Resource Estimate of the Pea Ridge Iron Ore Tailings Project

Prepared for

Sangra Moller

August 27, 2012

DE-00289

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Esteban Acuña

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1.0 EXECUTIVE SUMMARY AND INTRODUCTION

Pincock Allen & Holt (PAH) has been retained by Pea Ridge Resources to complete a Preliminary Economic Assessment (PEA) of the economic viability on reworking the tailings of the Pea Ridge iron mine near Sullivan, Missouri to recover iron as magnetite and hematite, and rare earth elements (REE) contained within the mineral apatite and apatite as a possible feedstock for fertilizer production.

PAH developed a drilling program which was carried out by Pea Ridge Resources to obtain samples of the tailings. Seventy-four holes were drilled for a total of 4,184 feet of drilling; 1,692 samples were collected. These samples were assayed for magnetic (SAT) and total iron (TFe), and 39 additional elements which included the entire suite of light and heavy REE.

This report includes the results of the resource estimation, first step in completing the PEA. Prior to estimating the resources, the REE were converted to oxides and divided into heavy (HREO) and light (LREO) groups. In addition yttrium was converted to an oxide and the phosphorus was converted to apatite using the ideal formula for apatite and assuming al the P was contained within the apatite.

The results of the resource estimates are shown in Table 1-1 for various cutoffs of total iron.

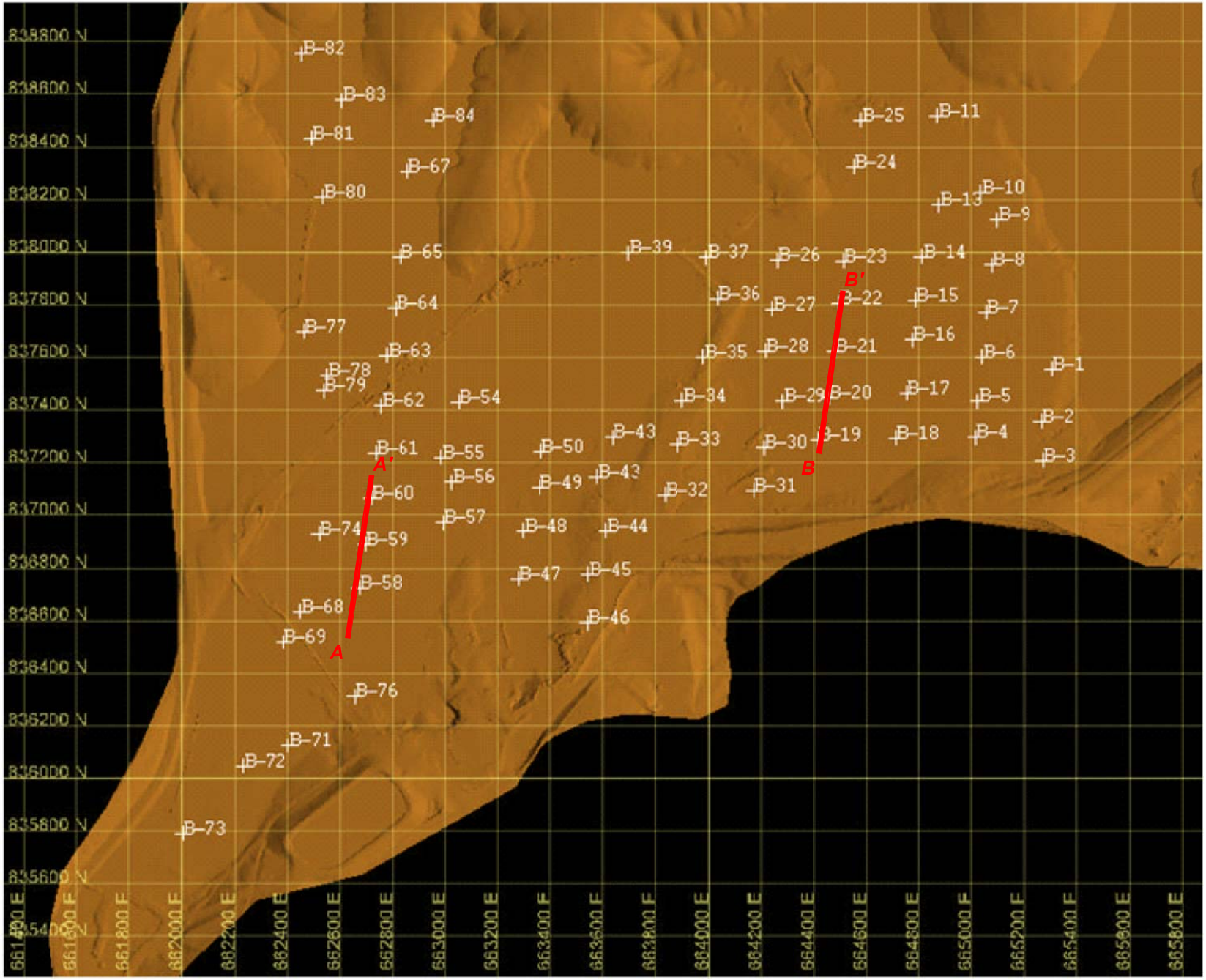
TABLE 1-1
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Results of Estimation

Cutoff	FeT (%)	Short Tons	Fe (M lb)	% Fe (Mag)	S (%)	LREO (ppm)	HREO (ppm)	Y_2O_3 (ppm)	Apatite (%)
0	19.8	27,216,513	10,772.3	3.430	0.110	3,953	328	648.1	10.0
10	19.8	27,093,313	10,745.2	3.440	0.110	3,952	328	647.8	10.0
25	27.9	8,233,827	4,586.2	6.120	0.110	3,609	284	556.2	9.7

1.1 *Information Available*

PAH constructed a drill hole database in EXCEL format from the assay certificates received from American Assay and Lerch Brothers Lab. Lerch Brothers prepped the samples and provided magnetic iron assays (SAT), total iron (TFe) and sulfur (S) assays while American assay reported assays for 39 elements including the rare earth elements (REE). In addition PAH was supplied with current and pre-tailings topographies in AutoCAD files. All information for SAT, TFe, S, the REE, and the topography were uploaded to Vulcan.

The database contains 74 drill holes with location and assay data. Locations are shown in Figure 1-1. The drill hole's depth varies from 10 to 114 ft. The total drilling length corresponds to 4,184 ft. Sample lengths are 2 ft, the total sampling length is 3,376 ft., and 808 ft are non-sampling intervals. All drill holes have TFe (% total Iron), SAT (% Magnetic Fe), and S (% sulfur) assays.



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 1-1 Location Map A-A' and B-B' Sections	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.1-1.dwg

PAH also included in the database apatite (calculated from the phosphate assays), Y_2O_3, light and heavy rare earth assays that were recalculated into rare earth oxides information (LREO and HREO, respectively), and sulfur. It includes 1,692 samples.

Downhole surveys were not specified and all the drill holes were assumed to be vertical.

The database was transformed from the Excel spreadsheets to ASCII files. In this process, PAH realized there were two missing collars (B-16 and B-79) which were recovered during the modeling. Additionally, the assays from B-59 were found in the B-69's spreadsheet, which was fixed by PAH.

Spacing between sections is 250 to 270 ft. and the average drill hole spacing within each section is 180 to 200 feet.

2.0 EXPLORATION DATA ANALYSIS, DOMAINING AND MODELING TFE, S AND SAT

Obviously, the material deposited in the settling ponds does not correspond to a geological process. Continuity and zonation are likely related to the production history and segregation process in the tailing ponds.

A vertical zonation of magnetic iron (SAT) was observed with high values in an upper level and lesser values in a lower zone (Figure 2-1 and Figure 2-2). SAT and total iron (TFe) show a high correlation coefficient (Table 2-1). For this reason, PAH modeled a surface to separate the higher SAT level from the lower SAT level.

The correlation coefficient (Pearson coefficient) between SAT and TFe in the upper level is higher than the lower level (0.61 versus 0.24). The TFe-S correlation increases from -0.07, in the upper level, to 0.32 in the lower level. Table 2-1 shows these correlations.

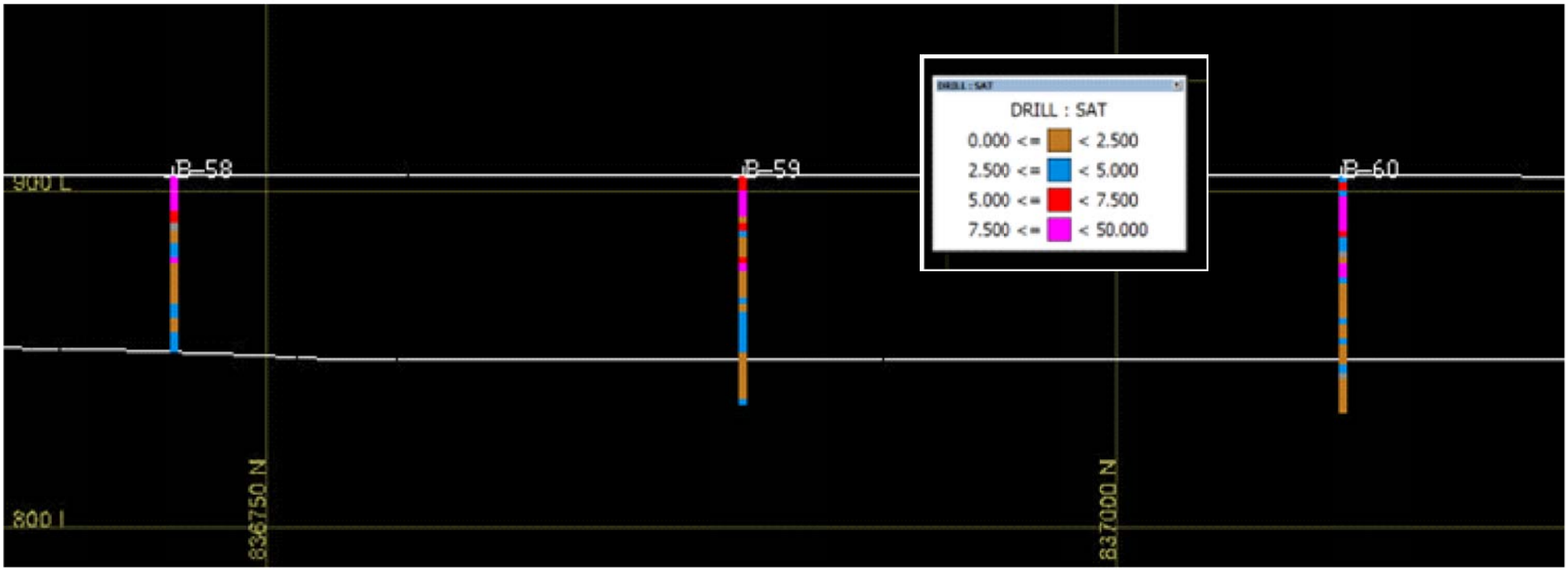
TABLE 2-1
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Correlation Matrix of SAT, TFe, and S

Upper			
Correlation	**SAT**	**TFe**	**S**
SAT	1	**0.61**	-0.19
TFe		1	-0.067
S			1
Lower			
Correlation	**SAT**	**TFe**	**S**
SAT	1	0.24	0.16
TFe		1	**0.32**
S			1

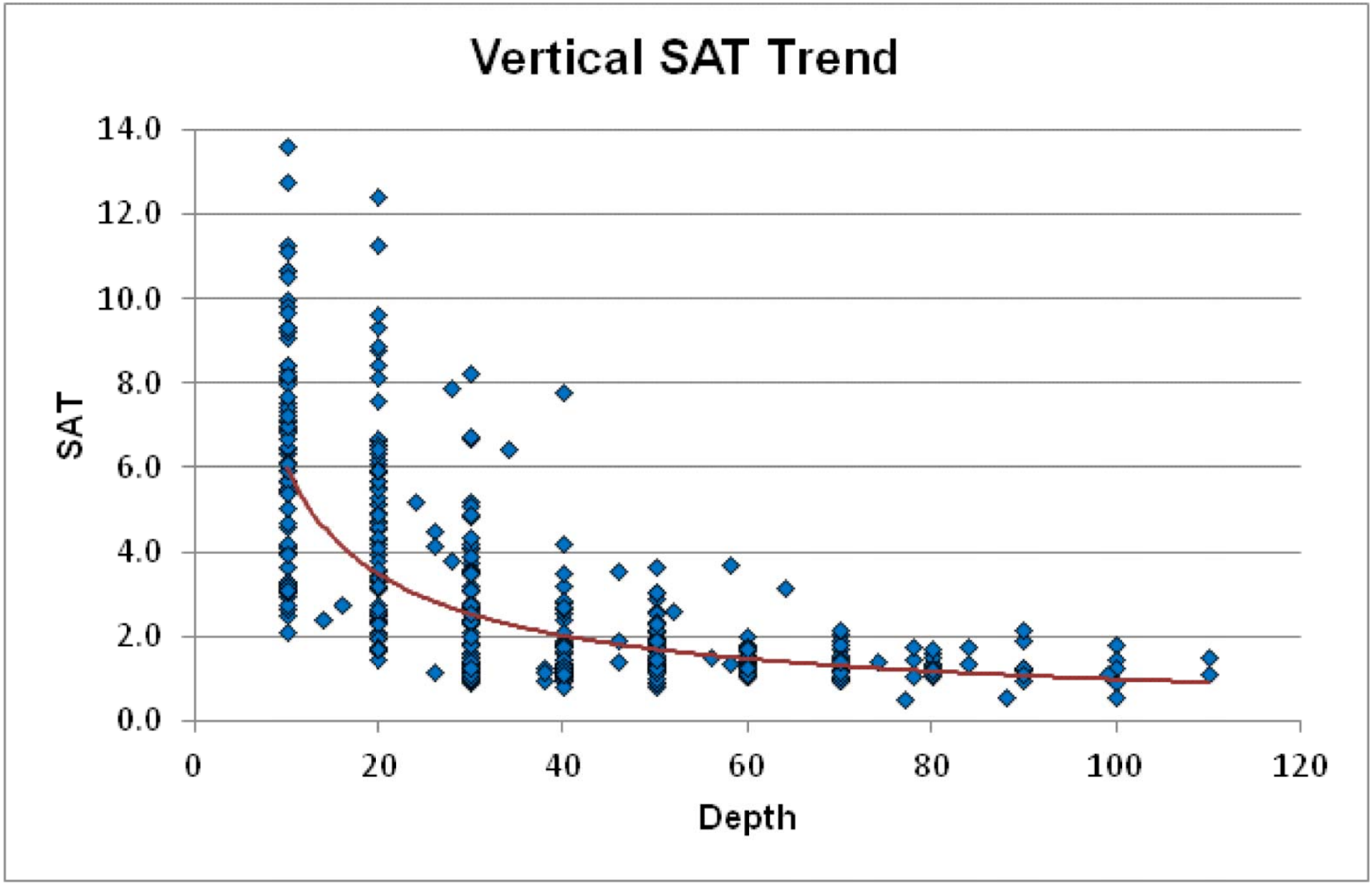
Some drill holes were below the original surface (pre-tailing surface). These samples were not used in the estimate of the tailings mineralization. Those samples are shown as *in situ* in the following tables.

The next two figures (Figures 2-3 and 2-4) show the original surface and the surface which divided the high magnetic from low magnetic level. The east part of the upper level is thinner than the west part of the tailings (Figure 2-4) while the lower low magnetic level is thinner than in the west side (Figure 2-3).

The data shown in the above figure could indicate that few iron sulfides may exist in the upper level but are likely more abundant in the lower level.



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950 Project No. DE-00289	Drawing Provided by/Prepared for ***Sangra Moller*** Project Name Pea Ridge Tailings	FIGURE 2-1 A-A' Section is Showing High TFE Values in the Upper Level	Date of Issue Aug. 2012 Drawing Name Fig.2-1.dwg



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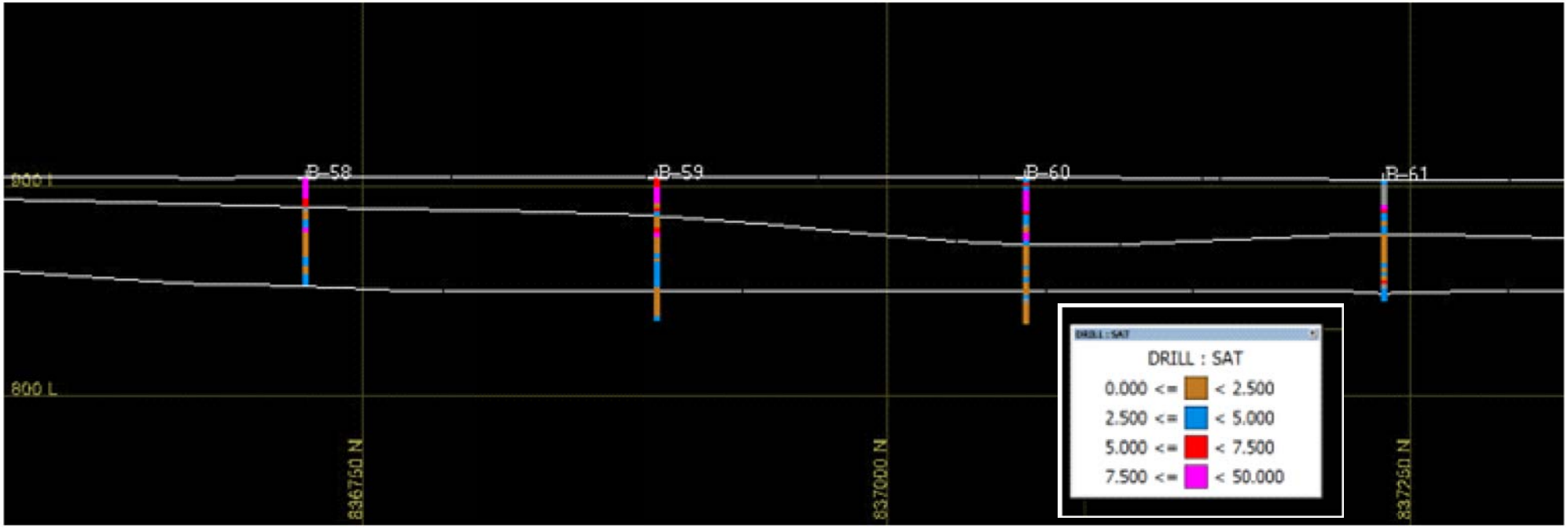
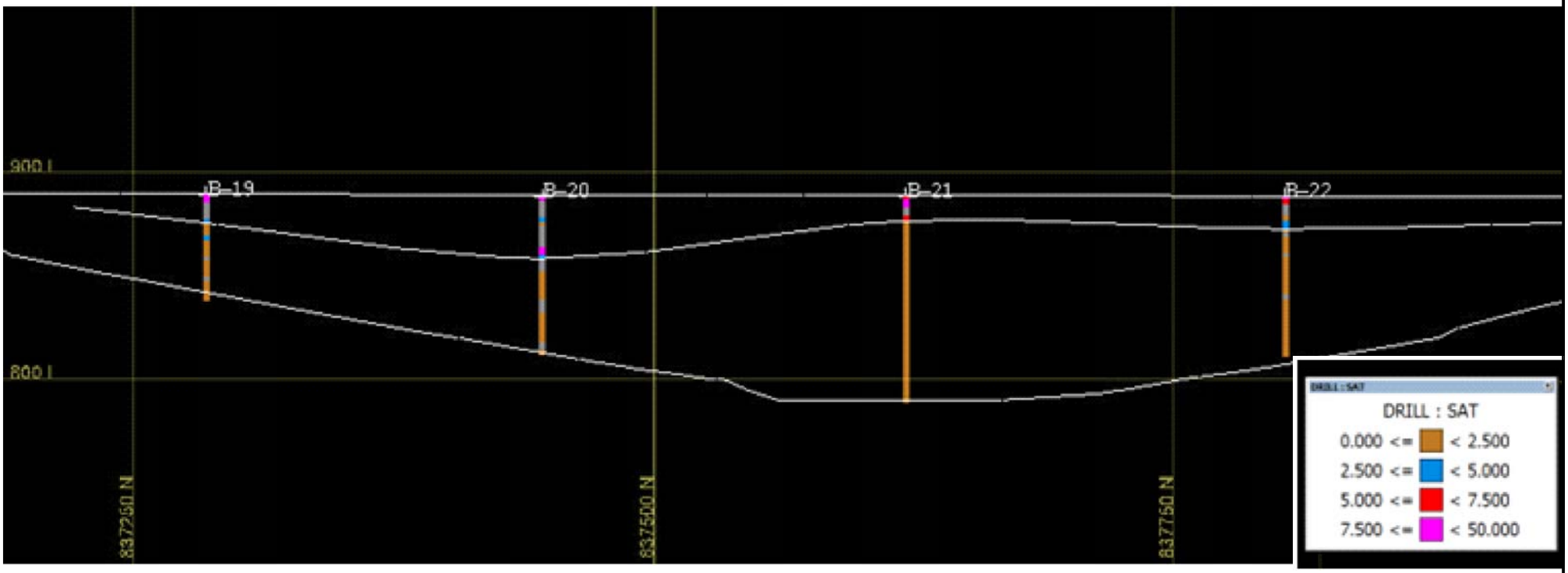


Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 2-3 A-A' Section Show the Surface Used to Constrain the Interpolation	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.2-3.dwg



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950 Project No. DE-00289	Drawing Provided by/Prepared for ***Sangra Moller*** Project Name Pea Ridge Tailings	FIGURE 2-4 B-B' Section Show the Surface Used to Constrain the Interpolation	Date of Issue Aug. 2012 Drawing Name Fig.2-4.dwg

A TFe contact analysis was done between the two levels to explore if the contact was hard, gradational or soft. PAH concluded that the contact is gradational with a high first step (Figure 2-5). For this reason, it was defined a hard contact to configure the samples search in the estimation.

PAH composited the samples to 10 ft. constant-length ignoring the non-sampling intervals. TFe, SAT and S composite stats are shown in Table 2-2.

TFe and SAT upper level means are considerably higher than those of the lower level, while the mean of sulfur is slightly elevated in the lower level.

Some samples are under the pre-tailing surface and are reported in the column in situ. Although the TFe, SAT and S in situ values are similar with the lower level, these samples were excluded from any resource estimation plan.

Based on above characteristics, two domains were defined to estimate TFe and SAT: Upper Level and Lower Level. S was estimated using the whole body, upper and lower level together. The average thicknesses of each level is shown in Table 2-3.

TABLE 2-3
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Thickness of the Levels

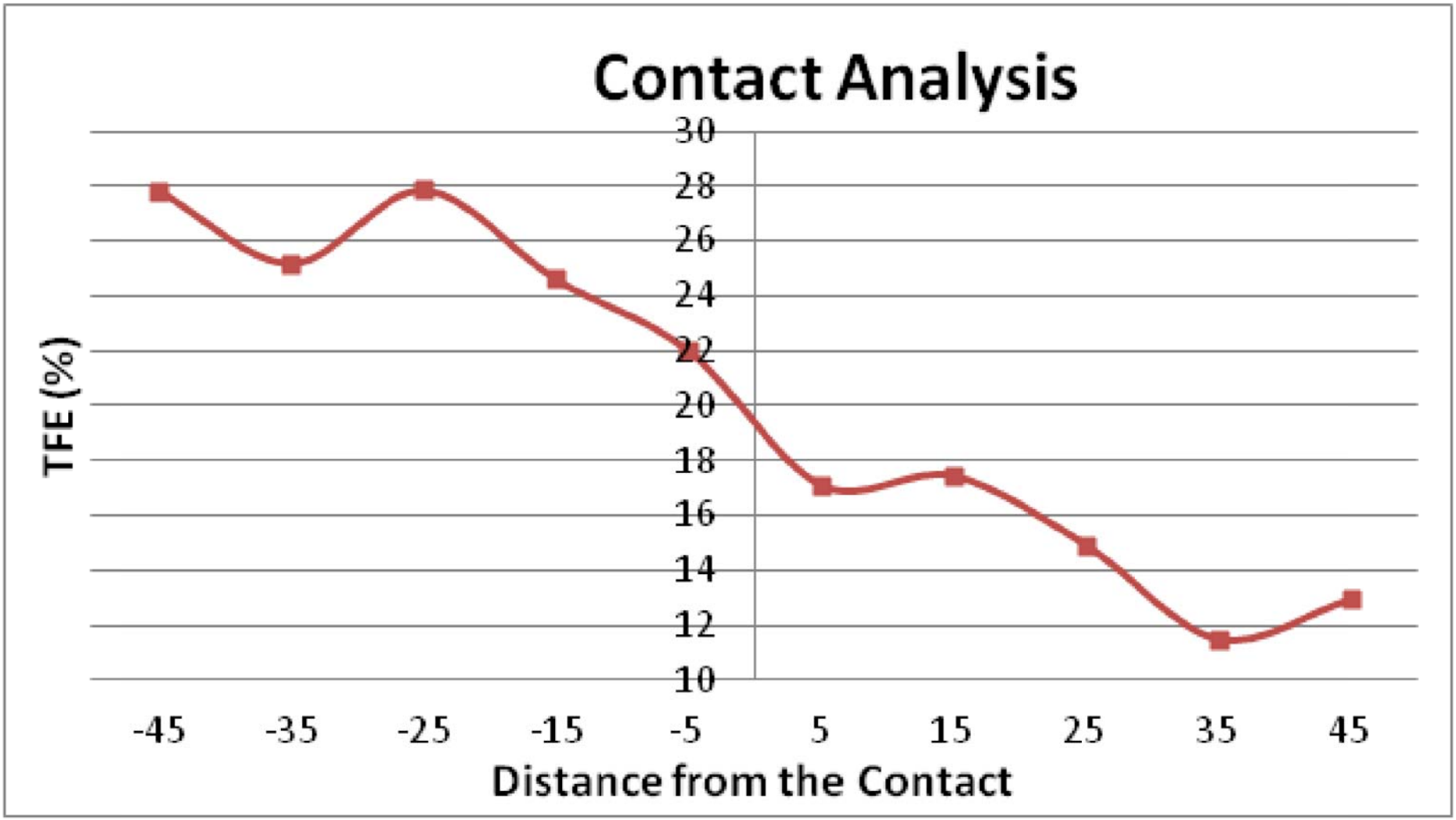
	Thickness (ft)
Upper level	20.6
Lower level	37.4

The estimation was constrained within the volume generated between the current topography and pre-tailings surface plus a bound built around the samples which was drawn avoiding the current settling ponds.

Figure 2-6 shows a perspective view of the interpolation zone. Using this solid, a sub-block model was built to estimate TFe, SAT, S, AP, TLREO and THREO. The minimum block size is 25 x 25 x 5 ft and the maximum block size is 50 x 50 x 10 ft.

TABLE 2-2
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Stats of TFe, SAT and S

10 ft Com	SAT				TFe (%)				S (%)			
	ALL	Upper zone	Lower zone	In Situ	ALL	Upper zone	Lower zone	In Situ	ALL	Upper zone	Lower zone	In Situ
N	436	148	254	34	436	148	254	34	436	148	254	34
Mean	3.14	5.77	1.78	1.89	19	25.98	15.6	13.8	0.11	0.115	0.112	0.08
Min	0.52	1.44	0.52	0.62	4.87	10.67	7.75	4.9	0.0145	0.028	0.0145	0.026
Max	13.63	13.63	7.81	5.35	38.2	38.7	36.7	26.98	0.553	0.518	0.553	0.159
Var	6.22	6.19	0.83	1.08	56.4	37.9	27.2	29.7	0.0024	0.003	0.0023	0.001
Q1	1.33	3.72	1.21	1.08	12.7	21.3	11.7	10.2	0.08	0.08	0.08	0.061
Median	2.13	5.5	1.49	1.7	17.2	26.5	14.34	12.8	0.106	0.11	0.106	0.082
Q3	4.13	7.2	2.03	2.32	25	30.8	18.02	16.8	0.134	0.14	0.134	0.112



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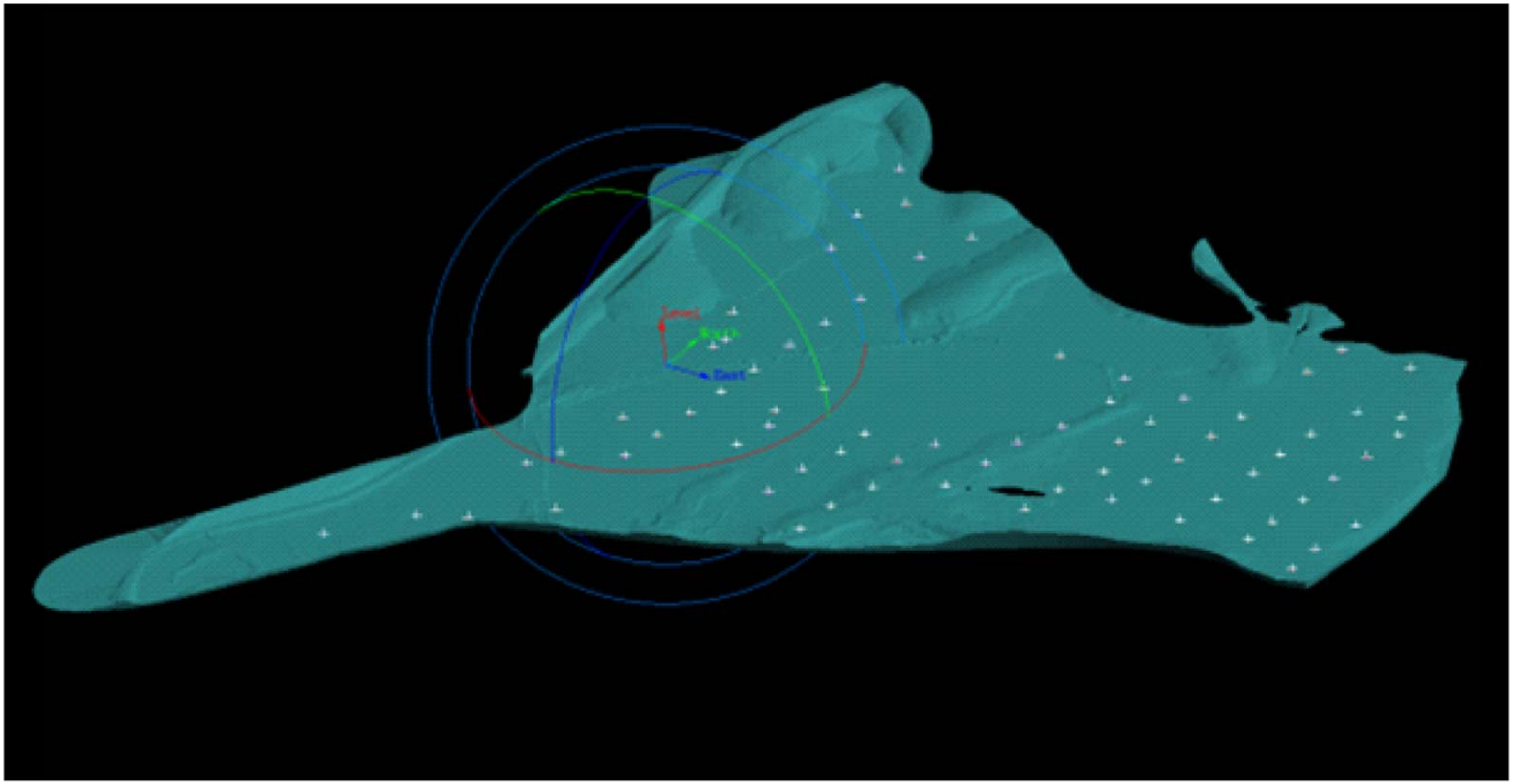


Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 2-6 Perspective View of the Interpolation Zone	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.2-6.dwg

3.0 EXPLORATION DATA ANALYSIS REE

There are 1,692 samples with assays for Light/Heavy Rare Earth (LRE LREE and HREE, respectively), Y_2O_3 and P (Apatite). The assays were reported as ppm for the elements but were converted to rare earth oxides by multiplying the elemental assay by a factor that represents the ratio in molecular weight between the element and its corresponding oxide. In addition, the phosphate assays were converted to apatite using the same method. The REE elements assayed were Ce, Eu, La, Nd, Pr and Sm in the LREE and Dy, Er, Gd, Ho, Lu, Tb, Tm, Yb in the HREE, Y and P were assayed as well. The statistics of their oxide form are shown in Tables 3-1 and 3-2.

TABLE 3-1
Sangra Moller
Pea Ridge Tailings, Resource Estimate
REE Stats

Oxide	N	Mean ppm	Min ppm	Max ppm	Variance	Q1 ppm	Median ppm	Q3 ppm	CV
Ce_2O_3	1691	1964.4	24	4166	427,162.5	1571	1991	2379	0.33
Eu_2O_3	1691	7.45	1	17	6	6	7	9	0.33
La_2O_3	1691	1,119.1	24	2595	158,883	862	1136	1364	0.36
Nd_2O_3	1692	657	8	1333	51,133	509	668	816	0.34
Pr_2O_3	1691	162.9	2	415	3,659	123	164	204	0.37
Sm_2O_3	1685	99.1	1	816	1,536	76	99	123	0.40
LREO	1692	4,007.6	63	8639	1,803,485	3,186	4,063	4,866	0.34
Dy_2O_3	1692	81.8	1	153	632	68	84	97	0.31
Er_2O_3	1692	56	2	113	309	46	56	67	0.31
Gd_2O_3	1684	98.8	1	193	1,065	79	99	119	0.33
Ho_2O_3	1526	7.58	1	25	23	4	7	11	0.63
Lu_2O_3	1686	11.2	1	29	12	9	11	13	0.31
Tb_2O_3	1641	15.9	1	136	41	13	16	19	0.40
Tm_2O_3	1662	5.6	1	12	3.6	4	6	7	0.34
Yb_2O_3	1692	57.6	1	109	301	48	58	69	0.30
HREO	1692	332.6	5	640	10,486	276	336	397	0.31

TABLE 3-2
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Y_2O_3 and Apatite Stats

Oxide	N	Mean	Min	Max	Var	Q1	Median	Q3	CV
Y_2O_3	1,692	658.3 ppm	13 ppm	1,262 ppm	38,554	545	679 ppm	791	0.30
Apatite	1,692	10%	0.17%	68.9%	18	7.4	10.2%	12.7	0.42

It is remarkable that Apatite, LREO and HREO present a low coefficient of variation; therefore, any lineal estimation will have an accurate result.

A visual inspection to analyze the behavior of LREO and HREO was executed concluding that both, LREO and HREO were higher in the east bottom part of the tailing pond. Additionally, we can conclude that HREO had a higher variability than LREO. The next two figures (Figures 3-1 and 3-2) show the LREO and HREO grades distribution.

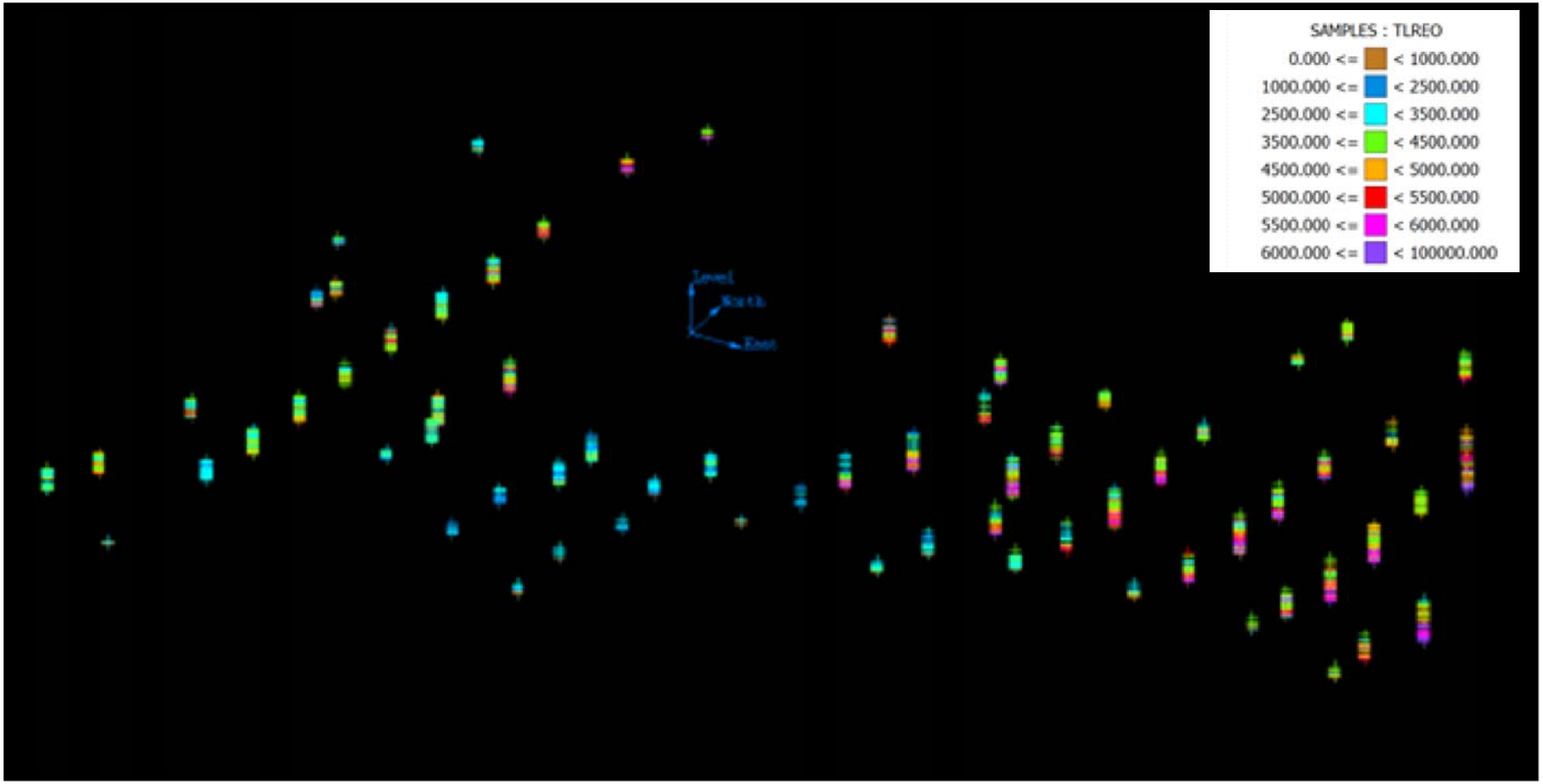
Correlation among each LREO (Table 3-3) and each HREO (Table 3-4) is higher than 0.75 and 0.5 (Pearson coefficient), respectively. Correlation among LREO and HREO, shown in Table 3-5 is higher than 0.4.

TABLE 3-3
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Correlation Matrix of LREE

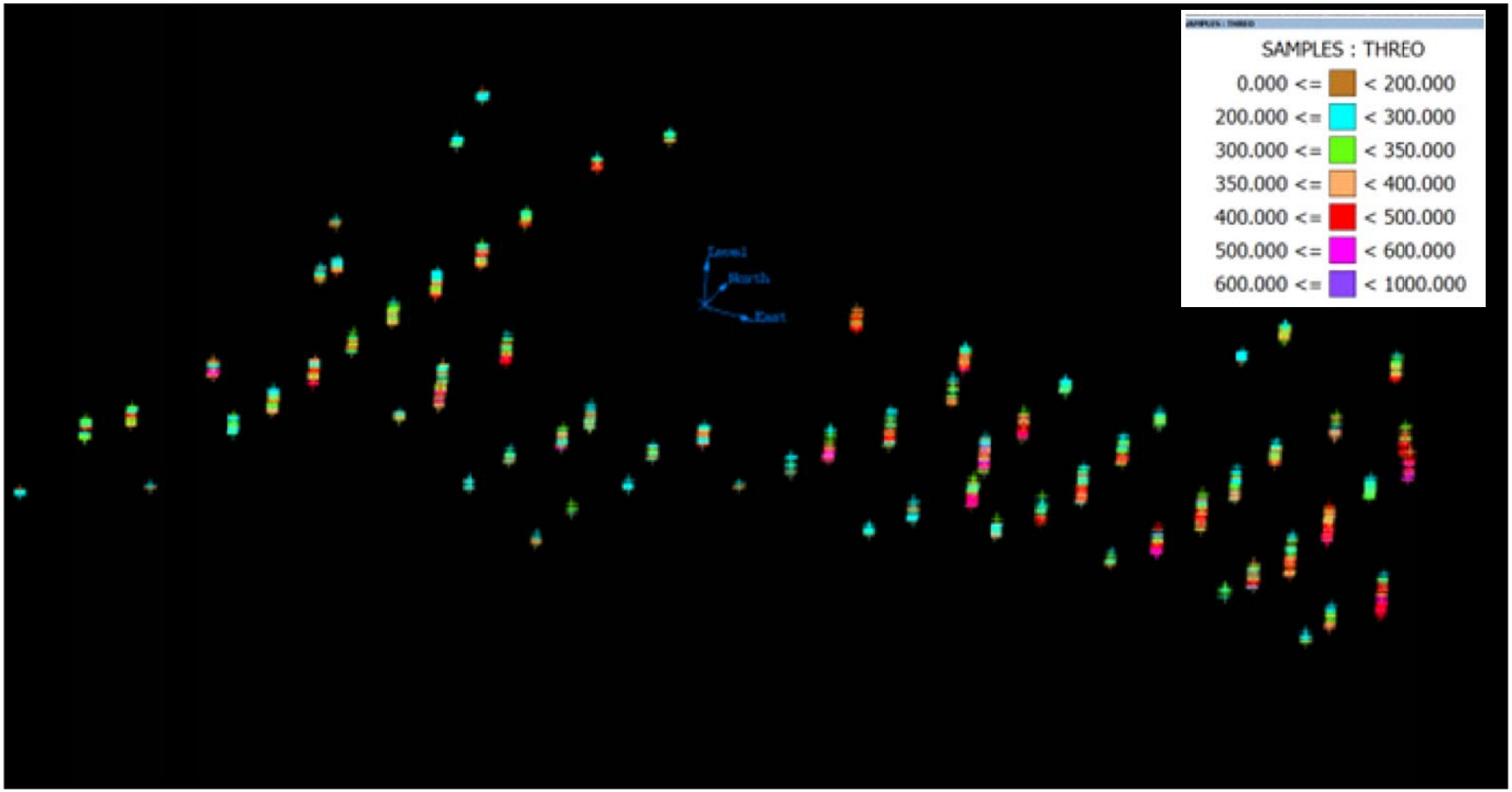
	Ce_2O_3	Eu_2O_3	La_2O_3	Nd_2O_3	Pr_2O_3	Sm_2O_3
Ce_2O_3	1.00	0.89	0.95	0.92	0.90	0.77
Eu_2O_3		1.00	0.86	0.88	0.88	0.78
La_2O_3			1.00	0.88	0.86	0.75
Nd_2O_3				1.00	0.96	0.79
Pr_2O_3					1.00	0.78
Sm_2O_3						1.00

TABLE 3-4
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Correlation Matrix of HREE

	Dy_2O_3	Er_2O_3	Gd_2O_3	Ho_2O_3	Lu_2O_3	Tb_2O_3	Tm_2O_3	Yb_2O_3
Dy_2O_3	1.00	0.93	0.95	0.55	0.54	0.66	0.89	0.95
Er_2O_3		1.00	0.85	0.57	0.58	0.70	0.91	0.97
Gd_2O_3			1.00	0.51	0.53	0.60	0.86	0.91
Ho_2O_3				1.00	0.37	0.48	0.60	0.56
Lu_2O_3					1.00	0.49	0.53	0.57
Tb_2O_3						1.00	0.64	0.67
Tm_2O_3							1.00	0.93
Yb_2O_3								1.00



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 3-1 LREE 3D Distribution	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.3-1.dwg



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Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.3-2.dwg

TABLE 3-5
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Cross-Correlation Matrix of LREE - HREE

	Y_2O_3	Dy_2O_3	Er_2O_3	Gd_2O_3	Ho_2O_3	Lu_2O_3	Tb_2O_3	Tm_2O_3	Yb_2O_3	P
Ce_2O_3	0.85	0.84	0.83	0.83	0.46	0.56	0.59	0.76	0.85	0.66
Eu_2O_3	0.87	0.95	0.93	0.92	0.53	0.54	0.66	0.87	0.95	0.66
La_2O_3	0.80	0.79	0.79	0.78	0.43	0.54	0.55	0.71	0.80	0.63
Nd_2O_3	0.92	0.84	0.80	0.86	0.45	0.49	0.56	0.78	0.84	0.64
Pr_2O_3	0.90	0.83	0.79	0.84	0.44	0.50	0.55	0.79	0.83	0.63
Sm_2O_3	0.78	0.75	0.77	0.77	0.44	0.45	0.53	0.73	0.79	0.54
Y_2O_3	1.00	0.90	0.88	0.88	0.51	0.52	0.61	0.87	0.90	0.64

A co-kriging could be executed because of the high coefficient correlations among REO and REO-Apatite; however, PAH estimated the total LREO and HREO due to the scope of this model.

The REO correlations are high enough to be modeled together. An average ratio between them could then be assumed from the composite means.

4.0 ESTIMATION

In spite of some continuity in both levels of the elements in to the settling pond deposition, ordinary kriging (OK) was chosen as the interpolator of the all variables, and thus assuring unbiased results. An almost isotropic horizontal continuity model was fitted in the variograms, together with a short vertical range. Figures 4-1 and 4-2 show the correlograms of TFe in the upper and lower levels.

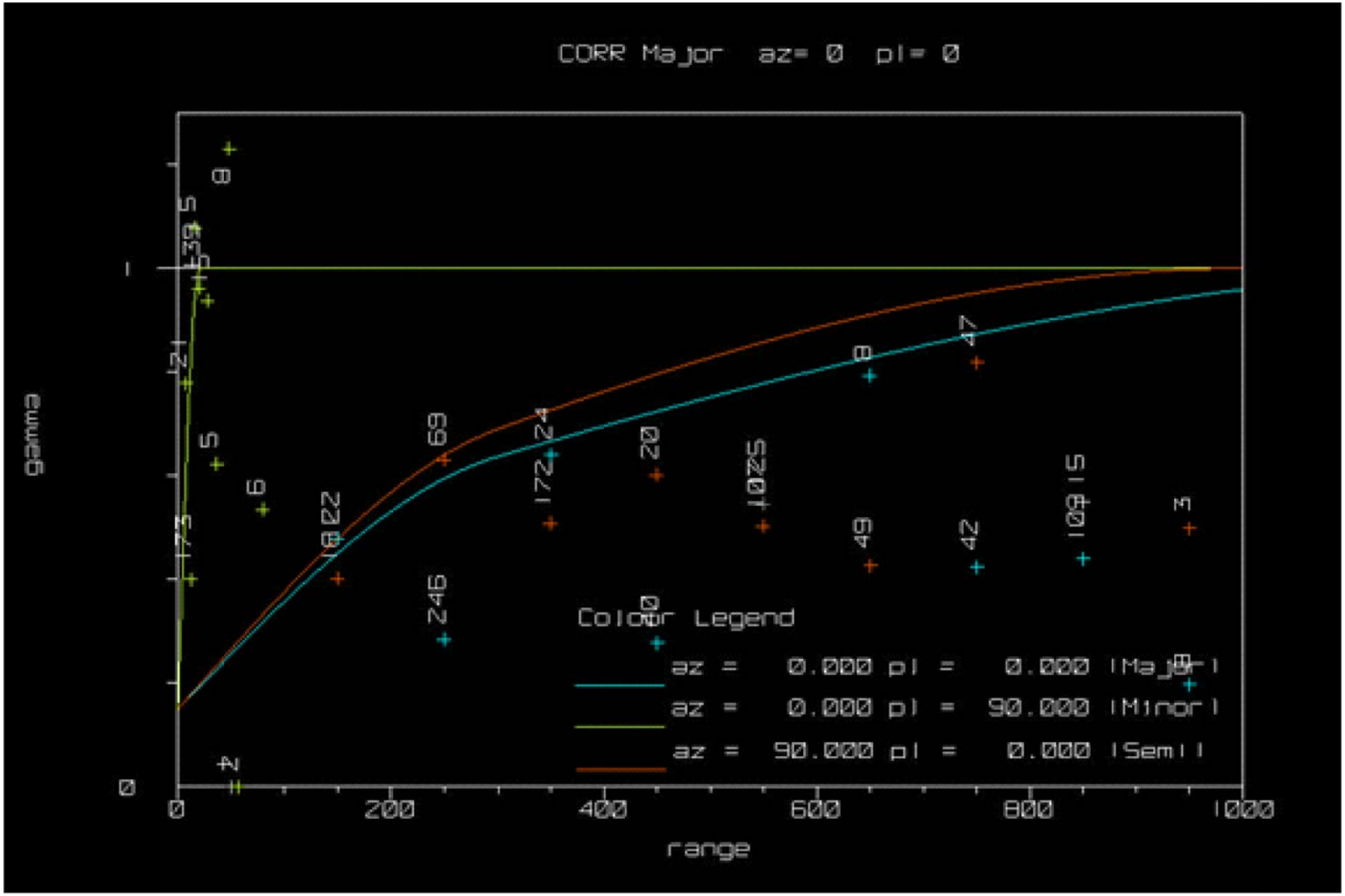
Ordinary Kriging of TFe, SAT and S was executed in two passes with a minimum of two drill holes in both cases. The minimum and maximum samples were established as 4 and 10, respectively. The first pass used a search ellipsoid of 300-200-15 ft and the second pass used 350-270-15 ft. TFe and SAT major axis orientation was 0° of azimuth, while S major axis azimuth was 60°.

Apatite, LREO and HREO were estimated in one pass using 6 minimum and 12 maximum samples. Ellipsoid orientation was established at 0° of azimuth for the major axis and search distances in 250-100-30, 300-200-15, and 400-350-15, respectively. Any non-estimated block after these two passes was filled with the mean value.

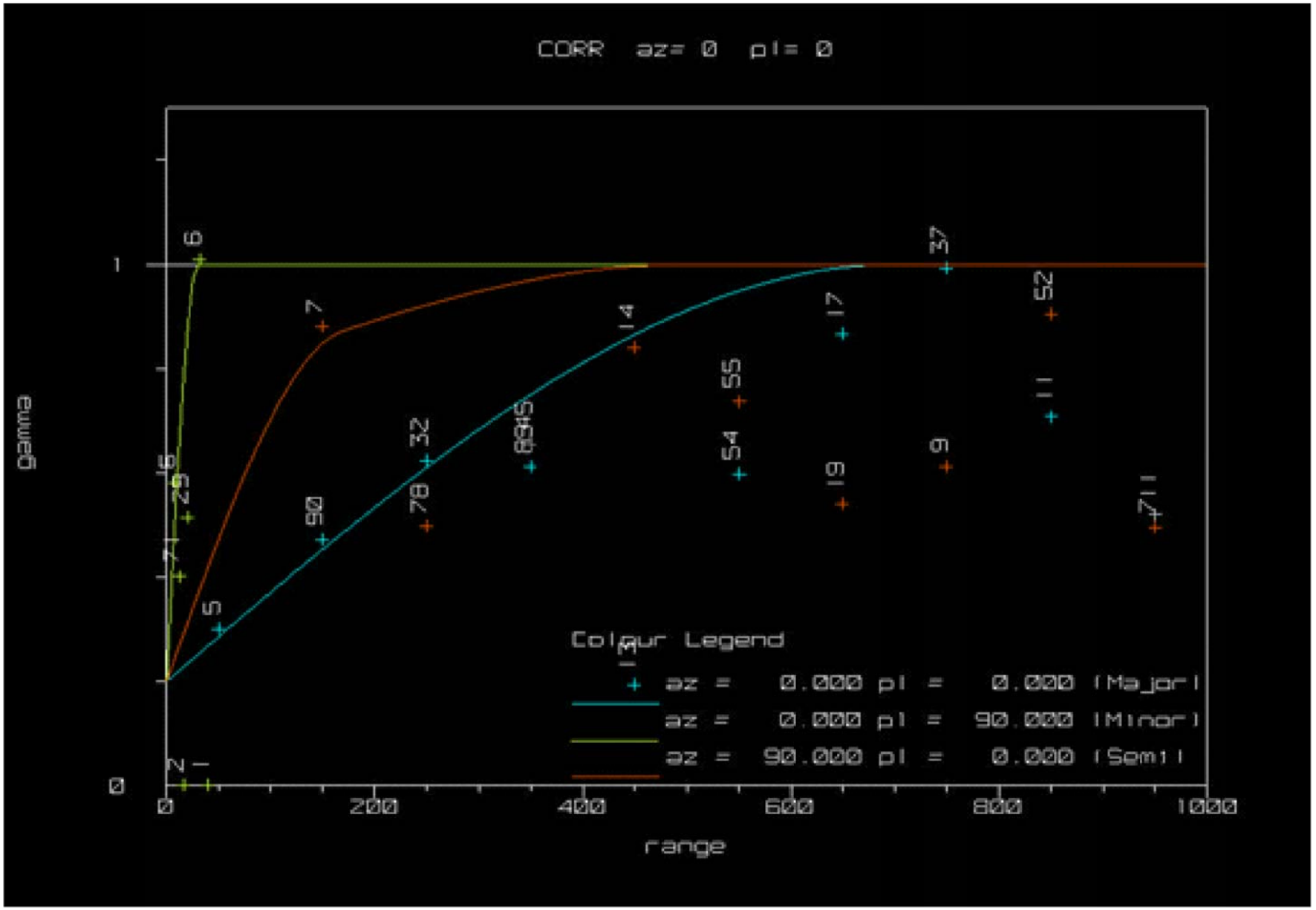
Nearest neighbor (NN) TFe estimation was made to compare, through swath plots, with the kriging values, NN's estimation parameters were the same as the Kriging parameters. Swath plots were generated using 100 ft wide vertical slices and 10 ft wide horizontal slices; they are shown in the next graphs (Figures 4-3 to 4-6). Swath plots show that ordinary Kriging (TFe OK) is unbiased with respect nearest neighbor estimation (TFe, NN), in both units, the upper magnetic and the lower low magnetic levels. Validation of SAT, S, Apatite, LREO, and HREO were done on screen by comparison between blocks and samples values. The summary by domain is shown in Table 4-1. Differences between samples and blocks are less than 5 percent with the exception of SAT.

TABLE 4-1
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Summary by Domain

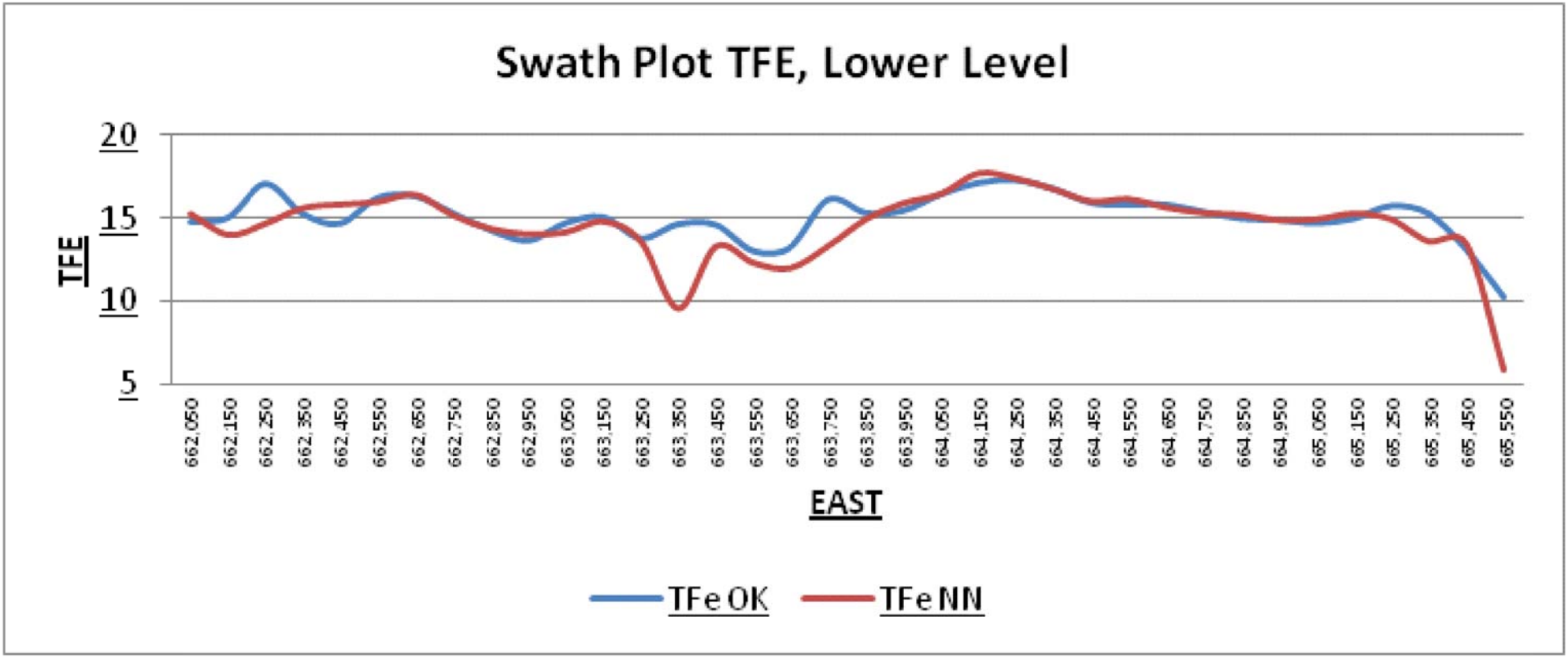
Domain	Variable	Mean		
		10 ft Com	Blocks	Difference
ALL	TFe (%)	19.0	19.6	3.1%
	S (%)	0.11	0.111	0.9%
	SAT (%)	3.14	3.39	7.3%
	Apatite (%)	10.0	9.96	-0.4%
	LREO (ppm)	4,008	4,001	-0.2%
	HREO (ppm)	333	331	-0.6%
Upper zone	TFe (%)	25.98	26.80	3.1%
	S (%)	0.115	0.111	-3.6%
	SAT (%)	5.77	6.08	5.0%
Lower zone	TFe (%)	15.6	15.7	0.6%
	S (%)	0.112	0.111	-0.9%
	SAT (%)	1.78	1.91	6.8%



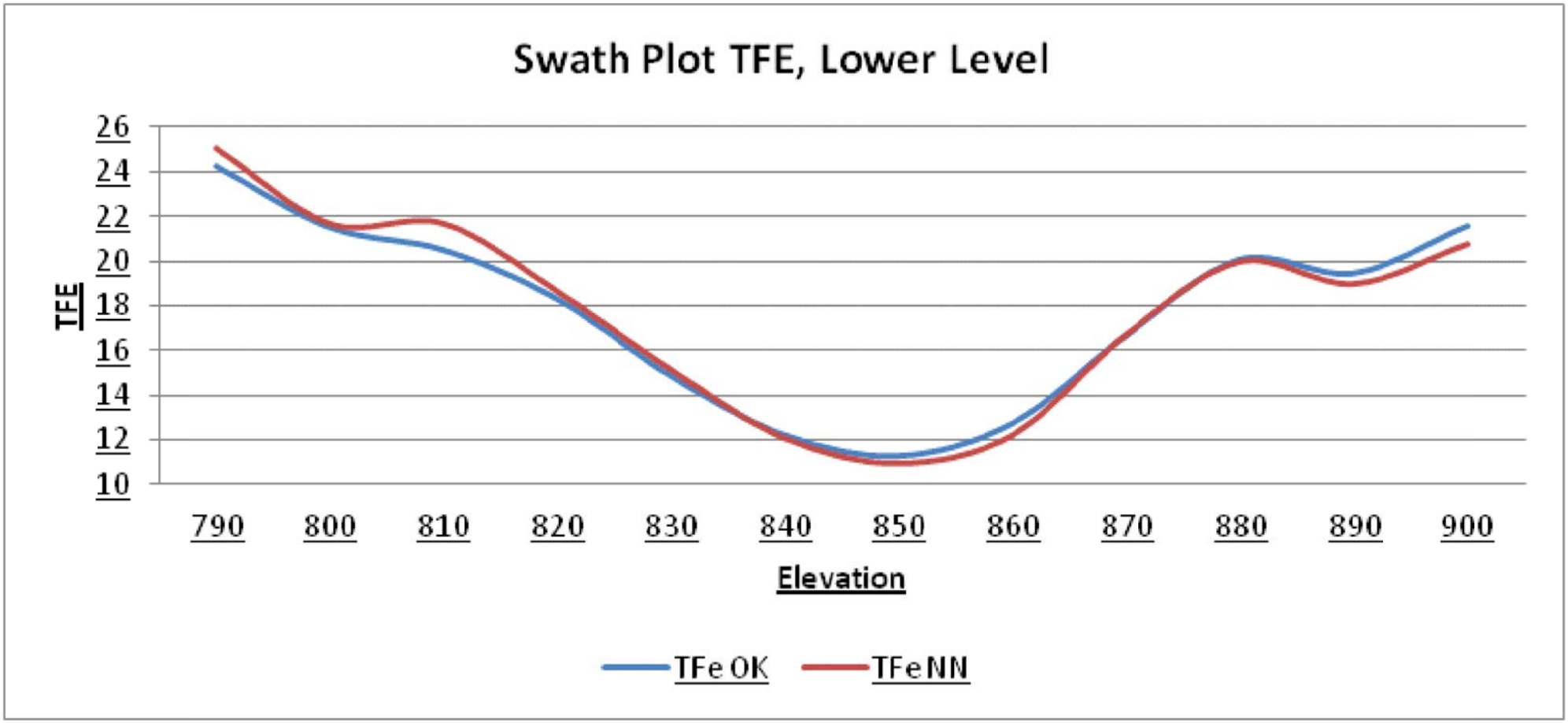
Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950 Project No. DE-00289	Drawing Provided by/Prepared for ***Sangra Moller*** Project Name Pea Ridge Tailings	FIGURE 4-1 TFE Upper Level Correlograms	Date of Issue Aug. 2012 Drawing Name Fig.4-1.dwg



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 4-2 TFE Lower Level Correlograms	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.4-2.dwg



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 4-3 Swath Plot TFE in the Lower Level to East Direction	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.4-3.dwg



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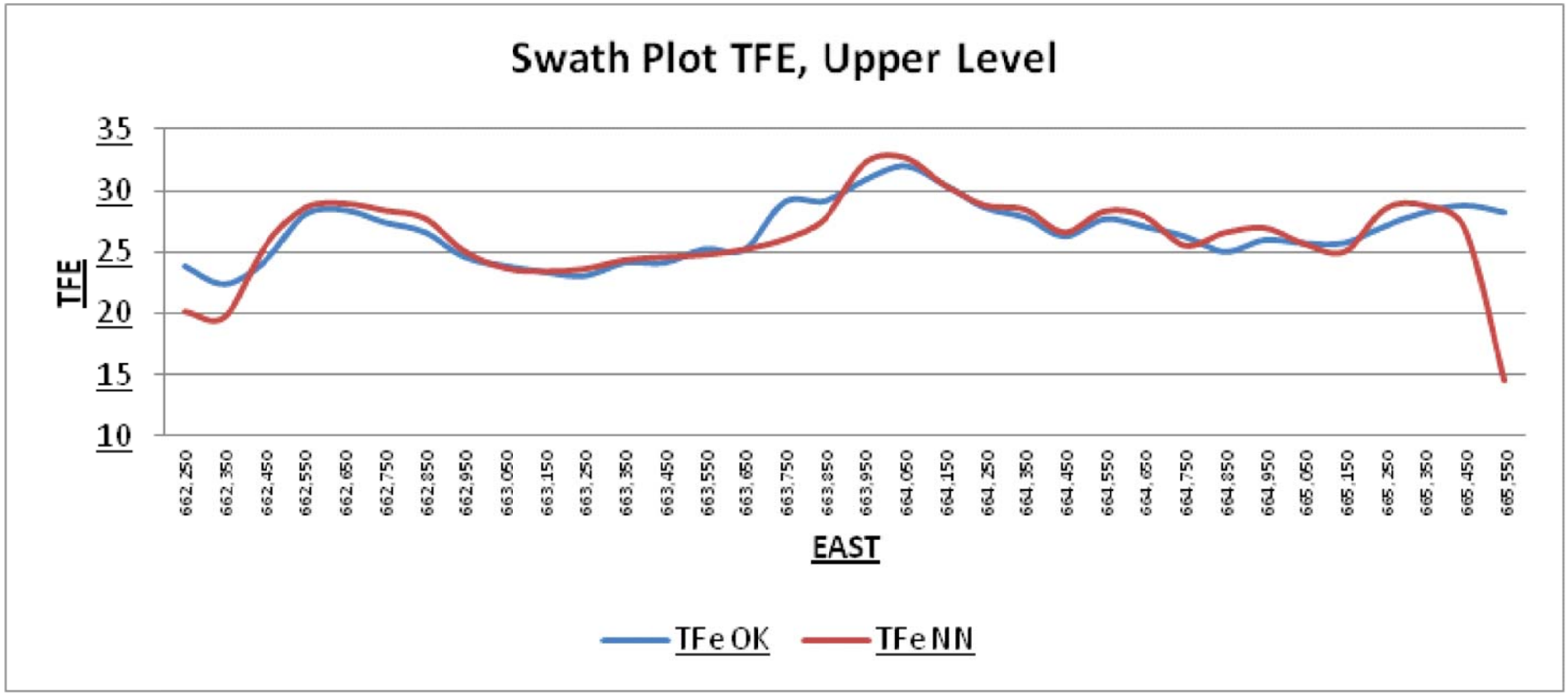

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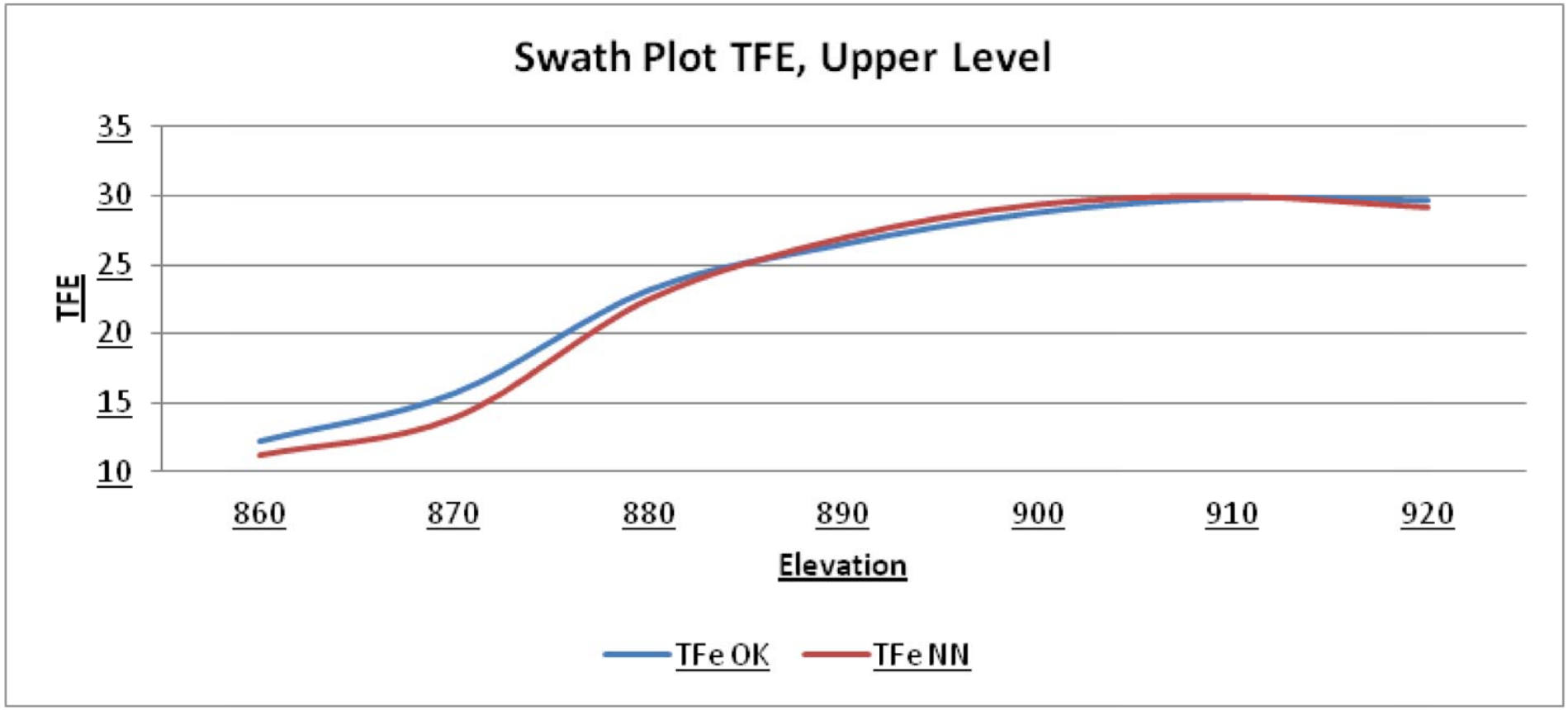

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5.0 DENSITY

The density database contains 382 density measurements of samples of the recovered tailings. The density varies from 2.68 to 4.16 and presents a strong correlation with Fe concentration (Table 5-1 and Figure 5-1).

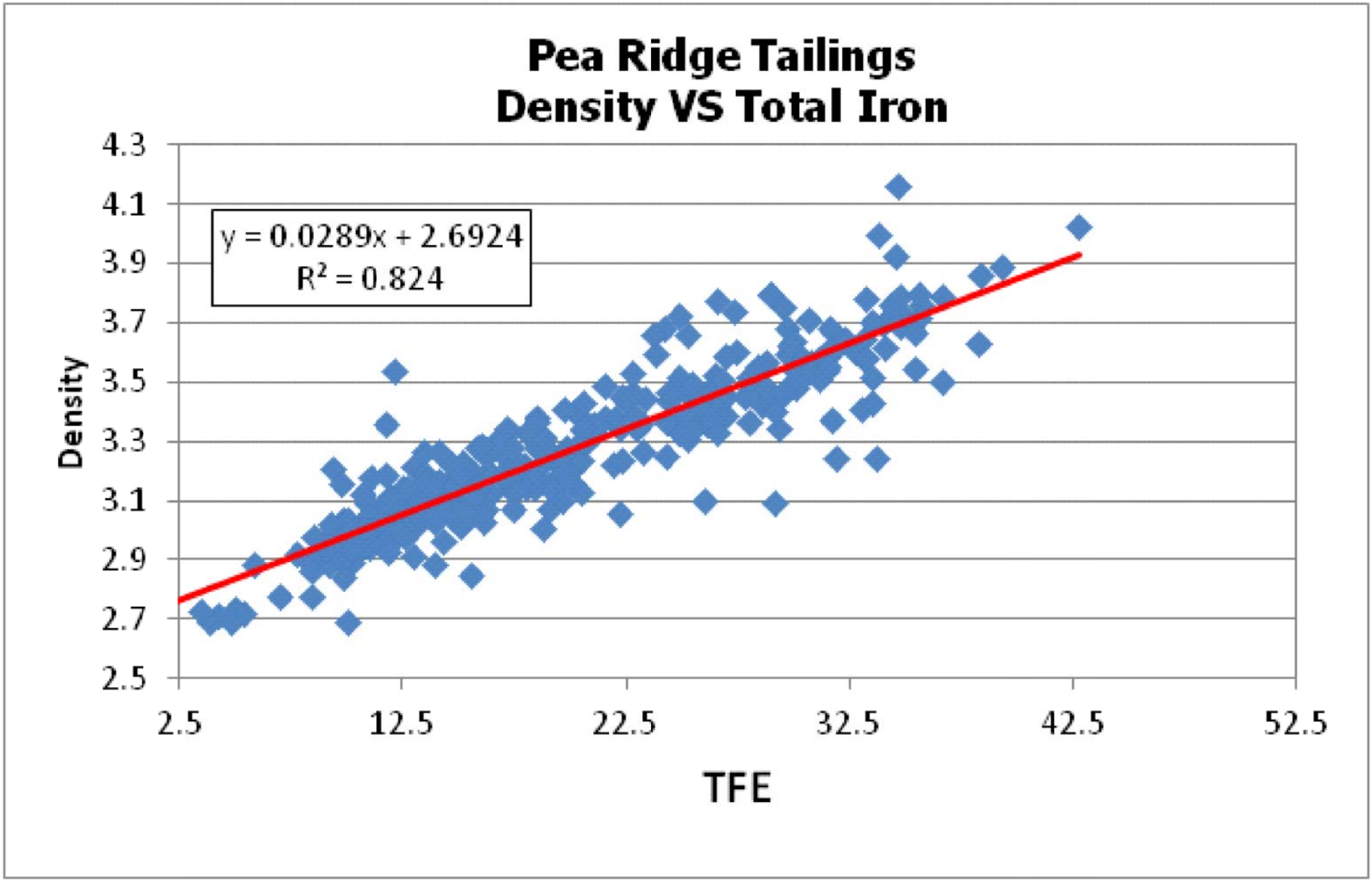
TABLE 5-1
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Density Statistics

	Density		
	ALL	**Upper Zone**	**Lower Zone**
N	382	154	199
Mean	3.26	3.44	3.12
Min	2.68	2.71	2.69
Max	4.16	4.16	3.93
Variance	0.07	0.05	0.04
Q1	3.04	3.28	2.99
Median	3.19	3.45	3.09
Q3	3.44	3.59	3.20

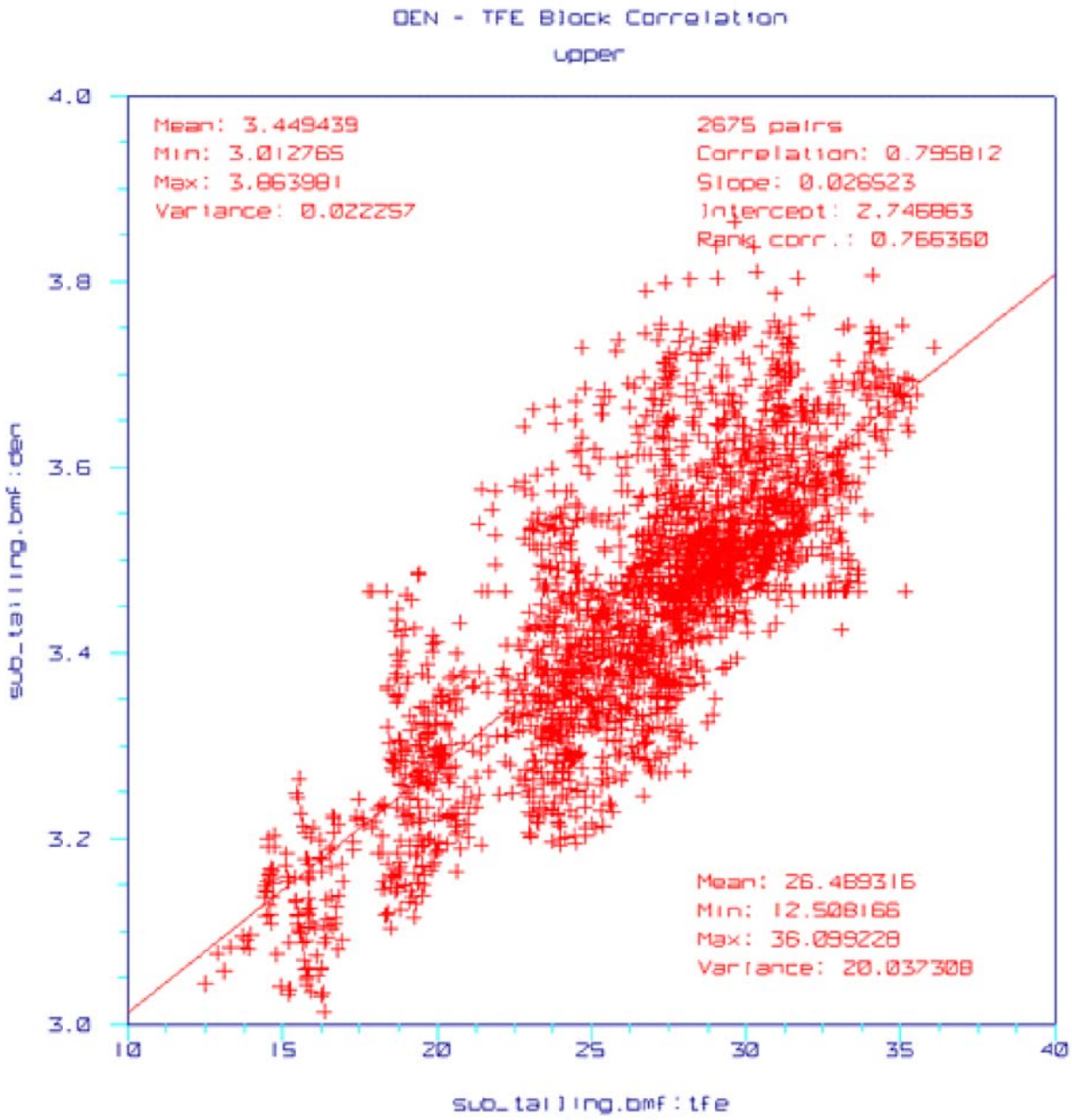
There is an important difference between the upper and lower level in the density values which is consistent with the iron gradation.

Density continuity was fitted similar to TFe continuity; it was interpolated using ordinary kriging to reproduce the local variability in both levels. Two passes were performed to estimate density; the mean of each level was assigned to the rest of the non-estimated blocks.

Density-TFe correlation was validated in the block model as it is shown in the next graph (Figure 5-2) of the upper level. Blocks have a good density-TFe correlation similar to the samples correlation.



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950	Drawing Provided by/Prepared for ***Sangra Moller***	FIGURE 5-1 TFE - Density Samples Correlation	Date of Issue Aug. 2012
Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.5-1.dwg



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Project No. DE-00289	Project Name Pea Ridge Tailings		Drawing Name Fig.5-2.dwg

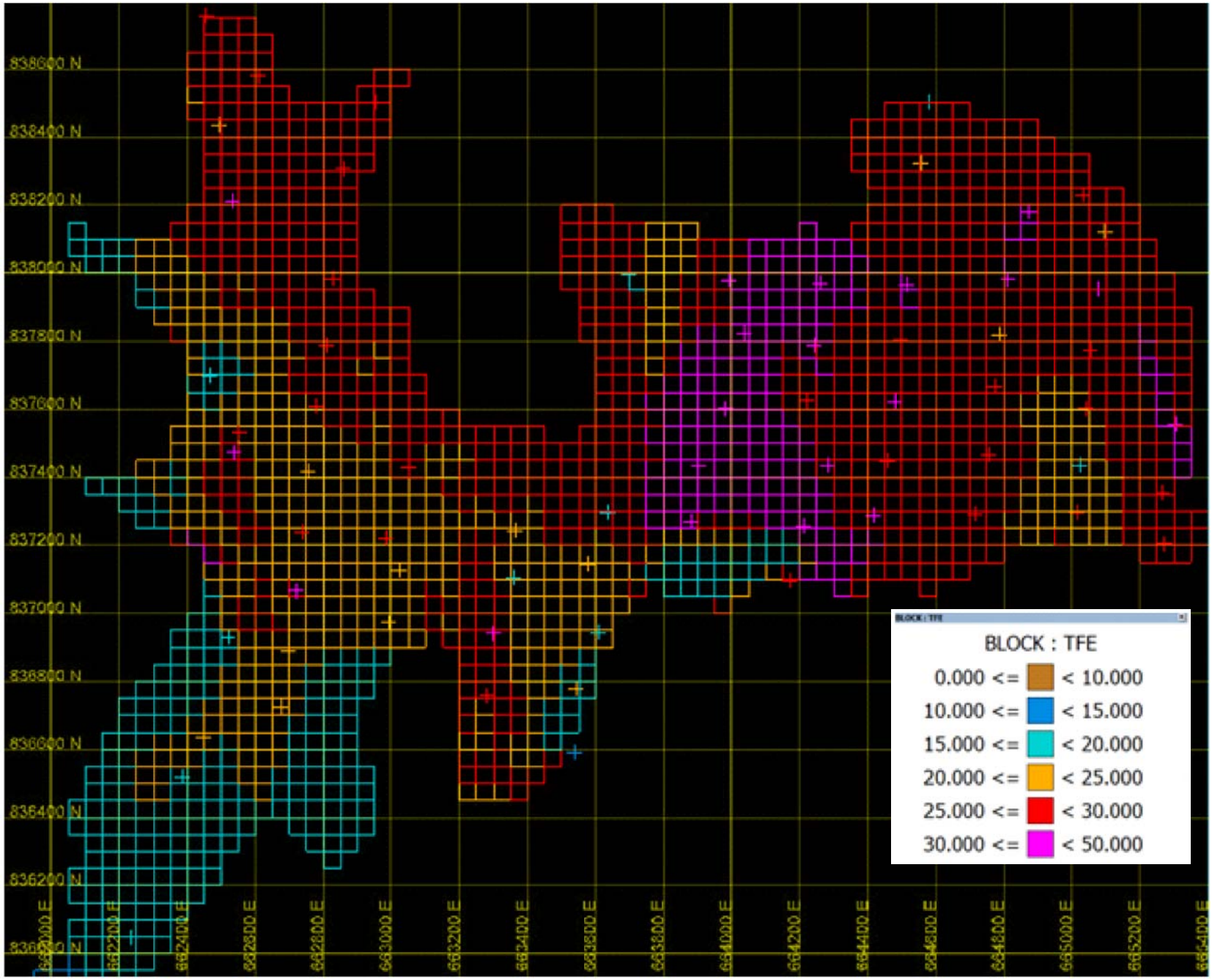
6.0 RESULTS

The sub-block model was regularized to 50 by 50 by 10 ft block model. This model contains TFe, SAT, S, Apatite, Y_2O_3, LREO, and HREO. The next two figures (Figures 6-1 and 6-2) correspond to TFe plans of upper and lower level, respectively.

Table 6-1 shows the result of the estimation.

TABLE 6-1
Sangra Moller
Pea Ridge Tailings, Resource Estimate
Results of Estimation

Cutoff	FeT (%)	Short Tons	Fe (M lb)	% Fe (Mag)	S (%)	LREO (ppm)	HREO (ppm)	Y_2O_3 (ppm)	Apatite (%)
0	19.8	27,216,513	10,772.3	3.430	0.110	3,953	328	648.1	10.0
10	19.8	27,093,313	10,745.2	3.440	0.110	3,952	328	647.8	10.0
25	27.9	8,233,827	4,586.2	6.120	0.110	3,609	284	556.2	9.7



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Project No.
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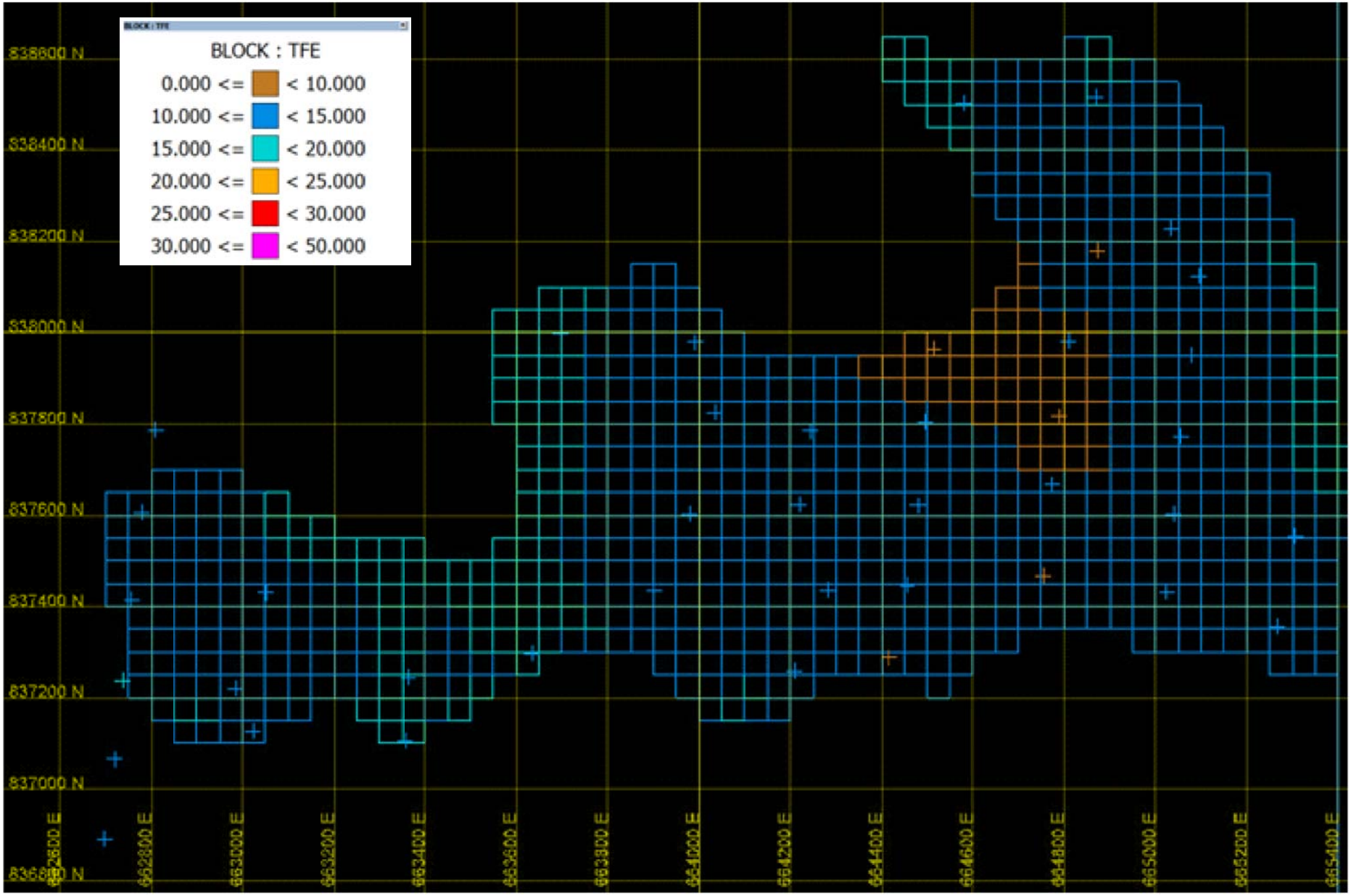
Sangra Moller

Project Name
Pea Ridge Tailings

FIGURE 6-1
Level 885
TFE Blocks vs. TFE Composites

Date of Issue
Aug. 2012

Drawing Name
Fig.6-1.dwg



Prepared by **pincock, allen & holt** 165 S. Union Boulevard, Suite 950 Lakewood, Colorado 80228 Phone (303) 986-6950 Project No. DE-00289	Drawing Provided by/Prepared for ***Sangra Moller*** Project Name Pea Ridge Tailings	FIGURE 6-2 Level 845 TFE Blocks vs. TFE Composites	Date of Issue Aug. 2012 Drawing Name Fig.6-2.dwg