by Hecla in detail. Because steeply dipping mineralized structures are common to almost all known Tertiary volcanic-hosted gold deposits, TWC paid particular attention to alternative interpretations and correlations of higher grade drill hole intercepts in cross section, particularly in the stratabound stockwork and disseminated mineralization of the LBT unit. Misinterpretation of steeply dipping mineralized structures has caused serious overestimations of ore reserves at deposits with geologic settings similar to Rosebud in the last five years, most notably at Amax Gold's Hayden Hill project. Hecla has also experienced this, albeit to a lesser degree, with the underground reserves at Grouse Creek. However, based upon our examination of the cross sections, TWC has no disagreement with the interpretations of the Hecla geologists and with the limitations imposed upon the estimation of block grades.

TWC has completed a comparison between the grade domain boundaries shown on the level plans and these same boundaries as depicted in the cross sections for the levels between the 4695 and 4785 elevations. TWC notes

that while the geometry of the domains and the transition between domain boundaries are smooth in plan, the sectional representation of these domain boundaries is more erratic. TWC suggests that prior to the next ore reserve calculation Hecla's Rosebud staff may want to adjust or smooth some of the more erratic section domain boundaries. ?

✳ Several cases were encountered on the cross sections where ore-grade drill hole intervals did not appear to be included within an applicable adjacent domain boundary. TWC believes that these occurrences are probably due to the difference between the projection of the drill hole intercepts into the planes of sections and the actual domain boundaries in sections. TWC will confirm this supposition once a set of level plans which contain drill hole intercepts can be obtained from Hecla.

2) <u>Comparison of Model Block Grades with Adjacent or Nearby Drill Hole Intercepts</u>

TWC has not completed a comprehensive comparison of model block grades in plan with nearby or adjacent drill hole intercepts. Some preliminary comparisons which have been made between the 1"=50' cross sections (which have drill hole intercepts) and the 1"=40' level plans (which have block centers and block grades) indicate reasonably good agreement. However, TWC

intends to complete these comparisons once a set of level plans containing drill hole intercepts is received from Hecla.

3) Drill Hole Spacing

For the majority of the South zone ore reserves, the spacing between drill holes amounts to 50 feet or less. These holes consist of older and recent diamond core holes drilled from the surface, along with the most recent drilling which consists of fans of diamond drill holes drilled from underground stations spacing to at least 50 feet was entirely appropriate. The significant improvement in orebody definition can be seen by comparing earlier cross sections constructed prior to the underground fan drilling with the current cross sections. For adequate underground planning of volcanic-hosted gold deposits of this type, the improved orebody definition is essential.

4) Data Base Statistics and Block Grade Estimation

Composite drill hole gold assays were listed by Mine Development Associates (MDA) and Hecla for each of the ore domains broken out as

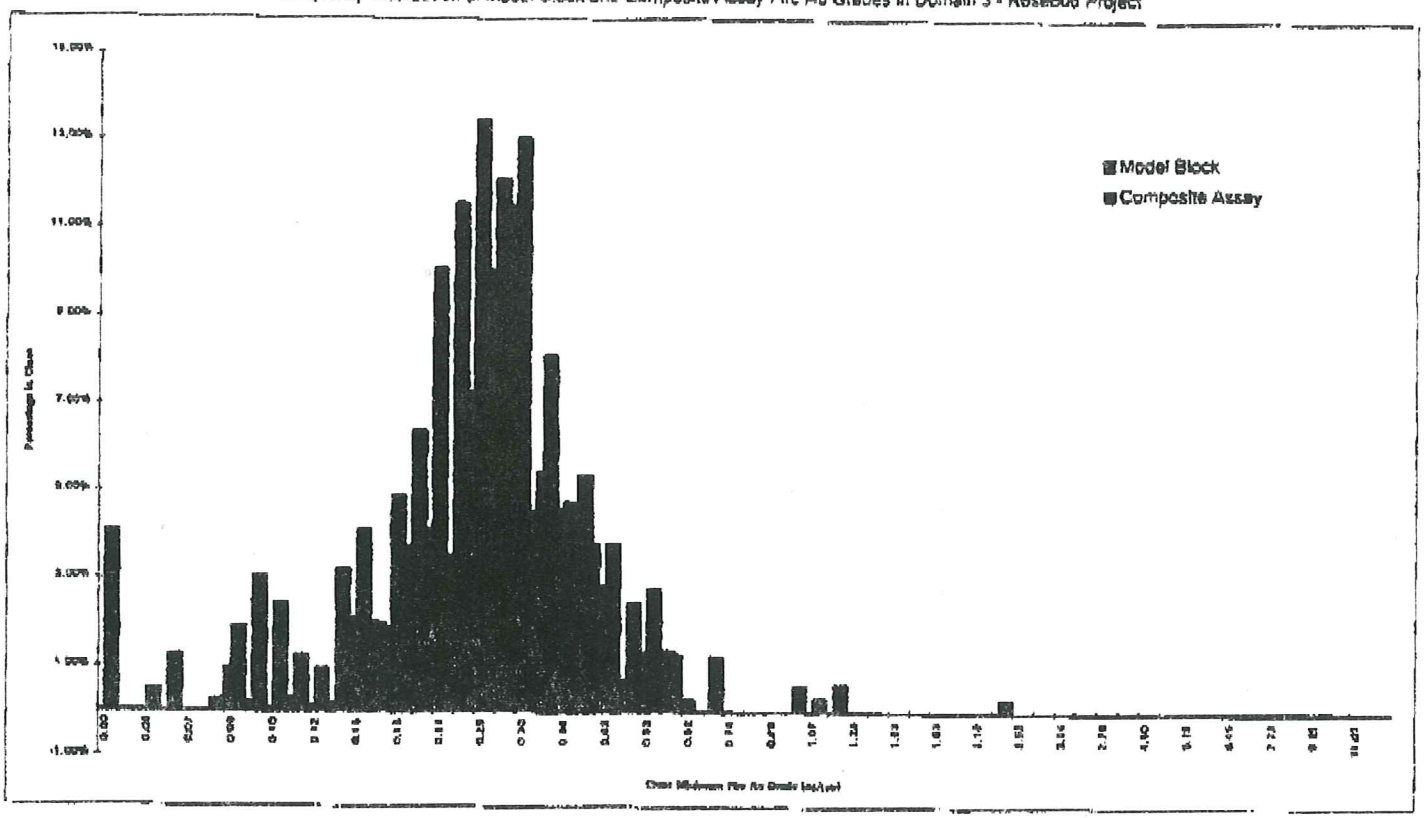
described in the MDA report titled "Rosebud Resource Audit". Similar listings were made for the model blocks for each of the ore domains. These listings were used by TWC to construct comparative frequency histograms and cumulative frequency diagrams. Examples of these comparisons are shown in Figures 1-1 through 1-3 for ore domains three, four, and eight. These three domains contain the majority of the economic gold mineralization in the Rosebud deposit.

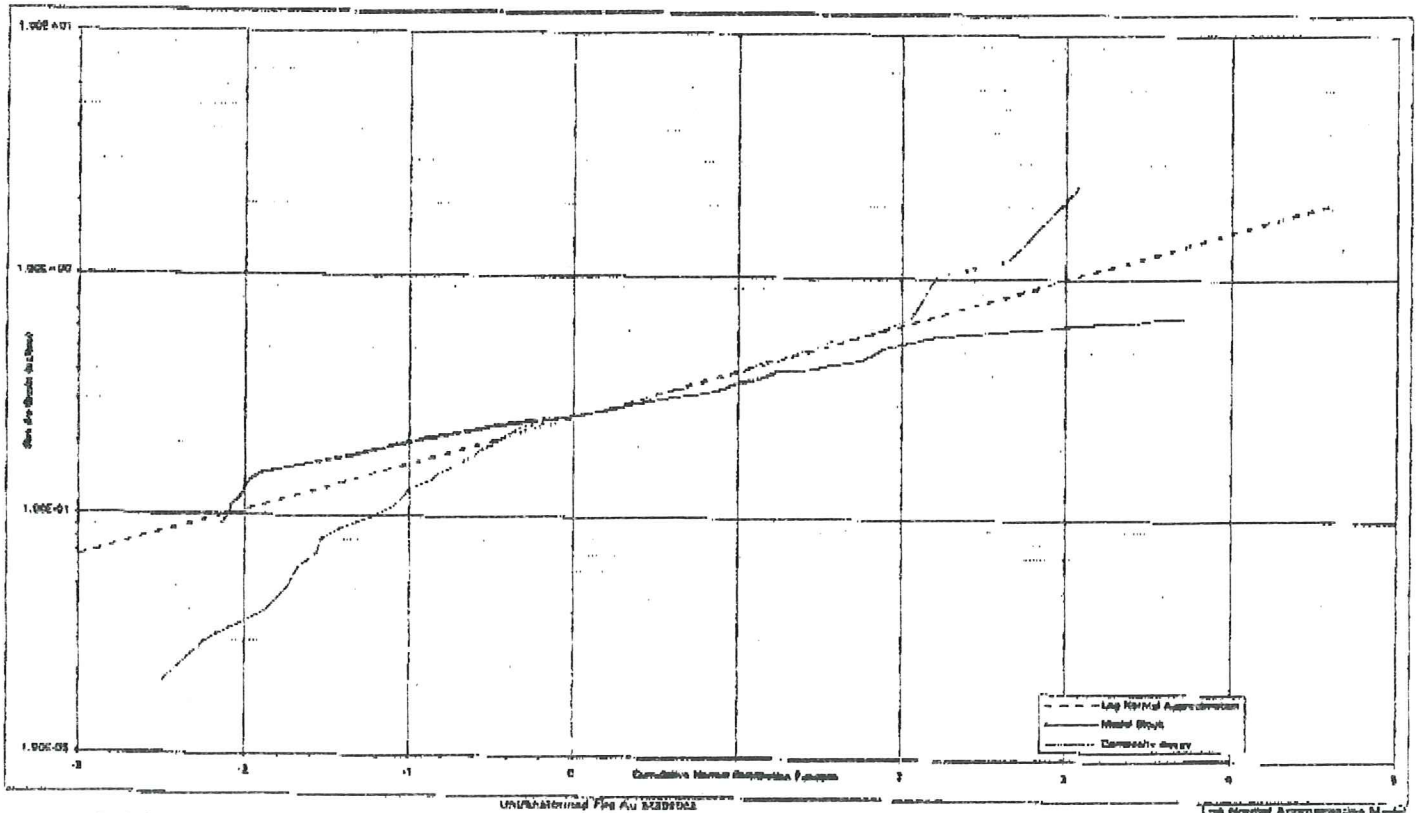
The comparisons shown in the three diagrams indicate that no overall bias exists in the block gold grade estimates as compared to the underlying composite gold grades. In each case, smoothing of the block gold grade estimates has prevented the model block gold grades from reaching the extreme high and low gold grades found in the composite assays. Rather, the center of the composite gold grade distribution is "over-represented" in the block model gold grades. The fact that the central modes in each of the block model gold grade distributions are not shifted considerably from the modes shown by the composite grades suggests that the overall bias in the block model grade estimate is within acceptable limits. However, ore tonnage represented by the large number of blocks near the mode should be handled with care. These tonnages cause the resource estimate to be overly sensitive to cutoff grades near the mode values. For example, in domain four, small changes in the cutoff grade around the mode gold value of 0.7 ounce per ton result in large changes in ore tonnage which are probably not realistic.

TWC suggests that these tonnage biases be further evaluated by Hecla using a Mintec MEDS routine which was designed to recognize block grade estimates which are over-smoothed. The routine is called M619V1 and it is used to compare block grade estimates with the composite grades used for the block grade estimate. The program simply constructs a grade window of plus or minus 50 percent of a given block grade estimate. Each of the composite grades used during the estimate is then compared to the window. If none of the composite grades fall within the window, the block is then flagged as being "over-smoothed". Such an analysis identifies those blocks which should be handled carefully during production scheduling. Rick Sims will bring a copy of the M619V1 routine with him when he meets with Charlie Muerhoff to review intercepts and after Rick Sims and Charlie Muerhoff hold their site meeting. This meeting should take place next week (May 2-5), depending on Charlie's schedule.

8:00 a.m. May 4th @ MDA, Reno

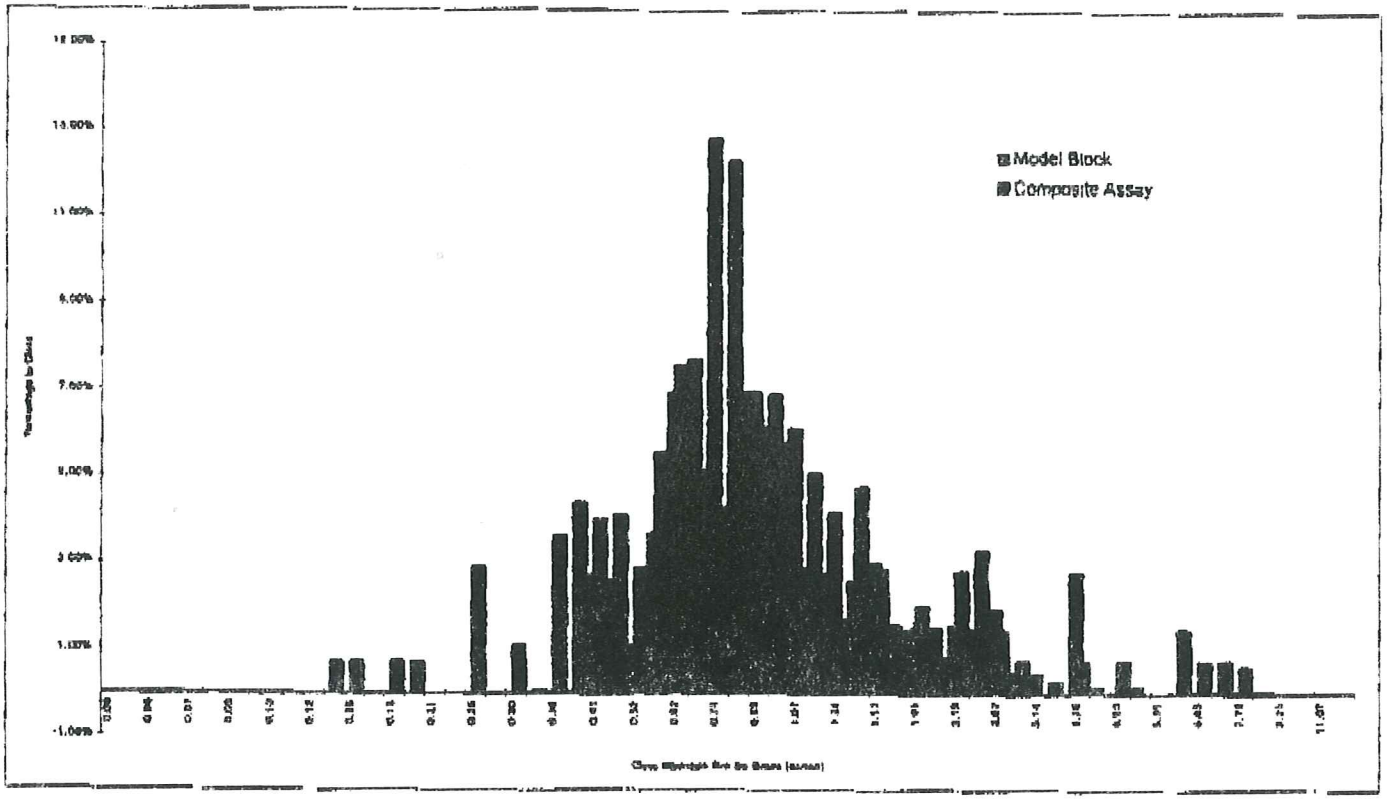
Figure 1 - 1
Frequency Distribution of Model Block and Composite Assay Fire Au Grades in Domain 3 - Rosebud Project

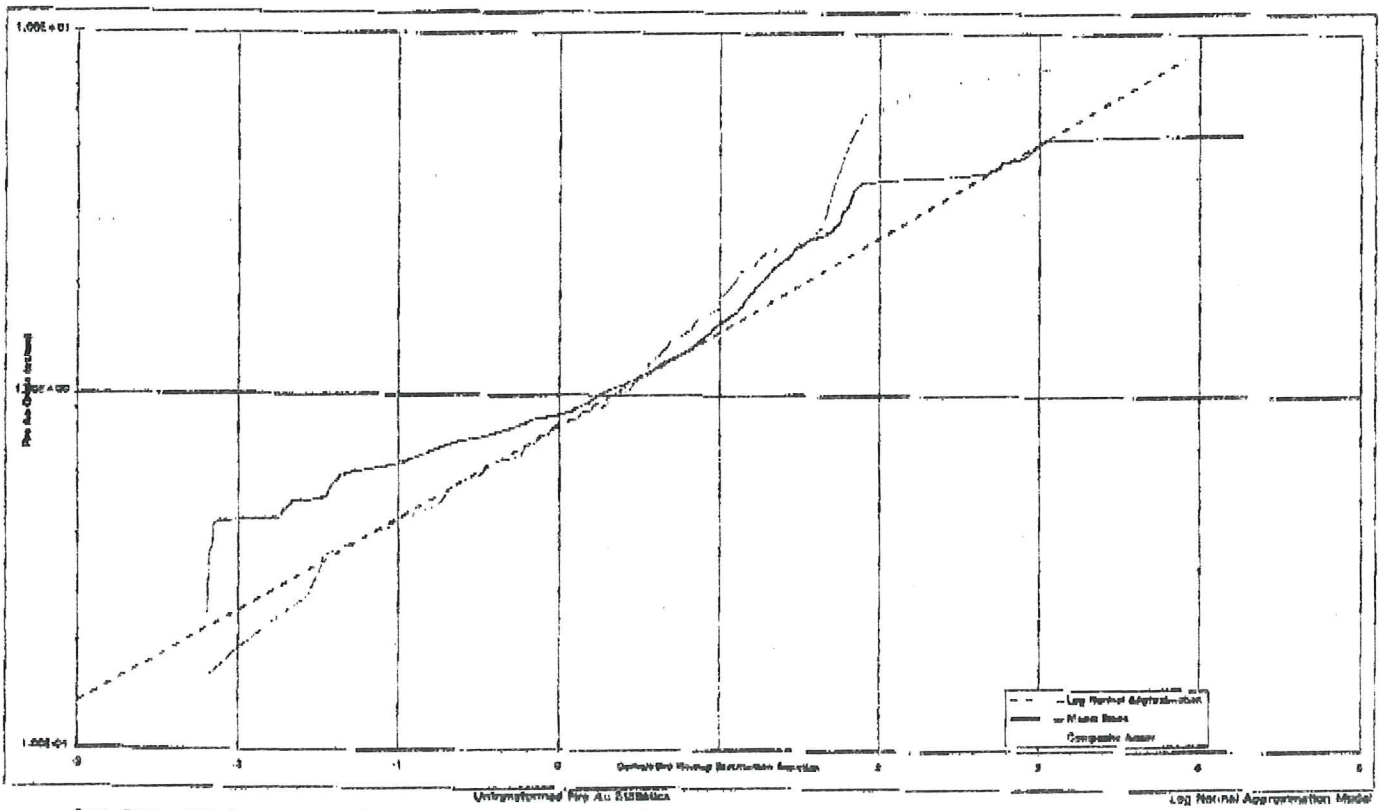




	Fire Au Cutoff = 0.00 oz/ton		Fire Au Cutoff = 0.10 oz/ton		Fire Au Cutoff = 0.60 oz/ton		Fire Au Cutoff = 1.00 oz/ton		(Log Normal Approximation Model)		
	Meters	fire Au (oz/ton)	Meters	fire Au (oz/ton)	Meters	fire Au (oz/ton)	Meters	fire Au (oz/ton)	Mean	Standard Deviation	Third Parameter
Model Block	299.885	0.288	296.000	0.290	8.884	0.648	0	0.000	-1.36	0.65	0.00
Composite Assa	1.641	0.283	1.641	0.283	135	0.785	31	1.380			

Figure 1 - 2
Frequency Distribution of Model Block and Composite Assay Fire Au Grades in Domain 4 - Rosebud Project





Untransformed Fire Au Statistics

	Fire Au Cutoff = 0.00 oz/ton		Fire Au Cutoff = 0.10 oz/ton		Fire Au Cutoff = 0.60 oz/ton		Fire Au Cutoff = 1.00 oz/ton		Log Normal Approximation Model		
	Meters	Fe Au (oz/ton)	Meters	Fe Au (oz/ton)	Meters	Fe Au (oz/ton)	Meters	Fe Au (oz/ton)	Mean	Standard Deviation	Third Parameter
Model Block	238,914	1.149	233,673	1.181	225,813	1.188	98,600	1.748	-0.20	0.60	0.00
omposite Ass	1,371	1.233	1,371	1.233	1,074	1.472	617	2.271			

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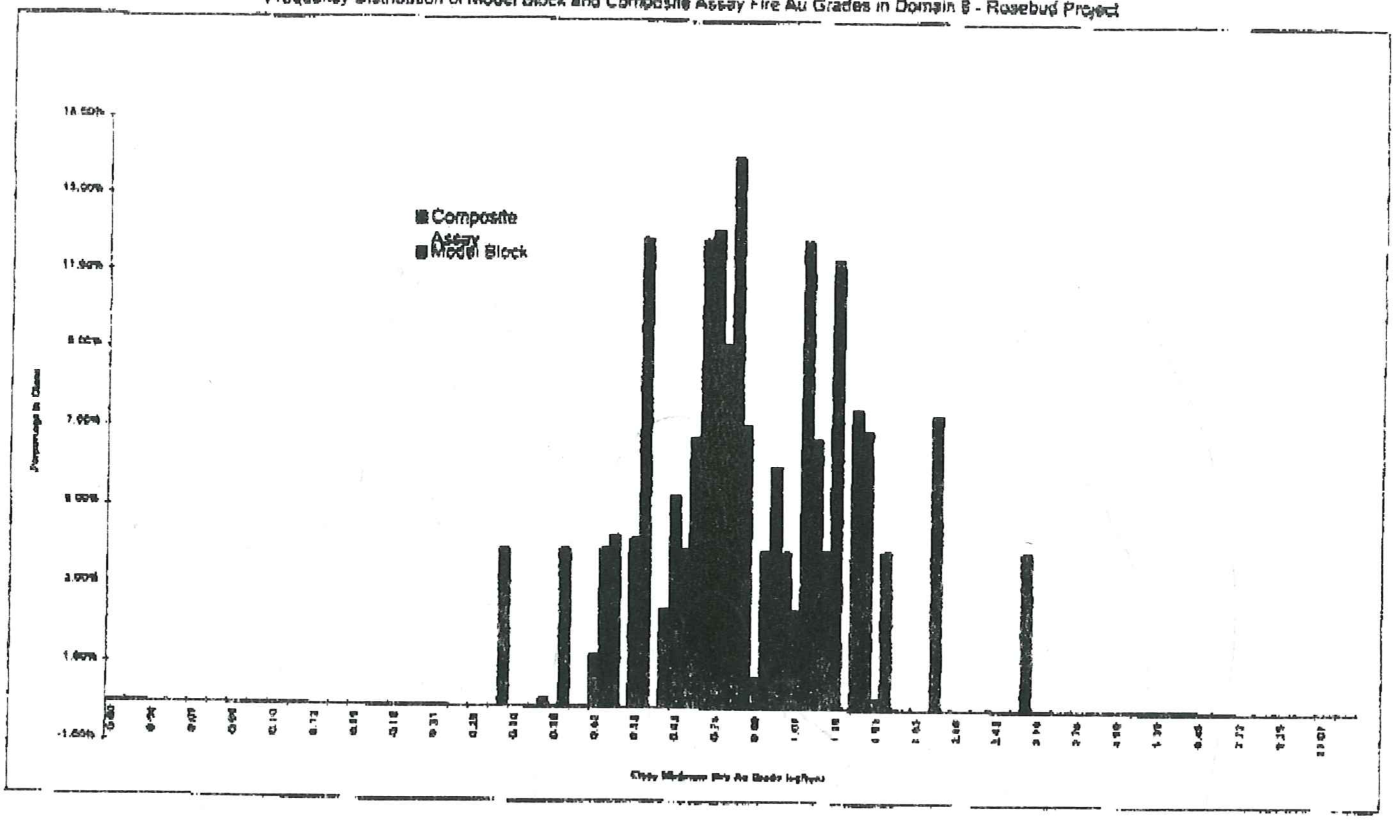
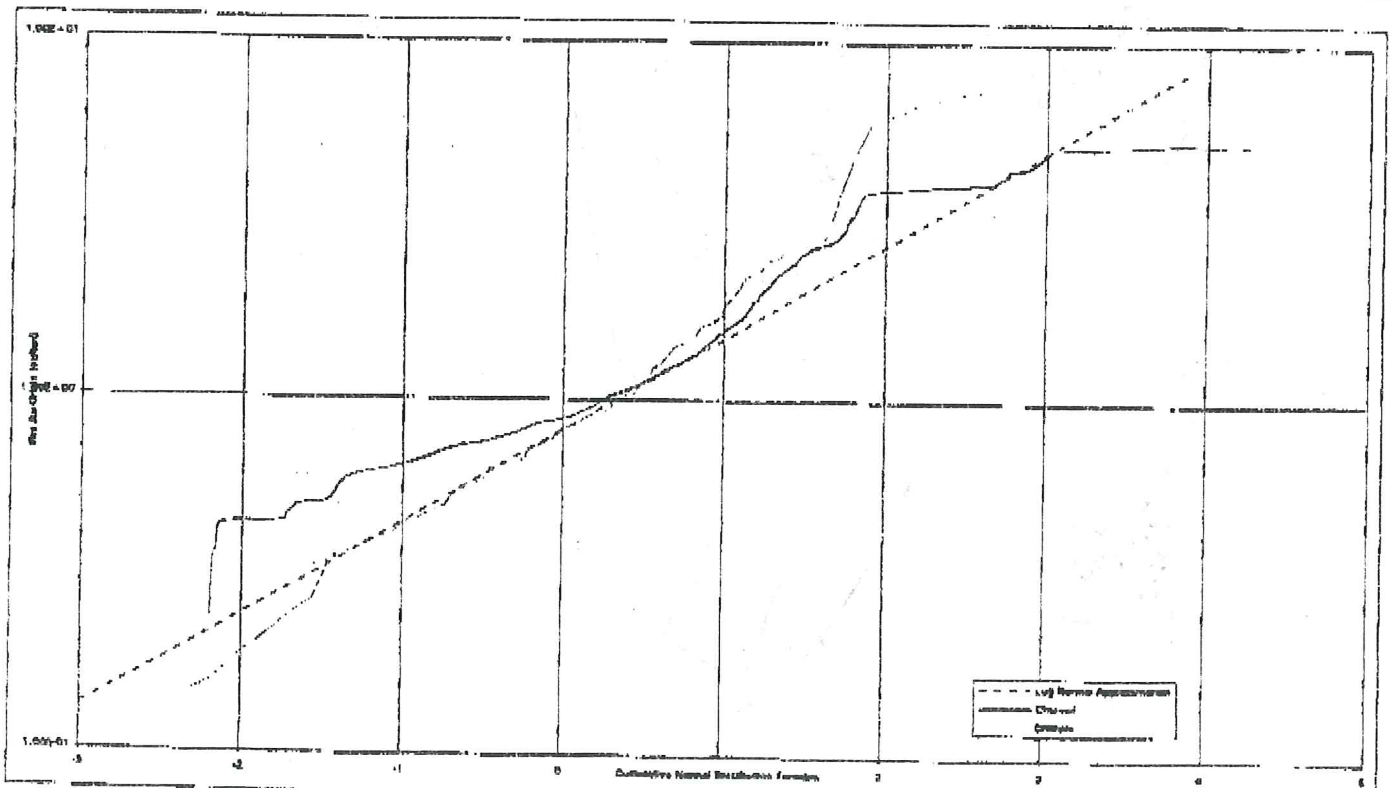
Figure 1 - 3

Frequency Distribution of Model Block and Composite Assay Fire Au Grades in Domain 8 - Rosebud Project





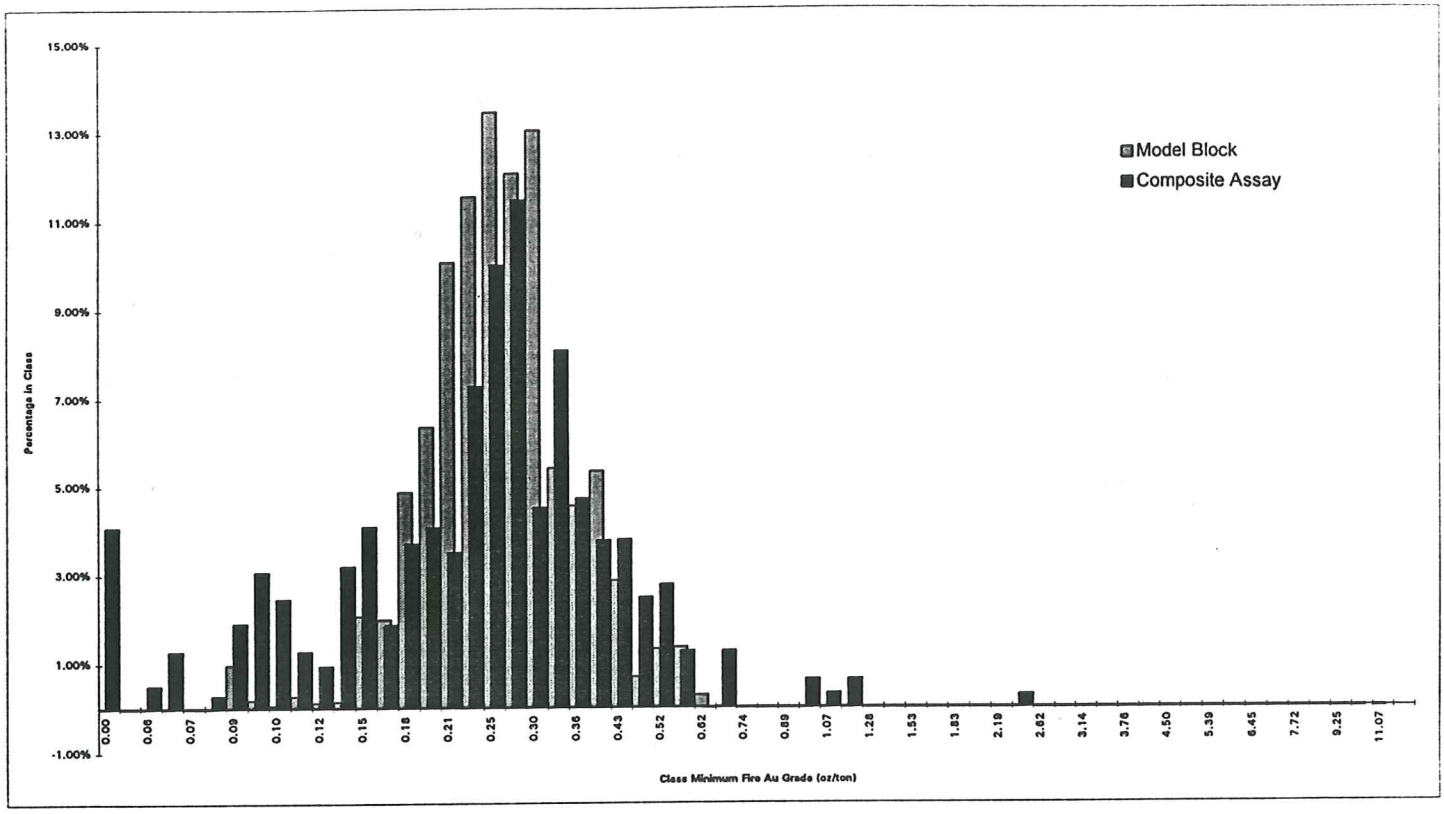
Untransformed Fire Au Statistics

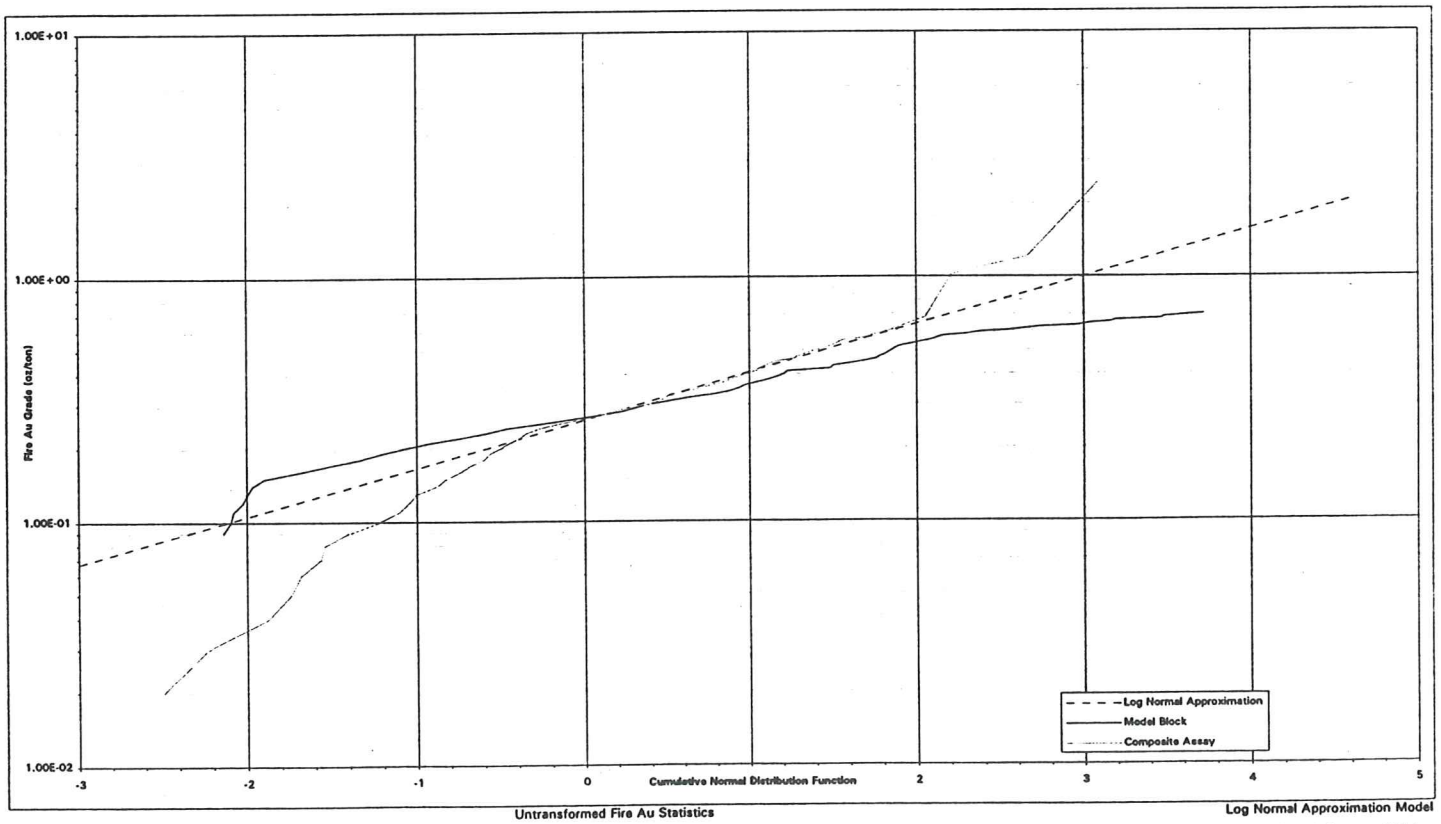
	Fire Au Cutoff = 0.00 oz/ton		Fire Au Cutoff = 0.10 oz/ton		Fire Au Cutoff = 0.50 oz/ton		Fire Au Cutoff = 1.00 oz/ton	
	Meters	Fire Au (oz/ton)	Meters	Fire Au (oz/ton)	Meters	Fire Au (oz/ton)	Meters	Fire Au (oz/ton)
Channel	80,051	0.864	73,498	1.039	66,043	1.077	33,990	1.407
Drillhole	261	1.213	261	1.213	220	1.329	83	2.334

Log Normal Approximation Model

Mean	Standard Deviation	Third Parameter
-0.20	0.80	0.00

Figure 1 - 1
Frequency Distribution of Model Block and Composite Assay Fire Au Grades in Domain 3 - Rosebud Project





Untransformed Fire Au Statistics

	Fire Au Cutoff = 0.00 oz/ton		Fire Au Cutoff = 0.10 oz/ton		Fire Au Cutoff = 0.50 oz/ton		Fire Au Cutoff = 1.00 oz/ton	
	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)
Model Block	299,863	0.286	295,000	0.290	9,886	0.568	0	0.000
Composite Assa	1,561	0.293	1,561	0.293	135	0.755	31	1.360

Log Normal Approximation Model

Mean	Standard Deviation	Third Parameter
-1.35	0.45	0.00

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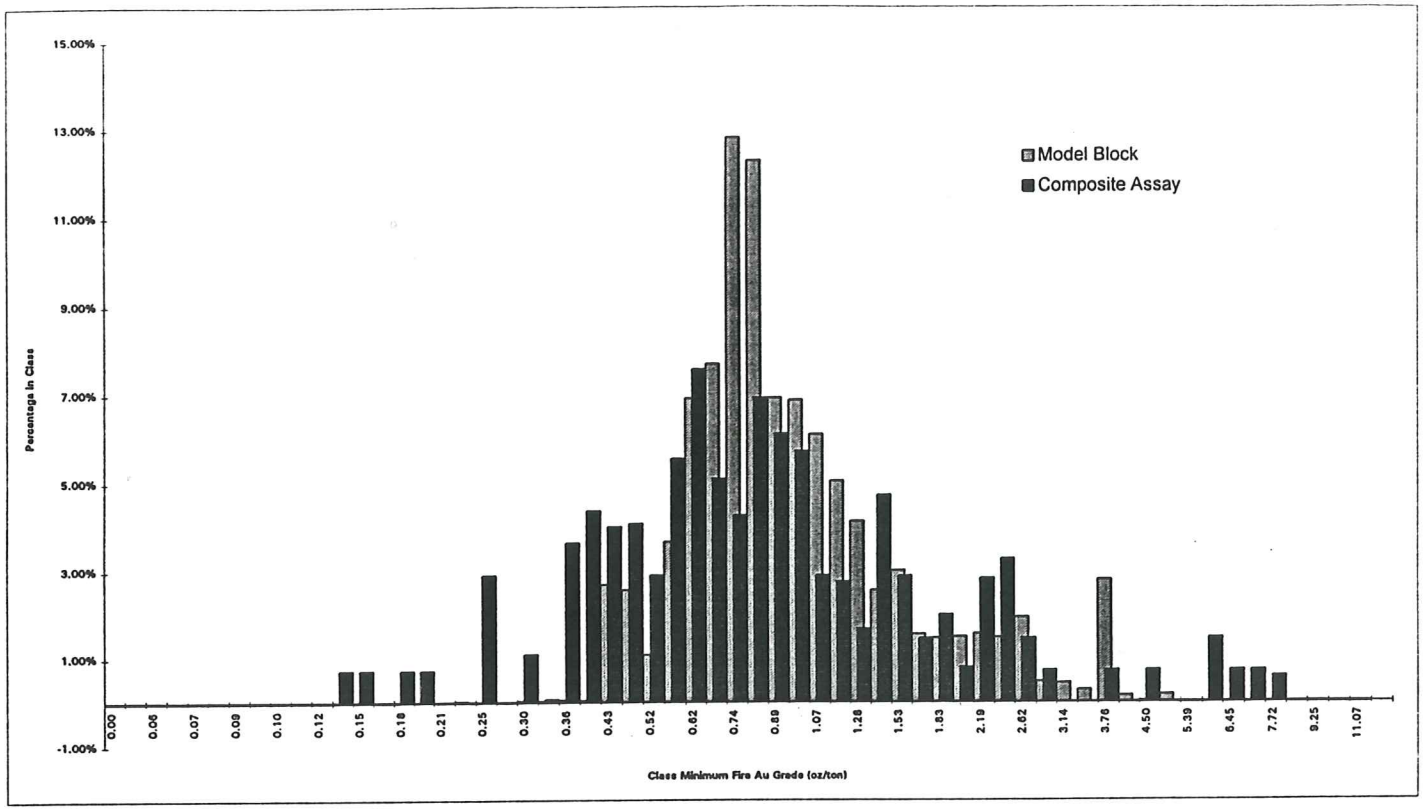
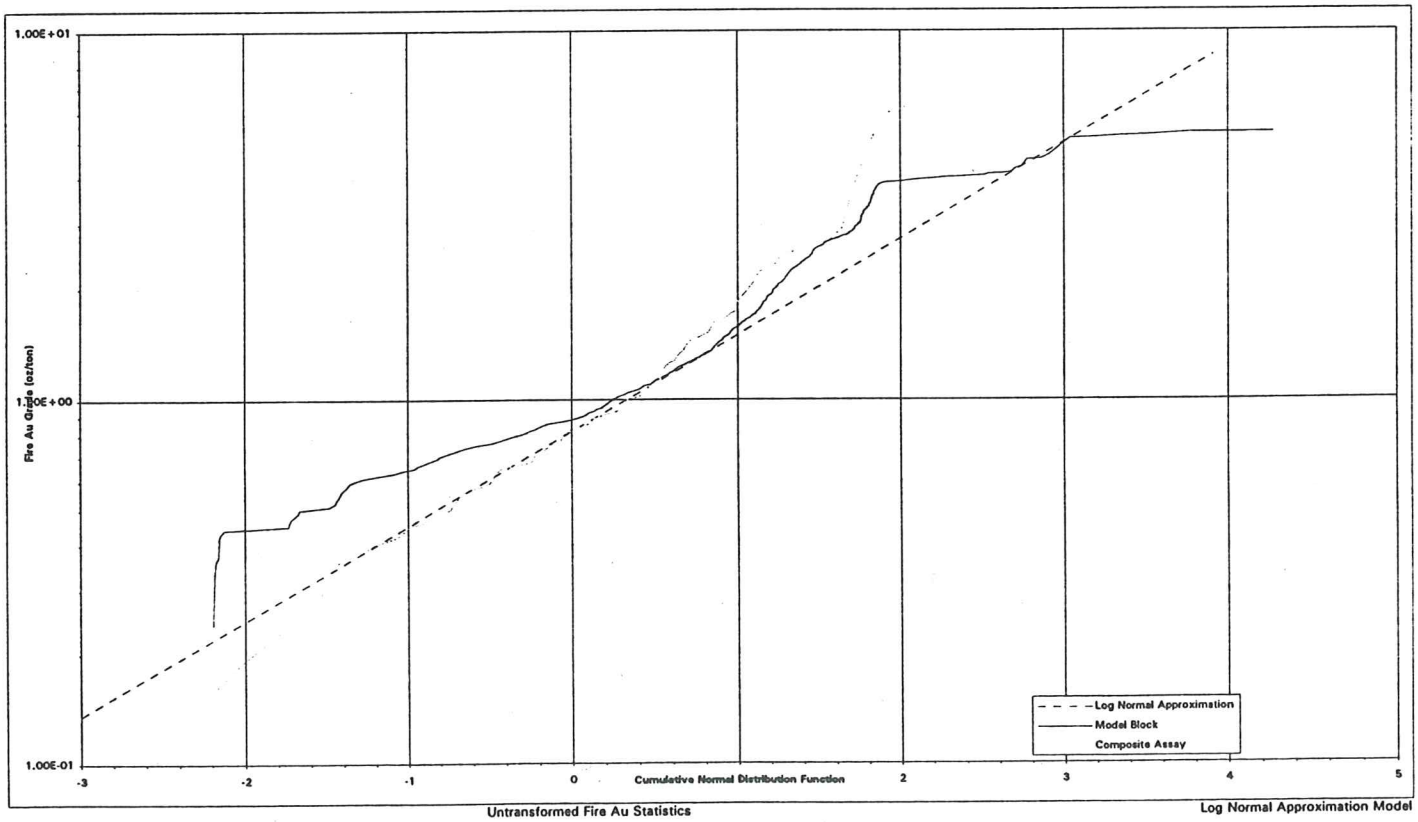
Figure 1 - 2
Frequency Distribution of Model Block and Composite Assay Fire Au Grades in Domain 4 - Rosebud Project





Untransformed Fire Au Statistics

	Fire Au Cutoff = 0.00 oz/ton		Fire Au Cutoff = 0.10 oz/ton		Fire Au Cutoff = 0.50 oz/ton		Fire Au Cutoff = 1.00 oz/ton	
	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)
Model Block	236,954	1.145	233,673	1.161	225,812	1.186	96,600	1.748
omposite Ass	1,371	1.233	1,371	1.233	1,074	1.472	517	2.271

Log Normal Approximation Model

Mean	Standard Deviation	Third Parameter
-0.20	0.60	0.00

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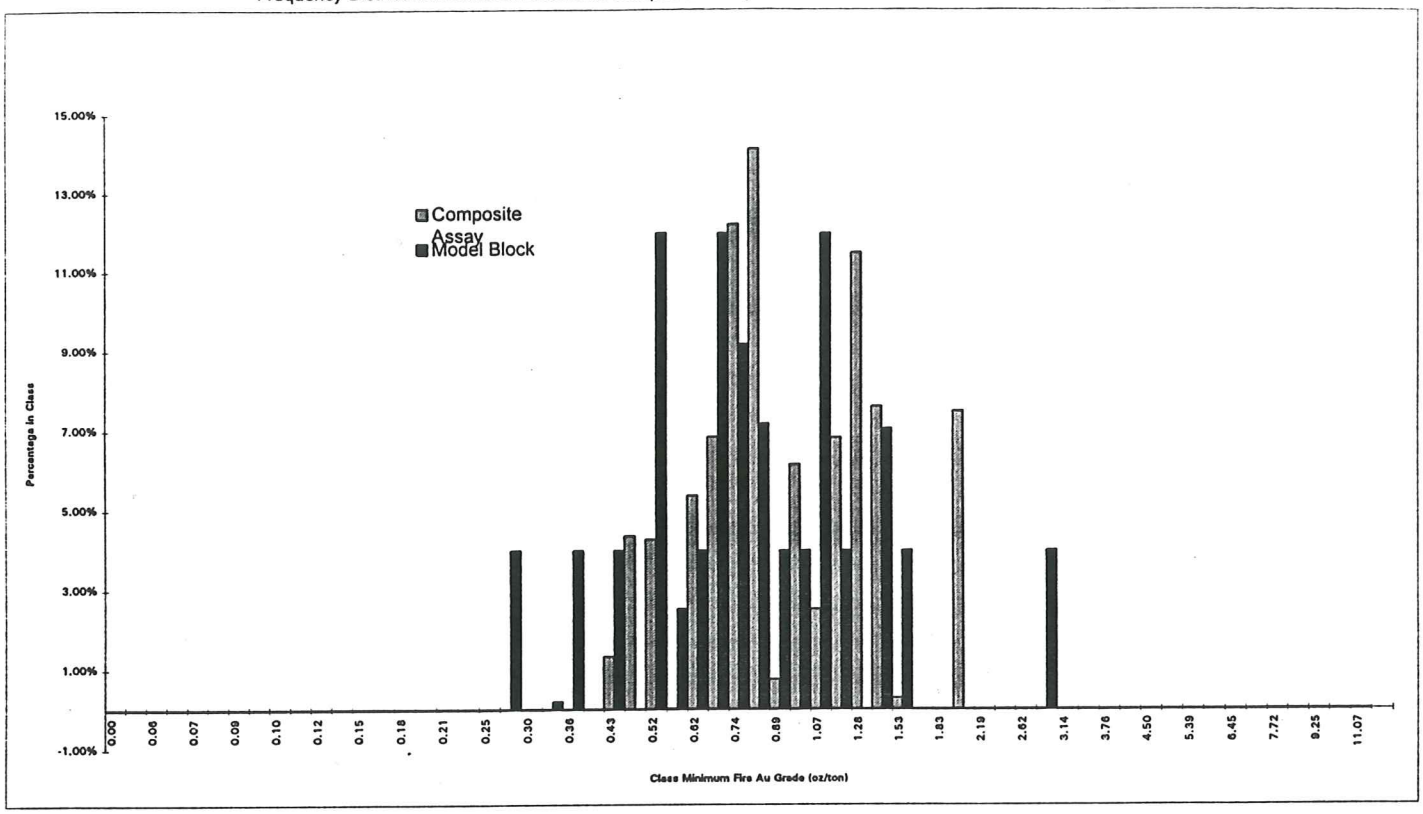
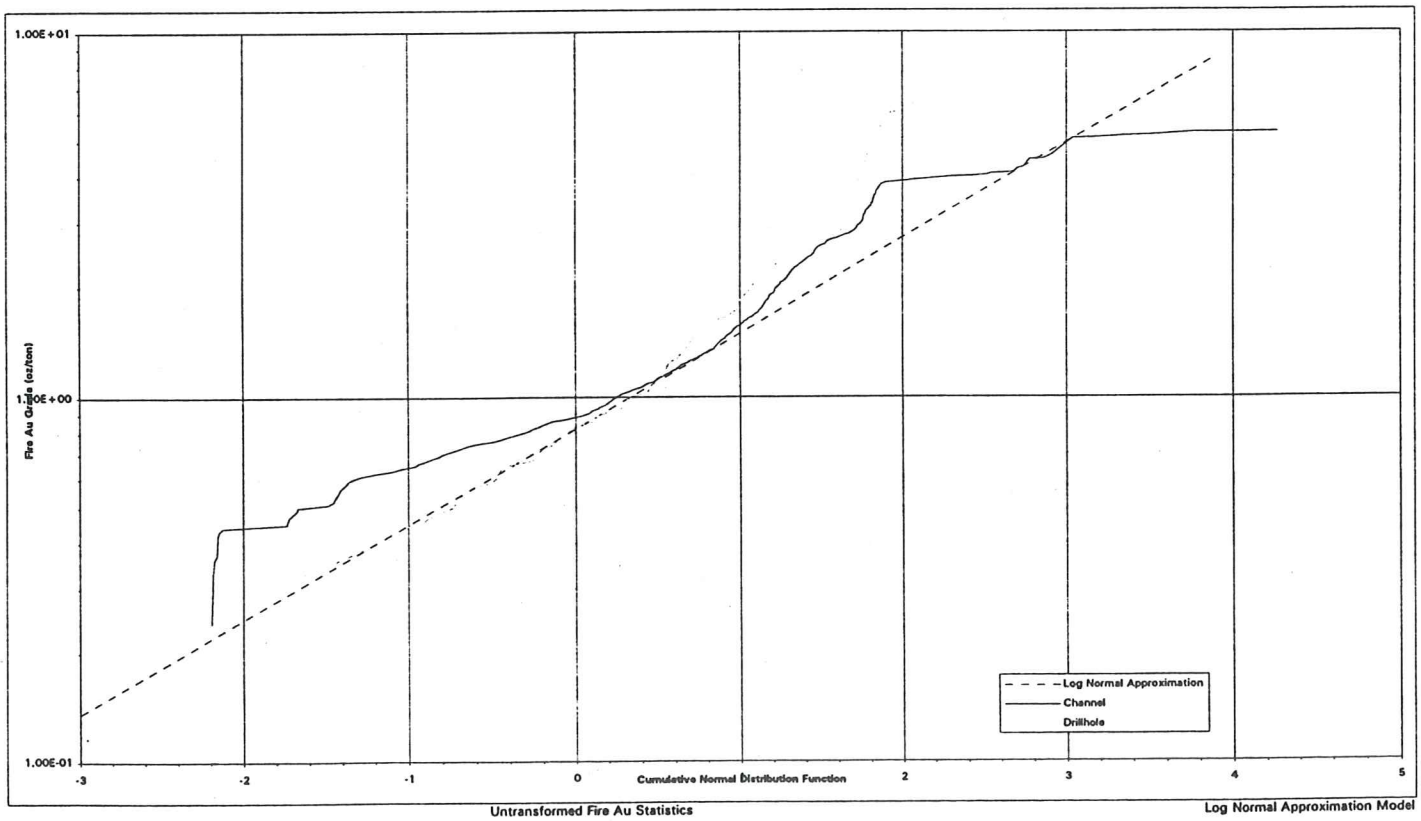
Figure 1 - 3
Frequency Distribution of Model Block and Composite Assay Fire Au Grades in Domain 8 - Rosebud Project





Untransformed Fire Au Statistics

	Fire Au Cutoff = 0.00 oz/ton		Fire Au Cutoff = 0.10 oz/ton		Fire Au Cutoff = 0.50 oz/ton		Fire Au Cutoff = 1.00 oz/ton	
	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)	Meters	ire Au (oz/ton)
Channel	80,051	0.954	73,498	1.039	68,943	1.077	33,996	1.407
Drillhole	251	1.213	251	1.213	220	1.329	83	2.334

Log Normal Approximation Model

Mean	Standard Deviation	Third Parameter
-0.20	0.60	0.00

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THE WINTERS COMPANY
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TUCSON, ARIZONA 85712
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Memo To: Ron Clayton

From: Harry J. Winters, Jr.

Date: May 22, 1995

Subject: Weekly Report for the Period May 15-19

During the week of May 15-19, 1995, the following activities took place:

1. TWC continued the audit of the Rosebud mine reserves by comparing the block model level plans with composite assay level plans. To review the way the block model allocates block grades in high-grade portions of the reserve, simplified block model cross sections are being constructed by hand to show the location of high grade blocks. These cross sections will be overlaid on the drill cross sections to determine if the block model is correctly accounting for lower grade material.

2. Scott Hartman forwarded Hazen laboratory data for flotation testwork involving grind size, recycled water, density, and pH, concentrate leaching data involving density, grind, and time, and CIL optimization

Hecla Rosebud

Don Earnest
Rick Sims

Site Visit - Geology and Ore Reserves Request

1. Underground Tour
2. Review of Geology
   a. Surface and underground geology maps
   b. Geologic cross sections
   c. Access to drill hole logs
   d. Access to representative drill core
3. Ore Reserves
   a. Ore reserve block model cross sections
   b. Ore reserve block model bench plans