

An Investigation in

SLD
9/17/90

HEAVY LIQUID SEPARATION

on Vangorda & Faro III Ore samples

submitted by

006207

CURRAGH RESOURCES

Progress Report No. 1

Project No. L.R. 3987

NOTE:

This report refers to the samples as received.

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**LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
September 14, 1990**

A B S T R A C T

Seventeen Curragh Resources Vangorda and Faro III ore samples were subjected to heavy liquid separation in order to determine whether heavy media treatment might be a viable processing option. Separations were made at specific gravities of 2.8, 3.0 and 3.3 g/cc with methylene iodide.

Limited or virtually no upgrading was achieved for the samples. Further testwork would not be recommended.

INTRODUCTION

At the request of Mr. G. McDonald of Curragh Resources, thirteen Vangorda ore samples and four Faro III ore samples were treated with methylene iodide (S.G. <3.3 g/cc) in order to determine the distribution of lead, zinc, silver (and gold for the Faro III samples) over a range of specific gravity levels.

The results were previously reported to Mr. McDonald by fax on August 10, 1990.

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SUMMARY AND CONCLUSIONS

1. SAMPLE PREPARATION

Thirteen ~~Vangorda~~ ^{FARO III} and four ~~FARO III~~ ^{VANGORDA} ore samples were received by Lakefield Research on July 9, 1990 and designated with LR #9034628. Total sample weight was about 150 kg.

Each sample was crushed, if required, to approximately 95% minus 19 mm (i.e. crushed as coarse as possible to reduce the production of fines). Each sample was then blended and a one kilogram sample split by riffing. (No direct head assay was performed on the samples).

A list of the samples follows:

VANGORDA:	2A4	2E4	LG "A"	June 8 mill feed
	2AQ	2EC	LG "C"	June 25 mill feed
	2BCD	2EQ		
		2F4	LG "LL"	June 27 mill feed
VANGORDA:	4A			
FARO:	4C			
	4E			
	4G			

The calculated head values calculated from the separation results are shown in Table No. 1.

TABLE NO. 1 : Calculated Head Assays

Ore	Sample Number	Assays %, g/t			
		Pb	Zn	Ag	Au
Vangorda FARO III	2A4	1.99	7.99	27.8	-
	2AQ	0.32	0.92	10.9	-
	2BCD	1.60	3.59	38.2	-
	2E4	2.58	3.40	32.3	-
	2EC	0.02	0.02	0.71	-
	2EQ	0.31	0.27	3.61	-
	2F4	5.96	11.2	29.8	-
	LG "A"	2.06	3.31	13.0	-
	LG "C"	1.98	2.61	29.0	-
	LG "LL"	1.51	2.72	24.8	-
	June 8 mill feed	2.44	4.33	26.8	-
	June 25 mill feed	3.69	5.77	51.2	-
	June 27 mill feed	3.13	5.61	25.3	-
VANGORDA FARO III	4A	3.88	8.12	60.2	0.63
	4C	0.65	0.85	0.40	13.4
	4E	4.75	6.10	64.1	0.62
	4G	4.96	7.14	78.5	0.94

?

Summary - Continued

2. HEAVY LIQUID SEPARATION

The separation procedure was as follows:

- separation in a beaker at a specific gravity of 2.8 g/cc with methylene iodide diluted with acetone of the coarse material, with a similar separation of the fines (i.e. powder) in a separatory funnel.
- the sinks of the 2.8 g/cc separation were similarly treated successively at specific gravity levels of 3.0 and 3.3 g/cc.
- all products were washed, dried, and assayed for Pb, Zn and Ag. The ~~base~~^{VANGORDA} samples were also assayed for Au.

Test results are presented in Table No. 2, and showed the following:

- None of the ore samples tested were significantly upgraded. Concentration ratios were generally less than 2. Sample 2AQ had higher ratios of 3.5-6, but the ore was very low grade and recoveries into the sink fractions were quite low. Samples 2A4 and 2BCD upgraded better than the other samples. Pb and Ag concentration ratios were 2.3-3.6, with recoveries of 20-60% in about 10-27% of the weight.
- Metal recoveries ranged from about 10-99% in the sink fractions, with weight recoveries of 2 to 97 %.

The general upgrading characteristics are summarized below in groups:

2A - 2B (VANGORDA ^{FARO II} 2A4, 2AQ, 2BCD)

Some limited upgrading resulted with modest metal recoveries.

2E-2F (VANGORDA ^{FARO III} 2E4, 2EC, 2EQ, 2F4)

Virtually all of each sample reported to the 3.3 g/cc sink product.

LG (VANGORDA ^{FARO III} LG "A", LG "C", LG "L")

Upgrading was limited with concentration ratios of less than 2.0. Metal recoveries were over 60-90 % in 35-40 % of the weight.

Summary -Continued

~~FABO III~~
Mill Feeds (~~Vangerda~~ June 8, 25, and 27)

Upgrading was very limited, with concentration ratios of less than 1.6. Metal recoveries were less than 80 % in 55-65 % of the weight for June 8, and 25. Virtually all the sample for June 27 reported to the 3.3 g/cc sink.

~~VANGORDA~~
4 (~~FABO III~~ 4A, 4C, 4E, 4G)

Upgrading was limited with concentration ratios of less than 2. Recoveries were 55-98 % of the weight in 30-86 % of the weight for samples 4A, 4C and 4E. Virtually all of Sample 4G reported to the 3.3 g/cc sink.

3. CONCLUSIONS

Heavy liquid separation of coarse (95 % -19 mm) samples at specific gravity values of 2.8-3.3 resulted in limited upgrading in some samples. Further heavy media testwork would not appear worthwhile.

TABLE NO. 2

RESULTS

Test No. 2F4

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	974.3	97.84	6.04	11.40	30.3	-	98.9	99.3	99.2	-
2. -3.3 S.G. +3.0 S.G.	13.6	1.37	3.53	4.12	12.3	-	0.8	0.5	0.6	-
3. -3.0 S.G. +2.8 S.G.	4.0	0.40	2.57	3.01	10.6	-	0.2	0.1	0.1	-
4. -2.8 S.G.	5.7	0.57	0.86	1.09	4.7	-	0.1	0.1	0.1	-
Head Calc.	997.6	100.18	5.96	11.21	29.83	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	99.21	6.01	11.30	30.05	-	99.7	99.8	99.8	-
Products 1to3	99.61	5.99	11.27	29.97	-	99.9	99.9	99.9	-

Test No. 4A

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	285.4	28.66	7.52	16.10	111.2	0.91	55.5	56.9	53.0	41.1
2. -3.3 S.G. +3.0 S.G.	330.4	33.18	3.66	7.76	59.0	0.60	31.3	31.7	32.5	31.4
3. -3.0 S.G. +2.8 S.G.	262.4	26.35	1.66	3.12	28.1	0.55	11.3	10.1	12.3	22.9
4. -2.8 S.G.	116.9	11.74	0.63	0.84	11.3	0.25	1.9	1.2	2.2	4.6
Head Calc.	995.1	99.93	3.88	8.12	60.22	0.63	100.0	100.0	100.0	100.0

Comb. Prod.

Products 1+2	61.84	5.45	11.63	83.19	.74	86.8	88.6	85.5	72.5
Products 1to3	88.19	4.32	9.08	66.73	.69	98.1	98.8	97.8	95.4

Test No. 4C

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	555.6	55.79	0.74	0.89	0.5	14.60	64.6	59.4	71.7	61.7
2. -3.3 S.G. +3.0 S.G.	200.4	20.12	0.59	1.05	0.3	12.80	18.6	25.3	14.0	19.5
3. -3.0 S.G. +2.8 S.G.	153.4	15.40	0.53	0.66	0.3	12.90	12.8	12.2	12.7	15.1
4. -2.8 S.G.	68.8	6.91	0.38	0.38	0.1	7.10	4.1	3.1	1.6	3.7
Head Calc.	978.2	98.23	0.65	0.85	0.40	13.44	100.0	100.0	100.0	100.0

Comb. Prod.

Products 1+2	75.92	0.70	0.93	0.44	14.12	83.1	84.7	85.7	81.2
Products 1to3	91.32	0.67	0.89	0.42	13.92	95.9	96.9	98.4	96.3

Test No. 4E4

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	765.7	76.89	5.58	7.06	74.9	0.72	90.7	89.4	90.3	89.8
2. -3.3 S.G. +3.0 S.G.	90.4	9.08	3.74	4.76	50.3	0.33	7.2	7.1	7.2	4.9
3. -3.0 S.G. +2.8 S.G.	56.5	5.67	1.13	2.62	17.6	0.28	1.4	2.4	1.6	2.6
4. -2.8 S.G.	78.5	7.88	0.47	0.80	7.9	0.22	0.8	1.0	1.0	2.8
Head Calc.	991.1	99.53	4.75	6.10	64.08	0.62	100.0	100.0	100.0	100.0

Comb. Prod.

Products 1+2	85.97	5.39	6.82	72.30	.68	97.9	96.5	97.5	94.6
Products 1to3	91.64	5.12	6.56	68.92	.65	99.2	99.0	99.0	97.2

Removal 15%

Test No. 4G

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	954.3	95.83	5.07	7.28	80.3	0.96	99.6	99.4	99.6	99.7
2. -3.3 S.G. +3.0 S.G.	5.2	0.52	2.60	4.42	30.2	0.28	0.3	0.3	0.2	0.2
3. -3.0 S.G. +2.8 S.G.	7.6	0.76	0.73	1.89	12.5	0.12	0.1	0.2	0.1	0.1
4. -2.8 S.G.	12.3	1.24	0.22	0.64	3.0	0.02	0.1	0.1	0.0	0.0
Head Calc.	979.4	98.35	4.96	7.14	78.54	0.94	100.0	100.0	100.0	100.0

AG

Comb. Prod.

Products 1+2	96.35	5.06	7.26	80.03	.96	99.8	99.7	99.8	99.9
Products 1to3	97.12	5.02	7.22	79.50	.95	99.9	99.9	100.0	100.0

Test No. 2E4

Product	Weight		Assays,%/g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	995.8	100.00	2.58	3.40	32.3	-	100.0	100.0	100.0	-
2. -3.3 S.G. +3.0 S.G.	0.0	0.00				-	0.0	0.0	.0	-
3. -3.0 S.G. +2.8 S.G.	0.0	0.00				-	0.0	0.0	.0	-
4. -2.8 S.G.	0.0	0.00				-	0.0	0.0	.0	-
Head Calc.	995.8	100.00	2.58	3.40	32.30	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	100.00	2.58	3.40	32.30	-	100.0	100.0	100.0	-
Products 1to3	100.00	2.58	3.40	32.30	-	100.0	100.0	100.0	-

Test No. 2A4

Product	Weight		Assays,%/g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	94.3	9.47	6.20	18.20	77.7	-	30.0	21.9	26.9	-
2. -3.3 S.G. +3.0 S.G.	88.9	8.93	2.58	10.50	32.3	-	11.8	11.9	10.5	-
3. -3.0 S.G. +2.8 S.G.	432.4	43.42	1.61	8.69	23.7	-	35.7	48.0	37.6	-
4. -2.8 S.G.	365.1	36.66	1.21	3.91	18.6	-	22.6	18.2	24.9	-
Head Calc.	980.7	98.48	1.99	7.99	27.77	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	18.40	4.44	14.46	55.67	-	41.7	33.8	37.4	-
Products 1to3	61.82	2.45	10.41	33.21	-	77.4	81.8	75.1	-

Test No. 2EC

Product	Weight		Assays,%/g/t				% Distribution			
	g	%	Pb	Zn	Ag*	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	517.4	51.96	0.019	0.032	0.9	-	50.1	70.3	66.0	-
2. -3.3 S.G. +3.0 S.G.	276.8	27.80	0.019	0.014	0.5	-	26.8	16.4	19.6	-
3. -3.0 S.G. +2.8 S.G.	160.7	16.14	0.023	0.016	0.5	-	18.8	10.9	11.4	-
4. -2.8 S.G.	42.2	4.24	0.020	0.013	0.5	-	4.3	2.4	3.0	-
Head Calc.	997.1	100.13	0.02	0.02	0.71	-	100.0	100.0	100.0	-

*All assays of 0.5 are < 0.5 g/t Ag

Comb. Prod.

Products 1+2	79.75	0.02	0.03	0.76	-	76.9	86.7	85.6	-
Products 1to3	95.89	0.02	0.02	0.72	-	95.7	97.6	97.0	-

Test No. June 27 Mill Feed

Product	Weight		Assays,%/g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	967.6	97.17	3.20	5.70	25.7	-	99.3	98.8	98.9	-
2. -3.3 S.G. +3.0 S.G.	8.1	0.81	1.10	6.30	11.4	-	0.3	0.9	0.4	-
3. -3.0 S.G. +2.8 S.G.	1.8	0.18	0.86	2.09	10.3	-	0.0	0.1	0.1	-
4. -2.8 S.G.	17.4	1.75	0.64	0.69	9.9	-	0.4	0.2	0.7	-
Head Calc.	994.9	99.91	3.13	5.61	25.28	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	97.98	3.18	5.70	25.58	-	99.6	99.7	99.2	-
Products 1to3	98.16	3.18	5.70	25.55	-	99.6	99.8	99.3	-

Test No. 2AG

Product	Weight		Assays,%/g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	17.3	1.74	1.75	3.26	64.8	-	9.6	6.2	10.4	-
2. -3.3 S.G. +3.0 S.G.	22.6	2.27	1.43	4.20	45.7	-	10.2	10.4	9.6	-
3. -3.0 S.G. +2.8 S.G.	205.4	20.63	0.36	2.58	21.7	-	23.4	58.0	41.3	-
4. -2.8 S.G.	747.6	75.08	0.24	0.31	5.6	-	56.8	25.4	38.8	-
Head Calc.	992.9	99.71	0.32	0.92	10.87	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	4.01	1.57	3.79	53.98	-	19.8	16.6	19.9	-
Products 1to3	24.63	0.56	2.78	26.95	-	43.2	74.6	61.2	-

Test No. 2BCD

Product	Weight		Assays,%/g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	104.0	10.44	3.65	5.57	113.3	-	23.9	16.3	31.1	-
2. -3.3 S.G. +3.0 S.G.	164.9	16.56	2.90	4.47	68.8	-	30.1	20.7	30.0	-
3. -3.0 S.G. +2.8 S.G.	522.3	52.45	1.17	3.52	23.3	-	38.5	51.6	32.1	-
4. -2.8 S.G.	200.5	20.13	0.60	2.02	12.8	-	7.6	11.4	6.8	-
Head Calc.	991.7	99.59	1.60	3.59	38.18	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	27.00	3.19	4.90	86.01	-	54.0	37.0	61.1	-
Products 1to3	79.45	1.86	3.99	44.61	-	92.4	88.6	93.2	-

Test No. 2EQ

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	926.7	93.06	0.32	0.27	3.6	-	97.0	94.8	93.9	-
2. -3.3 S.G. +3.0 S.G.	34.4	3.45	0.16	0.24	3.4	-	1.8	3.1	3.3	-
3. -3.0 S.G. +2.8 S.G.	10.1	1.01	0.18	0.32	5.4	-	0.6	1.2	1.5	-
4. -2.8 S.G.	13.6	1.37	0.14	0.17	3.3	-	0.6	0.9	1.3	-
Head Calc.	984.8	98.90	0.31	0.27	3.61	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	96.52	0.31	0.27	3.59	-	98.8	97.9	97.2	-
Products 1to3	97.53	0.31	0.27	3.61	-	99.4	99.1	98.7	-

Test No. June 8/90

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	547.9	55.02	3.56	5.66	32.3	-	82.4	74.0	68.2	-
2. -3.3 S.G. +3.0 S.G.	98.7	9.91	1.62	4.63	27.8	-	6.8	10.9	10.6	-
3. -3.0 S.G. +2.8 S.G.	152.6	15.32	0.92	2.64	21.9	-	5.9	9.6	12.9	-
4. -2.8 S.G.	169.2	16.99	0.68	1.35	12.7	-	4.9	5.5	8.3	-
Head Calc.	968.4	97.25	2.44	4.33	26.78	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	64.93	3.26	5.50	31.61	-	89.2	84.9	78.8	-
Products 1to3	80.26	2.82	4.96	29.76	-	95.1	94.5	91.7	-

Test No. June 25/90

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	526.7	52.89	5.86	8.81	76.5	-	83.6	80.3	78.6	-
2. -3.3 S.G. +3.0 S.G.	81.7	8.20	2.08	3.76	41.8	-	4.6	5.3	6.7	-
3. -3.0 S.G. +2.8 S.G.	216.4	21.73	1.62	3.06	25.4	-	9.5	11.5	10.7	-
4. -2.8 S.G.	176.2	17.69	0.49	0.94	11.6	-	2.3	2.9	4.0	-
Head Calc.	1001.0	100.52	3.69	5.77	51.20	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	61.10	5.35	8.13	71.84	-	88.2	85.7	85.3	-
Products 1to3	82.83	4.37	6.80	59.66	-	97.7	97.1	96.0	-

Test No. LG "LL"

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	395.7	39.74	2.69	4.16	39.4	-	71.4	61.3	63.6	-
2. -3.3 S.G. +3.0 S.G.	127.3	12.78	1.13	3.73	20.1	-	9.7	17.7	10.4	-
3. -3.0 S.G. +2.8 S.G.	295.6	29.68	0.77	1.66	18.0	-	15.3	18.3	21.7	-
4. -2.8 S.G.	169.9	17.06	0.32	0.44	6.1	-	3.6	2.8	4.2	-
Head Calc.	988.5	99.27	1.51	2.72	24.79	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	52.52	2.31	4.06	34.70	-	81.1	79.0	74.1	-
Products 1to3	82.21	1.75	3.19	28.67	-	96.4	97.2	95.8	-

Test No. LG "C"

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	336.6	33.80	4.43	5.26	61.2	-	76.4	68.9	72.0	-
2. -3.3 S.G. +3.0 S.G.	63.4	6.37	1.50	2.12	27.8	-	4.9	5.2	6.2	-
3. -3.0 S.G. +2.8 S.G.	373.7	37.53	0.76	1.45	12.5	-	14.6	21.1	16.3	-
4. -2.8 S.G.	212.0	21.29	0.38	0.58	7.5	-	4.1	4.8	5.6	-
Head Calc.	985.7	98.99	1.98	2.61	29.04	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	40.17	3.97	4.76	55.91	-	81.3	74.1	78.1	-
Products 1to3	77.70	2.42	3.16	34.94	-	95.9	95.2	94.4	-

Test No. LG "A"

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1. +3.3 S.G.	683.3	68.62	2.71	4.18	12.2	-	90.5	87.0	64.4	-
2. -3.3 S.G. +3.0 S.G.	21.0	2.11	1.15	2.47	14.1	-	1.2	1.6	2.3	-
3. -3.0 S.G. +2.8 S.G.	116.4	11.69	0.75	2.10	16.4	-	4.3	7.4	14.7	-
4. -2.8 S.G.	171.6	17.23	0.48	0.77	14.0	-	4.0	4.0	18.6	-
Head Calc.	992.3	99.65	2.06	3.31	13.04	-	100.0	100.0	100.0	-

Comb. Prod.

Products 1+2	70.73	2.66	4.13	12.26	-	91.7	88.5	66.7	-
Products 1to3	82.42	2.39	3.84	12.84	-	96.0	96.0	81.4	-