CARPCO ENGINEERING AND MANUFACTURING

Jacksonville, Florida, U. S. A.

Ref:

Sheet No. 3

Title of Project: Bulk Sample Products	**Project No.** 384
For: Mr. O. H. Perry	**Date:** Feb. 23, 1953

Analytical determinations

Sample No.	Description	TiO_2	ZrO_2	ReO	Cb_2O_5 Ta_2O_5	SnO_2
384-12	Production Rutile	92.06				None
384-15	Production Monazite			64.52		
384-20	Production Zircon		66.29			
384-24	Tabled fraction from Ilmenite				Trace*	
384-25	Production Ilmenite	54.90				

* Less than 0.05%

BY: Rowland Laboratories

Tuscaloosa Bulk Sample

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 1
Date: February 23, 1953
Project No. 384

Subject: Report of the Laboratory Production of Ilmenite, Rutile, Zircon and Monazite from a Bulk Sample of Heavy Mineral Concentrates.

Summary:

The results of the laboratory work on this sample indicate that from the type of material represented mineral products can be recovered of the grade and in the proportion as shown in the following tabulation.

Product	Percentage	Analyses
Magnetite	0.6	- - - - - - - - - -
Ilmenite	17.7	TiO_2 54.90%
Rutile	8.9	TiO_2 92.06%
Zircon	14.2	ZrO_2 66.29%
Monazite	6.2	ReO 64.52%
Plus 10 mesh oversize	10.1	Garnet, Staurolite, etc.
Others	42.3	Essentially garnet, staurolite and quartz, minus 20 mesh sizes.
	100.0	

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 2
Date: February 23, 1953

Subject: Report of the Laboratory Production of Ilmenite, Rutile, Zircon and Monazite from a Bulk Sample of Heavy Mineral Concentrates.

Remarks:

The ilmenite product was retabled to determine if a columbium-tantalum fraction could be obtained. A 5.9 percent fraction of the ilmenite was taken. The laboratory reported a trace, less than .05 percent, Cb-Ta present. The rutile fraction was examined for possible contaminants that would cause the grade to be less than normally expected for this product. An SnO_2 analysis was made as rutile and cassiterite appear very similar in the sand grain sizes and have the same high tension and magnetic separation characteristics. No tin could be detected chemically. The laboratory reported verbally that iron appeared to be the contaminator.

Attached is a table showing the chemical determinations that were made.

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 1
Date: March 4, 1953
Project No. 417, 418

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Line H Composite Sample and Line B Composite Sample.

Summary:

The laboratory investigation of these samples indicates that ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Line H Composite

Products	Wt. %	Assay	Std.	Products % of Sample
417-2 Magnetite	0.1			
417-3 Ilmenite	53.1	35.66 TiO_2	61.02 TiO_2	31.0
- - Monazite	- -	5.64 ReO^2	64.12 ReO^2	~~4.7~~ 8.2
417-4 Rutile	46.8	20.53 TiO_2	97.00 TiO_2	9.9
- - Zircon	- -	22.12 ZrO_2	62.01 ZrO_2	16.7
	100.0			62.3

Line B Composite

418-2 Magnetite	0.2			
418-3 Ilmenite	50.1	30.53 TiO_2	61.02 TiO_2	25.0
- - Monazite	- -	9.96 ReO^2	64.12 ReO^2	~~7.8~~ 4.4
418-4 Rutile	49.7	21.07 TiO_2	97.00 TiO_2	10.8
- - Zircon	- -	22.44 ZrO_2	62.01 ZrO_2	18.0
	100.0			61.6

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

C O P Y

CARPCO ENGINEERING AND MANUFACTURING

JACKSONVILLE 6, FLORIDA

March 17, 1953

Mr. C. H. Perry
Henderson Hotel
Aiken, South Carolina

Dear Mr. Perry:

Attached please find the original and one copy of the report covering the laboratory work on the Line C-4 and Line M Composite samples.

The laboratory has just notified me that they did get the ReO's crossed on the "B" and "M" samples. Recalculating these results shows the monazite in Line M composite to be 7.2% and in Line B Composite to be 4.4%. The TiO_2 and ZrO_2 analyses are O.K. as is.

Very truly yours,
CARPCO ENGINEERING AND MANUFACTURING

(Robert V. Spencer)

Robert V. Spencer

RVS/f

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet # 1
Date: March 18, 1953
Projects 443-444

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Line C-6 and Hole C-1-N Composite Samples.

Summary:

The laboratory investigation of these samples indicates that ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Products	Wt. %	Assay	Std.	Products % of Sample
Line C-6 Composite (Composite of all 6" holes Line C)				
443-2 Magnetite	Trace			
443-3 Ilmenite	51.0	31.52 TiO_2	61.02 TiO_2	26.4
- - Monazite	- -	9.22 ReO^2	64.12 ReO^2	7.3
443-4 Rutile	49.0	21.65 TiO_2	97.00 TiO_2	10.9
- - Zircon	- -	29.89 ZrO_2	62.01 ZrO_2	23.6
	100.0			68.2
Hole C-1-N Composite (Individual drill hole for shafting)				
444-2 Magnetite	0.2			
444-3 Ilmenite	57.3	11.79 TiO_2	61.02 TiO_2	11.1
- - Monazite	- -	3.17 ReO^2	64.12 ReO^2	2.8
444-4 Rutile	42.5	15.88 TiO_2	97.00 TiO_2	7.0
- - Zircon	- -	17.33 ZrO_2	62.01 ZrO_2	11.9
	100.0			32.8

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Motel
Aiken, South Carolina

Sheet no. 1
Date: March 17, 1953
Projects 437, 438

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Line C-4 and Line M Composite Samples.

Summary:

The laboratory investigation of these samples indicates that ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Products	Wt. %	Assay	Std.	Products % of Sample
Line C-4 Composite (**Composite of all 4" holes Line C)**				
437-2 Magnetite	0.1			
437-3 Ilmenite	50.5	33.68 TiO_2	61.02 TiO_2	27.9
- - Monazite	- -	6.51 ReO^2	64.12 ReO^2	5.1
437-4 Rutile	49.4	21.65 TiO_2	97.00 TiO_2	11.0
- - Zircon	- -	27.38 ZrO_2	62.01 ZrO_2	21.8
	100.0			65.8
Line M Composite				
438-2 Magnetite	0.1			
438-3 Ilmenite	49.5	36.33 TiO_2	61.02 TiO_2	29.4
- - Monazite	- -	5.65 ReO^2	64.12 ReO	4.4
438-4 Rutile	50.4	14.56 TiO_2	97.00 TiO_2	7.6
- - Zircon	- -	36.86 ZrO_2	62.01 ZrO_2	29.9
	100.0			71.3

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. 1
Date: March 16, 1953
Projects 425, 426, 427, 428, 429

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Line F-4 Composite, Line F-6 Composite, F-1-N Composite (0-10 feet), Line K Composite and Line K Hole 5 Composite Samples.

Summary:

The laboratory investigation of these samples indicates that ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Products	Wt. %	Assay	Std.	Products % of Sample
Line F-4 Composite (Composite of all 4" holes Line F)				
425-2 Magnetite	0.3			
425-3 Ilmenite	52.0	31.07 TiO_2	61.02 TiO_2	26.5
- - Monazite	- -	6.03 ReO	64.12 ReO	4.9
425-4 Rutile	47.7	29.45 TiO_2	97.00 TiO_2	14.5
- - Zircon	- -	19.38 ZrO_2	62.01 ZrO_2	14.9
	100.0			60.8
Line F-6 Composite (Composite of all 6" holes Line F)				
426-2 Magnetite	0.1			
426-3 Ilmenite	50.4	30.53 TiO_2	61.02 TiO_2	25.2
- - Monazite	- -	9.33 ReO	64.12 ReO	7.3
426-4 Rutile	49.5	35.94 TiO_2	97.00 TiO_2	18.3
- - Zircon	- -	21.74 ZrO_2	62.01 ZrO_2	17.3
	100.0			68.1
F-1-N Composite 0-10 feet (Individual drill hole for shafting)				
427-2 Magnetite	0.1			
427-3 Ilmenite	46.7	26.75 TiO_2	61.02 TiO_2	20.4
- - Monazite	- -	3.03 ReO	64.12 ReO	2.2
427-4 Rutile	53.2	18.91 TiO_2	97.00 TiO_2	10.4
- - Zircon	- -	22.69 ZrO_2	62.01 ZrO_2	19.5
	100.0			52.5

Attention: Mr. O. H. Perry

Sheet No. # 1
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Summary

The results of this laboratory investigation indicate that the ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Sample GIA Composite

	Products	WT %	Assay	Std.	Products % of Sample
	Oversize (1)	Nil			
	Magnetite	0.30			
370-3	Ilmenite (2)	35.80	22.97 TiO_2	61.02 TiO_2	13.4
370-3	Monazite (3)	- -	9.23 ReO	64.12 ReO	5.1
370-4	Rutile (4)	63.90	13.23 TiO_2	97.00 TiO_2	8.7
370-4	Zircon (5)	- -	23.75 ZrO_2	62.01 ZrO_2	24.4
	Totals	100.00			51.6 (6)

(1) Plus 20 mesh material. This appears to be essentially garnet.
(2) Calculations based on previously determined ilmenite standard of 61.02% TiO_2.
(3) Calculations based on 97.0% TiO_2 rutile. Actual analyses 88.2. This percentage to be revised when contaminating factor can be determined.
(4) Calculations based on previously determined zircon standard of 62.01% ZrO_2.
(5) Calculations based on previously determined monazite standard of 64.12% ReO.
(6) The differences between these totals and 100% would consist of uneconomic heavy minerals and some fine quartz.

Attention: Mr. O. M. Perry

Sheet No. # 2
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Summary continued

Sample GI Composite

	Products	WT %	Assay	Std.	Products % in Sample
	Oversize	5.9			
	Magnetite	0.1			
371-4	Ilmenite	44.2	28.37 TiO_2	61.02 TiO_2	20.5
371-4	Monazite	- -	5.62 ReO^2	64.12 ReO^2	3.9
371-5	Rutile	49.8	20.40 TiO_2	97.0 TiO_2	10.5
371-5	Zircon	- -	18.68 ZrO_2	62.01 ZrO_2	15.0
	Totals	100.0			49.9

Sample G2 Composite

	Oversize	5.3			
	Magnetite	0.2			
372-4	Ilmenite	55.2	25.39 TiO_2	61.02 TiO_2	22.9
372-4	Monazite	- -	4.32 ReO	64.12 ReO^2	3.7
372-5	Rutile	39.3	18.78 TiO_2	97.0 TiO_2	7.6
372-5	Zircon	- -	20.73 ZrO_2	62.01 ZrO_2	13.1
	Totals	100.0			47.3

Sample G3N Composite

	Oversize	1.2			
	Magnetite	0.1			
373-4	Ilmenite	48.3	29.72 TiO_2	61.02 TiO_2	23.5
373-4	Monazite	- -	10.2 ReO	64.12 ReO^2	7.7
373-5	Rutile	50.4	30.19 TiO_2	97.0 TiO_2	15.6
373-5	Zircon	- -	29.85 ZrO_2	62.01 ZrO_2	24.3
	Totals	100.0			71.1

Attention: Mr. O. H. Perry

To: Henderson Hotel
Aiken, South Carolina

Sheet No. # 3
Date: January 21, 1953
Projects: 370-376, Inclusive

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Summary continued

Sample G4N Composite

	Products	WT %	Assay	Std.	Products % in Sample
	Oversize	7.3			
	Magnetite	0.1			
374-4	Ilmenite	44.6	22.97 TiO_2	61.02 TiO_2	16.8
374-4	Monazite	---	4.51 ReO^2	64.12 ReO^2	3.1
374-5	Rutile	48.0	13.78 TiO_2	97.0 TiO_2	6.8
374-5	Zircon	---	21.47 ZrO_2	62.01 ZrO_2	16.6
	Totals	100.0			43.3

Sample G5N Composite

	Oversize	4.5			
	Magnetite	0.1			
375-4	Ilmenite	53.7	23.07 TiO_2	61.02 TiO_2	20.3
375-4	Monazite	---	7.01 ReO^2	64.12 ReO^2	5.9
375-5	Rutile	41.7	25.26 TiO_2	97.0 TiO_2	10.8
375-5	Zircon	---	21.29 ZrO_2	62.01 ZrO_2	14.3
	Totals	100.0			51.3

Sample G6N Composite

	Oversize	1.9			
	Magnetite	0.1			
376-4	Ilmenite	61.8	30.2 TiO_2	61.02 TiO_2	30.5
376-4	Monazite	---	7.65 ReO^2	64.12 ReO^2	7.4
376-5	Rutile	36.2	18.23 $TiO2$	97.0 TiO_2	6.8
376-5	Zircon	---	22.95 ZrO_2	62.01 ZrO_2	13.4
	Totals	100.0			58.1

Attention: Mr. O. H. Perry

Sheet No. # 4
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Remarks:

Carpco Projects No. 370-376 inclusive, were the laboratory separations of a series of heavy mineral concentrate samples from drill hole composites and the determination of the percentages of ilmenite, rutile, zircon and monazite in each sample.

One sample, Composite GIA, was analyzed for columbium. There was none present that could be determined chemically.

Very truly yours,

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. 2
Date: March 16, 1953
Projects 425, 426, 427, 428, 429

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Line F-4 Composite, Line F-6 Composite, F-1-N Composite (0-10 feet), Line K Composite and Line K Hole 5 Composite Samples.

Summary con't

Products	Wt. %	Assay	Std.	Products % of Sample
Line K Composite				
428-2 Magnetite	0.1			
428-3 Ilmenite	49.8	28.37 TiO_2	61.02 TiO_2	23.2
- - Monazite	- -	5.63 ReO	64.12 ReO	4.4
428-4 Rutile	50.1	18.64 TiO_2	97.00 TiO_2	9.6
- - Zircon	- -	15.97 ZrO_2	62.01 ZrO_2	12.9
	100.0			50.1
Line K - Hole 5 Composite (Individual drill hole for shafting)				
429-2 Magnetite	0.1			
429-3 Ilmenite	56.4	25.13 TiO_2	61.02 TiO_2	23.2
- - Monazite	- -	8.39 ReO	64.12 ReO	7.4
429-4 Rutile	43.5	21.62 TiO_2	97.00 TiO_2	9.7
- - Zircon	- -	22.25 ZrO_2	62.01 ZrO_2	15.6
	100.0			55.9

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

pmd

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 1
Date: February 20, 1953
Project No. 401

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Six Drill Hole Composite Samples, 0-5 to 0-10, Inclusive.

Summary:

The laboratory investigation of these samples indicates that ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Sample 0-5 Composite

Products	Wt. %	Assay	Std.	Products % of Sample
401-1 Magnetite	0.4			
401-2 Ilmenite	48.6	36.05 TiO_2	61.02 TiO_2	28.7
- - Monazite	- -	12.55 ReO	64.12 ReO	9.5
401-3 Rutile	51.0	25.65 TiO_2	97.00 TiO_2	13.5
- - Zircon	- -	30.07 ZrO_2	62.01 ZrO_2	24.7
	100.0			76.4

Sample 0-6 Composite

401-4 Magnetite	0.2			
401-5 Ilmenite	43.9	28.10 TiO_2	61.02 TiO_2	20.2
- - Monazite	- -	12.59 ReO	64.12 ReO	8.6
401-6 Rutile	55.9	19.32 TiO_2	97.00 TiO_2	11.1
- - Zircon	- -	35.91 ZrO_2	62.01 ZrO_2	32.3
	100.0			72.2

Sample 0-7 Composite

401-7 Magnetite	0.3			
401-8 Ilmenite	58.9	41.34 TiO_2	61.02 TiO_2	39.8
- - Monazite	- -	6.35 ReO	64.12 ReO	5.8
401-9 Rutile	40.8	27.28 TiO_2	97.00 TiO_2	11.5
- - Zircon	- -	27.43 ZrO_2	62.01 ZrO_2	18.0
	100.0			75.1

Sample 0-8 Composite

401-10 Magnetite	0.4			
401-11 Ilmenite	60.7	44.96 TiO_2	61.02 TiO_2	44.6

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 2
Date: February 20, 1953
Project No. 401

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Six Drill Hole Composite Samples, 0-5 to 0-10, Inclusive.

Summary: con't

	Products	Wt. %	Assay	Std.	Products % of Sample
- -	Monazite	- -	8.07 ReO	64.12 ReO	7.6
401-12	Rutile	38.9	26.75 TiO_2	97.00 TiO_2	10.7
- -	Zircon	- -	29.16 ZrO_2	62.01 ZrO_2	18.3
		100.0			81.2

Sample 0-9 Composite

401-13	Magnetite	0.1			
401-14	Ilmenite	51.4	33.77 TiO_2	61.02 TiO_2	28.4
- -	Monazite	- -	9.10 ReO	64.12 ReO	7.3
401-15	Rutile	48.5	26.75 TiO_2	97.00 TiO_2	13.4
- -	Zircon	- -	29.12 ZrO_2	62.01 ZrO_2	22.7
		100.0			71.8

Sample 0-10 Composite

401-16	Magnetite	0.2			
401-17	Ilmenite	56.8	32.15 TiO_2	61.02 TiO_2	29.9
- -	Monazite	- -	9.73 ReO	64.12 ReO	8.6
401-18	Rutile	43.0	22.42 TiO_2	97.00 TiO_2	9.9
- -	Zircon	- -	34.19 ZrO_2	62.01 ZrO_2	23.7
		100.0			72.1

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 1
Date: March 6, 1953
Projects 419, 420, 421, 422

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite in Drill Hole Composite Samples for Lines Q, S, V and X.

Summary:

The laboratory investigation of these samples indicates that ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Products	Wt. %	Assay	Std.	Products % of Sample
Line Q Composite				
419-2 Magnetite	0.2			
419-3 Ilmenite	53.0	34.31 TiO_2	61.02 TiO_2	29.8
- - Monazite	- -	4.64 ReO	64.12 ReO	3.8
419-4 Rutile	46.8	16.73 TiO_2	97.00 TiO_2	8.1
- - Zircon	- -	17.13 ZrO_2	62.01 ZrO_2	12.9
	100.0			54.6
Line S Composite				
420-2 Magnetite	0.5			
420-3 Ilmenite	54.4	38.37 TiO_2	61.02 TiO_2	34.2
- - Monazite	- -	9.61 ReO	64.12 ReO	8.2
420-4 Rutile	45.1	25.94 TiO_2	97.00 TiO_2	12.1
- - Zircon	- -	23.13 ZrO_2	62.01 ZrO_2	16.8
	100.0			71.3
Line V Composite				
421-2 Magnetite	0.3			
421-3 Ilmenite	52.6	42.86 TiO_2	61.02 TiO_2	37.0
- - Monazite	- -	11.03 ReO	64.12 ReO	9.1

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. # 2
Date: March 6, 1953
Projects 419, 420, 421, 422

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite in Drill Hole Composite Samples for Lines Q, S, V and X.

Summary con't

Product	Wt. %	Assay	Std.	Products % of Sample
421-4 Rutile	47.1	21.62 TiO_2	97.00 TiO_2	10.5
- - Zircon	- -	23.62 ZrO_2	62.01 ZrO_2	17.9
	100.0			74.5

Line X Composite

422-2 Magnetite	0.2			
422-3 Ilmenite	54.4	36.74 TiO_2	61.02 TiO_2	32.7
- - Monazite	- -	9.35 ReO^2	64.12 ReO^2	7.9
422-4 Rutile	45.4	16.21 TiO_2	97.00 TiO_2	7.6
- - Zircon	- -	18.22 ZrO_2	62.01 ZrO_2	13.3
	100.0			61.5

Very truly yours,

Robert W. Spencer

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet # 1
Date: March 25, 1953
Project 447

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Shaft No. 1 Composite Sample.

Summary:

The laboratory investigation of this sample indicates that ilmenite, rutile, zircon and monazite minerals are present in the composite sample in the ratio as shown under the following tabulation.

Products	Wt. %	Assay	Std.	Products % of Sample
Composite of Shaft No. 1 Complete				
447-2 Magnetite	Trace			
447-3 Ilmenite	52.3	36.45 TiO_2	61.02 TiO_2	31.2
- - Monazite	- -	8.46 ReO^2	64.12 ReO	6.9
447-4 Rutile	47.7	39.22 TiO_2	97.00 TiO_2	19.3
- - Zircon	- -	29.93 ZrO_2	62.01 ZrO_2	23.0
	100.0			80.4

Very truly yours,

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. 1
Date: April 2, 1953
Project No. 462

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Shaft No. 2 Composite Sample.

Summary:

The laboratory investigation of this sample indicates that ilmenite, rutile, zircon and monazite minerals are present in the composite sample in the ratio as shown under the following tabulation.

Products	Wt. %	Assay	Std.	Products % of Sample
Composite of Shaft No. 2				
462-2 Plus 20 mesh	4.8	Garnet-Staurolite		
462-3 Magnetite	Trace			
462-4 Ilmenite	55.3	38.26 TiO_2	61.02 TiO_2	34.7
- - Monazite	- -	9.92 ReO	64.12 ReO	8.5
462-5 Rutile	39.9	25.26 TiO_2	97.00 TiO_2	10.4
- - Zircon	- -	32.42 ZrO_2	62.01 ZrO_2	20.9
	100.0			74.5

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

To: Mr. O. H. Perry
Henderson Hotel
Aiken, South Carolina

Sheet No. 1
Date: April 8, 1953
Project No. 479

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Shaft No. 3 Composite Sample.

Summary:

The laboratory investigation of this sample indicates that ilmenite, rutile, zircon and monazite minerals are present in the composite sample in the ratio as shown under the following tabulation.

Products	Wt. %	Assay	Std.	Products % of Sample
Composite of Shaft No. 3				
479-2 Plus 20 mesh	6.3	Garnet-Staurolite		
- - Magnetite	Trace			
479-3 Ilmenite	54.7	35.25 TiO_2	61.02 TiO_2	31.6
- - Monazite	- -	13.08 ReO	64.12 ReO^2	11.1
479-4 Rutile	39.0	17.92 TiO_2	97.00 TiO_2	7.1
- - Zircon	- -	35.12 ZrO_2	62.01 ZrO_2	22.1
	100.0			71.9

Very truly yours,

Robert V. Spencer

CARPCO ENGINEERING AND MANUFACTURING

5M-4-51 F. & K. INC.

LEDOUX & COMPANY,
(Inc.)
ENGINEERS, CHEMISTS AND ASSAYERS
SPECTROSCOPISTS

REPORT OF ANALYSIS

D

No. 691047

May 4, 1953

Our analysis of the sample of ILMENITE

From Callahan Zinc - Lead Company. Inc.

Marked:

and submitted to us, shows:

- SPECTROGRAPHIC ESTIMATION -

Columbium - - - - - - - - - - - - -Low-Medium

Tantalum - - - - - - - - - - - - - - Low

* *** *

High 10-100%. Medium 1-10%. Low 0.1-1%. Trace less than 0.1%.

To

Callahan Zinc-Lead Company. Inc.

LEDOUX & COMPANY, Inc.

5M-4-51 F. & K. INC.

LEDOUX & COMPANY,
(Inc.)
ENGINEERS, CHEMISTS AND ASSAYERS
SPECTROSCOPISTS

D **REPORT OF ANALYSIS**

No. 691048

May 4, 1953

Our analysis of the sample of RUTILE

From Callahan Zinc-Lead Company, Inc.

Marked:

and submitted to us, shows:

- SPECTROGRAPHIC ESTIMATION -

Columbium - - - - - - - - - - - - Trace

Tantalum - - - - - - - - - - - - -None Found

* *** *

High 10-100%. Medium 1-10%. Low 0.1-1%. Trace less than 0.1%.

To Callahan Zinc-Lead Company, Inc.

LEDOUX & COMPANY, Inc.

SM-4-51 F. & K. INC.

LEDOUX & COMPANY,
(Inc.)

ENGINEERS, CHEMISTS AND ASSAYERS

SPECTROSCOPISTS

REPORT OF ANALYSIS

LM

No. 678499 A

July 22, 1952

Our analysis of the sample of Ilmenite Concentration Products

From Callahan Zinc-Lead Co., Inc.

Marked: 7/15/52
No.287-3 Tabled light from Ilmenite fraction N.C. Composite by RUS
No.287-4 Tabled heavies from Ilmenite fraction N. C. composite

and submitted to us, shows:

By Spectrographic graphic Examination:

	Light	Heavies
Tantalum - - - -	0.02%	0.20%
Columbium - - -	0.08%	Medium-High
? Titanium - -	-Medium	Medium

Note: Titanium determination by Spectrograph in the presence of considerable iron is unsatisfactory.

High 10-100%. Medium 1-10%. Low 0.1-1%. Trace less than 0.1%.

To Callahan Zinc-Lead Co., Inc.

LEDOUX & COMPANY, Inc.

5M-4-51 F. & K. INC.

LEDOUX & COMPANY,
(Inc.)
ENGINEERS, CHEMISTS AND ASSAYERS
SPECTROSCOPISTS

JUN 26 1952

T

REPORT OF ANALYSIS

No. 677544

June 25, 1952

Our analysis of the sample of SAND

From Callahan Zinc Lead Co., Inc.

Marked: as below

and submitted to us, shows:

By Spectrographic Estimation:

Mark	Tantalum	Columbium
Sample #263-4 Ilmenite Fraction	Trace	Low
263-5 Rutile "	none	Trace
263-6 Monazite "	none	Trace
263-7 Staurolite "	none	none
263-8 Quartz & Ziron "	none	none

* * *

High 10-100%. Medium 1-10%. Low 0.1-1%. Trace less than 0.1%.

To Callahan Zinc Lead Co., Inc.

LEDOUX & COMPANY, Inc.

R1 KENNAMETAL INC. CHEMICAL LABORATORY

REPORT OF ANALYSIS

Date May 5, 1953

MATERIAL: Table Concentrate from Ilmenite

SOURCE: Perry & Schroeder Mining Co.
Helena, Montana

re: Letter of 4-28-53

SAMPLE								
Lab. NO.	64,906							
Ti-Spectro	Major Constituent							
Fe- "	Major Constituent							
Cb- "	Minor Constituent				TiO_2	51.20%		
Ta- "	Minor Constituent				Cb_2O_5	4.60		
Mn- "	Minor Constituent (Low)				Ta_2O_5	4.28		
Cr- "	Trace							
Mg- "	Trace							
Si- "	Trace							
Na- "	Trace							
Sn- "	Trace							
Zr- "	Trace (Low)							

O.W. Adams

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 1200' N. of R. R.

DATE

START 11:00 A.M. Dec. 1, 1952

LINE NO. - 0 HOLE NO. 7 N.

FINISH 10:00 A.M. Dec. 2, 1952

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A &1B	5	13	6	7	45.5	3.8		2.8	Tr. 1	-	-	-	-
2A	7½	22	~~6~~ 6	16	27.2	11.6		10.6	Tr. 1	13.4	Tr.	5.1	-
2B	10	50	6	44	20.0	35.2		29.2	6	75.5	7.0	9.4	0.7
3A	12½	66	6	60	19.5	48.3							
3B	15	50	6	44	16.1	36.9 / 85.2		53.2	32	120.5	8.7	6.2	0.5
4A	17½	43	6	37	17.2	30.6		22.6	8	88.6	7.4	12.8	0.9
4B	20	30	6	24	15.3	20.3	4	8.3	8	91.6	8.9	19.7	1.8
5A	22½	32	6	26	16.0	21.8		14.8	7	80.6	5.3	16.3	0.9
	Samples 1A & 1B not included							AVERAGE 17ft. (5'-22½')			7.4	10.1	0.7
	4" Casing ~~4/34~~ 4 3/4" Drive Shoe												
/s/ J.M.M.													
	Total					208.5	4	141.5	63	470.2			
	Less 1A&1B					3.8				00.0			
	Total (5'-22½')					204.7				470.2			

Attention: Mr. O. H. Perry

Sheet No. # 1
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Summary

The results of this laboratory investigation indicate that the ilmenite, rutile, zircon and monazite minerals are present in each composite sample in the ratio as shown under the following tabulations.

Sample GIA Composite

	Products	WT %	Assay	Std.	Products % of Sample
	Oversize (1)	Nil			
	Magnetite	o.30			
370-3	Ilmenite (2)	35.80	22.97 TiO_2	61.02 TiO_2	13.4
370-3	Monazite (3)	- -	9.23 ReO	64.12 ReO	5.1
370-4	Rutile (4)	63.90	13.23 TiO_2	97.00 TiO_2	8.7
370-4	Zircon (5)	- -	23.75 ZrO_2	62.01 ZrO_2	24.4
	Totals	100.00			51.6 (6)

(1) Plus 20 mesh material. This appears to be essentially garnet.
(2) Calculations based on previously determined ilmenite standard of 61.02% TiO_2.
(3) Calculations based on 97.0% TiO_2 rutile. Actual analyses 88.2. This percentage to be revised when contaminating factor can be determined.
(4) Calculations based on previously determined zircon standard of 62.01% ZrO_2.
(5) Calculations based on previously determined monazite standard of 64.12% ReO.
(6) The differences between these totals and 100% would consist of uneconomic heavy minerals and some fine quartz.

Attention: Mr. O. H. Perry

Sheet No. # 2
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Summary continued

Sample GI Composite

	Products	WT %	Assay	Std.	Products % in Sample
	Oversize	5.9			
	Magnetite	0.1			
371-4	Ilmenite	44.2	28.37 TiO_2	61.02 TiO_2	20.5
371-4	Monazite	- -	5.62 ReO^2	64.12 ReO^2	3.9
371-5	Rutile	49.8	20.40 TiO_2	97.0 TiO_2	10.5
371-5	Zircon	- -	18.68 ZrO_2	62.01 ZrO_2	15.0
	Totals	100.0			49.9

Sample G2 Composite

	Oversize	5.3			
	Magnetite	0.2			
372-4	Ilmenite	55.2	25.39 TiO_2	61.02 TiO_2	22.9
372-4	Monazite	- -	4.32 ReO	64.12 ReO^2	3.7
372-5	Rutile	39.3	18.78 TiO_2	97.0 TiO_2	7.6
372-5	Zircon	- -	20.73 ZrO_2	62.01 ZrO_2	13.1
	Totals	100.0			47.3

Sample G3N Composite

	Oversize	1.2			
	Magnetite	0.1			
373-4	Ilmenite	48.3	29.72 TiO_2	61.02 TiO_2	23.5
373-4	Monazite	- -	10.2 ReO	64.12 ReO^2	7.7
373-5	Rutile	50.4	30.19 TiO_2	97.0 TiO_2	15.6
373-5	Zircon	- -	29.85 ZrO_2	62.01 ZrO_2	24.3
	Totals	100.0			71.1

Attention: Mr. O. H. Perry

Sheet No. # 3
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Summary continued

Sample G4N Composite

	Products	WT %	Assay	Std.	Products % in Sample
	Oversize	7.3			
	Magnetite	0.1			
374-4	Ilmenite	44.6	22.97 TiO_2	61.02 TiO_2	16.8
374-4	Monazite	---	4.51 ReO^2	64.12 ReO^2	3.1
374-5	Rutile	48.0	13.78 TiO_2	97.0 TiO_2	6.8
374-5	Zircon	---	21.47 ZrO_2	62.01 ZrO_2	16.6
	Totals	100.0			43.3

Sample G5N Composite

	Oversize	4.5			
	Magnetite	0.1			
375-4	Ilmenite	53.7	23.07 TiO_2	61.02 TiO_2	20.3
375-4	Monazite	---	7.01 ReO^2	64.12 ReO^2	5.9
375-5	Rutile	41.7	25.26 TiO_2	97.0 TiO_2	10.8
375-5	Zircon	---	21.29 ZrO_2	62.01 ZrO_2	14.3
	Totals	100.0			51.3

Sample G6N Composite

	Oversize	1.9			
	Magnetite	0.1			
376-4	Ilmenite	61.8	30.2 TiO_2	61.02 TiO_2	30.5
376-4	Monazite	---	7.65 ReO^2	64.12 ReO^2	7.4
376-5	Rutile	36.2	18.23 TiO_2	97.0 TiO_2	6.8
376-5	Zircon	---	22.95 ZrO_2	62.01 ZrO_2	13.4
	Totals	100.0			58.1

Attention: Mr. O. H. Perry

Sheet No. # 4
Date: January 21, 1953
Projects: 370-376, Inclusive

To: Henderson Hotel
Aiken, South Carolina

Subject: Laboratory Separation and Determination of Ilmenite, Rutile, Zircon and Monazite for Seven Composite Drill Hole Samples.

Remarks:

Carpco Projects No. 370-376 inclusive, were the laboratory separations of a series of heavy mineral concentrate samples from drill hole composites and the determination of the percentages of ilmenite, rutile, zircon and monazite in each sample.

One sample, Composite GIA, was analyzed for columbium. There was none present that could be determined chemically.

Very truly yours,

CARPCO ENGINEERING AND MANUFACTURING

COMPUTATION OF CARPCO ASSAYS OF LINE G

Hole No.	Carpco Assay Product %	Carpco Assay Lbs. per ton
G1A - 35.6 lbs. cons. per ton		
Ilmenite	13.4	4.77
Monazite	5.1	1.82
Rutile	8.7	3.10
Zircon	24.4	8.69
G1 - 20.4 lbs. cons. per ton		
Ilmenite	20.5	4.18
Monazite	3.9	0.796
Rutile	10.5	2.14
Zircon	15.0	3.06
G2 - 13.6 lbs. mids. and cons. per ton		
Ilmenite	22.9	3.14
Monazite	3.7	0.50
Rutile	7.6	1.03
Zircon	13.1	1.78
G3 - 15.6 lbs. cons. per ton		
Ilmenite	23.5	3.67
Monazite	7.7	1.20
Rutile	15.6	2.43
Zircon	24.3	3.79
G4 - 24.2 lbs. mids. and cons. per ton		
Ilmenite	16.8	4.07
Monazite	3.1	0.75
Rutile	6.8	1.65
Zircon	16.6	4.02
G5 - 20.2 lbs. cons per ton		
Ilmenite	20.3	4.10
Monazite	5.9	1.19
Rutile	10.8	2.18
Zircon	14.3	2.89
G6 - 10.3 lbs. cons. per ton		
Ilmenite	30.5	3.14
Monazite	7.4	0.762
Rutile	6.8	0.70
Zircon	13.4	1.38

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION On North Bank of Horse Creek Approx 1100N. of R.R.

DATE

START 10:15 A.M. Dec. 3, 1952

FINISH 8:15 A.M. Dec. 4, 1952

LINE NO. 0 HOLE NO. 5

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A&B	5	15	6	9	29.1	6.4		5.4	1	17.5	6.0	12.1	0.7
2A	7½	21	6	15	36.2	9.6							
2B	10	25	6	19	34.7	12.4		17	Trash 5	26.8	7.6	5.4	0.4
						22.0							
3A	12½	18	6	12	32.4	8.1		5.1	3	26.6	14.0	14.5	2.0
3B	15	36	6	30	18.2	24.6	3	14.6	7	134.3	11.8 ~~24.1~~	24.1	2.8
4A	17½	33	6	27	17.0	22.4	4	10.4	8	91.0	9.0	17.9	1.6
4B	20	28	6	22	21.8	17.2	2	6.2	9	19.8	14.2	5.1	0.7
Discard	1A & 1B					AVERAGE 15'					10.7	13.8	1.5
/s/ J. M. M.													
		4" Casing, 4 3/4" Drive Shoe											
			Totals			100.7	9	58.7	33	316.0			
			Less 1A&1B			6.4				17.5			
			Total for 15'			94.3				298.5			

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION Approx 1250' N of RR START 9:30 AM Dec 4, 1952 (DATE)

LINE NO. 0 HOLE NO. 6 FINISH 3:30 PM " " "

No.	Depth	Net Weight Gross	Tare	Net	Moist. %	Dry wt.	Wt. samp. lb. Mesh +4	+34	-14	Wt. blk. Conc. grams	O/OM	#Conc. / ton	#M/ ton
1A+1B	5	17	6	11	48.7	5.6		3.6	2	10.5	2r	8.2	—
2A+2B	10	35	6	29	26.3	21.4		12.4	clay 9	43.5	5.9	9.0	0.5
3A	12½	36	6	30	21.5	23.6		20.6	3	45.0	14.0	8.4	1.2
3B	15	53	6	47	16.2	39.4	4	26.4	9	193.4	15.2	21.6	3.3
4A	17½	76	6	70	18.3	57.2	4	41.2	12	117.0	12.3	15.2	1.9
4B	20	34	6	28	17.1	23.2	4	12.2	7	154.7	8.7	29.4	2.4
5A	22½	24	6	18	16.4	15.1	4	7.1	4	141.6	6.9	43.6	3.0
					Average 17'						109	19.2	2.1
					From 5.0' to 22.6'								
					(Top sample 1A + 1B not included)								
					4" Casing, 4 3/4" Drive Shoe								
Totals						185.5	4	123.5	46	793.7			
1 5/5 MM. Less 1A+1B						5.6				10.5			
						179.9				783.2			

LABORATORY LOG

Copy

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 600' N of RR

DATE

START 3:15 P.M. 12/5/52

LINE NO. 5 HOLE NO. 4N

FINISH 1:30 P.M. 12/6/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A+1B	5	5	1	4	54.0	1.8		0.8	1	8.8	TR.	21.6	—
Dis >													
2A+2B	10	34	6	28	22.2	21.8		17.8	4	46.1	7.0	9.3	0.6
3A	12½	23	6	17	20.4	13.5		9.5	4	16.3	TR.	5.3	—
3B	15	30	6	24	17.3	19.9	2	10.9	7	74.6	18.9	16.6	3.1
4A	17½	31	6	25	13.6	21.6	3	15.6	3	70.8	15.0	14.4	2.1
4B	20	25	1	4	21.0	19	4	13	2	86.1	5.8	20.0	1.2
5A	22½	35	6	29	16.3	24.3	1	18.3	5	41.6	6.0	7.6	0.5
				Average		5' to 22½'					10.6	12.3	1.3
				/s/	J. M. M.								
			Totals			121.9	10	85.9	26	344.3			
			Less			1.8				8.8			
		Total for Average				120.1				335.5			
				4" Casing			4¾" Drive Shoe						

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 800' N of R.R.

DATE

START 2:15 P.M. 12/6/52

LINE NO. 5 HOLE NO. 5

FINISH 11:25 A.M. 12/8/52

SAMPLE NUMBER	DEPTH	NET WEIGHT GROSS	NET WEIGHT TARE	NET WEIGHT NET	MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS. PLUS 4 MESH	WEIGHT OF SAMPLE LBS. MINUS 14 MESH	WEIGHT OF SAMPLE LBS. PLUS 14 MESH	WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
1A+1B	5 No Sample (No Core)												
2A+2B	10	27	6	21	62.7	7.5	–	–	Tr. 9.5	–			
3A+3B	15	36	6	30	41.0	17.7		8.7	Tr. 9	90.3	5.7	22.5	1.3
Dis/													
4A	17½	56	6	50	20.2	40		35	5				
4B	20	43	6	37	17.1	30.7 / 70.7	4	19.7	7	383.8	7.5	23.9	1.9
5A	22½	30	6	24	14.5	20.5	3	10.5	7	28.9	9.9	6.2	0.6
5B	25	29	6	23	17.4	18.9	–	15.9	3	19.2	8.0	4.5	0.4
				Average		15' to 25'					8.0	16.2	1.3
					/s/ J.M.M.								
	Totals					135.6	7	89.8	38.8	522.2			
	Less					17.7				90.3			
	Totals for Avg.					117.9				431.9			
				4" Casing			4 3/4		Drive Shoe				

LABORATORY LOG

Copy

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 1000' N of RR

DATE

START 1:00 P.M. 12/8/52

LINE NO. 3 HOLE NO. 6

FINISH 11:00 A.M. 12/9/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A + 1B	5	18	6	12	77	2.8	—	—	TRASH 2.8	—	—	—	—
2A + 2B	10	40	6	34	35.4	22		18	TR. 5. 4	35.0	2.0	7.0	0.1
3A + 3B	15	62	6	56	25.8	41.5		35.5	6	45.0	3.0	4.8	0.1
4A	17½	46	6	40	18.4	32.4		23.4	9	32.9	13.0	4.5	0.6
4B	20	32	6	26	17.5	21.4		11.4	10	66.5	9.1	13.7	1.2
5A	22½	24	6	18	17.6	14.8	1	10.8	3	76.5	10.5	22.8	2.4
5B	25	22	6	16	16.3	13.4	2	7.4	4	62.7	9.2	20.6	1.9
				AVERAGE		5' TO 25'					8.2	9.7	0.8
				/S/	J. M. M.								
			TOTALS			148.3	3	106.5	38.8	318.6			
		TOTALS FOR AVERAGES				145.5				318.6			
				4" CASING			4 3/4" DRIVE SHOE						

/ COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 1200' N. of R.R. DATE START 11:30 A.M. 12/9/52

LINE NO. 5 HOLE NO. 7 FINISH 10:00 A.M. 12/10/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A+1B	5	40	6	34	25.6	8.3	—	—	Tr. 8.3	—			
2A+B	10	22	6	16	57.4	6.8		2.8	4	3.0 g	Tr.	1.9	—
3A+B	15	42	6	36	20.2	28.8		20.8	8	9.8	Tr.	1.5	—
4A	17½	25	6	19	17.5	15.7		10.7	5	53.3	14.0	11.4	1.6
4B	20	26	6	20	17.9	16.4		11.4	5				
5A	22½	33	6	27	14.8	23	1	17	5	76.7	8.6	14.7	1.3
5B	25	42	6	36	16.3	30.2	3	24.2	3	93.6	11.2	13.7	1.5
				Average		10' To		25'			11.0	10.2	1.1
					1st	J.M.M.							
	Totals					129.2	4	86.9	38.3	263.4			
	Less					15.1							
	Totals for Averages					114.1							

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LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 850 N of R.R. DATE START 1:10 P.M. 12/10/52

LINE NO. V HOLE NO. 5 FINISH 9:40 A.M. 12/11/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOIST-URE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CON-CENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2½	28	6	22	40.9	13		5	8 Trash	13.9	7.6	4.7	0.4
1B	5	22	6	16	16.4	13.4	2	9.4	2	54.8	8.6	18.0	1.5
2A	7½	25	6	19	19	15.4	3	10.4	2	27.1	10.0	7.8	0.8
2B	8¾	18	6	12	19.5	9.6	3 Clay Lumps	5.6	1	8.2	Tr.	3.8	—
				Average			8.75'				8.1	8.9	0.7
						/s/ J.M.M.							
		Totals		69		51.4	8	30.4	13	104.0			
				4" Casing			4¾" Drive Shoe						

LABORATORY LOG

Copy

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 700' N of RR. DATE START 1:10 PM 12/10/52

LINE NO. V HOLE NO. 4 FINISH 9:40 A.M. 12/11/52

SAMPLE NUMBER	DEPTH	NET WEIGHT GROSS	NET WEIGHT TARE	NET WEIGHT NET	MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS. PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH	WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
1A	2½	28	6	22	20.7	17.5							
1B	5	17	6	11	22.1	8.6		23.1	3	25.2	8.8	4.3	0.4
						26.1							
2A	7½	20	6	14	18.5	11.4							
2B	10	25	6	19	19.4	15.3		18.7	8	41.2	4.8	6.8	0.3
						26.7							
3A	12½	24	6	18	25.9	13.4							
3B	15	30	6	24	24.1	18.2		26.6	TRASH 5	84.4	3.6	11.8	0.4
						31.6							
4A	17½	30	6	24	13.8	20.7	4	13.7	3	84.5	14.3	18.0	2.6
4B	20	22	6	16	13.8	13.8	3	5.8	5	13.9	10	4.4	0.4
				AVERAGE		5' TO 20'					8.3	10.6	0.9
				/s/	J.M.M.								
		TOTALS			118.9	7	87.9	24	24.2				
		LESS			26.1				25.2				
	TOTALS FOR AVERAGE				92.8				224.0				

4" CASING 4¾" DRIVE SHOE

LABORATORY LOG

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DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 500' N of RR

DATE

START 2:20 P.M. 12/11/52

LINE NO. V HOLE NO. 3

FINISH 9:30 A.M. 12/12/52

SAMPLE NUMBER	DEPTH	NET WEIGHT GROSS	NET WEIGHT TARE	NET WEIGHT NET	MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS. PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH	WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
1A	2½	15	6	9	23.8	6.8							
1B	5	17	6	11	33.4	7.3		12	2	21.9	7.9	6.9	0.5
						14.1							
2A	7½	26	6	20	18.1	16.4		15.4	1	29.8	6.0	8.0	0.5
2B	10	24	6	18	21.8	14.1		7.1	7	19.3	5.1	6.0	0.3
3A	12½	34	6	28	15.8	23.6		18.6	5	31.5	3.8	5.9	0.2
3B	15	33	6	27	16.1	22.6	½	17.1	5	44.6	4.4	8.7	0.4
4A	16.25	20	6	14	17.5	11.5	1	6.5	4	20.9	8.8	8.0	0.7
				Average		5 to 16.25'					5.3	7.3	0.4
				/s/ J. M. M.									
			Totals			102.3	1½	76.7	24	168.0			
			Less			14.1				21.9			
		Totals for Average				88.2				146.1			
				4" Casing			4¾" Drive			Shoe			

LABORATORY LOG

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DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 300' N of RR

DATE

START 10:15 A.M. 12/12/52

LINE NO. V HOLE NO. 2

FINISH 2:45 P.M. 12/12/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A + 1B	5	25	6	19	18.8	15.4		9.4	6	43.2	8.8	12.4	1.1
2A	7½	42	6	36	19.7	28.9	3	16.9	9	181.1	7.1	27.6	2.0
2B	10	39	6	33	13.9	28.4	2	18.4	8	191.4	9.8	29.7	2.9
3A	12½	41	6	35	20.4	27.9	½	13.4	14	84.2	3.6	13.3	0.5
				AVERAGE			0	TO	12½'		7.7	22.0	1.7
				/s/	J. M. M.								
			TOTALS			100.6	5½	58.1	37	499.9			
				4" CASING			4¾" DRIVE SHOE						

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LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 400' N. of R.R. DATE START 8:45 A.M. 12/13/52

LINE NO. 5 HOLE NO. 3 FINISH 1:00 P.M. 12/13/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A+1B	5	13	6	7	30.0	4.9		2.9	Tr. 2	9.2	Tr.	8.3	—
2A	7½	10	6	4	42.0	2.3							
2B	10	19	6	13	43.0	7.4		2.7	7	24.8	8.7	14.9	1.3
						9.7							
3A	12½	29	6	23	16.8	19.1		13.1	6	57.5	8.2	13.3	1.1
3B	15	23	6	17	16.3	14.2	3	6.2	5	53.4	5.7	16.6	0.9
4A	17½	37	6	31	14.0	26.6	3½	18.1	5	122.6	3.1	20.3	0.6
4B	20	21	6	15	16.3	12.5		3.5	4	36.1	3.4	12.7	0.4
					1/4 I.M.M.			Avg.	7½	To 20'	5.1	16.3	0.8
	Totals					87.0	2½	51.6	29	311.6 ~~26.4~~			
	Less					7.2				17.2			
	Totals for average					79.8				294.4			
				4" Casing			4 3/4" Drive Shoe						

LABORATORY LOG

Copy

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 200' N of RR

DATE

START 2:30 P.M. 12/13/52

LINE NO. 5 HOLE NO. 2

FINISH 9:15 A.M. 12/15/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A + 1B	5	22	6	16	27.1	11.7		9.7	2	55.6	10.0	20.9	2.09
2A	7 1/2	33	6	27	17.2	22.4	2	16.4	4	103.0	8.2	20.3	1.66
2B	10	35	6	29	15.1	24.6	3	15.6	6	16.6	3.2	3.0	0.10
3A	12 1/2	32	6	26	19.8	20.8		13.8	7	43.8	1.0	9.3	0.09
		12 1/2'		AVERAGES							6.8	12.1	0.83
		/s/	J. M. M.										
TOTALS		12 1/2'				79.5	5	55.5	19	219			
				4" CASING			4 3/4" DRIVE SHOE						

✓

LABORATORY LOG

Copy

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 400' S of RR. DATE START 1:15 P.M. 12/15/52

LINE NO. C+500 HOLE NO. 3-S FINISH 9:45 A.M. 12/16/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A + 1B 2A + 2B	10	25	6	19	35.4	12.3		7.3	TRASH 5	6.3	TR.	—	—
3A	12½	26	6	20	19.1	16.2		12.2	4	37.2	1.0	10.1	0.10
3B	15	53	6	47	15.8	39.6	3	26.6	10	217.3	8.9	23.0	2.0
4A	17½	37	6	31	16.6	25.8	4	12.8	9	162.7	6.9	27.8	1.9
4B	20	23	6	17	11.3	15.1	2	9.1	4	146.4	3.3	42.7	1.4
	2ND 10	AVERAGES									6.3	25.7	1.62
	1/5/	J. M. M.											
			TOTALS			109.0	9	68.0	32	569.9			
			LESS			12.3		7.3	5	6.3			
		TOTALS 2ND 10				96.7		60.7	27	563.6			

4" CASING 4¾" DRIVE SHOE

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 150' N of RR

LINE NO. B HOLE NO. 1-N

DATE

START 1:15 pm 12/16/52

FINISH 12:45 pm 12/17/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2½	61	6	55	18.1	45.0		38	7	27.3	2.8	2.7	.08
1B	5	39	6	33	16.8	27.4		19.4	8	38.2	1.0	6.1	.06
2A	7½	59	6	53	15.3	44.8		36.8	8	86.9	0.7	8.5	.06
2B	10	57	6	51	19.3	41.2		37.2	4	63.1	1.5	6.7	.10
3A	12½	29	6	23	19.5	18.5		12.5	clay 6	45.0	1.6	10.7	.17
3B	15	89	6	83	17.2	68.7		45.7	23	148.8	6.0	9.5	.57
4A	17½	77	6	71	12.2	62.3	22	25.3	15	545.4	6.2	38.5	2.38
4B	20	71	6	65	15.5	54.9	4	24.9	26	271.7	2.2	21.8	.48
5A	22½	81	6	75	15.8	63.1	1	43.1	19	234.1	0.5	16.2	.08
	0-20	Average									4.25	14.9	0.63
Totals	2nd 10					204.4	26	108.4	70	1010.9			
	0-20					362.8	26	239.8	97	1226.4			
			6"	Casing				7½"	Drive Shoe				

Copy

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 350' N of RR

LINE NO. C+ 500 HOLE NO. 2N.

DATE
START 1:45 pm 12/17/52
FINISH 1:00 pm 12/18/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2 1/2	62	6	56	18.8	45.4		41.4	4	186.8	3.5	18.1	0.63
1B	5	43	6	37	16.7	30.8		23.8	7	122.9	0.7	17.6	0.12
2A	7 1/2	57	6	51	26.2	37.4		23.4	mud 14	76.1	0.8	8.9	0.07
2B	10	37	6	31	24.7	23.3		19.3	4	59.8	0.9	11.3	0.10
3A	12 1/2	73	6	67	16.4	55.9	4	32.9	19	368.8	11.3	28.9	3.28
3B	15	52	6	46	18.0	37.7	4	20.7	13	343.4	9.0	40.1	3.6
4A	17 1/2	81	6	75	17.7	6.17	1	36.7	24	469.2	5.6	33.5	1.87
4B	20	64	6	58	17.6	4.78		28.8	19	110.0	3.7	10.1	0.37
5A	22 1/2	90	6	84	12.1	73.7		46.7	27	42.7	1.0	2.5	0.02
	2nd 10	averages									7.9	28.0	2.2
	0-20		"								6.4	22.5	1.44
Total					Dry Weight 413.7 - 73.7	Plus 4 mesh 9 0		273.7 - 46.7	131 - 27	1779.7 - 42.7			
Totals	2nd 10				203.1	9		119.1	75	1291.4			
	0-20				340	9		227	104	1737			
					6" Casing			7 1/2" Drive Shoe					

Copy

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 300' S of RR

LINE NO. F HOLE NO. 2. S.

DATE

START 2.20 pm 12/18/52

FINISH 10:00 am 12/19/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOIST-URE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CON-CENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2 1/2	58	6	52	22.0	40.6		24.6	16	137.1	9.4	14.8	1.39
1B	5	27	6	21	17.2	17.4		8.4	9	65.3	4.5	16.5	0.74
2A	7 1/2	77	6	71	14.2	61.0	2	50.0	9	425.1	10.1	30.1	3.04
2B	10	69	6	63	15.2	53.4	11	21.4	21	950.1	5.6	78.3	4.38
3A	12 1/2	55	6	49	13.7	42.3	2	29.3	11	124.0	3.6	12.4	0.44
3B	15	85	6	79	19.4	63.6		60.6	3	127.9	3.5	8.8	0.31
	15	Averages									6.6	29.0	1.92
Totals	15					278.3	15	194.3	69	1829.5			
				6" Casing			7 1/2" Drive Shoe						

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 100' S of RR

LINE NO. HOLE NO. 15

DATE

START 11:00 am 12/19/52

FINISH 2:00 pm 12/19/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2½	68	6	62	20.2	49.4		23.4	trash 26	61.1	18.4	5.4	1.0
1B	5	74	6	68	14.9	57.8	4	41.8	12	405.0	9.6	30.8	2.9
2A	7½	125	6	119	16.3	10.0	7	66	27	640.5	6.2	28.2	1.75
2B	10	65	6	59	19.0	47.7	8	25.7	14	265.5	2.6	24.5	0.6
3A	12½	81	6	75	13.0	65.2	11	41.2	13	533.0	2.8	36.1	1.0
3B	15	74	6	68	24.6	51.7		35.7	16	62.9	3.8	5.3	0.2
	15	Averages									5.8	23.3	1.35
Totals	15					371.8	30	233.8	108	1968.0			

6" Casing 17½" Drive Shoe

LABORATORY LOG

COPY

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 300' N of RR

LINE NO. F HOLE NO. 2N

DATE

START 9:30 am 12/20/52

FINISH 11.10 am 12/20/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2½	77	7	70	25.2	52.3		29.3	23	45.3	9.0	3.8	0.34
1B	5	63	6	57	22.3	44.2		38.2	6	80.2	4.9	8.0	0.39
2A	7½	125	6	119	13.2	103.0	3	78.0	22	233.3	4.3	9.5	0.41
2B	10	122	6	116	14.6	99.0	10	62.0	27	333.8	3.9	14.8	0.58
3A	12½	127	6	121	18.3	98.8	13	52.8	33	523.4	6.7	23.4	1.56
3B	15	93	6	87	15.4	73.6	7	49.6	17	405.7	3.9	24.2	0.95
	15	Averages									5.1	15.1	0.8
Totals	15					470.9	33	309.9	128	1611.7			

6" Casing 7½" Drive Shoe

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 500' N of RR

DATE

START 11:45 am 12/20/52

LINE NO. F HOLE NO. 3N

FINISH 10:45 am 12/22/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOIST-URE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CON-CENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2½	40	6	34	36.8	21.4		7.4	trash 14	19.2	6.0	3.9	0.2
1B	5	77	6	71	23.0	54.7		45.7	9	99.0	3.9	7.9	0.3
2A	7½	116	6	110	18.3	89.8	11	62.8	16	245.9	6.7	12.0	0.8
2B	10	83	6	77	17.7	63.4	8	43.4	12	527.9	6.2	36.7	2.27
3A	12½	108	6	102	15.5	86.2	10	64.2	12	840.2	6.7	43.0	2.88
3B	15	112	6	106	15.2	90.0	28	34.0	28	1272.5	4.5	62.3	2.80
4A	17½	72	6	66	15.7	55.0	21	17	17	1063.6	3.0	8.50	2.55
4B	20	78	6	72	18.6	58.6		45.6	13	160.6	3.2	12.0	0.38
	20	Averages									4.8	35.9	1.72
totals	20					519.1	78 ~~519.1~~	320.1 ~~78~~	121 ~~320.1~~	4228.9 ~~121~~			

6" Casing 7½" Drive Shoe

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 150 N of RR

LINE NO. C+500' HOLE NO. 1N

DATE

START 2:10 pm 12/22/52

FINISH 10:10 am 12/24/52

SAMPLE NUMBER	DEPTH	NET WEIGHT GROSS	NET WEIGHT TARE	NET WEIGHT NET	MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS. PLUS 4 MESH	WEIGHT OF SAMPLE LBS. MINUS 14 MESH	WEIGHT OF SAMPLE LBS. PLUS 14 MESH	WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
1A	2½	25	6	19	29.5	13.4		11.4	2	23.3	3.2	7.6	0.2
1B	5	31	6	25	17.6	20.6		15.6	5	47.7	3.0	10.2	0.3
2A	7½	27	6	21	37.8	13.0		4.0	9 mud	31.1	1.1	10.5	0.1
2B	10	35	6	29	29.0	20.6		5.6	15	19.4	tr.	4.1	—
3A	12½	28	6	22	20.1	17.6		8.6	9	29.8	1.1	7.4	0.08
3B	15	22	6	16	16.5	13.3		10.3	3	31.6	2.2	10.4	0.2
4A	17½	30	6	24	16.0	20.1	1	18.1	1	137.6	8.1	30.2	2.44
4B	20	32	6	26	16.6	21.7	4	10.7	7	399.8	3.9	81.1	3.16
5A	22½	29	6	23	13.8	19.8	6	3.8	10	292.8	1.7	65.2	1.1
5B	25	30	6	24	19.2	19.3		13.3	6	76.7	0.8	17.5	0.1
	0-25	Averages									3.29	26.8	0.88
total	0-25					179.4	11	101.4	67	1089.8			
						4"	casing ~~Closing~~			4 3/4"	Drive Shoe		

LABORATORY LOG

COPY

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 100' N of RR

DATE

START 10.45 am 12/24/52

LINE NO. F HOLE NO. 1N

FINISH 3.40 pm 12/24/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOIST-URE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CON-CENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2½	24	6	18	15.1	15.3		8.3	7	22.2	3.0	6.4	0.19
1B	5	38	6	32	16.9	26.6		22.6	4	281.2	3.4	46.6	1.58
2A	7½	53	6	47	14.3	40.3	6	21.3	13	623.6	2.8	68.6	1.92
2B	10	37	6	31	12.5	27.1	4	14.1	9	325.5	1.7	53.0	0.9
3A	12½	38	6	32	18.7	26.0	3	15.0	8	224.3	1.7	38.0	0.6
3B	15	33	6	27	16.4	22.5	2	16.5	4	103.5	1.1	20.3	0.22
	15	Averages									2.4	44.2	1.06
Totals	15					157.8	15	97.8	45	1580.3			

4" Casing 4 3/4" Drive Shoe

COPY

LABORATORY LOG

DRILL LOG TRACT Home Creek SH. NO.

LOCATION 700' N of RR

LINE NO. F HOLE NO. 4N

DATE

START 7:30am 12/26/52

FINISH 2:30pm 12/26/52

SAMPLE NUMBER	DEPTH	NET WEIGHT			MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS.			WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
		GROSS	TARE	NET			PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH				
1A	2 1/2	12	6	6	19.4	4.8		3.8	1	19.2	6.4	17.6	1.13
1B	5	44	6	38	19.9	30.4		26.4	4	73.3	4.1	10.6	0.43
2A	7 1/2	28	6	22	19.7	17.7		14.7	3	51.0	3.9	12.7	0.49
2B	10	37	6	31	19.9	24.8		22.8	2	77.9	3.5	13.8	0.48
3A	12 1/2	33	6	27	16.8	22.4	4	15.4	3	118.0	9.4	23.2	2.18
3B	15	55	6	49	15.7	41.3	2	35.8	3 1/2	387.3	3.9	41.3	1.61
4A	17 1/2	32	6	26	15.8	21.9	1	16.9	4	146.7	5.3	29.5	1.58
4B	20	30	6	24	22.1	18.7	1/2	14.2	4	104.3	1.5	24.6	0.37
	20	Average									4.5	23.7	1.06
Totals	20					182	7.5	150	24.5	977.7			
					4" Casing 4 3/4" Drive shoe								

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 900' N of RR

LINE NO. F HOLE NO. 5 N

DATE

START 3:30 pm 12/26/52

FINISH 11:00 am 12/30/52

SAMPLE NUMBER	DEPTH	NET WEIGHT GROSS	NET WEIGHT TARE	NET WEIGHT NET	MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS. PLUS 4 MESH	WEIGHT OF SAMPLE LBS. MINUS 14 MESH	WEIGHT OF SAMPLE LBS. PLUS 14 MESH	WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
1A	2½	17	6	11	29.5	7.8		48	trace 3	13.2	~~12.3~~ 5.5	7.4	0.4
1B	5	34.5	6	28.5	21.9	22.2		20.2	2	50.3	~~60.3~~ 2.9	10.0	0.29
2A	7½	63.5	6	57.5	16.3	48.1	2½	35.6	10	148.0	6.7	13.5	0.9
2B	10	41.5	6	35.5	17.8	29.2	4½	14.7	10	267.8	7.0	40.3	2.82
3A	12½	49	9	40	21.6	31.4	4	18.4	9	421.4	3.9	59.1	2.30
3B	15	65	9	56	18.4	45.7	4	30.7	11	675.5	2.8	65.2	1.82
4A	17½	51	6	45	18.5	36.7	6	23.7	7	375.5	2.5	45.0	1.12
4B	20	31	6	25	16.6	20.9	3	13.9	4	233.8	2.0	49.0	0.98
											3.7	39.8	1.47 ~~14.7~~
	20	Averages											
Totals	20					242	24	162	56	2185.5			
						4" Casing			4 3/4" Drive Shoe				

COPY

LABORATORY LOG

DRILL LOG TRACT Horse Creek SH. NO.

LOCATION 850' S of RR

LINE NO. C+500 HOLE NO. ~~55~~ 55

DATE

START 9:15 am 12/30/52

FINISH 8:30 am 1/1/53

SAMPLE NUMBER	DEPTH	NET WEIGHT GROSS	NET WEIGHT TARE	NET WEIGHT NET	MOISTURE %	DRY WEIGHT	WEIGHT OF SAMPLE LBS. PLUS 4 MESH	MINUS 14 MESH	PLUS 14 MESH	WEIGHT OF BULK CONCENTRATE GRAMS	EST. % MONAZITE	LBS. PER TON CONS.	EST. LBS. PER TON MONAZITE
1A+1B	5	17	6	11	46.1	5.9		2.9	Trash 3	9.1	tr	6.8	—
2A	7 1/2	21	6	15	35.9	9.6		4.6	Trash 5	27.5	tr	12.6	—
2B	10	19	6	13	36.5	8.2		2.2	Trash 6	16.8	tr	9.0	—
3A	12 1/2	22	6	16	31.2	11.0		6.0	5	36.3	1.9	14.5	0.17
3B	15	26	6	20	23.9	15.2		10.2	5	54.2	1.5	16.7	0.23
4A	17 1/2	45	6	39	19.7	31.4	4	22.4	5	288.6	6.2	40.5	2.51
4B	20	39	6	33	25.0	24.7	7	7.7	10	331.8	5.1	59.2	3.02
5A	22 1/2	33	6	27	26.1	19.9	3	10.4	6.5	241.2	1.7	53.3	0.9
5B	25	31.5	6	25.5	15.6	21.5	1	15.5	5	50.8	3.9	10.4	0.4
	10 to 25	Averages									4.2	35.8	1.5
Totals						147.4	15	81.9	50.5	1056.3			
						-23.7		-9.7	-14.0	-53.4			
totals	10 to 25					123.7	15	72.2	36.5	1002.9			

4" Casing 4 3/4" Drive Shoe

MF-200
(June 1951)
(Revised Feb. 1952)

DOCKET NO. EA 2576

COMMODITY Monazite-Columbium-Rutile

Division Copy
Idm-E392

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

EXPLORATION PROJECT CONTRACT [1]

IT IS AGREED this 27th day of August, 1952, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and [2] Callahan Zinc-Lead Company, Inc., (an Arizona Corporation)
100 Park Avenue
New York 17, N. Y.

hereinafter called the "Operator," as follows:

ARTICLE 1. *Authority for contract.*—This agreement is entered into under the authority of the Defense Production Act of 1950, as amended, pursuant to DMEA Order 1 entitled "Government Aid in Defense Exploration Projects."

ARTICLE 2. *Operator's property rights.*—With respect to that certain land situated in the State of South Carolina, County of Aiken, described as ~~[illegible]~~: set forth in Appendix I

the Operator represents and undertakes: [4]

(*a*) ~~That the Operator is the owner, in possession and entitled to possession, and [illegible] following claims, liens, or encumbrances as to each of which the subordination agreement [illegible]~~:

(*b*) That the Operator is a lessee, in possession and entitled to possession, ~~[illegible]~~

The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof.

ARTICLE 3. *Exploration project.*—The Operator, within 45 days from the date of this contract shall commence work on a project of exploration for [5] Monazite-Columbium-Rutile

in or upon the described land; and shall bring the project to completion within a period of 6 months from the date of this contract. The work to be performed is more fully described in Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, are made a part of this contract. The Government will contribute to the cost of this work as hereafter provided.

ARTICLE 4. *Performance of the work.*—(*a*) *Operator's responsibility.* The work shall be performed efficiently, expertly, in a workmanlike manner, in accordance with good mining standards and State regulations for health and safety and for workmens' compensation and employers' liability insurance, with suitable and adequate equipment, materials, and labor, to bring the project to completion within the time fixed. To the extent specified in Exhibit "A," attached hereto, the work may be performed by independent contractor or contractors; and work not specified in Exhibit "A" for performance by independent contractor may nevertheless be so performed upon amendment of Exhibit "A," as agreed to by the parties, to state the work to be so performed and the estimated unit costs thereof, as provided hereafter.

(*b*) *Independent contracts.*—Any independent contract for the performance of work shall be on a unit-price basis (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved), or on some basis that will indicate the amount due for work performed at any stage of the work to be performed under such independent contract. The Government shall not be nor be considered to be a party to any such independent contract, and the Government's right to terminate the exploration project contract under any of its provisions shall not in any manner be affected by reason of any such independent contract. If the reference in Exhibit "A" to any such independent contract states that the Government's approval thereof is required, the Government may refuse to participate in the cost thereof unless and until it has given its written approval of the independent contract.

(*c*) *Government may inspect.*—The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

ARTICLE 5. *Estimated costs of the project.*—A statement of the estimated cost of the project is set forth in Exhibit "A," attached hereto. Except insofar as any item of requirement or the estimated cost thereof set forth in Exhibit "A" is there or elsewhere designated as an "allowable maximum," such items of requirement and of related cost are estimates only, and may be exceeded to the extent that the Government may from time to time approve for the most economic and beneficial performance of the work within the limitation of the total aggregate estimate of costs. The Government's approval of any such excess over the estimate for an item of requirement or related cost will be signified by its approval and payment of any invoice or voucher for payment which expressly calls attention to such excess. Items expressly designated in Exhibit "A" or elsewhere as "allowable maximum," and the total aggregate estimated cost are limitations, and any excess therein will be for the sole account of the Operator in which the Government will not participate.

ARTICLE 6. *Allowable costs of the project.*—(*a*) The costs of the project in which the Government will participate are limited to the following:

(1) *Independent contracts.*—Payments to independent contractors under independent contracts listed in Exhibit "A." The estimated cost of any work to be performed under an independent contract is or shall be included in the estimate of costs in Exhibit "A" in terms of the estimated numbers of units of work to be performed, the estimated amount to be paid per unit, and the estimated total amount to be paid to the independent contractor, and such estimates shall be allowable maximums above which the Government will not contribute. Regardless of the provisions of any such independent contract, the Government will participate in the payments to the independent contractor only on account of work actually performed and that conforms with the provisions of the exploration project contract, and only to the extent that the Government deems the unit prices for the work under the independent contract to be reasonable and necessary. No such independent contract shall have the effect of increasing the estimated total cost of the exploration project contract nor the maximum amount which the Government will pay as provided in the exploration project contract.

(2) *Labor, supervision, consultants.*—Labor, supervision and technical services (including engineering and geological consultants), a schedule of which is included in the estimate of costs set forth in Exhibit "A." The requirements and related estimated costs for supervision and technical services are allowable maximums.

(3) *Operating materials and supplies.*—Necessary materials and supplies including items of equipment costing less than $50.00 each, and power, water, and fuel, a schedule of which is included in the estimate of costs in Exhibit "A."

(4) *Operating equipment.*—Any operating equipment to be rented or purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or the allowable depreciation, as the case may be, a schedule of which is included in Exhibit "A." Any items listed as owned and to be furnished by the Operator, and related ~~[illegible]~~ allowable depreciation, are allowable maximums.

(5) *Rehabilitation and repairs.*—Any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and to be devoted to the purposes of the exploration contract, a schedule of which is included in the estimate of costs set forth in Exhibit "A." These items are allowable maximums.

(6) *New buildings, improvements, installations.*—Any necessary buildings, fixed improvements, or installations to be purchased, installed, or constructed for the purposes of the exploration work, with the estimated cost of each, a schedule of which is included in the estimate of costs in Exhibit "A." All of these items are allowable maximums.

(7) *Miscellaneous.*—Repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance and payroll taxes.

(8) *Contingencies.*—Such other necessary, reasonable direct costs of performing the exploration work, within the limit of the total aggregate estimate of costs, whether or not included in any schedule of costs in Exhibit "A," as may be approved by the Government in the course of the work, as indicated by its approval and payment of invoices and vouchers.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property, particularly excluding any land or interest therein to which the Government's lien is not to attach or the production from which is not to be subject to the Government's percentage royalty.
[4] Strike out the provision not applicable.
[5] Name of mineral or minerals.

(*b*) The Government's payment all cases will be based on actual, necessa osts (including contract unit prices) incurred not in excess of any "allowa maximum," and not in excess of the fixed perce age of the total aggregate estimated cost. Costs will be considered to be incurred only as they are or become due and payable.

(*c*) No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes) or any other indirect costs, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

ARTICLE 7. *Reports, accounts, audits.*—(*a*) *Progress reports.* The Operators shall provide the Government with monthly reports of work performed and costs (including contract unit prices) incurred under the contract, in quintuplicate (five copies), upon forms provided by the Government. These progress reports shall be certified by the Operator, and shall constitute both the Operator's invoice of costs incurred on the project during the period covered by the report and his voucher for repayment by the Government, unless the Government requires the use of a standard voucher form with invoice attached. Progress reports shall include surface and/or underground engineering-geological maps or sketches showing the progress of the exploration, with assay-reports on samples taken concurrently with the advance in mineralized ground.

(*b*) *Final report.*—Upon completion of the exploration work or termination of the contract the Operator shall provide the Government with an adequate geological and engineering report, in quintuplicate (five copies), including an estimate of ore reserves resulting from the exploration work.

(*c*) Compliance with requirements.—If, in the opinion of the Government, any of the Operator's reports are insufficient or incomplete, the Government may procure the making or completion of such reports and attachments as an expense of the exploration work; and the Government may withhold approval and payment of any vouchers depending upon insufficient or incomplete reports.

(*d*) *Accounts and audits.*—The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract. Upon the completion of the project or termination of the contract the Operator shall render a final account as provided in Article 12.

ARTICLE 8. *Payments by the Government.*—(*a*) The Government will pay 83 percent of the allowable costs incurred, as they accrue, in an aggregate total amount not in excess of $31,506.80, which is 83 percent of $37,960.00, the agreed, estimated total cost of the project in which the Government will participate; *Provided,* that until the Operator's final report and final accounting have been rendered to the Government, and any final auditing required by the Government has been made, and a final settlement of the contract has been made, the Government may withhold from the last voucher or vouchers such sums as it sees fit not in excess of ten (10) percent of the maximum total which the Government might have been called upon to pay under the terms of the contract.

(*b*) The Government may make any payment or payments direct to independent contractors and to suppliers, for the account of the Operator, rather than to the Operator.

ARTICLE 9. *Repayment by Operator.*—(*a*) If, at any time, the Government considers that a discovery or a development from which production may be made has resulted from the exploration work, the Government, at any time not later than 6 months after the Operator has rendered the required final report and final account, may so certify in writing to the Operator. The certification shall describe broadly or indicate the nature of the discovery or development. In the event of such certification, any minerals mined or produced from the land described in Article 2 within 10 years from the date of this contract, including any mined or produced before the certification, shall be subject to a percentage royalty which the Operator or his successor in interest shall pay to the Government, upon the net smelter returns, the net concentrator returns, or other net amounts realized from the sale or other disposition of any such production, in whatever form disposed of, including ore, concentrates, or metal, until the total amount contributed by the Government, without interest, is fully repaid, or said 10 years have elapsed, whichever occurs first, as follows:

(1) One and one-half (1½) percent of any such net amounts not in excess of eight dollars ($8.00) per ton.

(2) One and one-half (1½) percent of any such net amounts, plus one-half (½) percent of such net amounts for each additional full fifty cents ($0.50) by which such net amounts exceed eight dollars ($8.00) per ton, but not in excess of five (5) percent of such net amounts.

(For instance: The percentage royalty on a net amount of five dollars ($5.00) per ton would be one and one-half (1½) percent; on a net amount of ten dollars ($10.00) per ton, three and one-half (3½) percent.)

(*b*) As here used, "net smelter returns," "net concentrator returns," and "other net amounts realized from the sale or other disposition," mean gross revenue from sales; or if not sold, the market value of the material after it is mined in the form in which and the place where it is held. In the case of integrated operations in which the material is not disposed of as such, these terms mean what is or would be gross income from mining operations for percentage depletion purposes in income-tax determination.

(*c*) To secure the payment of its percentage royalty, the Government shall have and is hereby granted a lien upon the land described in Article 2 and upon any production of minerals therefrom, until the royalty claim is extinguished by lapse of time or is fully paid.

(*d*) This article is not to be construed as imposing any obligation on the Operator or the Operator's successor in interest to engage in any mining or production operations.

ARTICLE 10. *Assignment, transfer, or loss of Operator's interest.*—Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder. The Operator shall not make any voluntary nor permit any involuntary transfer or conveyance of the Operator's rights in the land described in Article 2, without making suitable provision for the preservation of the Government's right to a percentage royalty on production and lien for the payment thereof; *Provided,* that mere failure by the Operator to maintain the Operator's rights in the land, without any consideration running to the Operator other than relief from the cost of maintaining such rights (as by surrender of a leasehold, failure to perform assessment work, or failure to exercise an option), coupled with complete abandonment by the Operator of all interest in or operations on the land for a period of 10 years from the date of this contract, shall not constitute such a transfer or conveyance. Should the Operator make or permit any transfer or conveyance in violation of this provision, the Operator shall be and remain liable for payment to the Government of the same amounts, at the same times, as would have been paid under the terms of the percentage royalty on production. If for any reason the net smelter returns, net concentrator returns, or other net amounts realized from the sale or other disposition of such production are not available as a means of measuring the amount of the Operator's liability, the amount thereof shall be estimated as well as may be, and in the event of dispute as to such estimates, the determination thereof by the Administrator of Defense Minerals Exploration Administration or by his successor shall be final and binding upon the Operator.

ARTICLE 11. *Title to and disposition of property.*—All facilities, buildings, fixtures, equipment, or other items costing more than $50.00 each, paid for or purchased with funds contributed jointly by the Operator and the Government, although title may be taken in the name of the Operator, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the completion of the work or the termination of the contract shall be disposed of promptly by the Operator for the joint account of the Government and the Operator, either by return to the vendor, by sale to others, or purchase by the Operator at a price at least as high as could otherwise be obtained, as may appear to be for the best interest of the Government, unless the Government, in writing, waives its interest in any such item. If necessary to accomplish such disposition, the Operator shall dismantle, sever from the land, and remove any such item, the cost thereof to be for the joint account of the parties in proportion to their respective interests. If the Operator, within 90 days after the receipt of written notice from the Government, fails, neglects, or refuses to dispose of such property, the Government may itself enter upon the land, take possession of, and remove and dispose of any such property as above provided.

ARTICLE 12. *Termination and completion.*—The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worth while discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall dispose of any remaining materials, supplies, facilities, buildings, fixtures, and equipment in which the Government has an interest, for the joint account of the Operator and the Government in the proportion of their respective interests; shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; and shall pay to the Government its pro rata share of any money remaining.

ARTICLE 13. *Changes and added provisions.* .....

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

By E. P. Mutterdorf
Acting Administrator
Defense Minerals Exploration Administration

Callahan Zinc-Lead Company, Inc.
(Operator)

By R. F. Mahoney Vice President

I, E. A. Salo, certify that I am the secretary of the corporation named as Operator herein; that R. F. Mahoney, who signed this contract on behalf of the Operator, was then Vice-President of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

E. A. Salo

[CORPORATE SEAL]

U. S. GOVERNMENT PRINTING OFFICE 16—66328-1

Horse Creek
Outline of Project
OR-7H 56
Rock Creek
Oak Knob
Savannah River Project Highway

Commodity:
Monazite
Columbium
Rutile

Docket No. D.M.E.A. 2576
Contract No. Idm. E392

9/28/53

FINAL ENGINEERING REPORT

Horse Creek Exploration

Aiken County South Carolina

April 25, 1953

NOTE: All data pertaining to this project are submitted with this report with the exception of copies of Original Drill and Laboratory Logs, which have been submitted monthly as completed. These should be held as a supplement to this report. All data and computations submitted with monthly reports should be disregarded when at variance with this Final Report, as all work has been re-checked and some errors found and corrections made. Map and Cross Sections, marked Supplement "A" and photostats of Assay Returns, marked Supplement "B" are submitted under separate cover.

SUMMARY AND CONCLUSIONS

A. The Horse Creek Deposit covered by this examination contains 18,334,000 cubic yards of dredgible material having a content of heavy minerals of commercial value as follows:

Monazite	1.56	lbs. per cubic yard
Rutile	2.60	" " " "
Zircon	4.42	" " " "
Ilmenite	6.63	" " " "
Saleable Gravel (-4 Mesh). . .	139.9	" " " "

These minerals are distributed with surprising uniformity from one end of the deposit to the other. (See Section II, Final Computations)

B. The examination extended over a length of about four miles of the valley. The deposit covers an area of approximately 685 acres, of which about 367 acres is covered with trees and with from three to ten feet of semi-fluid bog containing about 20% solids and making up an additional 5,622,000 cubic yards in place.

C. With the trees cleared from the ground it is practical to dredge this deposit with a bucket-ladder type dredge with but little interference from the bog overburden. Conditions, generally, are favorable for dredge operation.

D. The heavy minerals can be recovered on a practical basis (80% to 90% overall recovery) by gravity concentration with jigs and with final separation by usual electro-static and magnetic methods, and products of a saleable grade can be made by these methods.

E. While assays show columbium to be present, due to its small volume the difficulty of assaying and the limited extent of the work, it has not been possible to prove it to be in commercial quantities, but in actual operation it may be well worth saving. (See Section I Assay Methods)

Signed

G. H. Perry
Engineer in Charge

SECTION I

DISCUSSION AND EXPLANATION

General Geology and Description of Deposit

Method of Drill Sampling (For original logs see Monthly Reports)

Assay Methods (For original Assay Returns see Supplement "B")

Shaft work to check Drill Results

Bulk Concentration to prove Practical Commercial Recovery

Computations of Mineral Content and Yardage

GENERAL GEOLOGY AND DESCRIPTION OF DEPOSIT

Horse Creek, located in Aiken County, South Carolina, rises on the deeply weathered crystaline rocks north of the town of Vaucluse, S.C., flows southward to cross the "fall line" at Graniteville, where it turns in a westerly direction, cutting through the ancient beach terraces (Tuscaloosa and Barnwell formations) and empties into the Savannah River at a point opposite and about two miles below the city of Augusta, Georgia. This examination was confined to the area beginning at the Langly Mill Pond, which is about three miles below Graniteville and extending about four miles down stream to where the new four-lane highway, running to the Savannah River Project of the A.E.C. crosses Horse Creek at a distance of two miles from it's mouth.

The Augusta branch of the Southern Railway runs up the valley, crossing it not far from Clearwater. U.S.No. 1 Highway parallels the valley on the high ground to the north. The towns of Clearwater and Bath lay on either side of the deposit examined.

The valley is about one-half mile or more wide and is confined between hills standing as much as three hundred feet above the present creek level. The creek has a gradient of about seven feet to the mile over this area.

The heavy minerals found in this deposit seem to be scattered thinly all through the old Tuscaloosa beach terraces on either side and there is but little question that their presence in quantity in the valley is due to a reconcentration by the creek of these old beach sands into which the valley has been cut from Graniteville down to the Savannah River. This and the uniform gradient of the stream no doubt accounts for the surprising uniformity of the values found over the length of the deposit.

The material in the deposit is mostly quartz sand, averaging about 25% plus ten mesh, and 5% plus four mesh. The plus four gravel is made up of rounded, water-worn pebbles and is suitable for construction or road agrigates. The sand is all very angular. In some places a layer of sandy clay sediment deposited by the high water over-flowing the creek banks lies on top of the sand for a depth of one to three feet. The dredging bed rock of the deposit is the old beach terrace material made up of clay-bound sand and in some places clay. There is no hard bed rock in the area.

On about 362 Acres of the total 685 Acres examined, there is a stand of swamp timber, some of it marketable as saw logs and some as pulp wood. This timber stands in a typical creek swamp common in this part of the country. The swamp is a semifluid black muck containing about 20% solids. The trees have very shallow roots and where they are not rotten can be tipped over and pulled to one side with a logging winch, carrying the roots with the tree. Such roots and brush as are left should give no serious trouble to a bucket-ladder-type dredge. The swamp muck varies in depth from 0' to 10'.

The project is cut in two by the right of way of the Southern Railway, which will probably make it necessary to dismantle a dredge once during the operation to cross the right of way. Several county roads of minor importance will have to be crossed but should offer no difficulty.

Transportation, both rail and highway, are available on the deposit. Electric power is also available on the ground. There is an abundance of water available in Horse Creek.

METHOD OF DRILL SAMPLING

Drilling was begun about October 1, 1952, with a standard churn-type drill, using six inch casing and following the usual placer practice of driving the pipe, measuring the rise of core in the pipe and, with a "sand pump" type of baler, taking only such core as rose in the pipe as sample. Since the material was all sand, we were able to bring into the pipe only about one-third of the theoretical core that should have resulted from a true hole of the diameter of the cutting shoe used on the pipe. (See Sec.II Drill Log Data Summary.) The remainder of the material was driven away as is done when a piling is driven in sand. We, therefore, adopted the method worked out by the U.S.Bureau of Mines, in their prospecting for Monazite, of saving all solids, including slimes, that came from the drill hole,and basing all computation on the weight of material recovered as sample, rather than on a theoretical volume of hole.

It was soon found that it would not be practical to use such heavy equipment as a standard 6-inch drill in the swamp area. A similar drill was then improvised and mounted on a jeep, and equipped with four-inch casing to be used where the heavier equipment could not be moved.

Eighty-one holes were drilled, 38 being 6-inch and 43 being 4-inch. With the eight holes drilled by the applicant a year ago the computations in this report are based on 89 drill holes, which are divided among thirteen cross sections. The cross sections were spaced at intervals of about 2000 feet, but due to the difficulty of the terrain it was impossible to make these spacings exact. On line the drill holes are spaced at 200 ft.

Samples were taken in drives of $2\frac{1}{2}$ feet. Each sample as taken from the hole was placed in a separate sample tub and taken to a laboratory that was set up on the project. Here the sample was weighed and sampled for moisture, and the dry weight determined. It was then screened by hand over a 4-mesh and a 12-mesh screen and the fines concentrated on a Wilfley table.

The concentrates were weighed and the Monazite content determined radiometrically with a Geiger Counter. (See Sec.II Drill Log Data Summary.) The concentrates from the $2\frac{1}{2}$ foot samples were combined in total to make up a composite concentrate representative of the hole. The radiometric determinations of Monazite were found to be sufficiently accurate to serve as a guide for the drilling and laboratory work.

The final assay work for all minerals was done by the Carpco Engineering & Manufacturing Company's laboratory in Jacksonville, Florida. Two lines of holes were selected (Lines "O" and "G") to have individual assays made of each hole. These assays showed nothing inconsistent in any way, and the Monazite values ran reasonably close to the radiometric determinations. It was decided, therefore, to make composite samples of concentrates for each of the remaining cross sections to save the many individual assays.

Computations in making up a composite sample of concentrate to represent the line, showed that if (1) the simple method of mixing together all concentrates recovered from all holes in the line was used, or that (2) only the concentrate representing a uniform weight of core per foot of drive for each hole was used, then in either case the uniformity of values was such that the results would be so close as to make any differences insignificant. (See Sec.II Computation by Cross Sections Lines "G" and "O") The latter method seemed the more correct since there is a wide variation in lbs. core recovered per foot of drive. Therefore, as it did not involve much time, the second method was used in making up all composites for lines. Some lines were divided into a composite representing six-inch holes and another representing four-inch holes to see if there might be a difference in the drilling. Again no inconsistencies were shown. (See Sec.II Computation by Cross Section Lines "C" and "F".) Computation sheets showing a summary of log data and showing the compositing of samples are attached.

All drill logs and the laboratory logs for all holes have been submitted, as they became available, with the monthly progress reports, and

are not reproduced here, as they are of considerable bulk and they can be gathered from the monthly reports as a supplement to this final report, if needed to verify the data shown here.

* (See Sec. II Drill Log Data Summary)

ASSAY METHODS AND RESULTS

All assay work was carried on by the Carpco Engineering laboratory in Jacksonville, Florida. Determinations were made for Monazite, Rutile, Ilmenite, and Zircon. The method used was to split the sample through a magnetic separator so as to separate the Rutile from the Ilmenite. A TiO_2 and ZrO_2 determination of the mon-magnetic fraction could then be calculated as Rutile and Zircon. A TiO_2 and a R.E.O. determination on the magnetic fraction could be calculated as Ilmenite and Monazite.

This method of assaying was used on all samples. Photostats of all assay returns are included with this report under separate cover as Supplement "B".

The bulk of concentrates obtained from the material sent to the Tuscaloosa Laboratory of the U.S.B.M. for testing the recoverability of these minerals on jigs and spirals, and later the large quanitty of concentrates (about 500 lbs.) obtained from three test shafts that were put down to check the drilling, was sent to the Carpco Laboratory for a complete separation by commercial electrostatic and magnetic equipment into the four minerals it is planned to produce, i. e. Monazite, Rutile, Ilmenite, Zircon. The purpose was to determine that a separation could be made on a practical basis and that the resultant products wuld be of saleable grade.

An assay return submitted herewith (See Supplement "B") shows the following assays for the minerals obtained under pilot plant production conditions: --

Production Monazite	equals	64.52% R.E.O.
Production Rutile	"	92.06% TiO_2
Production Ilmenite	"	54.90% TiO_2
Production Zircon	"	66.90% ZrO_2

As a general rule higher grade products can be made under full operating conditions than in a small batch run. The results above are satisfactory.

The Monazite is of very high grade.

The Rutile, to bring the top price, should be brought up from 92.% to 95.% TiO_2, which is the usual commercial standard. It is saleable, however, whether this can be done or not.

The Ilmenite, at 54.9%, should also be raised to between 55% and 60% TiO_2, but these two problems, we believe, are not properly part of this project.

The Zircon, while not very clean, is of saleable quality.

Further beneficiation of these products can probably be made, but that is beyond the purpose of this examination.

COLUMBIUM ASSAY

A spectrographic examination was made by Ledoux & Company of all resultant products from the original drilling to determine if columbium might be present. It showed in small quantity in the ilmenite fraction (magnetic and conductor). A quantity of this fraction was then put over the Wilfley table and a cut of 2% of the heaviest material taken out. A spectrographic was again done on each part, and the heavy 2% showed a concentration of the columbium. (See Assays Supplement "B")

This same reconcentration was carried out on the ilmenite resulting from the later drilling, and a wet assay made by Garpco, and only a trace of columbium found. Because other operators have experienced this same difficulty of getting consistent returns on columbium assays, it was decided that when a larger quantity of material was available from the shaft samples, assays from several laboratories would be necessary to be sure of the presence of recoverable columbium. Therefore, the same 2% cut was again made from the larger quantity of material and samples of the concentrate assayed by Garpco and also by Kennametal, Inc. and by Union Carbide and Carbon Co.

A copy of the assay return from the laboratory of Kennametal, Inc. is included in Supplement "B". This shows a Cb_2O_5 content of 4.6% and a Ta_2O_5 of 4.28% of the sample submitted. A sample of the rutile fraction reconcentrated in the same way, and also submitted to them shows no columbium and tantalum.

An additional examination was then made of this same heavy cut from the ilmenite by the laboratory of the Union Carbide and Carbon Co. Their assay as to columbium content checks substantially with that of Fundamental. However, this laboratory also developed the fact that the mineral present is apparently not a true columbite but probably an "ilmeno-rutile" type of mineral containing 48% TiO_2 and 23% Fe_2O_3 along with the Cb_2O_5 and Ta_2O_5.

If this is the case, the difference in gravity between this mineral and the ilmenite would not be as great as if we had a true columbite, and it is probable that in taking an arbitrary 2% cut of the ilmenite we did not get all of the columbium bearing mineral and, in fact, may have gotten only a fraction of it. However, on the basis of work done to date on the 2% cut, the columbium-tantalum represents a small content in the original material. On the basis of our operation as planned (6,000 cu. yds. per day) we could produce 100 lbs. of Cb_2O_5 and Ta_2O_5 contained in about 1,000 lbs. of the titanium-iron mineral.

SHAFT WORK TO CHECK DRILL RESULTS

It is customary in sampling placer deposits with a churn drill, to put down several shafts directly over drill holes, getting an accurate measure of volume, weight,and values, that can be compared with the drilling results. This is considered necessary to check and to evaluate the drill's recovery of core. Also, since we have found it advisable to compute all results in pounds and tons, it was also necessary to convert all our figures into cubic yards, so as to put a value on the measured volume of the deposit, and so the weight of the average cubic yard in the deposit had to be determined.

For these reasons three shafts were put down by hand, beginning the middle of February, 1953. A dimension of about four feet square was used to allow room for tight and careful timbering. This gave a large sample to be washed and concentrated, and it was necessary to put up a washing plant with bins, vibrating screen and small size jigs to do this work. A set of Pan American test jigs were obtained from the Dorr Company. The jigs had an effective bed area of 9" x 9" per cell, and had six cells. A rotary sampler was installed just ahead of the jigs for head sampling, and cutter put in the tail sluce, cutting about 1 to 20 for tailing sample.

All the material from each shaft was weighed, washed, screened, and jigged, and the final jig concentrate cleaned on the laboratory Wilfley table. A radiometric determination was made of Monazite, and the concentrates sent to the Carpco laboratory for separation and assay.

To put these shafts down, a well-point system was used to dewater the ground, and an expert brought in with the rented equipment to operate it. Shafts were put down over drill holes "F 1 N", a four-inch hole, and "K 5 N" and "O 10 N", both six-inch holes.

Difficulty was encountered with the water, due partly to six weeks of rainy weather while this work was going on. The principal difficulty, however, was inherent in the conditions, as follows: The typical material of the deposit is a very clean bed of sand that carries the high values, and through which the flow of water is very free. Above the bed rock, however, for a depth of 2 feet to 5 feet this clean sand has been mixed to an increasing degree with the clay bed rock forming a more or less impervious material of decreasing values, that, while dredgible, does not make up an important part of the total values.

It was found to be impossible to dewater this layer, and it was impractical to get any accurate results below this depth due to the running-in of water and the running-in of material with it. It was decided, therefore, that the purposes of the shafts would be best accomplished if they were driven accurately through the principal values, and the results compared with the equal depth of the drill holes, the small values below being disregarded from both logs. Shaft and laboratory logs of these three shafts are attached.

The jigs were fed very slowly so that the recovery of the heavy mineral from the shaft samples by the jigs was practically 100%. Shaft "F 1 N" the first one put down, showed a great amount of coarse staurolite and garnet, just as the drill hole had shown. A considerable amount of this was rejected on the Wilfley table. With the Geiger Counter as a check, no Monazite was permitted to escape, but the concentrates were reduced to about the normal for the deposit (18 lbs. Cons/ton as against 50 lbs. cons/ton for this drill hole). When the assay returns were compared with the drill hole it was found that the Monazite checked well (shaft 1.3 lbs., drill 1.1 lbs/ton), but that we had tabled off a part of the other lighter values.

The two remaining shafts were not tabled as clean, and the comparison of the shaft results with the drill hole was surprisingly close for all values, the shafts running slightly above the drill in most cases. (See Sec.II shaft laboratory logs for comparison.)

A computation of weight of bank run material in place was made from the shafts, and shows an average weight of 2,640 lbs. per cubic yard. To get the last 18" to 2' of the bottom of each shaft, spiling had to be driven, giving an inexact cubic measure, which was not used in getting this figure. (See Sec.II Shaft Data Summary.) It is assumed that 2,600 lbs. per cubic yard is a conservative average figure to use for this deposit and all computations in this report are based on this figure.

BULK CONCENTRATION TESTS

To evaluate this deposit it was necessary to determine that the valuable minerals can be separated and recovered by practical, commercial means.

It was decided that the gravity concentration of the minerals could best be done by jigs or by spirals. The U. S. Bureau of Mines volunteered that their laboratory at Tuscaloosa, Alabama, had such equipment that could be used and that they would be glad to have us send some material there for testing. Therefore, about twenty tons of bank-run material was shipped to Tuscaloosa. With the help of the Bureau's men some tests were run that demonstrated that a good recovery could be made at a very low rate of feed and a low ratio of concentration. However, the laboratory equipment and facilities were too small to accomplish any more than this.

Therefore, when the washing and concentration of the shaft samples was completed with the Test jig plant on the project, six trial runs were put through from material available at the site (alongside the creek just west of "Old P" Line). About two tons of material was used for each run. Variations were made in screen size of feed and in thickness of jig bed only.

There are many possible variations in the setting of a jig, but no attempt was made to go into these or other production problems, but simply to establish the fact that these minerals can be recovered at a practical rate of feed (1 ton per hour per square foot of jig bed), and to establish a practical recovery factor under this condition (80% - 90% overall recovery). The data for these tests follows:

AS COMPUTED FROM ALL CONS. RECOVERED FROM JIG & TAIL SAMPLE

Test No.	BEDDING Permanent	BEDDING Live	3/16" MESH % Recovery Monazite	3/16" MESH % Recovery Concentrates	3/16" MESH Ratio of Concentration	- 10 MESH % Recovery Monazite	- 10 MESH % Recovery Conc.	- 10 MESH Ratio of Concen.
3-4	5"	3-1/4"	81.5	76.5	33 to 1	85.7	86.8	21 to 1
5-6	5"	1-3/4"	89.8	77.5	26 to 1	92.0	77.3	17 to 1
9-10	5"	3/4"	93.0	81.1	14½ to 1	96.5	83.3	7¼ to 1

NOTE: Slimes were lost by cutter in taking both head and tail samples, which makes head sample show slightly higher than true, and recovery slightly lower than was accomplished.

AS COMPUTED FROM HEAD SAMPLE AS AGAINST TAIL SAMPLE ONLY

3-4	5"	3-1/4"	85.2	80.0	33 to 1	87.0	86.5	21 to 1
5-6	5"	1-3/4"	91.4	83.0	26 to 1	95.0	82.0	17 to 1
9-10	5"	3/4"	94.0	83.0	14½ to 1	97.1	86.5	7¼ to 1

NOTE: Rate of feed equals 1 ton per sq. ft. of jig bed per hour.
Stroke equals 11/16 inch @ 165 per minute.
Permanent Bed equals 1" steel shot plus 4" hematite pebbles.
Live Bed equals height of lip above permanent bed.
Monazite determined by radiometric method.
Slimes were lost by cutter from both head and tail samples and have been disregarded in this computation.
Concentrates were cleaned on the laboratory table only, and no heavy liquid separation made. Therefore % Recovery of Concentrates figure is not definitive but can vary with the grade of table concentration accomplished on each sample.
Test No. 1-2 run for adjustment of equipment.
Test No. 7-8 discarded due to plugging of hutch valves.

COMPUTATIONS OF MINERAL CONTENT AND YARDAGE

Computation sheets for each Cross Section assay sample are attached, showing the compositing of the sample and the mineral content as computed from the assay returns. There are also attached the computation sheets showing the Total Mineral Content for the Project.

Computations showing the method of arriving at the volume of the Dredging Section, and the overlying muck or stripping section are included. These can be interpreted in conjunction with the map and Cross Sections in Supplement "A".

SECTION II

DATA AND COMPUTATION

Drill Log Data Summary

Computation of Mineral Content by Cross Sections

Shaft Data Summary

Final Computation of Mineral Content

Final Computation of Yardage

S U M M A R Y

DRILL LOG DATA

REVISED LIST DRILL DATA

March 1, 1953

Hole No.	Thickness of Dredging Stratum	Dredging Depth	lbs. Conc. per ton	R.M.D. lbs. Monazite per ton
B 1 N	20	20	14.9	0.6
B 2 S	20	20	25.0	2.1
B 1 S	12	12	26.4	1.8
B 3 S	12-1/2	22-1/2	5.3	0.2
C 2 N	20	20	22.5	1.4
C 1 N	25	25	26.8	0.9
C 1 S	25	25	25.0	2.5
C 2 S	17-1/2	17-1/2	12.0	0.9
C 3 S	10	20	25.7	1.6
C 4 S	18-1/2	23-1/2	16.3	0.8
C 5 S	15	25	35.8	1.5
C 7 S	13-3/4	21-1/4	19.0	1.4
C 8 S	17-1/2	22-1/2	10.3	0.5
C 9 S	11-1/4	16-3/4	19.5	1.5
C 10 S	12-1/2	20	6.7	0.4*
P 5	17-1/2	17-1/2	15.6	0.8
P 7	17-1/2	17-1/2	12.4	0.8
P 3	15	15	15.0	1.1
P 1	15	15	34.5	1.1
P 6	15	21-1/2	9.0	0.8
P 2	20	25	16.4	0.6
P 8	17-1/2	25	13.9	1.0
P 4	20	20	12.4	0.8
F 7 N	15	15	17.0	0.6 *
F 6 N	21	21	28.7	2.4
F 5 N	20	20	39.8	1.5
F 4 N	20	20	23.7	1.1
F 3 N	20	20	35.9	1.7
F 2 N	15	15	15.1	0.8
F 1 N	15	15	44.2	1.1
F 1 S	15	15	23.3	1.3
F 2 S	15	15	29.0	1.9
G 6 N	15	15	10.3	1.1
G 5 N	15	20	23.9	1.6
G 4 N	17-1/2	17-1/2	19.8	1.2
G 3 N	17-1/2	17-1/2	15.6	1.2
G 2 N	25	25	10.3	0.9
G 1 N	15	25	21.1	0.6
G 1A N	12-1/2	17-1/2	35.4	1.8

* Outside Dredging Limits

REVISED LIST DRILL DATA

March 1, 1953

Hole No.	Thickness of Dredging Stratum	Dredging Depth	lbs. Conc. per ton	R.M.D. lbs.Monazite per ton
H 5 N	15	15	9.8	0.4
H 4 N	15	15	19.5	1.0
H 3 N	12-1/2	12-1/2	15.1	0.9
H 2 N	16	21	17.4	0.9
H 1 N	11-1/4	21-1/4	14.9	0.9
H 1 S	15	22-1/2	13.5	0.55
H 2 S	15	25	21.3	1.0
H 3 S	12-1/2	22-1/2	23.9	2.5
H 4 S	12-1/2	17-1/2	8.7	1.0
K 6 N	15	15	12.4	0.7
K 5 N	20	20	16.8	1.2
K 4 N	10	15	13.6	0.7
K 3 N	12-1/2	17-1/2	29.8	1.5
K 2 N	17	22	35.4	2.8
M 11 N	7	15	11.0	0.4 *
M 10 N	15	15	10.9	0.6
M 9 N	25	25	12.6	0.5
M 8 N	15	15	12.0	1.1
M 7 N	11	21	26.4	1.5
M 6 N	12-1/2	22-1/2	23.4	1.1
M 5 N	17-1/2	22-1/2	12.9	1.6
O 11 N	20	20	8.2	0.4 *
O 10 N	20	20	17.8	2.3
O 9 N	10	15	21.6	2.1
O 8 N	10	20	6.9	0.6
O 7 N	15	22-1/2	10.4	0.8
O 6 N	17	22	19.2	2.1
O 5 N	15	20	14.0	1.5
Q 9 N	30	30	13.0	0.7 *
Q 8 N	27	27	18.8	0.9
Q 7 N	25	25	27.4	0.9
Q 6 N	10	20	8.3	0.4
Q 5 N	15	25	14.3	1.3
Q 4 N	17-1/2	22-1/2	13.1	0.7
Q 3 N	10	10	6.2	0.2 *

* Outside Dredging Limits

REVISED LIST DRILL DATA

March 1, 1953

Hole No.	Thickness of Dredging Stratum	Dredging Depth	lbs. Conc. per ton	R.M.D. lbs. Monazite per ton
S 7 N	15	25	10.3	1.1
S 6	20	25	9.7	0.8
S 5	12-1/2	22-1/2	20.4	1.5
S 4	17-1/2	22-1/2	12.3	1.3
S 3	12-1/2	20	16.3	0.8
S 2	12-1/2	12-1/2	12.1	0.8 *
V 5	9	9	8.9	0.7
V 4	15	20	10.6	0.9
V 3	15	15	7.1	0.4
V 2	12-1/2	12-1/2	22.6	1.7
X 8	16-1/2	16-1/2	15.9	0.8
X 7	12-1/2	22-1/2	16.6	2.4
X 6	22-1/2	22-1/2	18.2	1.1
X 5	17-1/2	22-1/2	12.4	0.8
X 4	25	25	14.6	0.8

* Outside dredging limits

CORE RECOVERY PER FT. OF HOLE (Dredging Section only)

Hole No.	Dia. Hole	Dredging Depth	Total Weight Core (dry)	Weight per foot Dry
B 1 S	6"	12	192.0	16.0
B 2 S	6"	20	463.7	23.185
B 3 S	4"	13.75	143.7	10.45
B 1 N	6"	20	362.8	18.14
C 1 S	6"	25	623.1	24.9
C 2 S	6"	17.5	311.5	17.8
C 3 S	4"	10.0	96.7	9.67
C 4 S	4"	18.5	179.9	9.72
C 5 S	4"	15	123.7	8.25
C 7 S	4"	13.75	222.5	16.18
C 8 S	4"	17.5	256.3	14.65
C 9 S	4"	11.25	133.9	11.9
C 1 N	4"	25	179.4	7.18
C 2 N	6"	20	340.0	17.0
F 1 S	6"	15	371.8	24.79
F 2 S	6"	15	278.3	18.55
F 1 N	4"	15	157.8	10.52
F 2 N	6"	15	470.9	31.39
F 3 N	6"	20	519.1	25.96
F 4 N	4"	20	182.0	9.1
F 5 N	4"	20	242.0	12.1
F 6 N	4"	21.25	128.3	6.04
G 1 A	4"	12.5	105.5	8.44
G 1	6"	15	476.3	31.75
G 2	6"	25	532.0	21.28
G 3	6"	17-1/2	383.1	21.9
G 4	6"	17-1/2	434.3	24.82
G 5	6"	15	376.0	25.07
G 6 N	6"	15	354.7	23.65
H 1 S	4"	15	203.8	13.59
H 2 S	4"	15	210.4	14.03
H 3 S	4"	12.5	94.1	7.53
H 4 S	4"	12.5	163.4	13.07
H 1 N	4"	11.25	158.2	14.06
H 2 N	4"	16	239.8	14.99
H 3 N	4"	12.5	89.2	7.14
H 4 N	4"	15	157.3	10.49
H 5 N	4"	15	115.7	7.71
K 2	4"	17	343.9	20.22
K 3	4"	12-1/2	240.7	19.26
K 4	6"	10	227.5	22.75
K 5	6"	20	411.7	20.58
K 6	6"	15	289.1	19.27

CORE RECOVERY PER FT. OF HOLE (Dredging Section only)

Hole No.	Dia. Hole	Dredging Depth	Total Weight Core (dry)	Weight per foot (dry)
M 5	4"	17.5	184.5	10.54
M 6	4"	12.5	168.0	13.44
M 7	4"	11	145.6	13.24
M 8	6"	15	237.9	15.86
M 9	6"	25	630.5	25.22
M 10	6"	15	234.6	15.64
O 5	4"	15	94.3	6.29
O 6	4"	17	179.9	10.58
O 7	4"	15	193.1	12.87
O 8	4"	10	85.3	8.53
O 9	6"	10	194.7	19.47
O 10	6"	20	322.5	16.13
Q 4 N	6"	17.5	389.5	22.26
Q 5 N	6"	15	419.1	27.94
Q 6 N	6"	10	194.1	19.41
Q 7 N	6"	25	467.1	18.68
Q 8 N	6"	26.8	511.1	19.07
S 3	4"	12.5	79.8	6.38
S 4	4"	17.5	120.1	6.86
S 5	4"	12-1/2	108.9	8.71
S 6	4"	20	145.5	7.28
S 7	4"	15	114.1	7.61
V 2	4"	12.5	100.6	8.05
V 3	4"	15	90.7	6.05
V 4	4"	15	92.8	6.19
X 4	6"	25	582.7	23.31
X 5	6"	17.5	504.4	28.82
X 6	6"	22.5	530.5	23.58
X 7	4"	12.5	125.4	10.03
X 8	6"	16.5	277.2	16.80

H O R S E C R E E K

COMPUTATIONS OF MINERAL CONTENT

by

CROSS SECTIONS

DATA FOR COMPOSITING

"B" LINE

Hole No.	Total Core Recovered Dry Wgt lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core per foot	lb. Core Allowed for Hole	Grams Conc. Recovered per lb. Core	Grams Conc. Allowed for Hole
B 22	172 15.06	1160.0	6.05	12	10	120	6.05	726
B 28	463.7 23.18	2573.6*	5.55	20	10	200	5.55	1110.0
B 33	143.7 10.45	174.2	1.21	13-3/4	10	137.5	1.21	166.4
B 38	362.8 18.14	1226.4	3.38	20	10	200	3.38	676.0
TOTALS	1162.2	5135.0		65-3/4		657.5		2678.4

*52.0g rejected as plus 14 mesh

Average for line $\frac{2678.4}{657.5} \times \frac{2000}{453.6}$ equals 18.0 lb. Conc./ton

CARPCO ASSAY

Ilmenite	25.0%	x 18.0	equals	4.5	lb	per ton
Monazite	4.4%	x 18.0	"	0.8	"	" "
Rutile	10.6%	x 18.0	"	1.9	"	" "
Zircon	18.0%	x 18.0	"	3.2	"	" "

DATA FOR COMPOSITING

"C" LINE 6" HOLES

Hole No.	Total Core Recovered Dry Weight lb.	Total Cons. Recovered Grams	Grams Cons. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core per Foot	Lb Core Allowed for Hole	Grams Cons. Recovered per lb. Core	Grams Cons. Allowed for Hole
C 15	423.1	2,583.0	5.67	25	17	425	5.67	2,409.8
C 25	311.5	845.7	2.72	17.5	17	297.5	2.72	808.2
C 28	540	1,737.0	5.11	20	17	340	5.11	1,737
TOTALS	1,274.6	6,117.6		62.5		1,062.5		4,956.0

Average for Line $\frac{4956}{1062.5} \times \frac{2000}{454.6}$ equals 20.6 lb Cons./ton

CARPCO ASSAY

Ilmenite	36.4%	x	20.6	equals	7.4 lb per ton
Monazite	7.5%	x	20.6	"	1.5 " " "
Rutile	10.9%	x	20.6	"	2.2 " " "
Zircon	23.4%	x	20.6	"	4.8 " " "

DATA FOR COMPOSITING

"C" LINE "A" Holes

Hole No.	Total Core Recovered Dry Weight lb.	Total Cons. Recovered Grams	Grams Cons. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core per foot	lb. Core Allowed for Hole	Grams Cons. Recovered per lb. Core	Grams Cons Allowed for hole
C 35	96.7	563.6	5.83	10	7	70	5.83	408.1
C 45	179.5	662.7	3.69	18.5	7	129.5	3.69	477.9
C 55	123.7	1002.9	8.11	15	7	105	8.11	851.6
C 75	222.5	957.7	4.30	13.75	7	96.25	4.30	413.9
C 85	256.3	601	2.34	17.5	7	122.5	2.34	286.7
C 95	133.9	592.2	4.42	11.25	7	78.75	4.42	348.1
TOTALS	1,012.6	4,380.1		86.0		602.		2,786.3

Average for Line $\frac{2,786.3}{602} \times \frac{2,000}{453.6}$ equals 20.4 lb. Cons./ton

CARPCO ASSAY

Ilmenite	27.9%	x 20.4	equals	5.7 lb. per ton	
Monazite	5.1%	x 20.4	"	1.0 " " "	
Rutile	11.0%	x 20.4	"	2.2 " " "	
Zircon	21.8%	x 20.4	"	4.4 " " "	

DATA FOR AVERAGE OF "OLD P" LINE

Hole No.	Total Core Recovered Dry Weight - lb.	Total Conc. Recovered lb.
P 1	370	6.518
P 2	486	5.003
P 3	340	3,[illegible]
P 4	400	2.890
P 5	465	2.971
P 6	237	1.175
P 7	503	2.870
P 8	455	3.678
TOTAL	3,266	27.444

Average for Line $\frac{27.444}{3,266}$ x 2,000 equals 16.8 lb Conc./ton

CARPCO ASSAY

Ilmenite	28.3%	x	16.8	equals	4.8	lb/ton
Monazite	7.4%	x	16.8	"	1.2	"
Rutile	10.8%	x	16.8	"	1.8	"
Zircon	17.4	x	16.8	"	2.9	"

DATA FOR COMPOSITING

"F" LINE

(4" Holes)

Hole No.	Total Core Recovered Dry weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core per foot	lb Core Allowed for Hole	Grams Conc. Recovered per lb.Core	Grams Conc. Allowed for Hole
F 4N	182	977.7	5.37	20	6	120	5.37	644.4
F 5N	242	2,185.5	9.03	20	6	120	9.03	1,083.6
F 6N	128.3	836.8	6.51	21	6	126	6.51	820.3
TOTALS	552.3	3,999.0		61		366		2,548.3

Average for Line $\frac{2548.3}{366} \times \frac{2000}{453.6}$ equals 30.7 lb Conc./ton

CARPCO ASSAY

Ilmenite	26.5%	x 30.7	equals	8.1	lb.	per	ton
Monazite	4.9%	x 30.7	"	1.5	"	"	"
Rutile	14.8%	x 30.7	"	4.5	"	"	"
Zircon	14.9%	x 30.7	"	4.6	"	"	"

DATA FOR COMPOSITING

"F" LINE

(6" Holes)

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered grams	Grams Conc. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core per foot	lb. Core Allowed for Hole	Grams Conc. Recovered per lb. Core	Grams Conc. Allowed for Hole
F 1X	371.8	1,968.0	5.29	15	18	270	5.29	1,428.3
F 2X	278.3	1,819.8	6.57	15	18	270	6.57	1,773.9
F 3X	470.9	1,611.7	3.42	15	18	270	3.42	923.4
F 4X	519.1	4,226.9	8.15	20	18	360	8.15	2,934.0
TOTALS	1,640.1	9,638.1		65		1,170		7,059.6

Average for Line $\frac{7059.6}{1170} \times \frac{2000}{453.6}$ equals 26.6 lb. Conc./ton

CARPCO ASSAY

Ilmenite	25.3%	x 26.6	equals	6.7	lb per ton
Monazite	7.3%	x 26.6	"	1.9	" " "
Rutile	18.3%	x 26.6	"	4.9	" " "
Zircon	17.3%	x 26.6	"	4.6	" " "

DATA FOR AVERAGING ASSAYS

"G" LINE

Hole No.	Grams Conc. Allowed Per Hole	ILMENITE Carpco Assay % Ilmenite	ILMENITE Product	MONAZITE Carpco Assay % Monazite	MONAZITE Product	RUTILE Carpco Assay % Rutile	RUTILE Product	ZIRCON Carpco Assay % Zircon	ZIRCON Product
G 1 A	790	13.4	10,586	5.1	4,029	8.7	6,873	24.4	19,276
G 1 N	576	20.5	11,808	3.9	2,246	10.5	6,048	15.0	8,640
G 2 N	540	22.8	12,306	3.7	1,998	7.6	4,104	13.1	7,074
G 3 N	490	23.5	11,515	7.7	3,773	15.5	7,595	24.3	11,907
G 4 N	770	16.8	12,936	3.1	2,387	6.8	5,236	16.6	12,782
G 5 N	648	20.3	13,154	5.9	3,823	10.6	6,868	14.2	9,202
G 6 N	276	20.5	5,658	7.4	2,042	6.8	1,877	13.4	3,698
TOTAL	4,090		90,788		20,298		38,780		72,645
Average			90,788 / 4,090		20,298 / 4,090		38,780 / 4,090		72,645 / 4,090
%		19.78		5.0		9.5		17.8	

DATA FOR COMPUTING

"G" LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb.Core	Depth Hole Feet	Unit lb. Core per foot	lb.Core Allowed for hole	Grams Conc. Recovered per lb.Core	Grams Conc. Allowed for Hole
G 1 A	105.5	854.5	7.8	12.5	8	100	7.8	780
G 1 N	478.5	2,288.5	4.8	15.0	8	120	4.8	576
G 2 N	522.	1,687.5	2.7	25.0	8	200	2.7	540
G 3 N	388.1	1,382.9	3.5	17.5	8	140	3.5	490
G 4 N	434.5	2,388.0	5.5	17.5	8	140	5.5	770
G 5 N	376.0	2,040.0	5.4	15.0	8	120	5.4	648
G 6 N	264.7	885.5	3.3	15.0	8	120	3.3	396
TOTALS	2,881.8	11,131.8		117.5		940		4,000

Average for Line $\frac{4000}{940} \times \frac{2000}{2881.8}$ equals 19.2 lbs. Conc./ton

COMBINED

CARPCO ASSAY

Ilmenite	19.78%	x 19.2	equals	3.8	lb per ton
Monazite	5.0%	x 19.2	"	1.0	" " "
Rutile	9.8%	x 19.2	"	1.8	" " "
Zircon	17.8%	x 19.2	"	3.4	" " "

DATA FOR COMPUTING "O" LINE AVERAGE ASSAYS
USING TOTAL CORE AND TOTAL CONCENTRATE

Hole No.	Total Core Recovered Dry lbs.	Total Conc. Recovered Dry Conc.	Carpco Assay % Ilmenite	Ilmenite Product Dry Conc.	Carpco Assay % Monazite	Monazite Product Dry Conc.	Carpco Assay % Rutile	Rutile Product Dry Conc.	Carpco Assay % Zircon	Zircon Product Dry Conc.
O 1 A	105.5	834.5	13.4	111.8230	5.1	42.5595	8.7	72.6015	24.4	203.6180
O 1 N	476.3	2,283.3	20.5	468.0765	3.9	89.0487	10.5	239.7465	15.0	342.4950
O 2 N	532.0	1,427.3	22.9	326.8517	3.7	52.8101	7.6	108.4148	13.1	186.9763
O 3 N	383.1	1,352.9	23.5	317.9315	7.7	104.1733	15.6	211.0524	24.3	328.7547
O 4 N	434.3	2,368.0	16.8	397.8240	3.1	73.4080	6.8	161.0240	16.6	393.0880
O 5 N	376.0	2,040.0	20.3	414.1200	5.9	120.3600	10.8	220.3200	14.3	291.7200
O 6 N	354.7	825.8	30.5	251.8690	7.4	61.1092	6.8	56.1544	13.4	110.6672
TOTAL	2,661.9	11,131.8		2,288.4957		543.4688		1,069.3736		1,857.3092

Average % 20.558 = $\frac{2288.4957}{11131.8}$ 4.88 = $\frac{543.4688}{11131.8}$ 9.61 = $\frac{1069.3736}{11131.8}$ 16.68 = $\frac{1857.3092}{11131.8}$

Average lbs. Conc. per ton = $\frac{11131.8}{2661.9} \times \frac{2000}{453.6}$ = 18.44 lbs. Conc/ton

AVERAGE COMPUTED FOR LINE FROM CARPCO ASSAY

Ilmenite	20.558% x 18.44	lbs.	equals	3.8	lbs/ton
Monazite	4.88 % x 18.44	"	"	0.9	"
Rutile	9.61 % x 18.44	"	"	1.8	"
Zircon	16.68 % x 18.44	"	"	3.1	"

DATA FOR COMPOSITING

"H" LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb.Core	Depth Hole Feet	Unit lb Core per foot	Lb Core Allowed for Hole	Grams Conc. Recovered per lb. core	Grams Conc. Allowed for Hole
H 13	208.8	634.8	3.07	15	7	105	3.07	322.4
H 23	210.4	1015.9	4.83	15	7	105	4.83	507.2
H 33	94.1	511.6	5.44	12.5	7	87.5	5.44	476.0
H 43	183.4	332.3	1.97	12.5	7	87.5	1.97	172.4
H 12	158.2	535.4	3.38	11.25	7	78.75	3.38	266.2
H 22	239.8	949.2	3.96	16.	7	112	3.96	443.5
H 32	89.2	306.5	3.44	12.5	7	87.5	3.44	301.0
H 42	157.3	696.0	4.42	15.	7	105.	4.42	464.1
H 52	115.7	256.7	2.22	15	7	105	2.22	233.1
TOTALS	1451.9	5218.0		134.75		943.25		3185.9

Average for Line $\frac{3185.9}{943.25} \times \frac{2000}{453.6}$ equals 16.1 lb Conc/ton

CARPCO ASSAY

Ilmenite	31.0%	x	16.1	equals	5.0	lb	per ton
Monazite	8.2%	x	16.1	"	1.3	"	" "
Rutile	9.9%	x	16.1	"	1.6	"	" "
Zircon	16.7%	x	16.1	"	2.7	"	" "

DATA FOR COMPOSITING

"K" LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb.Core	Depth Hole Feet	Unit lb. Core per foot	lb.Core Allowed for Hole	Grams Conc. Recovered per lb.Core	Grams Conc. Allowed for Hole
K 2 K	343.9	2,755.7	8.01	17.0	19	323.0	8.01	2,587.2
K 3 K	240.7	1,624.7	6.75	12.8	19	227.5	6.75	1,803.1
K 4 K	227.5	702.9	3.09	10.0	19	190.0	3.09	587.1
K 6 K	289.1	812.2	2.81	15.	19	285.0	2.81	800.0
TOTALS	1,101.2	5,895.9		54.5		1,035.5		5,578.3

Average for Line $\frac{5578.3}{1035.5} = \frac{2000}{485.5}$ equals 23.8 lb. Conc./ton

CANFCO ASSAY

Ilmenite	23.2%	x 23.8	equals	5.5	lb per ton
Monazite	4.4%	x 23.8	"	1.0	" " "
Rutile	9.6%	x 23.8	"	2.3	" " "
Zircon	13.9%	x 23.8	"	3.1	" " "

DATA FOR COMPOSITING

"g" LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb. Core	Depth Hole feet	Unit lb. Core per foot	lb. Core Allowed for Hole	Grams Conc. Recovered per lb. Core	Grams Conc. Allowed for Hole
H 5	181.5	540.2	2.93	17.5	10	175	2.93	512.8
H 6	168.0	893.2	5.32	12.5	10	125	5.32	665.0
H 7	115.6	871.7	5.99	11	10	110	5.99	658.9
H 8	237.9	643.9	2.71	15	10	150	2.71	406.5
H 9	630.5	1807.9	2.87	25	10	250	2.87	717.5
H 10	234.6	579.9	2.47	15	10	150	2.47	370.5
TOTALS	1601.1	5336.8		96		960		3331.2

Average for Line $\frac{3331.2}{960} \times \frac{2000}{453.6}$ equals 15.3 lb. conc./ton

CARPCO ASSAY

Ilmenite	29.4	x 15.3	equals	4.5	lb. per ton
Monazite	4.4	x 15.3	"	0.7	" " "
Rutile	7.6	x 15.3	"	1.2	" " "
Zircon	29.9	x 15.3	"	4.6	" " "

COMPUTATION OF HEAVY MINERAL CONTENT
From Assay of Individual Holes

"O" LINE

Hole No.	Total Core Recovered Dry Wt. lb.	Total Cons. Recovered Grams	Grams Cons. Recovered per lb.Core	Depth Hole Feet	Unit lb. Core per foot	lb.Core Allowed for Hole	Grams Cons. Recovered per lb.Core	Grams Cons. Allowed for Hole
O 5	94.3	298.0	3.16	15	6	90	3.16	284.4
O 6	179.9	783.4	4.35	17	6	102	4.35	443.7
O 7	193.1	456.0	2.36	15	6	90	2.36	212.4
O 8	85.3	133.1	1.56	10	6	60	1.56	93.6
O 9	194.7	954.8	4.90	10	6	60	4.90	294.0
O 10	322.5	1,320.7	4.10	20	6	120	4.10	492.0
TOTALS				87		522	20.43	1,820.1

AVERAGE FOR LINE $\frac{1820.1}{522} \times \frac{2000}{453.6}$ equals 15.4 lb. Cons./ton

NOTE, - To determine the grams per lb. (or lbs per ton) of various minerals in the entire line; from the individual assays of each hole in the line, it is not necessary to introduce a constant of unit of core as above. A direct computation from Grams c ons. per lb. of core x Assay % x Depth of Hole is in order, to determine true weighted value. See data for line G.

The computation of a unit of core per fot., shown above is necessary only when making up a composite sample of cons for the line to get the same weighted result from a single assay, as is accomplished in combining individual assays.

"O" LINE

Hole No.	Gross Conc. Allowed for Hole	MONAZITE Carpco Assay %	MONAZITE Product	RUTILE Carpco Assay %	RUTILE Product	ZIRCON Carpco Assay %	ZIRCON Product	Ilmenite Carpco Assay %	Ilmenite Product
O 5	284.4	9.5	2,702	13.5	3,839	24.7	7,025	28.7	8,162
O 6	443.7	8.6	3,816	11.1	4,925	32.3	14,332	20.2	8,963
O 7	212.4	5.8	1,232	11.5	2,443	18.0	3,823	39.8	8,453
O 8	93.6	7.6	711	10.7	1,002	18.3	1,713	44.6	4,175
O 9	294.0	7.3	2,146	13.4	3,940	22.7	6,674	28.4	8,350
O 10	492.0	8.6	4,231	9.9	4,874	23.7	11,660	29.9	14,711
TOTALS	1,820.1		14,838		21,020		45,227		52,814

$\frac{14838}{1820.1}$ equals 8.15% Monazite; $\frac{21020}{1820.1}$ equals 11.55% Rutile; $\frac{45227}{1820.1}$ equals 24.85% Zircon; $\frac{52814}{1820.1}$ equals 29.02% Ilmenite

COMBINED CARPCO ASSAY

Ilmenite	29.02% x 15.4	equals	4.47	lbs.	per ton
Monazite	8.15% x 15.4	"	1.26	"	" "
Rutile	11.55% x 15.4	"	1.78	"	" "
Zircon	24.85% x 15.4	"	3.83	"	" "

DATA FOR COMPUTING "O" LINE AVERAGE ASSAYS
USING TOTAL CORE AND TOTAL CONCENTRATE

Hole No.	Total Core Recovered Dry lbs	Total Conc. Recovered Dry Grams	Carpco Assay % Ilmenite	Ilmenite Product Dry Grams	Carpco Assay % Monazite	Monazite Product Dry Grams	Carpco Assay % Rutile	Rutile Product Dry Grams	Carpco Assay % Zircon	Zircon Product Dry Grams
O 5 N	94.3	298.0	20.7	85.5260	7.5	28.3100	13.5	46.2300	24.7	73.6060
O 6 N	179.9	763.4	20.2	158.2468	8.6	67.3724	11.1	86.9574	32.3	253.0382
O 7 N	193.1	456.0	39.8	181.4880	5.8	26.4480	11.5	52.4400	18.0	82.0800
O 8 N	85.3	133.1	44.6	59.3626	7.6	10.1156	10.7	14.2417	18.3	24.3573
O 9 N	194.7	954.8	28.4	271.1632	7.3	69.7044	13.4	127.9432	22.7	216.7396
O 10 N	321.5	1,320.7	29.9	394.8893	8.6	113.5802	9.9	130.7493	23.7	313.0059
TOTALS	1069.8	3,946.0		1,350.6759		315.5266		452.5616		962.8270
Average %			27.26 =	$\frac{115067.52}{3946}$	7.996 =	$\frac{31552.66}{3946}$	11.47 =	$\frac{45256.16}{3946}$	24.40 =	$\frac{96282.7}{3946}$

Average lbs. Conc. per ton = $\frac{3946}{1069.8} \times \frac{2000}{453.6}$ = 16.27 lbs. conc/ton

AVERAGE COMPUTED FOR LINE FROM CARPCO ASSAY

Ilmenite	27.26 % x 16.27 lbs.	equals	4.7	lbs./ton
Monazite	7.996% x 16.27 "	"	1.3	"
Rutile	11.47 % x 16.27 "	"	1.9	"
Zircon	24.4 % x 16.27 "	"	4.0	"

DATA FOR COMPOSITING

No. 1132

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core Per foot	lb. Core Allowed for Hole		Grams Conc. Recovered per lb. Core		Grams Conc. Allowed for Hole
Q 4 N	389.5	1,140.05	2.98	17.5	18	315	x	2.98	equals	938.7
Q 5 N	419.1	1,359.5	3.24	15.0	18	270	x	3.24	"	874.8
Q 6 N	194.1	366.9	1.89	10.0	18	180	x	1.89	"	340.2
Q 7 N	467.1	2,912.2	6.23	25.0	18	450	x	6.23	"	2,803.5
Q 8 N	511.5	2,181.2	4.27	27.0	18	486	x	4.27	"	2,075.2
TOTALS	1,981.3	7,961.0		94.5		1,701				7,032.4

Average for Line $\frac{7,032.4}{1701} \times \frac{2000}{153.6}$ equals 16.2 lb. Conc./ton

CARPCO ASSAY

Ilmenite	29.8% x 16.2	equals	5.4	lbs/ton
Monazite	3.8% x 16.2	"	0.7	"
Rutile	8.15 x 16.2	"	1.5	"
Zircon	12.9% x 16.2	"	2.3	"

DATA FOR COMPOSITING

"S" LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb. Core	Depth Hole Feet	Unit lb. Core per foot	lb. Core Allowed for Hole		Grams Conc. Recovered per lb. Core		Grams Conc. Allowed for Hole		
S 3	79.8	294.4	3.69	12.5	6	75	x	3.69	equals	276.8	5.1	1,412
S 4	120.1	335.5	2.79	17.5	6	105	x	2.79	"	293.0	10.6	3,106
S 5	108.9	503.0	4.62	12.5	6	75	x	4.62	"	346.5	7.5	2,599
S 6	145.5	318.6	2.19	20.0	6	120	x	2.19	"	262.8	8.2	2,155
S 7	114.1	263.4	2.31	15.0	6	90	x	2.31	"	207.9	11.0	2,287
TOTALS	568.4	1,714.9		77.5		465				1,387.0		11,559

Average for line $\frac{1387}{465} \times \frac{2000}{153.6}$ equals 13.2 lb. Conc./ton

CALCULATION

Ilmenite	38.2%	x	13.2	equals	5.5	lb/ton
Monazite	8.2%	x	13.2	"	1.1	"
Rutile	12.1%	x	13.2	"	1.6	"
Zircon	16.8%	x	13.2	"	2.2	"

DATA FOR COMPOSITING

WEST LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. Recovered per lb.Core	Depth Hole Feet	Unit lb. Core per foot	lb.Core Allowed for Hole		Grams Conc. Recovered per lb.Core		Grams Conc. Allowed for hole
V 2	100.6	499.2	4.97	12.5	6	75	x	4.97	equals	372.8
V 3	90.7	147.1	1.62	15.0	6	90	x	1.62	"	145.8
V 4	72.8	224.0	2.41	15.0	6	90	x	2.41	"	216.9
TOTALS	264.1	871.0		42.5		255				735.5

Average for Line $\frac{735.5}{255}$ $\frac{2000}{453.6}$ equals 12.7 lb.Conc/ton

CALCULATED ASSAY

Ilmenite	37.0%	x 12.7	equals	4.7	lb./ton
Monazite	9.1	x 12.7	"	1.2	"
Rutile	10.5	x 12.7	"	1.3	"
Zircon	17.9	x 12.7	"	2.3	"

DATA FOR COMPUTING

"Y" LINE

Hole No.	Total Core Recovered Dry Weight lb.	Total Conc. Recovered Grams	Grams Conc. recovered per lb.Core	Depth Hole Feet	Unit lb. Core per foot	lb.Core Allowed for hole		Grams Conc. recovered per lb.Core		Grams Conc. Allowed for hole		
X 4	582.7	1,921.6	3.30	25.0	10	250	x	3.30	equals	825.0	5.3	4,373
X 5	504.4	1,415.8	2.81	17.5	10	175	x	2.81	"	491.8	6.2	3,049
X 6	530.5	2,189.0	4.13	22.5	10	225	x	4.13	"	929.3	5.8	5,390
X 7	125.4	472.3	3.77	12.5	10	125	x	3.77	"	471.3	14.4	6,787
X 8	277.2	1,000.2	3.61	15.5	10	155	x	3.61	"	595.7	4.8	2,859
TOTALS	2,020.2	6,998.9		94.5		940				3,313.1		22,458

Average for Line $\frac{3313.1}{940} \times \frac{2000}{453.6}$ equals 15.5 lb.Conc./ton

CARPCO ASSAY

Ilmenite	32.7% x 15.5	equals	5.1	lb./ton
Monazite	7.9% x 15.5	"	1.2	"
Rutile	7.6% x 15.5	"	1.2	"
Zircon	13.3% x 15.5	"	2.1	"

LINE AVERAGES COMBINING ASSAYS

"C" LINE

Sale No.	Lb. Gravel	Gram Conc.	% Ilmenite	Product	% Monazite	Product	% Rutile	product	% Zircon	Product
C-4"	602	2,786.3	27.9	77,737.8	5.1	14,210.1	11.0	30,649.3	21.3	60,741.3
C-6"	1,082.5	4,886.0	26.4	130,858.4	7.3	36,178.8	10.8	54,080.4	23.6	118,961.6
C-1N	175.0	1,032.3	11.1	11,791.5	2.8	2,974.4	7.0	7,426.1	11.9	12,641.4
TOTALS	1,859.5	8,804.3		220,387.7		53,363.3		92,105.8		190,344.3
Averag.			25.0		6.1		10.5		21.6	
lb/ton	21.1 Conc.		5.3		1.3		2.2		4.6	

"F" LINE

F-4"	306	2,568.3	26.5	67,589.9	4.9	12,486.7	14.5	36,990.3	14.3	37,960.7
F-6"	1,170	7,059.8	25.2	177,901.2	7.3	51,535.1	18.3	129,190.7	17.3	122,151.1
F 1N	90	900.9	20.4	18,378.4	2.2	1,982.0	10.4	9,369.4	19.5	17,567.8
TOTALS	1,526	10,508.8		263,810.2		66,003.8		175,510.4		177,688.4
Averag.			25.1		6.3		16.7		16.9	
lb/ton	29.5 Conc.		7.2		1.8		4.8		4.8	

"K" LINE

K Line	1,035.5	5,878.8	22.2	129,418.5	4.4	24,544.5	9.5	53,861.7	12.2	71,960.9
K 1N	380	1,451.6	23.2	33,677.1	7.4	10,741.8	9.7	14,090.8	15.6	22,646.9
TOTALS	1,415.5	7,029.2		163,095.6		35,286.3		67,952.3		94,606.8
Averag.			22.2		5.0		9.8		13.5	
lb/ton	21.9 Conc.		5.1		1.1		2.1		3.0	

S H A F T D A T A

1. SHAFT LOG

2. LABORATORY LOG

3. COMPARISON DRILL AND SHAFT

4. WEIGHT COMPUTATION OF BANK RUN MATERIAL

DRILL LOG

Copy

DRILL LOG TRACT Shaft #1 SH. NO.

LOCATION Drill Hole F-1-N DATE START Feb. 18-53 7:30 am

LINE NO. F HOLE NO. 1 N FINISH

SAMPLE NUMBER	DEPTH ~~FEET~~ Inches	CORE BEFORE PUMP	CORE AFTER PUMP	Shaft ~~VOLUME~~ Size	EST. CONS.	COLOR SLIMES	REMARKS
	7			48"x48"		Black	Soil
	11			"		Brown	Sand - Clay - Roots
	11			"		Light	Clay - no sand
#1	26			"		White	Coarse Sand + some pea Grav.
	12	Sand Pushing		55"x55"		"	" " " " "
	28			"		Yellow	" " " " "
	12	water + Sand Running		"		Red	" " " " "
	4			55"x55"		Grey	Clay + white sand
#2	4			"		"	" " "

Total Depth 10 ft. Bedrock ft. Water Level -2" ft.

Sig Panner

Lester Robertson

In Charge

Sample bucket No. 1 tub 17¼" dia.

LABORATORY LOG

SHAFT F 1 N

0-5 feet

Recovered 7,139.2 lb. dry material

From $\frac{4' \times 4' \times 5.0'}{27}$ equals 2,963 cu. yd.

Pounds material per cu. yd. equals 2,409

Recovered 14.63 lb. Concentrate
from 7,139.2 lb. of material

$\frac{14.63}{7,139.2} \times 2000$ equals 4.1 lb. Conc./ton material

R.M.D. equals 9.3% Monazite (Est)
0.093 x 4.1 equals 0.4 lb. Monazite/ton

5-10 feet

Recovered 10,513.5 lb. dry material

from (est) $\frac{55" \times 56" \times 5.0'}{27}$ equals 3.89 cu. yds.

Pounds material per cu. yd. equals 2,702

Recovered 146 lbs. concentrate
from 10,513.5 lb. of material

$\frac{146}{10,513.5} \times 2000$ equals 27.8 lb. Conc./ton material

R.M.D. equals 5.6% Monazite (Est.)
0.056 x 27.8 equals 1.6 lb. Monazite/ton

Totals and Averages

(7,139.2 plus 10,513.5) equals 17,652.7 lb. material recovered from shaft

(14.63 plus 146) equals 160.63 lb. concentrate

$\frac{160.63}{17,652.7} \times 2000$ equals 18.2 lb. Conc./ton

R.M.D. equals 5.9% Monazite (Average)
0.059 x 18.2 equals 1.1 lb. Monazite/ton

Average lb. per cu. yd.
$\frac{(7,139.2 \text{ plus } 10,513.5)}{(2,963 \text{ plus } 3.89}$ equals 2,576 lb/cu. yd.

LABORATORY LOG

SHAFT F I N - cont'd

Shaft Recovered 18.2 lb. Conc./ton

CARPCO ASSAY

Ilmenite	31.2 x 18.2	equals	5.7	lb.	per	ton
Monazite	8.3 x 18.2	"	1.5	"	"	"
Rutile	19.3 x 18.2	"	3.5	"	"	"
Zircon	23.0 x 18.2	"	4.2	"	"	"

NOTE: Conc. from shaft sample contained 80.4% of above minerals.

Drill Hole Recovered 50.5 lb. Conc./ton

CARPCO ASSAY

Ilmenite	20.4% x 50.5	equals	10.3	lb.	per	ton
Monazite	2.2% x 50.5	"	1.1	"	"	"
Rutile	10.4% x 50.5	"	5.3	"	"	"
Zircon	18.5% x 50.5	"	9.3	"	"	"

NOTE: Conc. from Drill Hole sample contained 51.5% of above minerals.

DRILL LOG

Copy

DRILL LOG TRACT Shaft #2 SH. NO.

LOCATION Drill Hole K-5-N

LINE NO. K HOLE NO. 5 N

DATE

START Mar. 2 7:30 am

FINISH Mar. 12 12 noon

SAMPLE NUMBER	DEPTH ~~FEET~~ Inches	CORE BEFORE PUMP	CORE AFTER PUMP	Shaft ~~VOLUME~~ Size	EST. CONS.	COLOR SLIMES	REMARKS
	5			50"x50"		Black	Sandy Soil
	18			"		Brown	" " & Roots
	20			"		Red	Sandy clay
	15			"		white	clay & Red layers of
#1	2			"		Red	coarse sand & clay
	28			"		Red	Sand & Pea Gravel
	8			"		white	Sugar sand with Red streaks
	12			"		Brown	" "
	9			"		Brown	" "
#2	3			"		white	" "
	30			"		white	" " with Brown "
	6			"		white	" " " Spots of clay
	6	Drove Spiling		"		"	" " " Layers " "
	10			41"x42"		Brown	Sand & Pea Gravel
	5			"		"	Coarse Gravel
#3	3			"		white	clay

Total Depth 15 ft. Bedrock ft. Water Level 10'-4" ft.

Running water and Sand 300# Extra - Est.

Sig. Panner

Lester Robertson

In Charge

Sample bucket No. 1 tub 17¼" dia.

LABORATORY LOG

SHAFT K 5 N

0-5 ft. Recovered 8,165.6 lb. dry material

From $\frac{50" \times 50" \times 5.0'}{27}$ equals 3.31 Cu. yds.

Pounds material per cu. yd. equals 2,546

Recovered 35.0 lb. concentrate
from 8,165.6 lb of material

$\frac{35.0}{8,165.6} \times 2000$ equals 8.6 lb. Conc./ton Material

R.M.D. equals 5.8% Monazite (Est.)
0.058 x 8.6 equals 0.5 lb. Monazite/ton

5-10 ft. Recovered 8,300.9 lb. dry material

from $\frac{50" \times 50" \times 5'0"}{27}$ equals 3.21 cu. yds.

Pounds material per cu. yd. equals 2,586

Recovered 106.4 lb. Concentrate
from 8,300.9 lb of material

$\frac{106.4}{8,300.9} \times 2000$ equals 25.6 lb. Conc/ton Material

R.M.D. equals 11.3% Monazite (Est.)
0.113 x 25.6 equals 2.9 lb Monazite/ton

10-13 ft. Recovered 5,151.7 lb. dry material

from $\frac{50" \times 50" \times 3.0'}{27}$ equals 1.93 cu. yds.

Pounds material per cu. yd. equals 2,669

13-15 ft. Recovered 2,606.9 lb. dry material

from $\frac{41" \times 42" \times 2.0'}{27}$ equals 0.886 cu. yd.

$\frac{2606.9}{0.886}$ Equals 2,942 lb. per cu. yd.

NOTE: Run in of material in this 2 ft. makes lb per cu.yd. unreliable

10-15 ft. Recovered 74.88 lb Concentrate

From 7,758.6 lb. of material

$\frac{74.88}{7,758.6} \times 2000$ equals 19.3 lb. Conc/ton material

R.M.D. equals 9.6% Monazite (Est.)
0.096 x 19.3 equals 1.85 lb. Monazite/ton

LABORATORY LOG - cont'd

K 5 N

		Material	Gems.
Totals and Averaged	0-5 feet	8,165.6 lb.	55.0 lb.
	5-10 "	8,300.9 "	106.4 "
	10-15 "	7,758.6 "	74.93 "
	Totals	24,225.1 lb.	216.33 lb.

Average $\frac{216.33}{24,225.1}$ x 2000 equals 17.9 lb. Gems. per ton

Calculated R.M.D. equals 9.8% Monazite
0.098 x 17.9 equals 1.8 lb. Monazite/ton

Shaft

Recovered 17.9 lb. Gems/ton

CARPCO ASSAY OF SHAFT (15' only)

Ilmenite	34.7% x 17.9	equals	6.2	lb/ton
Monazite	8.5% x 17.9	"	1.5	"
Rutile	10.4% x 17.9	"	1.9	"
Zircon	20.5% x 17.9	"	3.7	"

Drill Hole

Recovered 19.5 lb. Gems/ton

CARPCO ASSAY OF DRILL HOLE (Composite for 15' of 20' held Calc.)

Ilmenite	23.2% x 19.5	equals	4.5	lb/ton
Monazite	7.4% x 19.5	"	1.4	"
Rutile	9.7% x 19.5	"	1.9	"
Zircon	15.6% x 19.5	"	3.0	"

DRILL LOG

Copy

DRILL LOG TRACT Shaft #3 SH. NO.

LOCATION Drill Hole 0-10-N

LINE NO. 0 HOLE NO. 10 N

DATE

START Mar. 13 7:30 am

FINISH Mar. 21 4:30 pm

SAMPLE NUMBER	DEPTH ~~FEET~~ Inches	CORE BEFORE PUMP	CORE AFTER PUMP	Shaft ~~VOLUME~~ Size	EST. CONS.	COLOR SLIMES	REMARKS
#1	7			48¼"x48¾"		Black	Top Soil
	9			"		Grey	Sand
	44			"		Red	Sandy Clay
#2	6			48½"x49"		"	" "
	28			"		Red	Fine "
	17			"		"	Sandy Clay some white spots
	9			"		"	Sand - Rocks
#3	30			50"x50"		"	" + Pea Gravel
	29			"		"	Sand
	1			Spiling 42"x42½"	inside Sp	Brown	"
				44"x43½"	outside		White Clay Bottom

Drove spiling at 13½'

Water & Sand Run-in 100% Est.

Loads 1-16 to 13½'

Loads 17 & 18 from 13½' to 15'

Total Depth 15 ft. Bedrock ft. Water Level 13½ ft.

Sig. Panner

Lester Robertson

In Charge

Sample bucket No. 1 tub 17¼" dia.

LABORATORY LOG

SHAFT "O"

0- 5 ft. Recovered 8,500.4 lb. dry Material

from $\frac{48.25" \times 48.5" \times 60"}{1728 \times 27}$ equals 3.022 cu.yds.

Pounds material per cu.yd. equals 2807.3 lb.

Recovered 16.4 lb Concentrate
from 8,500.4 lb of material

$\frac{16.4}{8,500.4} \times 2,000$ equals 3.6 lb. Conc./ton Material

R.M.D. equals 2.7% Monazite (Est.)
0.027 x 3.6 equals 0.1 lb Monazite/ton (Est.)

5-10 ft. Recovered 8,668.3 lb. dry material

from $\frac{48.5" \times 49" \times 61.5"}{1728 \times 27}$ equals 3.117 cu. yds.

Pounds material per cu. yd. equals 2780.3 lb.

Recovered 59.1 lb Concentrate
From 8,668.3 lb of Material

$\frac{59.1}{8668.3} \times 2,000$ equals 13.6 lb. Conc./ton material

R.M.D. equals 7.2% Monazite (Est.)
0.072 x 13.6 equals 1.0 lb Monazite/ton (Est.)

10-15½ ft. Recovered 5,680.6 lb. dry material

from $\frac{50" \times 50" \times 5.4'}{27}$ equals 2.185 cu. yd.

Pounds material per cu. yd. equals 2,600 lb.

10-15 ft. Recovered 165.3 lb. concentrate

from 5,436.7 lb. of material

$\frac{165.3}{5,436.7} \times 2,000$ equals 30.2 lb. Conc./ton

R.M.D. equals 12.7% Monazite (Est.)
0.127 x 30.2 equals 3.0 lb Monazite/ton

LABORATORY LOG

SHAFT "G"

		Material	Conc.
Totals and Averages	0-5 feet	8,500.4 lb	16.4 lb.
	5-10 "	8,668.3 lb.	52.1 "
	10-15 "	8,438.7 lb.	165.3 "
	Totals	25,606.4 lb.	239.8 lb.

AVERAGE $\frac{239.8}{25,606.4}$ x 2,000 equals 18.7 lb. Conc. per ton.

Average R.M.D. equals 10.6% Monazite
0.106 x 18.7 equals 1.9 lb. Monazite per ton

Shaft: Recovered 18.7 lb. conc/ton

CARPCO ASSAY FOR SHAFT (15' only)

Ilmenite	31.8% x 18.7	5.9 lb/ton
Monazite	11.1% x 18.7	2.1 "
Rutile	7.1% x 18.7	1.3 "
Zircon	22.1% x 18.7	4.1 "

Drill Hole: Recovered 18.9 lb Conc./ton

CARPCO ASSAY FOR DRILL HOLE (Composite for 15' of 20' hole Calc.)

Ilmenite	29.9% x 18.9	5.7 lb/ton
Monazite	8.6% x 18.9	1.6 "
Rutile	9.9% x 18.9	1.9 "
Zircon	23.1% x 18.9	4.4 "

WEIGHT - BANK RUN MATERIAL PER CUBIC YARD (Averages)

Shaft Depth (feet)	Shaft F 1 N		Shaft K 5 N		Shaft O 10 N		AVERAGE
	Cu.Yds.	Wt. (lbs.)	Cu.Yds.	Wt. (lbs.)	Cu.Yds.	Wt.(lbs.)	lb/cu.yd.
0-5	2.963	7,139.2	3.21	8,165.6	3.028	8,500.4	2,587
5-10	3.89	10,513.5 *	3.21	8,300.9	3.117	8,668.3	2,690
10-13			1.93	5,151.7 *			
10-13½					2.185	5,680.8	2,632
Weighted Average	(62,120.4) / (23,533)						2,640

*Spiling begins at this depth

Below this level material run in

Makes cubic measure inexact.

S U M M A R Y

M I N E R A L C O N T E N T

1. FINAL TOTAL COMPUTATION

2.)
) COMPARISON OF METHODS OF COMPUTATION
3.)

4. GRAVEL CONTENT

AVERAGE MINERAL CONTENT OF DEPOSIT
FINAL COMPUTATION OF MINERAL CONTENT OF DEPOSIT USING CARPCO ENGINEERING CO. ASSAYS OF COMPOSITE SAMPLES OF CROSS-SECTIONS AND WEIGHTING FOR CROSS-SECTION AREA OR "END AREA" OF BLOCK.

Line	Cross Section Dig Area	ILMENITE		MONAZITE		RUTILE		ZIRCON		CONCENTRATE	
		lb. per ton	Product	lb. per ton	Product	lb. per ton	Prduct	lb. per ton	Product	lb. per ton	Product
B	5,505	4.5	24,772.5	0.8	4,404.0	1.9	10,459.5	3.2	17,616.0	18.0	99,090.0
C	35,130	5.3	186,189.0	1.3	45,669.0	2.2	77,286.0	4.6	161,598.0	21.1	741,243.0
P	31,765	4.8	152,472.0	1.2	38,118.0	1.8	57,177.0	2.9	92,118.5	16.8	533,652.0
F	23,541	7.2	169,495.2	1.8	42,373.8	4.8	112,996.8	4.8	112,996.8	28.5	670,918.5
G	18,946	3.8	71,994.8	1.0	18,946.0	1.8	34,102.8	3.1	58,732.6	19.2	363,763.2
H	21,786	5.0	108,930.0	1.3	28,321.8	1.6	34,857.6	2.7	58,822.2	16.1	350,754.6
K	11,875	5.1	60,562.5	1.1	13,062.5	2.1	24,937.5	3.0	35,625.0	21.9	260,062.5
M	18,428	4.5	82,926.0	0.7	12,899.6	1.2	22,113.6	4.6	84,768.8	15.3	281,948.4
O	14,949	4.5	67,270.5	1.3	19,433.7	1.8	26,908.2	3.8	56,806.2	15.4	230,214.6
Q	18,093	5.4	97,702.2	0.7	12,665.1	1.5	27,139.5	2.3	41,613.9	18.2	329,292.6
S	15,863	4.5	71,383.5	1.1	17,449.3	1.6	25,380.8	2.2	34,898.6	13.2	209,391.6
V	7,313	4.7	34,371.1	1.2	8,775.6	1.3	9,506.9	2.3	16,819.9	12.7	92,875.1
X	14,511	5.1	74,006.1	1.2	17,413.2	1.2	17,413.2	2.1	30,473.1	15.5	224,920.5
TOTAL	237,705		1,202,075.4		279,531.6		480,279.4		802,889.6		4,388,126.6

WEIGHTED AVERAGE FOR DEPOSITS

Ilmenite $\frac{1,202,075.4}{237,705.0}$ equals 5.1 lb/ton equals 6.63 lbs. per cu.yd. of 2600 lbs.

Monazite $\frac{279,531.6}{237,705.0}$ " 1.2 " " 1.56 " " " " " " "

Rutile $\frac{480,279.4}{237,705.0}$ " 2.0 " " 2.60 " " " " " " "

Zircon $\frac{802,889.6}{237,705.0}$ " 3.4 " " 4.42 " " " " " " "

AVERAGE MINERAL CONTENT FOR COMPARISON OF METHODS OF COMPUTATION

COMPUTATION USING TOTAL CORE RECOVERED AND TOTAL CONCENTRATES RECOVERED

+ 1/4 inch Gravel

Line	Grams Conc. Recovered from Drill Holes	ILMENITE %	ILMENITE Product	MONAZITE %	MONAZITE Product	RUTILE %	RUTILE Product	ZIRCON %	ZIRCON Product	Core Recov'd from Drill Hole	lb. Conc. per ton	Recov'd from Drill Hole lbs	lbs. per ton
B Line	5,135.0	25.0	128,375.0	4.4	22,594.0	10.8	55,458.0	18.0	92,430.0	1,162.2	19.5	77	132
C Line 4"	4,380.1	27.9	122,204.8	5.1	22,338.5	11.0	48,181.1	21.8	95,486.2	1,012.6	19.1		
C Line 6"	6,117.6	26.4	161,504.6	7.3	44,658.5	10.9	66,681.8	23.6	144,375.4	1,274.6	21.2	159.5	129
C 1 N	1,089.8	11.1	12,096.8	2.8	3,051.4	7.0	7,628.6	11.9	12,968.6	179.4	26.8		
F Line 4"	3,999.0	26.5	105,973.5	4.9	19,595.1	14.5	57,985.5	14.9	59,585.1	552.3	31.9		
F Line 6"	9,638.1	25.2	242,880.1	7.3	70,358.1	18.3	176,377.2	17.3	166,739.1	1,640.1	25.9	208.5	177
F 1 N	1,580.3	20.4	32,238.1	2.2	3,476.7	10.4	16,435.1	19.5	30,815.9	157.8	44.2		
G Line	11,131.8	19.8	220,409.6	5.0	55,659.0	9.5	105,752.1	17.8	198,146.0	2,661.9	18.4	147.9	111
H Line	5,218.0	31.0	161,758.0	8.2	42,787.6	9.9	51,658.2	16.7	87,140.6	1,431.9	16.1	82.0	115
K Line	5,895.9	23.2	136,784.9	4.4	25,942.0	9.6	56,600.6	12.9	76,057.1	1,101.2	23.6	69	91
K 5 N	1,573.4	23.2	36,502.9	7.4	11,643.2	9.7	15,262.0	15.6	24,545.0	411.7	16.8		
M Line	5,336.8	29.4	156,901.9	4.4	23,481.9	7.6	40,559.7	29.9	159,570.3	1,601.1	14.7	48	60
O Line	3,946.0	29.0	114,434.0	8.2	32,357.2	11.6	45,773.6	24.9	98,255.4	1,069.8	16.3	56	105
Q Line	7,981.0	29.8	237,833.8	3.8	30,327.8	8.1	64,646.1	12.9	102,954.9	1,981.3	17.8	45.5	46
S Line	1,714.9	34.2	58,649.6	8.2	14,062.2	12.1	20,750.3	16.8	28,810.3	568.4	13.3	30.5	107
V Line	871.0	37.0	32,227.0	9.1	7,926.1	10.5	9,145.5	17.9	15,590.9	284.1	13.5	13	91
X Line	6,998.9	32.7	228,864.0	7.9	55,291.3	7.6	53,191.6	13.3	93,085.4	2,020.2	15.3	99	98
P Line	12,448.6	28.3	352,295.4	7.4	92,119.6	10.8	134,444.9	17.4	216,605.6	3,265.0	16.8	163	100
TOTALS	95,056.2		2,541,934.0		577,670.2		1,026,531.9		1,703,161.8	22,375.6		1,198.9	
Average		26.7		6.1		10.8		17.9					107.2

$\frac{95,056.2}{22,375.6} \times \frac{2000}{453.6}$ equals 18.7 lb./ton Conc.Average

Average Ilmenite 26.7% x 18.7 equals 5.0 lb./ton
" Monazite 6.1% x 18.7 " 1.1 "
" Rutile 10.8% x 18.7 " 2.0 "
" Zircon 17.9% x 18.7 " 3.4 "

AVERAGE MINERAL CONTENT FOR COMPARISON OF METHODS OF COMPUTATION
COMPUTATION USING UNIFORM CORE PER FOOT OF HOLE AS COMPOSITED

Line	Grams Conc. Allowed for Composite	ILMENITE		MONAZITE		RUTILE		ZIRCON		lb. Core Allowed for Hole	lb. Conc. per ton
		%	Product	%	Product	%	Product	%	Product		
B Line	2,678.4	25.0	66,960.0	4.4	11,785.0	10.8	28,926.7	18.0	48,211.2	657.5	18.0
C Line4"	2,786.3	27.9	77,737.8	5.1	14,210.1	11.0	30,649.3	21.8	60,741.3	602.0	20.4
C Line6"	4,956.0	26.4	130,838.4	7.3	36,178.8	10.9	54,020.4	23.6	116,961.6	1,062.5	20.6
C 1 N	1,062.3	11.1	11,791.5	2.8	2,974.4	7.0	7,436.1	11.9	12,641.4	175	26.8
F Line4"	2,548.3	26.5	67,529.9	4.9	12,486.7	14.5	36,950.3	14.9	37,969.7	366	30.7
F Line6"	7,059.6	25.2	177,901.9	7.3	51,535.1	18.3	129,190.7	17.3	122,131.1	1,170	26.6
F 1 N	900.9	20.4	18,378.4	2.2	1,982.0	10.4	9,369.4	19.5	17,567.6	90	44.1
G Line	4,090	19.8	80,982.0	5.0	20,450.0	9.5	38,855.0	17.8	72,802.0	940	19.2
H Line	3,185.9	31.0	98,762.9	8.2	26,124.4	9.9	31,540.4	16.7	53,204.5	873.25	16.1
K Line	5,578.3	23.2	129,416.5	4.4	24,544.5	9.6	53,551.7	12.9	71,960.1	1,035.5	23.8
K 5 N	1,451.6	23.2	33,677.1	7.4	10,741.8	9.7	14,080.5	15.6	22,644.9	380.	16.9
M Line	3,321.2	29.4	97,937.3	4.4	14,657.3	7.6	25,317.1	29.9	99,602.9	960	15.3
O Line	1,820.1	29.0	52,782.9	8.2	14,924.8	11.6	21,113.2	24.9	45,320.5	522	15.4
Q Line	7,032.4	29.8	209,565.5	3.8	26,723.1	8.1	56,962.4	12.9	90,718.	1,701	18.2
S Line	1,387.	34.2	47,435.4	8.2	11,373.4	12.1	16,782.7	16.8	23,301.6	465	13.2
V Line	735.5	37.0	27,213.5	9.1	6,693.1	10.5	7,722.8	17.9	13,165.5	255	12.7
X Line	3,313.1	32.7	108,338.4	7.9	26,173.5	7.6	25,179.6	13.3	44,064.2	940	15.5
P Line	12,448.6	28.3	352,295.4	7.4	92,119.6	10.8	134,444.8	17.4	216,605.6	3,265	16.8
TOTALS	66,365.5		1,789,544.8		405,677.6		722,093.1		1,169,613.7	15,459.75	
AVERAGE		27.0		6.1		10.9		17.6			

$$\frac{66,365.5}{15,459.75} \times \frac{2000}{453.6}$$ equals 18.9 lb./ton Conc. Average

Average	Ilmenite	27.0% x 18.9	equals	5.1	lb./ton
"	Monazite	6.1% x 18.9	"	1.2	"
"	Rutile	10.9% x 18.9	"	2.1	"
"	Zircon	17.6% x 18.9	"	3.3	"

AVERAGE GRAVEL CONTENT OF DEPOSIT
Weighted for Cross Section Area

Line	Cross Section Area Digging Stratum	lbs. Gravel per ton	Product
B	5,505	132	726,660
C	35,130	129	4,531,770
P	31,765	100	3,176,500
F	23,541	177	4,166,757
G	18,946	111	2,103,006
H	21,786	115	2,505,390
K	11,875	91	1,080,625
M	18,428	60	1,105,680
O	14,949	105	1,569,645
Q	18,093	46	832,278
S	15,863	107	1,697,341
V	7,313	91	665,483
X	14,511	98	1,422,078
TOTAL	237,705		25,583,213

AVERAGE FOR DEPOSIT

$\frac{25,583,213}{237,705}$ equals 107.6 lbs./ton equals 139.9 lbs/ cu.yd. 2600 lbs.

SUMMARY OF YARDAGE

DIG

Block I	710,846	Cu.	Yds.
Block II	3,398,890	"	"
Block III	3,896,636	"	"
Block IV	2,907,349	"	"
Block V	3,432,964	"	"
Block VI	3,987,734	"	"
TOTAL	18,334,419	"	"

STRIP

Block I	0	Cu.	yds.
Block II	1,539,120	"	"
Block III	471,319	"	"
Block IV	1,291,505	"	"
Block V	976,470	"	"
Block VI	1,343,584	"	"
TOTAL	5,621,998	"	"

COMPUTATION OF YARDAGE BY BLOCK (See Map)
USING CROSS SECTION AREAS OF DRILL LINES

BLOCK I

Dig Areas	C Line	8,500 Sq. Ft.
	P Line	10,322 " "
		18,822 " "
Dig Lengths	C Line	370 ft.
	P Line	600 "
		970 "

Aver.Dig Depth Block I equals $\frac{18,822}{3x970}$ equals 6.47 yds.
2910

Volume of Block I
22.7 Acres x 4,840 sq. yds. x 6.47 yds equals 710,846 Cu. Yds.

BLOCK II

Dig. Areas	B Line	5,325 sq. ft.
	C Line (35,130- 8,500)	26,630 "
	P Line (31,765- 10,322)	21,443 "
		54,126 "
		180
		53,578
Dig Lengths	B Line	380 ft.
	C Line (2200- 490)	1,710 "
	P Line (2000- 720)	1,280 "
		3,370 "

Aver.Dig Depth Block II $\frac{53,578}{3x3370}$ equals 5.30 yds.

Volume of Block II
132.5 Acres x 4,840 sq. yds. x 5.30 yds equals 3,398,890 cu. yds.

BLOCK III

Dig Areas	P Line (31,765-21,443)	10,322 sq. ft.
	F Line (23,541- 3,450)	20,091 " "
	G Line	18,946 " "
	H Line (21,786- 8,357)	13,429 " "
	K Line	11,875 " "
		74,663 " "
Dig Lengths	P Line	600 ft.
	F Line (1,440- 350)	1,090 "
	G Line	1,060 "
	H Line (1,700- 730)	970 "
	K Line	700 "
		4,420 "

Aver.Dig Depth of Block III $\frac{74,663}{3x4,420}$ equals 5.63 yds.

Volume of Block III
143 Acres x 4,840 sq. yds. x 5.63 yds. equals 3,896,636 cu. yds.

BLOCK IV

Sheet #2 Volumes

Dig. Areas	P Line	(31,765- 10,322)	21,443 sq. ft.
	H Line	(21,786- 13,429)	8,357 " "
			29,800 " "
Dig Lengths	P Line	(2,000- 720)	1,280 ft.
	H Line	(1,700- 1,090)	610 "
			1,890 "

Aver.Dig Depth of Block IV equals $\frac{29,800}{3x1,890}$ equals 5.26 yds.

Volume of Block IV
114.2 Acres x 4,840 sq. yds. x 5.26 yds equals 2,907,349 Cu. yds.

BLOCK V

Dig Areas	M Line	18,428 sq. ft.
	O Line	14,949 " "
	Q Line	18,093 " "
		51,470 " "
Dig Lengths	M Line	1,125 ft.
	O Line	1,035 "
	Q Line	930 "
		3,090 "

Aver.Dig Depth of Block V $\frac{51,470}{3x3,090}$ equals 5.55 yds.

Volume of Block V
127.8 Acres x 4,840 sq. yds. x 5.55 yds. equals 3,432,964 cu. yds.

BLOCK VI

Dig Areas	Q Line	18,093 sq. ft.
	S Line	15,863 " "
	V Line	7,313 " "
	X Line	14,511 " "
		55,780 " "
Dig Lengths	Q Line	930 ft.
	S Line	1,030 "
	V Line	530 "
	X Line	780 "
		3,270 "

Aver. Dig Depth of Block VI $\frac{55,780}{3x3,270}$ equals 5.69 yds.

Volume of Block VI
144.8 Acres x 4,840 sq. yds. x 5.69 yds. equals 3,987,734 cu. yds.

COMPUTATION OF STRIPPING BY BLOCK (See Map) Sheet #1 Strip Volumes
USING CROSS SECTION AREAS OF DRILL LINES

BLOCK II

Strip Areas	C Line	10,789 sq. feet
Strip Length	C Line	1,510 feet

Aver. Strip Depth Block II equals $\frac{10,789}{3x1510}$ equals 2.4 yds.

Strip
Volume of Block II
132.5 Acres x 4,840 sq. yds. x 2.4 equals 1,539,120.0 Cu. yds.

BLOCK III

Strip Areas	G Line		688 Sq. ft.
	H Line		2,950 " "
	K Line		1,275 " "
		TOTAL	4,913 " "
Strip Lengths	G Line		185 feet
	H Line		460 "
	K Line		255 "
		TOTAL	900 "

Aver. Strip Depth Block III $\frac{4,913}{3x900}$ equals 1.8 yds.

Strip Volume of Block III
54.1 Acres x 4,840 sq. yds. x 1.8 equals 471,319 cu. yds.

BLOCK IV

Strip Area	H Line	5,206 sq. ft.
Strip Length	H Line	610 feet

Average Strip Depth Block IV equals $\frac{5,206}{3x610}$ equals 2.8 yds.

Strip Volume of Block IV
95.3 Acres x 4,840 sq. yds. x 2.8 equals 1,291,505 cu. yds.

BLOCK V

Strip Areas	M Line		4,288 sq. ft.
	O Line		5,226 " "
	Q Line		3,675 " "
		TOTAL	13,189 " "
Strip Lengths	M Line		575 feet
	O Line		735 "
	Q Line		460 "
		TOTAL	1,770 "

Aver. Strip Depth Block V $\frac{13,189}{3x1770}$ equals 2.5 yds.

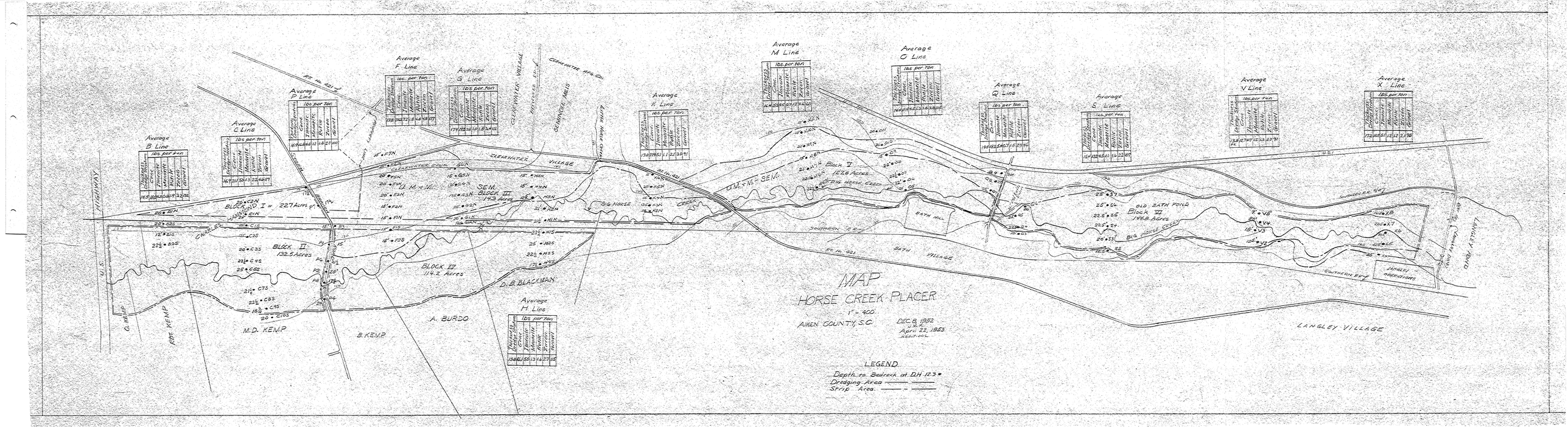
Strip Volume of Block V
80.7 Acres x 4,840 sq. yds. x 2.5 equals 976,470 cu. yds.

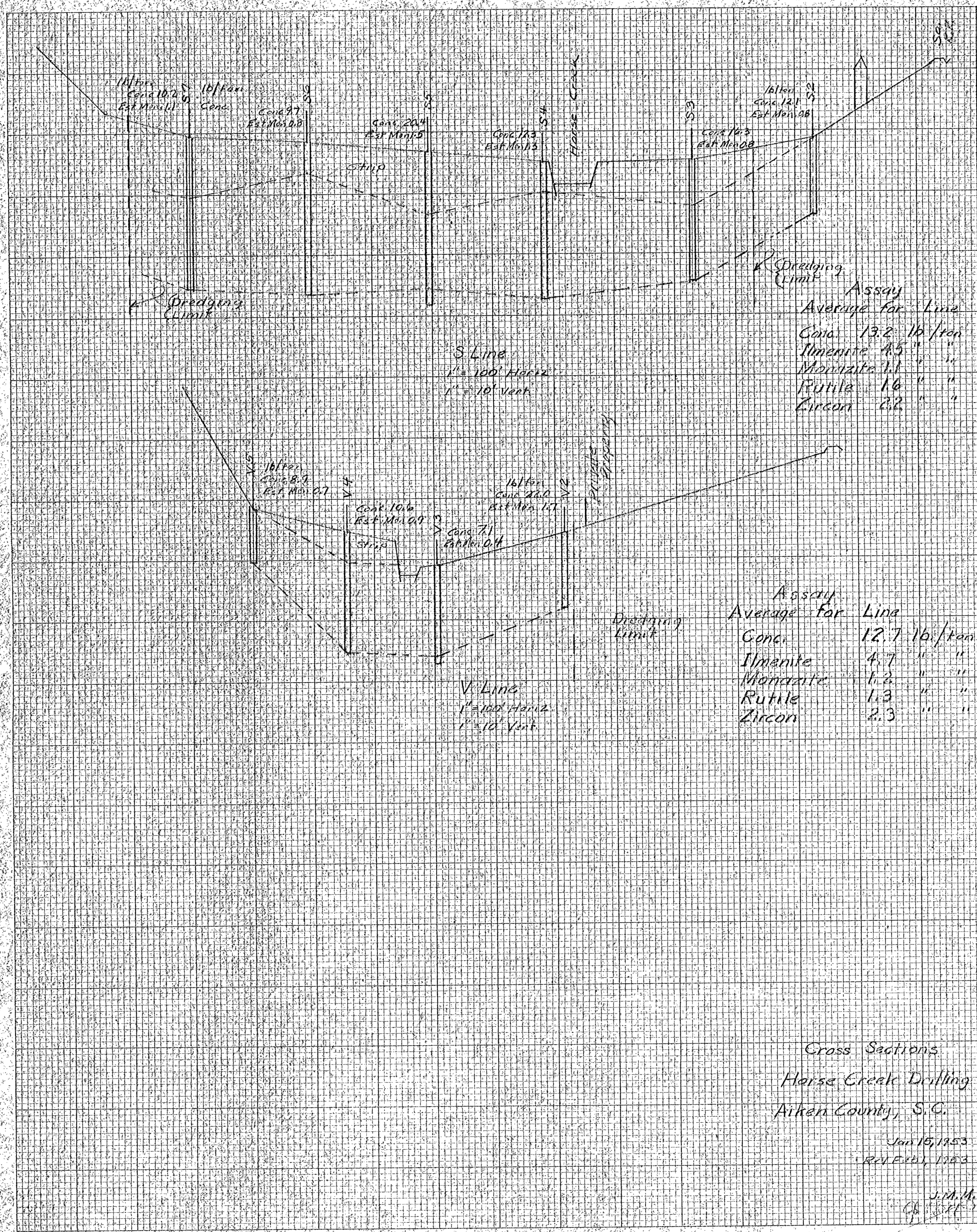
BLOCK VI

Strip Areas	Q Line		3,675 sq. ft.
	S Line		7,169 " "
	V Line		770 " "
	X Line		1,976 " "
		TOTAL	13,590 " "
Strip Lengths	Q Line		460 feet
	S Line		1,030 "
	V Line		240 "
	X Line		540 "
		TOTAL	2,270 "

Average Strip Depth Block VI equals $\frac{13,590}{3x2270}$ equals 2.0 yds.

Strip Volume of Block VI
138.8 Acres x 4,840 sq. yds. x 2.0 equals 1,343,584 cu. yds.


MAP
HORSE CREEK PLACER
1" = 400'
AIKEN COUNTY, S.C.
DEC 8, 1952
April 22, 1953
LEGEND
Depth to Bedrock at D.H. 12.5'
Dredging Area
Strip Area
Average B Line
Average C Line
Average P Line
Average F Line
Average G Line
Average H Line
Average K Line
Average M Line
Average O Line
Average Q Line
Average S Line
Average V Line
Average X Line
lbs. per ton
Thickness Depth to Bedrock
Clay
Ilmenite
Monazite
Rutile
Zircon
Gravel
BLOCK I = 227 Acres
BLOCK II 132.5 Acres
BLOCK III 114.2 Acres
SEM. BLOCK III 143 Acres
U.M.+M. SEM.
Block I 127.8 Acres
Block II 144.8 Acres
OLD BATH POND
BIG HORSE CREEK
CLEARWATER VILLAGE
CLEARWATER MFG. CO.
SEMINARY MILLS
BATH VILLAGE
BATH MILL
LANGLEY VILLAGE
LANGLEY POND
DREDGING OPERATIONS
D.B. BLACKMAN
A. BURDO
B. KEMP
M.D. KEMP
G. KEMP
FOX KEMP
HIGHWAY
U.S.
CHARLES
SOUTHERN R.R.
U.S. 1

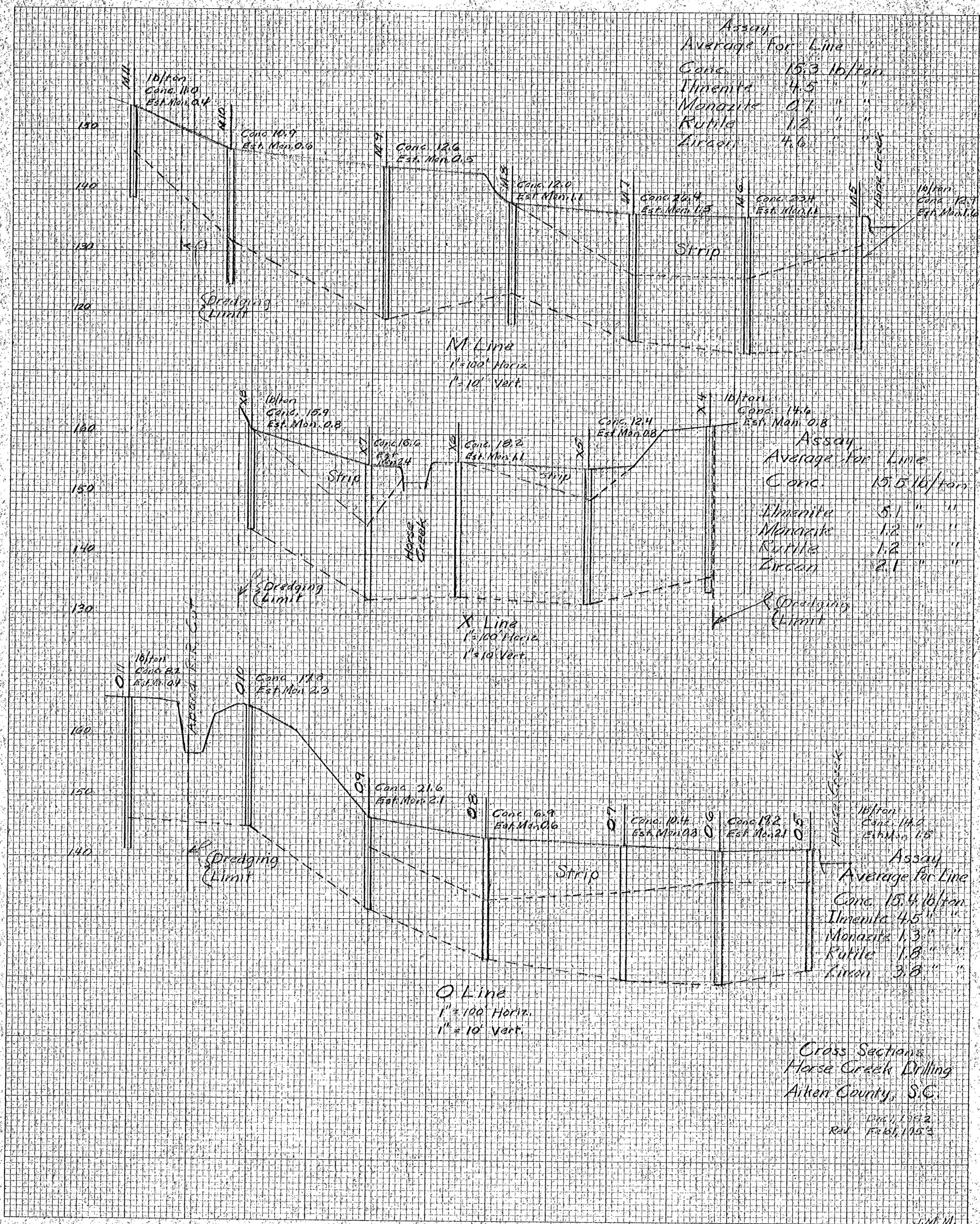


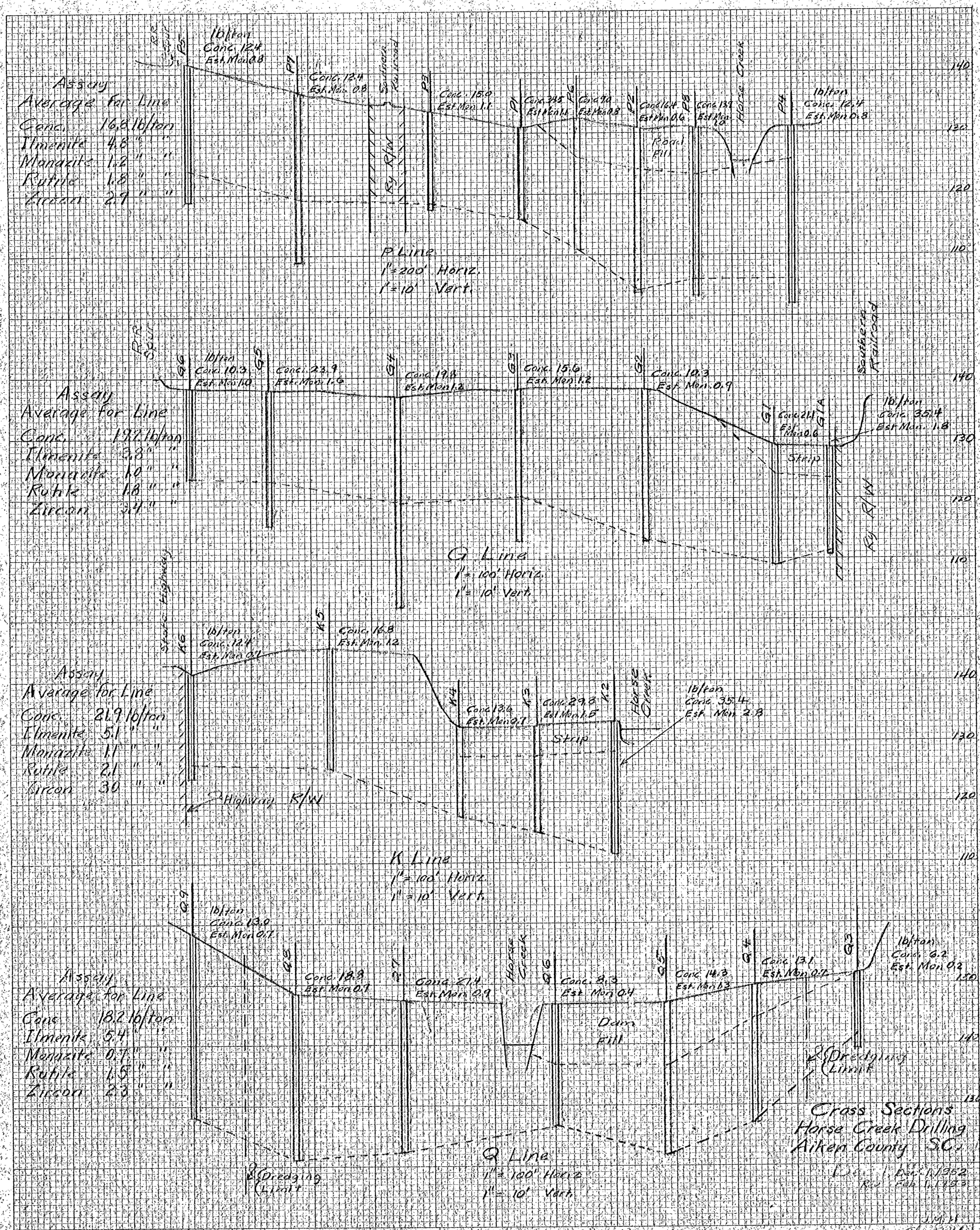
Cross Sections
Horse Creek Drilling
Aiken County, S.C.

Jan 15, 1953
Rev Feb 1, 1953

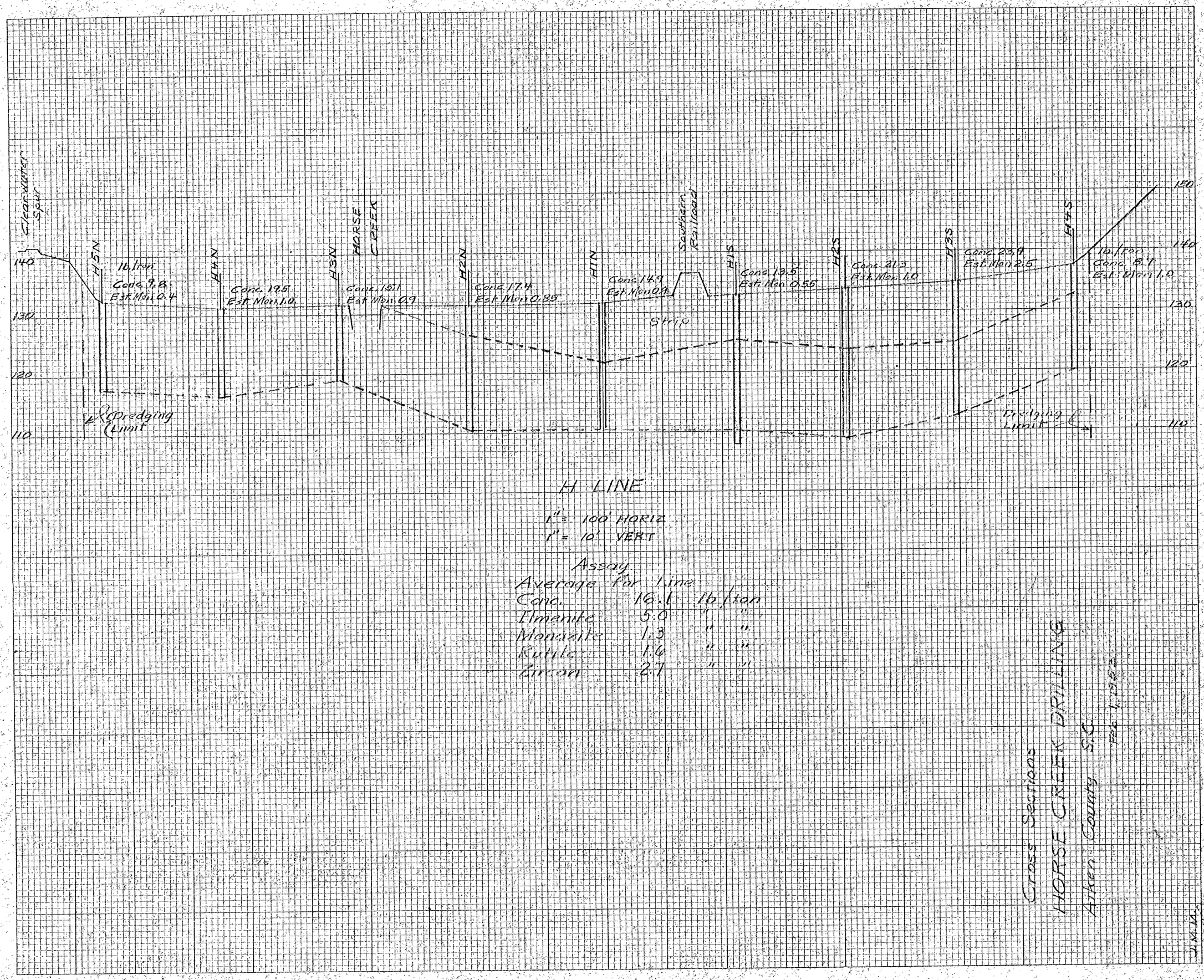
J.A.H.

CHARLES BRUNING COMPANY, INC.
TRACING MATERIAL
NO. 845


Assay
Average for Line
Conc. 15.3 lb/ton
Ilmenite 4.5 " "
Monazite 0.7 " "
Rutile 1.2 " "
Zircon 4.6 " "
M11
lb/ton
Conc. 11.0
Est. Mon. 0.4
M10
Conc. 10.9
Est. Mon. 0.6
M9
Conc. 12.6
Est. Mon. 0.5
M8
Conc. 12.0
Est. Mon. 1.1
M7
Conc. 26.4
Est. Mon. 1.5
M6
Conc. 23.4
Est. Mon. 1.1
M5
Horse Creek
lb/ton
Conc. 12.7
Est. Mon. 1.6
Strip
Dredging Limit
M Line
1" = 100' Horiz.
1" = 10' Vert.
X8
lb/ton
Conc. 15.9
Est. Mon. 0.8
X7
Conc. 16.6
Est. Mon. 0.4
X6
Conc. 18.2
Est. Mon. 1.1
X5
Conc. 12.4
Est. Mon. 0.8
X4
lb/ton
Conc. 14.6
Est. Mon. 0.8
Assay
Average for Line
Conc. 15.5 lb/ton
Ilmenite 5.1 " "
Monazite 1.2 " "
Rutile 1.2 " "
Zircon 2.1 " "
Horse Creek
X Line
1" = 100' Horiz.
1" = 10' Vert.
O11
lb/ton
Conc. 8.2
Est. Mon. 0.4
O10
Conc. 17.0
Est. Mon. 2.0
Horse Creek
O9
Conc. 21.6
Est. Mon. 2.1
O8
Conc. 6.9
Est. Mon. 0.6
O7
Conc. 10.4
Est. Mon. 0.3
O6
Conc. 19.2
Est. Mon. 2.1
O5
lb/ton
Conc. 14.0
Est. Mon. 1.6
Assay
Average for Line
Conc. 15.4 lb/ton
Ilmenite 4.5 " "
Monazite 1.3 " "
Rutile 1.8 " "
Zircon 3.8 " "
O Line
1" = 100' Horiz.
1" = 10' Vert.
Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Feb. 1952
Rev. Feb. 1953
J.M.M.
5 of 6



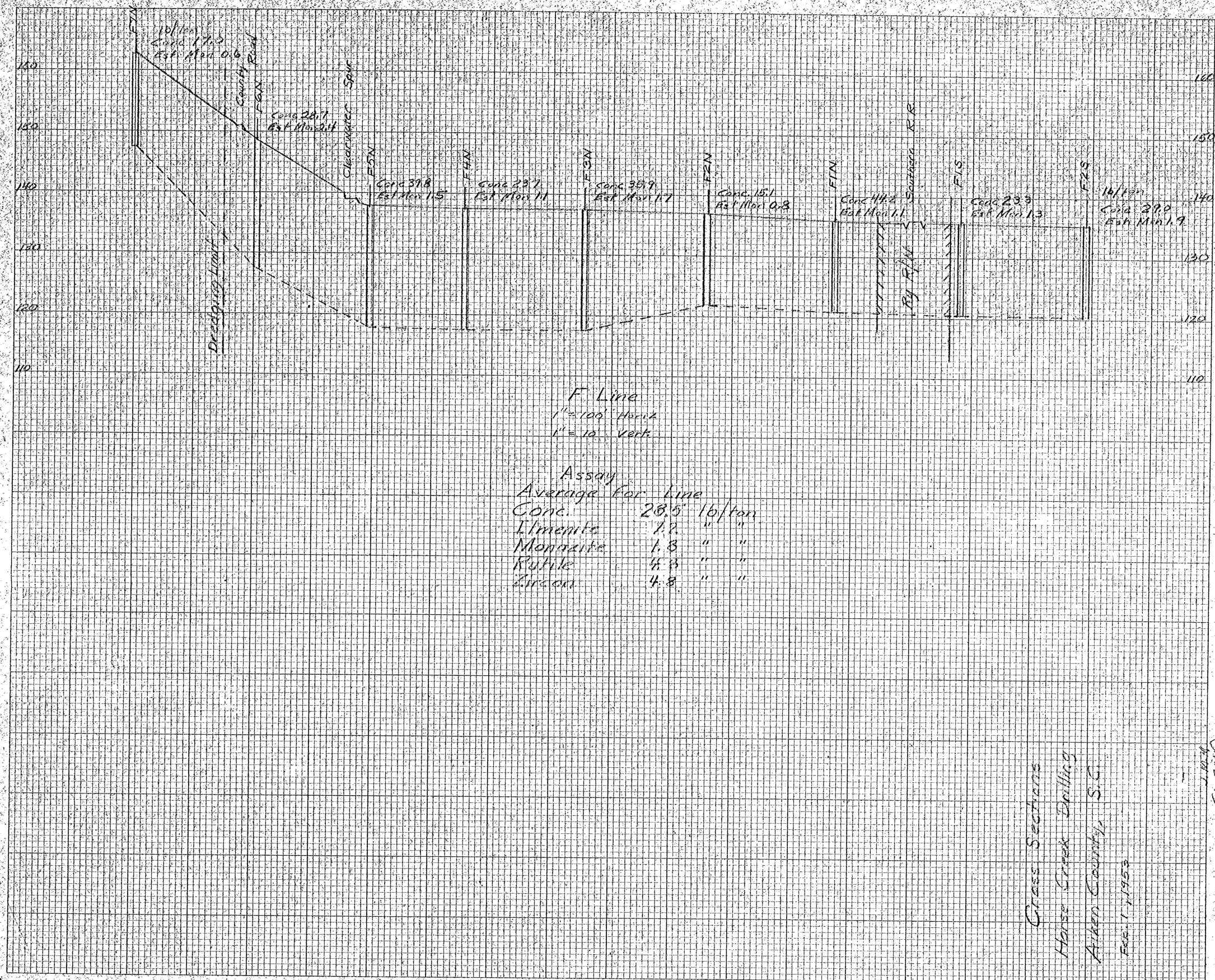
CHARLES BRUNING COMPANY, INC.
10 x 10 to inch Tracing
No. 6.5.5



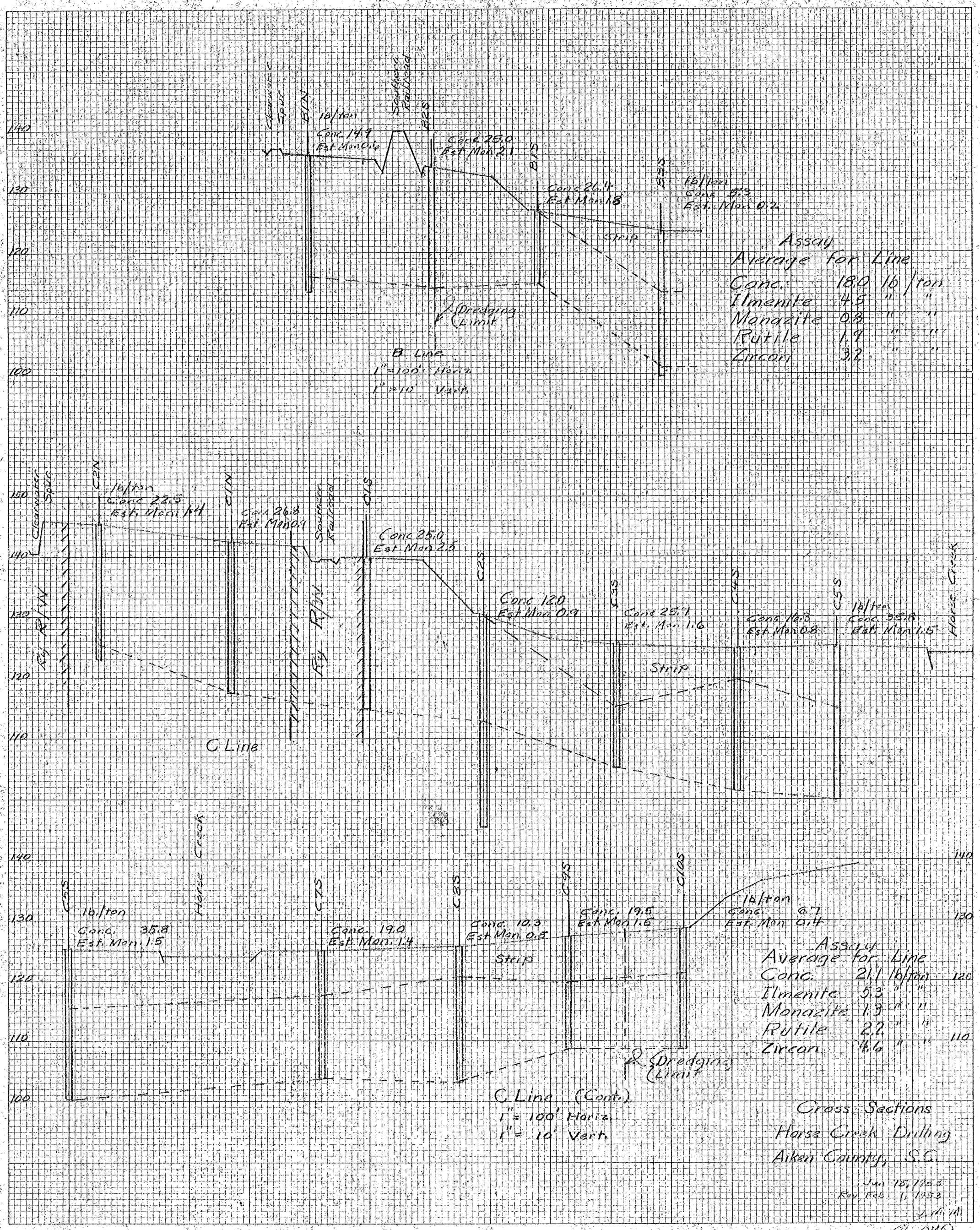
Cross Sections
HORSE CREEK DRILLING
Aiken County S.C.
Feb. 1, 1952

J.M.M.

CHARLES BRUNING COMPANY, INC.
10 x 10 to the inch
NO. 645

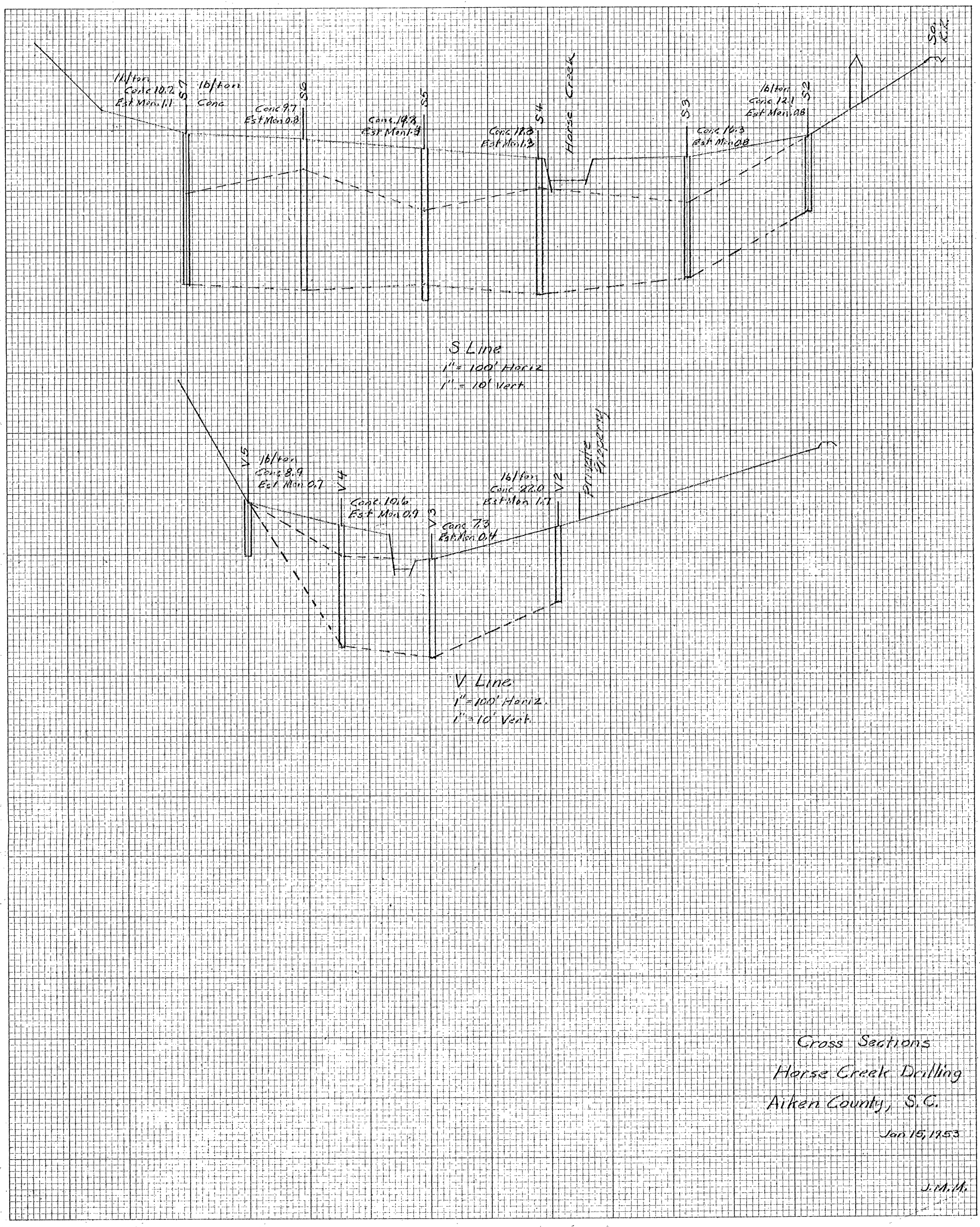


CHARLES BRUNING COMPANY, INC.
10 x 10 to one inch.
NO. 643


Clearwater Spur
B1N
lb/ton
Conc. 14.9
Est. Mon. 0.6
Southern Railroad
B2S
Conc. 25.0
Est. Mon. 2.1
B3S
Conc. 26.4
Est. Mon. 1.8
B5S
lb/ton
Conc. 8.3
Est. Mon. 0.2
Strip
Assay
Average for Line
Conc. 18.0 lb/ton
Ilmenite 4.5 " "
Monazite 0.8 " "
Rutile 1.9 " "
Zircon 3.2 " "
℄ Dredging Limit
B Line
1" = 100' Horiz.
1" = 10' Vert.
C2N
lb/ton
Conc. 22.5
Est. Mon. 1.4
C1N
Conc. 26.8
Est. Mon. 0.9
C1S
Conc. 25.0
Est. Mon. 2.5
C2S
Conc. 12.0
Est. Mon. 0.9
C3S
Conc. 25.1
Est. Mon. 1.6
C4S
Conc. 16.3
Est. Mon. 0.8
C5S
lb/ton
Conc. 35.8
Est. Mon. 1.5
Horse Creek
C6S
lb/ton
Conc. 35.8
Est. Mon. 1.5
C7S
Conc. 19.0
Est. Mon. 1.4
C8S
Conc. 10.3
Est. Mon. 0.8
C9S
Conc. 19.5
Est. Mon. 1.6
C10S
lb/ton
Conc. 9.7
Est. Mon. 0.4
Strip
Assay
Average for Line
Conc. 21.1 lb/ton
Ilmenite 5.3 " "
Monazite 1.3 " "
Rutile 2.2 " "
Zircon 4.6 " "
℄ Dredging Limit
C Line (Cont.)
1" = 100' Horiz.
1" = 10' Vert.
Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Jan 18, 1953
Rev. Feb. 11, 1953
J.W.M.
CHARLES BRUNING COMPANY, INC.
10 x 10 to the inch
NO. 645

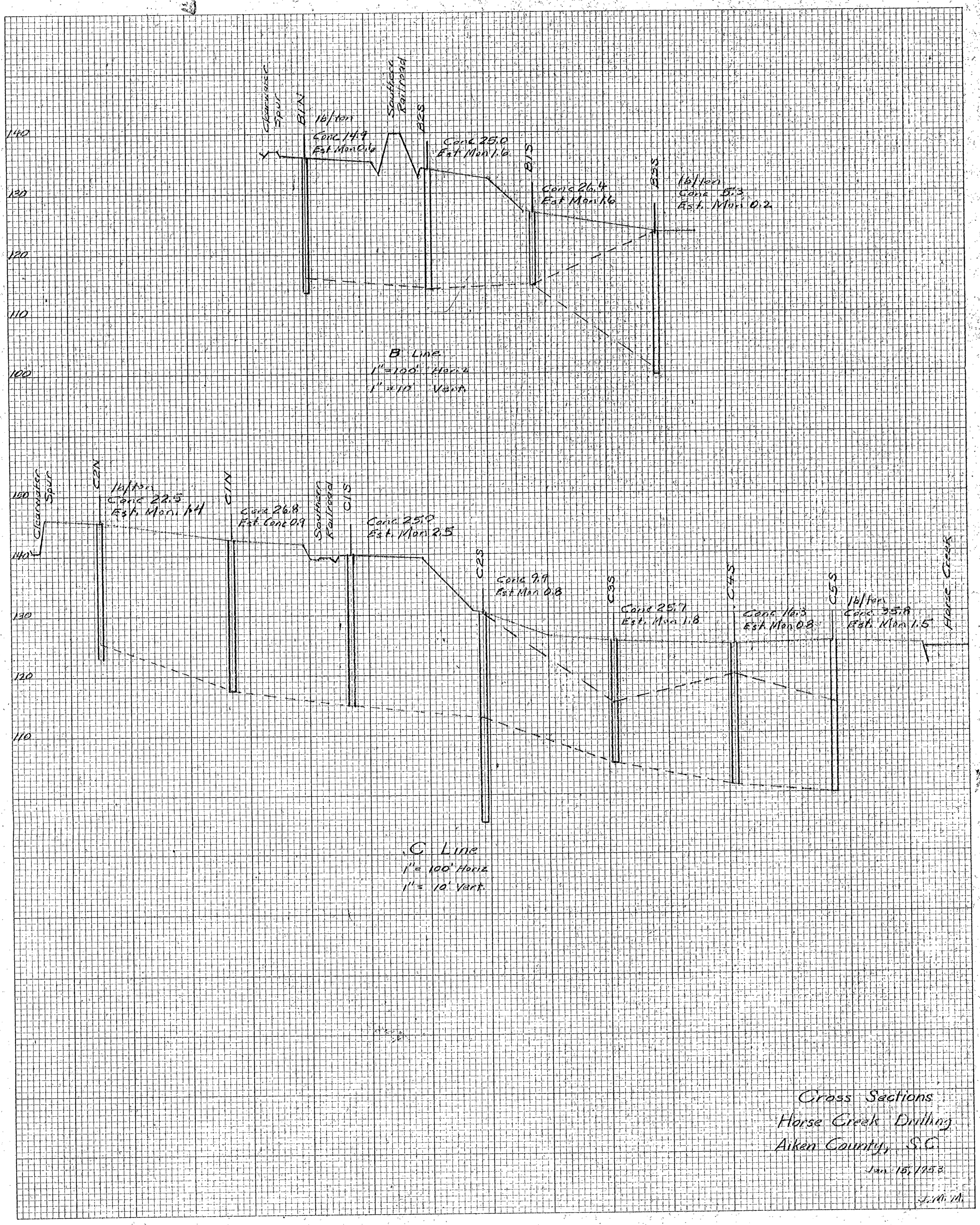
OMP

1 of 6



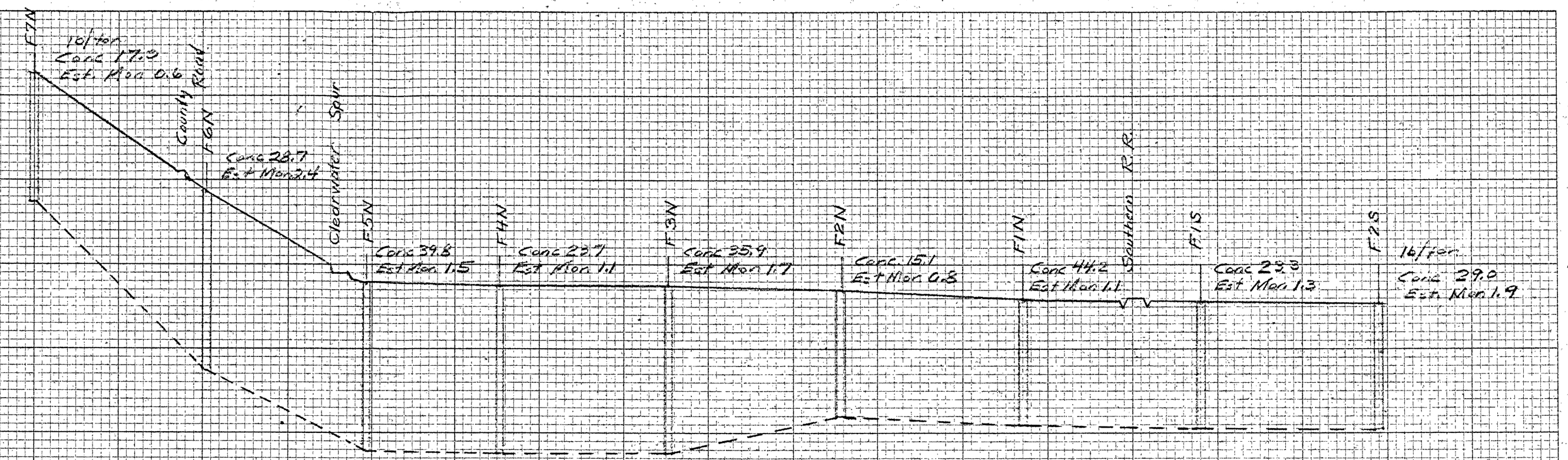
Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Jan 15, 1953
J.M.M.

CHARLES BRUNING COMPANY, INC.
10 x 10 to one inch.
NO. 643



Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Jan 15, 1953
J.M.M.

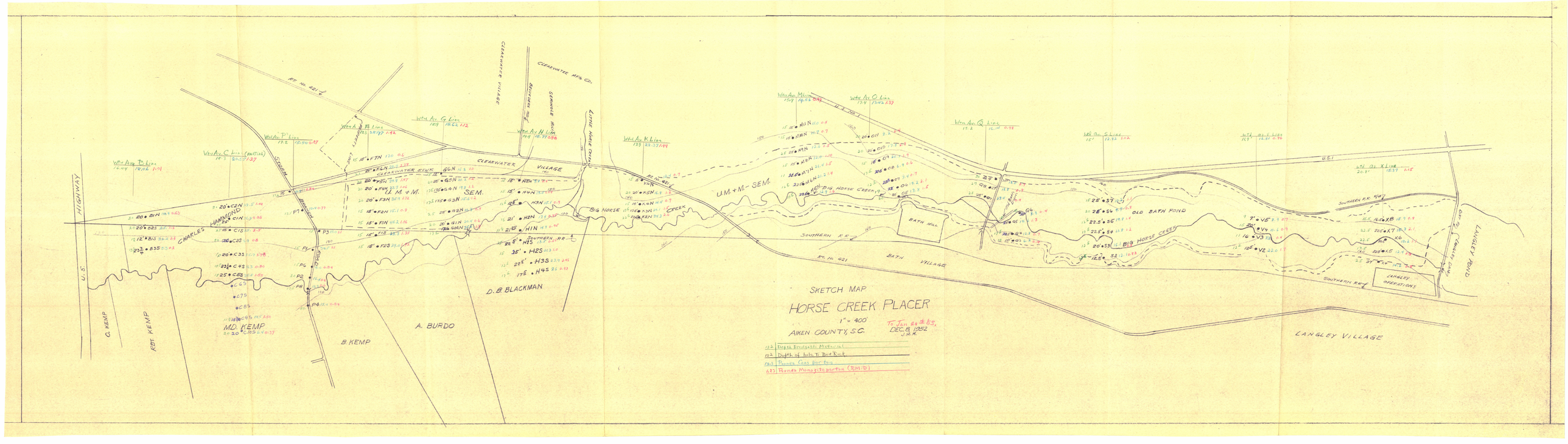
CHARLES BRUNING COMPANY, INC.
10 X 10 to one inch
NO. 643

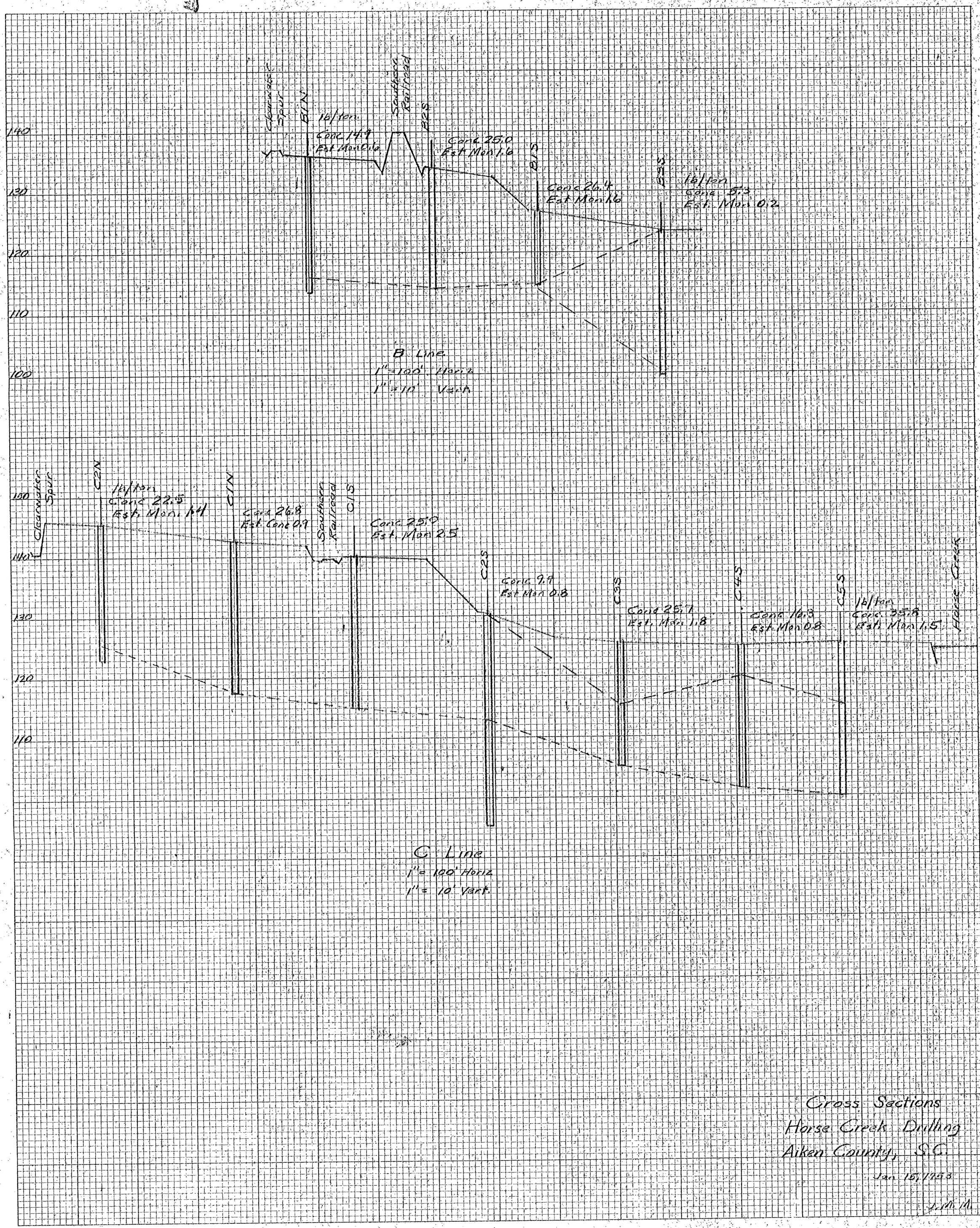


F Line
1" = 100' Horiz
1" = 10' Vert.

Cross Sections
Horse Creek Drilling
Aiken County S.C.
Feb. 16, 1983
J.W.K.

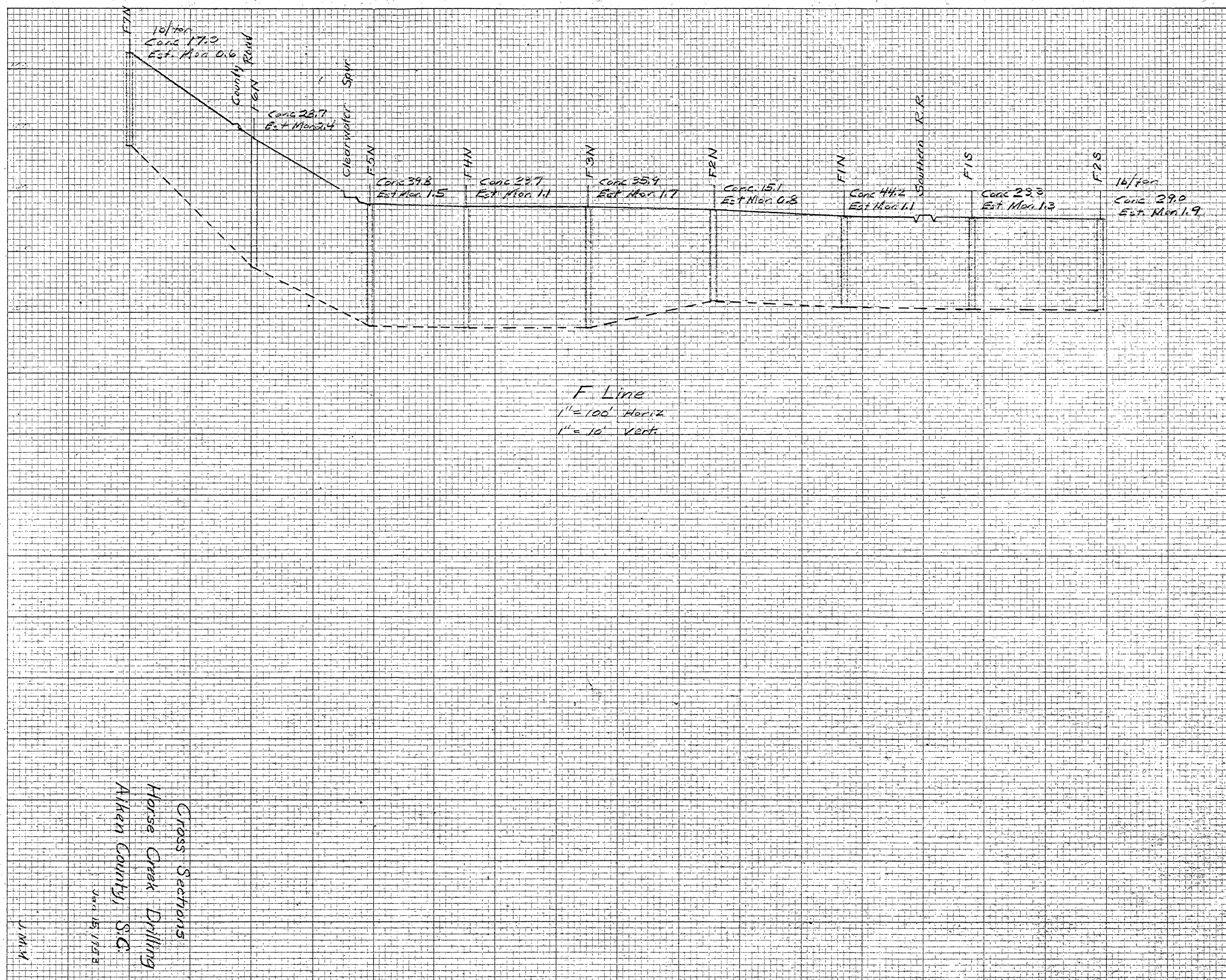
CHARLES BRUNING COMPANY, INC.
10 x 10 to one inch.
NO. 645


SKETCH MAP
HORSE CREEK PLACER
1" = 400'
AIKEN COUNTY, S.C.
DEC. 8, 1952
J.M.M.
Depth of Bridgable Material
Depth of holes to Bed Rock
Pounds Gas per ton
Pounds Monazite per ton (RMID)
U.S. HIGHWAY
Rt. No. 421
CLEARWATER VILLAGE
CLEARWATER MFG. CO.
CLEARWATER CRK.
BIG HORSE CREEK
LITTLE HORSE CREEK
U.M.+M. SEM.
D.B. BLACKMAN
A. BURDO
B. KEMP
MD. KEMP
G. KEMP
REV. KEMP
CHARLES HAMMOND
BATH WALL
BATH VILLAGE
OLD BATH POND
SOUTHERN R.R.
LANGLEY VILLAGE
LANGLEY OPERATIONS
LANGLEY POND
U.S. 1



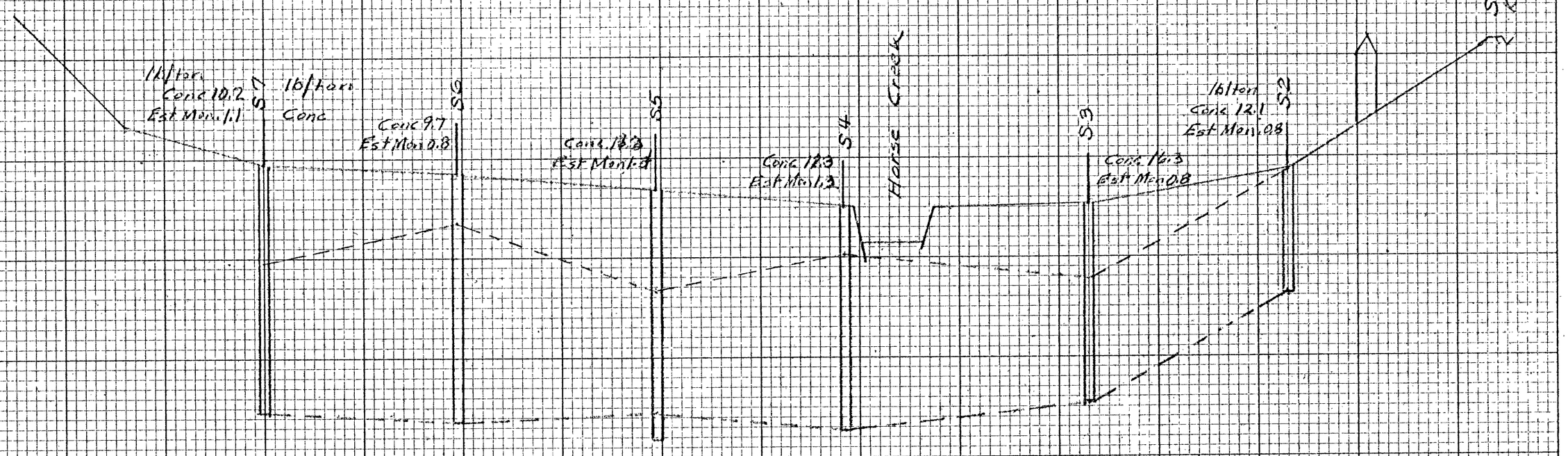
Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Jan 16, 1953
J.M.M.

CHARLES BRUNING COMPANY, INC.
10 x 10 to the inch.
NO. 645

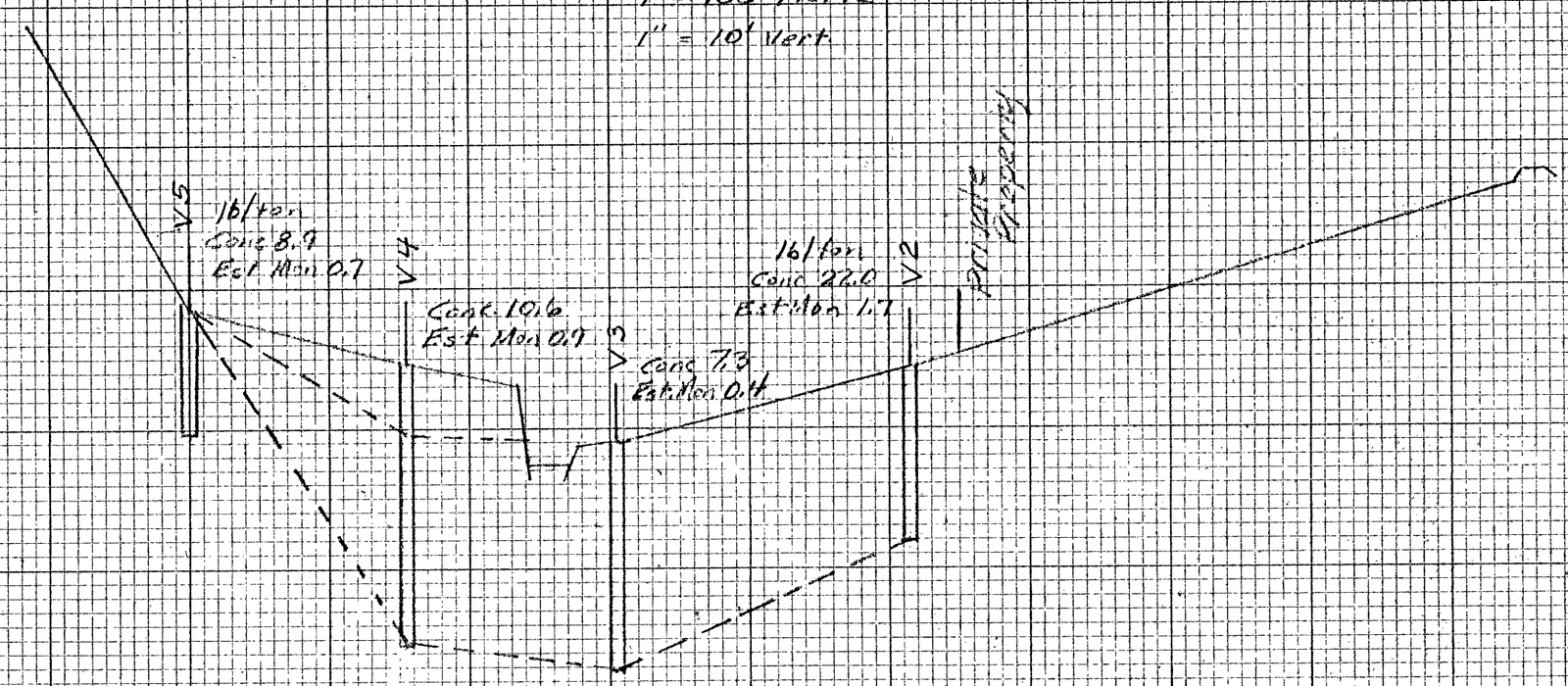


Cross Sections
Horse Creek Drilling
Aiken County S.C.
Jan. 15, 1982
T.M.M.

CHARLES BRUNING COMPANY, INC.
10 x 10 to one inch.
NO. 645



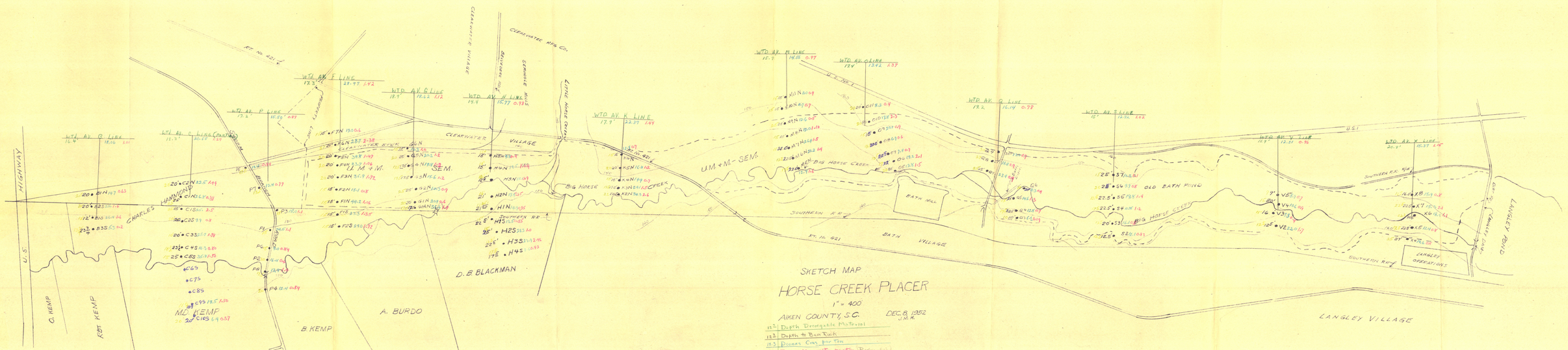
S Line
1" = 100' Horiz
1" = 10' Vert.

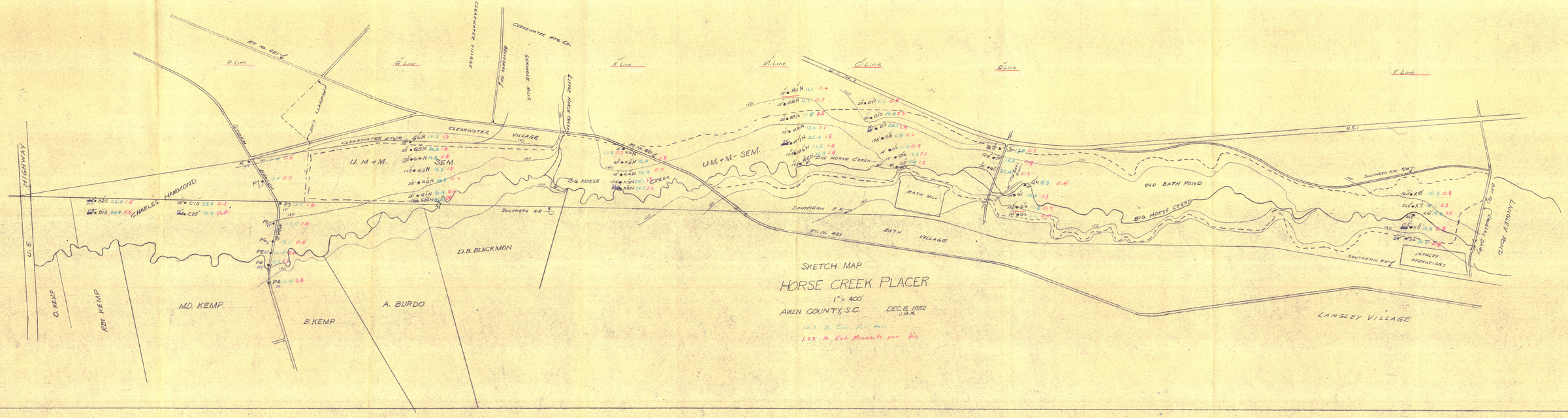


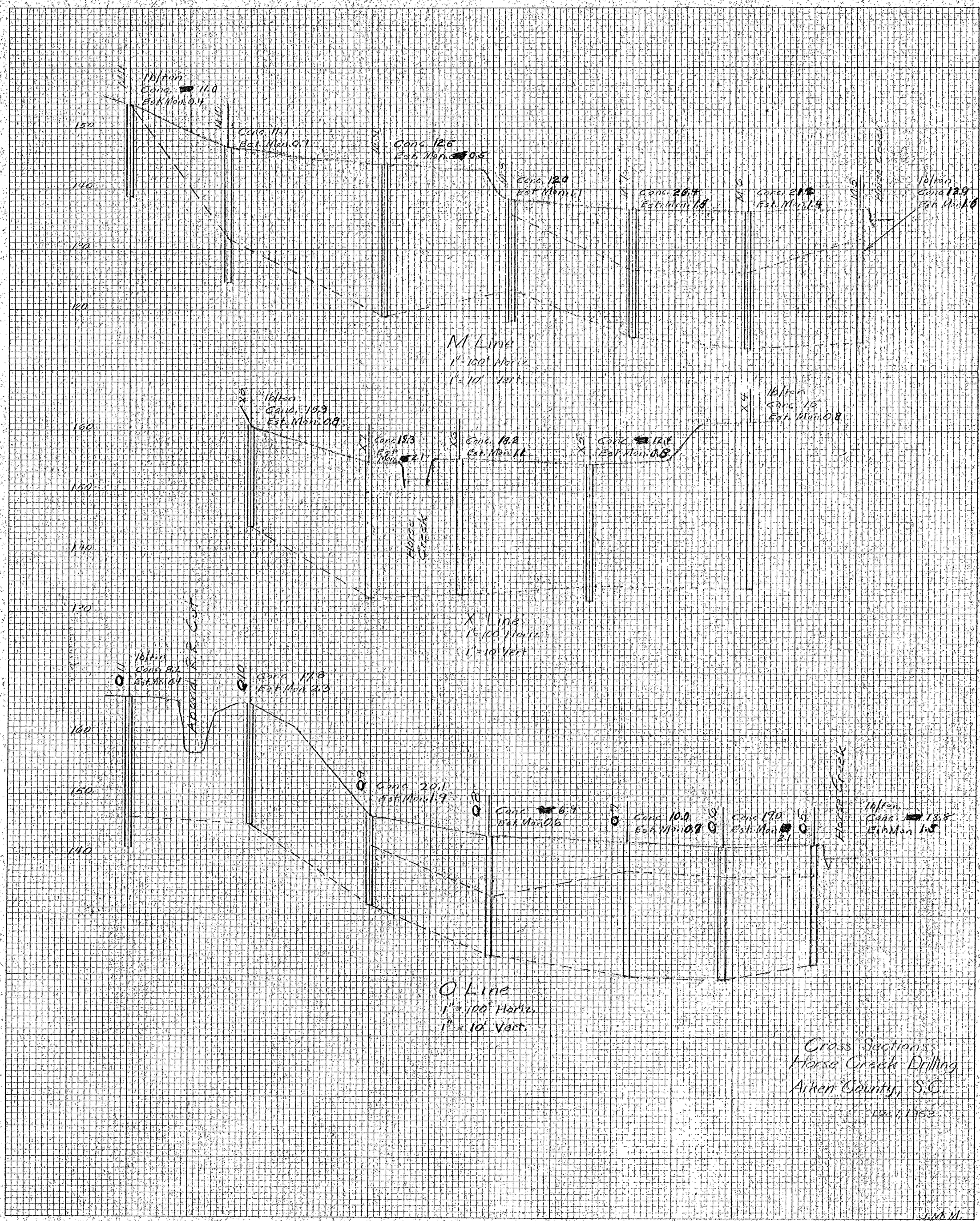
V Line
1" = 100' Horiz.
1" = 10' Vert.

Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Jan 15, 1953
J.M.M.

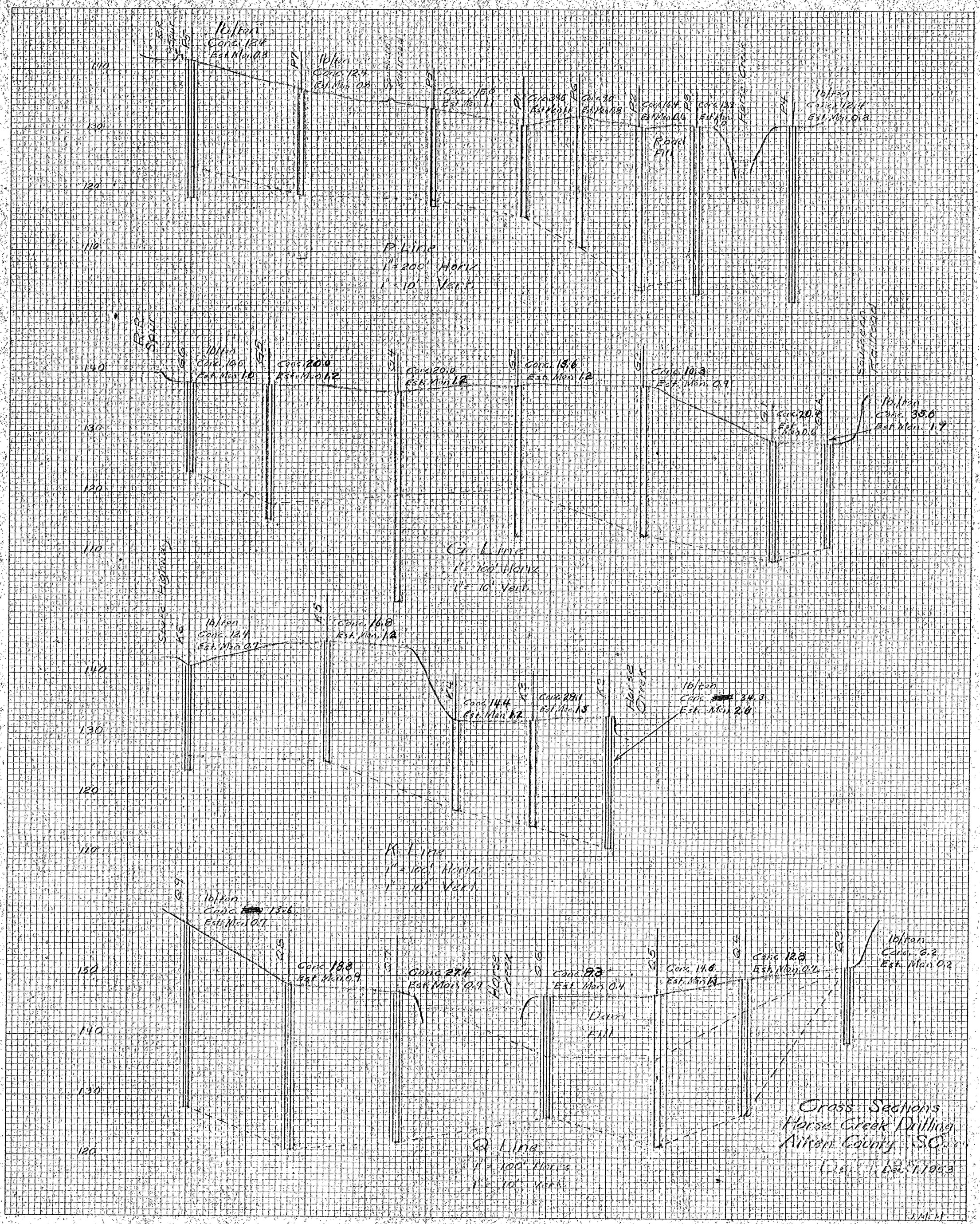
CHARLES BRUNING COMPANY, INC.
10 x 10 to the inch.
NO. 643


SKETCH MAP
HORSE CREEK PLACER
1" = 400'
AIKEN COUNTY, S.C.
DEC. 8 1952
J.M.M.
Depth Dredgable Material
Depth to Bed Rock
Pounds Cu. Yd. Pan
Pounds Monazite Bearing Material
HIGHWAY
U.S.
G. KEMP
ROT KEMP
MD. KEMP
B. KEMP
A. BURDO
D.B. BLACKMAN
CHARLES HAMMOND
U.M.+M. SEM.
CLEARWATER VILLAGE
CLEARWATER SINK
CLEARWATER RR. CO.
BELVEDERE RD.
SEMINOLE MILL
LITTLE HORSE CREEK
BIG HORSE CREEK
SOUTHERN R.R.
BATH MILL
BATH VILLAGE
OLD BATH MILL
LANGLEY VILLAGE
LANGLEY OPERATIONS
LANGLEY POND
U.S. 1
WTD AV. F LINE
WTD AV. B LINE
WTD AV. H LINE
WTD AV. K LINE
WTD AV. M LINE
WTD AV. O LINE
WTD AV. Q LINE
WTD AV. S LINE
WTD AV. V LINE
WTD AV. X LINE


SKETCH MAP
HORSE CREEK PLACER
1" = 400'
AIKEN COUNTY, S.C.
DEC. 6, 1952
J.M.K.
1.23 lb. Est. Monazite per ton
P Line
G Line
K Line
M Line
O Line
Q Line
X Line
HIGHWAY
U.S.
Rt. No. 421
CLEARWATER STORE
CLEARWATER VILLAGE
CLEARWATER MFG. CO.
BEVERAGE PLANT
GERMINDE MILLS
LITTLE HORSE CREEK
BIG HORSE CREEK
SOUTHERN R.R.
U.M.+M.
SEM.
U.M.+M.-SEM.
CHARLES HAMMOND
D.B. BLACKMON
MD. KEMP
B. KEMP
A. BURDO
O. KEMP
ROY KEMP
BATH WILL
BATH VILLAGE
OLD BATH POND
LANGLEY OPERATIONS
LANGLEY POND
LANGLEY VILLAGE



CHARLES BRUNING COMPANY, INC.
10 x 10 to one inch.
NO. 643


P Line
1" = 200' Horiz.
1" = 10' Vert.
G Line
1" = 100' Horiz.
1" = 10' Vert.
K Line
1" = 100' Horiz.
1" = 10' Vert.
Q Line
1" = 100' Horiz.
1" = 10' Vert.
Road Fill
Dam Fill
Horse Creek
Cross Sections
Horse Creek Drilling
Aiken County, S.C.
Dec. 1, 1953
J.M.H.