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An Investigation of
THE RECOVERY OF GOLD
from samples
submitted by
TECK CORPORATION LIMITED
Progress Report No. 1

Project No. 3027

NOTE:

This report refers to the samples as received.

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LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
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I N T R O D U C T I O N

This report contains the results of testwork conducted on Mount Calvery project samples as requested by Mr. C. Sibbald, Teck Corporation Limited. The program involved flotation, carbon-in-leach and cyanidation with preoxidation tests to investigate the recovery of gold. The results were given to Mr. Sibbald when they became available.

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1. Head Analysis

A representative sample of Composite 1 was removed for analysis:

Gold: 4.47 g/t Au
 Organic Carbon: 1.85 % C
 Sulphur: 2.29 % S
 Iron: 3.90 % Fe

2. Flotation Testwork

Flotation tests were conducted to examine the effect of pH on the recovery of a sulphide concentrate. The samples were ground to 75 % minus 200 mesh. Sulphuric acid was used as the pH modifier and PAX was applied as collector. Test No. 8 was performed to investigate the flotation at the natural pH of the pulp, 7.8. In this test, copper sulphate and PAX were applied but were ineffective in recovering the sulphide minerals. After 17 minutes of rougher flotation time, the pH was lowered. The results of these tests are summarized in Table No. 1.

Table No. 1 - Flotation Results

Test No.	H ₂ SO ₄ g/t	pH Range	CuSO ₄ kg/t	Product	Weight %	Assay, g/t		% Distribution	
						Au		Au	
2	210	4 - 6.8	-	Cleaner Conc.	17.5	19.5		95.5	
				Rougher Conc.	31.9	10.8		96.8	
				Rougher Tail.	68.1	0.17		3.2	
				Head(Calc.)	100.0	3.57		100.0	
6	2015	3.5 - 4	-	Cleaner Conc.	18.2	25.0		96.3	
				Rougher Conc.	33.7	13.7		97.4	
				Rougher Tail.	66.3	0.19		2.6	
				Head (Calc.)	100.0	4.73		100.0	
8	287	4 - 7.5	0.75	Cl. Conc.	20.0	19.4		93.3	
				Ro. Conc.	42.6	8.60		97.0	
				Ro. Tail.	57.4	0.23		3.0	
				Head (Calc.)	100.0	4.07		100.0	

Summary - Continued

2. Flotation Testwork - Cont'd

Although some acid was beneficial in recovering the sulphides, maintaining the low pH in Test No. 6 did not reduce the gold tailing assay. The organic carbon analysis of the cleaner concentrate from tests 2 and 6 was 6.9 % and 6.7 % respectively. The increased weight recovery in test No. 8 may be due to the copper sulphate addition and initial flotation at the natural pH. Further testwork should be directed towards reducing the weight of final concentrate to produce a cleaner product for leaching.

3. Carbon-In-Leach Testwork

3.1. Direct Carbon-In-Leach

Two tests were performed on Composite 1 to investigate the recovery of gold by cyanide leaching in the presence of carbon. The effect of fineness of grind was briefly examined. The cyanide concentration was maintained at 1 g/L NaCN and the pH at 10.5 throughout the 48-hour retention time. 10 g/L preattritioned carbon were added at the start of the test and were replaced with fresh carbon at predetermined times. The results are presented in Table No. 2.

Table No. 2 - Carbon-In-Leach

Test No.	% -200 Mesh	Reagent Cons., kg/t		% Adsorption Au	Residue g/t Au	Head g/t Au
		NaCN	CaO			
1	76	1.73	0.77	49.7	2.08	4.16
7	92	2.46	0.82	66.3	1.51	4.52

Increasing the fineness of grind from 76 % to 92 % minus 200 mesh improved the recovery of gold by direct carbon-in-leach of the ore from 50 % to 66 %.

Summary - Continued

3.2. Carbon-In-Leach of the Flotation Concentrate

The recovery of gold from the flotation concentrate was investigated using the carbon-in-leach method. The cleaner concentrates from tests 2 and 8 were reground in a pebble mill and leached for 48 hours with 1 g/L NaCN and 10 g/L carbon. The carbon was replaced periodically. The results are summarized below.

Table No. 3

Carbon-In-Leach Results of Concentrate

Test No.	Weight % of ore	% -400 Mesh	Reag. Cons. kg/t ore		% Au Recovery		Residue g/t Au	Head (Calc.), g/t Au	
			NaCN	CaO	CIL	O'all		Conc.	Ore
3	17.5	96	0.79	0.22	92.0	87.9	1.54	19.5	3.57
9	20.0	98	0.62	0.25	93.5	87.2	1.24	19.4	4.16

The finer grind in test No. 9 resulted in a slightly higher recovery of gold in the carbon-in-leach stage and reduced the residue assay from 1.5 to 1.2 g/t Au. Because the recovery of gold to the flotation concentrate was 2 % lower than in the feed to test No. 3, the overall gold recovery was similar in both tests.

Summary - Continued

4. Preoxidation and Cyanidation

Tests were conducted to investigate the effect of preoxidation with air and chlorine on the recovery of gold by cyanidation. The samples were ground to 76 % minus 200 mesh. 25 kg/t Na₂CO₃ were added and the samples were aerated at 75°C for 18 hours. The pulp was diluted from 50 % to 40 % solids and the temperature was reduced to 55°C. Chlorine was added over a 12 hour period. The samples were then transferred to bottles and leached for 48 hours in a 0.5 g/L NaCN, pH 10.5 solution. The results are given in Table No. 4.

Table No. 4 - Cyanidation Results

Test No.	Chlorination		Reagent Cons., kg/t		% Recovery Au	Residue g/t Au	Head g/t Au
	kg/t Cl ₂	Final pH	NaCN	CaO			
4	25	6.2	0.24	3.32	66.3	1.64	4.87
5	50	5.9	0.18	5.22	63.6	1.29	3.54

Because of the variation in the calculated head assays, the effect of increasing the chlorine addition cannot be quantified. The addition of the preoxidation stages improved the recovery of gold from the ore from 50 % by carbon-in-leach to approximately 65 %.

SAMPLE PREPARATION

On August 23, 1985, five pails containing 25 Mount Calvery project samples were received at Lakefield Research and given our Reference Number 8525553. Sample Number 26067 was stored. Each of the remaining samples was riffled in half. Composite 1 was prepared by combining one half of these samples while the remaining half was stored. The composite was crushed to minus 10 mesh. A head sample and test charges were prepared.

A list of the samples received is given below:

25506	26053	26331	26341	26436
25508	26055	26333	26343	26544
25510	26059	26335	26433	26546
25512	26063	26337	26434	26548
26051	26067	26339	26435	26555

DETAILS OF TESTS

Test No. 1

Purpose: To investigate the effect of carbon adsorption of gold with the carbon changed at 8, 24, and 32 hours.

Procedure: The sample was pulped with water into a 2.5 litre bottle. NaCN and lime and carbon were added. Cyanidation was then carried out on the rolls for one 48hour stage with the carbon being changed at 8, 24 and 32 hours. The carbon was then screened out at 48 hours and the pulp was filtered and washed three times with water.

Feed: 500 g Composite 1 -10 mesh.

Solution Volume: 611 mL Pulp Density 45 % solids

Solution Composition: 1.0 g/L NaCN

pH Range: 10.5-11 with Ca(OH)₂

Carbon: 10 g/L preatrittioned +20 Mesh GRC 22 carbon

Grind: 1 kg sample ground in the laboratory ball mill at 50 % solids for 7 minutes.

Reagent Balance:

Time Hours	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
	NaCN	Ca(OH) ₂	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0-2	0.64	0.30	0.61	0.23	0.43	0	0.18	0.23	11.0-10.3
2-4	0.19	0.10	0.18	0.08	0.61	0.01	0	0.07	11.0-10.6
4-8	0	0.05	0	0.04	0.43	0.01	0.18	0.04	11.0-10.8
8-24	0.19	0	0.18	0	0.37	0	0.24	0.01	10.8-10.5
24-32	0.25	0.05	0.24	0.04	0.43	0.01	0.18	0.03	11.0-10.6
32-48	0.19	0.05	0.18	0.04	0.54	0.05	0.07	0	11.0-10.8
Total	1.46	0.55	1.39	0.43	0.54	0.05	0.85	0.38	-

Reagent Consumption (kg/t of cyanide feed) NaCN: 1.73 CaO: 0.77

Test No. 1 - Continued

Metallurgical Results

Product	Amount	Assays, g/t, mg/L, mg/g	% Distribution
		Au	Au
1. 8 h Carbon	7.2 g	0.073	25.8
2. 24 h Carbon	6.3 g	0.050	15.5
3. 32 h Carbon	6.2 g	0.011	3.3
4. 48 h Carbon	6.1 g	0.017	5.1
5. 48 h Barren Sol'n	1865 mL	0.003	0.3
6. 48 h Cyanide Res.	490.5 g	2.08	50.0
Head (Calculated)	490.5 g	4.16	100.0

Calculated Grades and Recoveries

Products 1 and 2	13.5	0.062	41.3
Products 1 to 3	19.7	0.051	44.6
Products 1 to 4	25.8	0.039	49.7
Products 1 to 5			50.0

Screen Analyses

Cyanide Residue

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 35	0.4	0.4	99.6
48	0.6	1.0	99.0
65	2.0	3.0	97.0
100	4.4	7.4	92.6
150	7.6	15.0	85.0
200	9.3	24.3	75.7
270	9.0	33.3	66.7
400	9.0	42.3	57.7
- 400	57.7	100.0	-
Total	100.0	-	-

Test No. 2

Purpose: To prepare a cleaner concentrate for cyanidation.
 Procedure: As below.
 Feed: 2 kg -10 mesh Composite 1
 Grind: 2 kg ground in the laboratory ball mill at 65 % solids for 14 minutes.
 Conditions:

Stage	Reagents Added, grams per tonne			Time, minutes			pH
	A350	H ₂ SO ₄	MIBC	Grind	Cond.	Froth	
Rougher 1	25	1400	-	-	-	-	7.7
	-	-	4	-	-	6	4.0
Rougher 2	25	-	22	-	1	15	-
Rougher 3	25	-	6	-	1	4	-
Rougher 4	25	-	8	-	1	4	-
Rougher 5	25	-	10	-	1	5	-
Rougher 6	25	-	-	-	1	5	-
1st Cleaner	-	-	-	-	-	-	6.8
	-	500	-	-	1	8	4.0
	10	-	10	-	1	7	-
	10	-	6	-	-	5	-
2nd Cleaner	-	-	-	-	-	-	6.8
	-	200	6	-	-	15	4
	5	-	4	-	-	3	-

Stage	Rougher	1st Cleaner	2nd Cleaner
Flotation Cell	1000	500	250
Speed: r.p.m.	1800	1500	900

Test No. 2 - Continued

Metallurgical Results

Product	Weight	Assays, g/t	% Distribution
	%	Au	Au
1. Cleaner Conc.	17.47	19.52	95.5
2. 2nd Cl. Tail.	4.31	0.57	0.7
3. 1st Cl. Tail.	10.15	0.22	0.6
4. Rougher Tail.	68.07	0.17	3.2
Head (Calc.)	100.00	3.57	100.0

Calculated Grades and Recoveries

Products 1 and 2	21.78	15.8	96.2
Products 1 to 3	31.93	10.8	96.8

Test No. 3

Purpose: To investigate the gold recovery from a cleaner concentrate by carbon-in-leach.

Procedure: The sample was pulped into a 2.5 litre bottle with water. NaCN, lime and carbon were added and cyanidation was carried out on the roll in one 48 hour stage. The carbon was changed at 7, 24 and 32 hours and replaced with fresh carbon. The pulp was filtered and the residue washed several times with water.

Feed: 380 g cleaner concentrate (from test No. 2).

Solution Volume: 772 mL **Pulp Density** 33 % solids

Solution Composition: 1.0 g/L NaCN

pH Range: 10.5-11 with Ca(OH)₂

Carbon: 10 g/L preatrittioned +20 M GRC 22 Carbon

Grind: 380 grams of sample ground in the laboratory pebble mill at 50 % solids for 25 minutes.

Reagent Balance:

Time Hours	Added, Grams				Residual		Consumed		pH	O ₂ mg/L
	Actual		Equivalent		Grams		Grams			
	NaCN	Ca(OH) ₂	NaCN	CaO	NaCN	CaO	NaCN	CaO		
0-1	0.81	0.25	0.77	0.19	0.41	0	0.36	0.19	11.0-10.0	-
1-4	0.38	0.10	0.36	0.08	0.39	0	0.38	0.08	10.8-10.2	6- 8.8*
4-7	0.40	0.10	0.38	0.08	0.58	0.03	0.19	0.05	11.1-10.8	-
7-24	0.20	0.05	0.19	0.04	0.31	0	0.46	0.07	11.0-10.6	7.6
24-32	0.48	0.05	0.46	0.04	0.70	0.02	0.07	0.02	11.0-10.6	-
32-48	0.07	0.05	0.07	0.04	0.69	0.04	0.08	0.02	10.9-10.6	7.8
Total	2.34	0.60	2.23	0.47	0.69	0.04	1.54	0.43	-	-

* The oxygen level was raised by an air sparge

Reagent Consumption (kg/t of cyanide feed) NaCN: 4.52 CaO: 1.26

Test No. 3 - Continued

Metallurgical Results

Product	Amount	Assays g/t,mg/g,mg/L	% Distribution Au	
		Au	Ind.	O'all
1. 7 Hour Carbon	10.9 g	0.529	86.7	82.8
2. 24 Hour Carbon	7.7 g	0.032	3.7	3.5
3. 32 Hour Carbon	7.6 g	0.007	0.8	0.8
4. 48 Hour Carbon	7.9 g	0.007	0.8	0.8
5. 48 h Barren Sol'n	2020 mL	0.002	0.1	0.1
5. 48 h Cyanide Residue	340.5 g	1.54	7.9	7.5
Head (Calculated)	340.5 g	19.52	100.0	95.5

Calculated Grades and Recoveries

Products 1 and 2	18.6	-	90.4	86.3
Products 1 to 3	26.2	-	91.2	87.1
Products 1 to 4	34.1	-	92.0	87.9
Products 1 to 5	-	-	92.1	88.0

Screen Analyses

Cyanide Residue

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 150	0.2	0.2	99.8
200	0.3	0.5	99.5
270	0.8	1.3	98.7
400	2.4	3.7	96.3
- 400	96.3	100.0	-
Total	100.0	-	-

Test No. 4

Aeration, Chlorination, Cyanidation

Purpose: To investigate the effect of aeration and chlorination prior to cyanidation on the gold extraction.

Procedure: The sample was pulped to 50 % solids with water into a 2.5 litre resin kettle. A mechanical mixer was used for agitation. The pulp was then heated to 75°C using a heating jacket. Na₂CO₃ was added and aeration was carried out for 18 hours, with an air flowrate of 670 mL/min.

The pulp was then diluted to 40 % solids, the temperature was lowered to 55°C and Cl₂ was then added (as Ca(OCl)₂) over a period of 12 hours.

The sample was then transferred to a 2.5 litre bottle. NaCN and lime were added and cyanidation was carried out on the rolls for one 48 hour stage. The sample was then filtered and washed three times with water.

Feed: 500 grams Composite No. 1 -10 mesh

Grind: 1 kg sample ground in the laboratory ball mill at 50 % solids for 7 minutes.

1. Aeration Stage

Solution Volume: 500 mL	Pulp Density: 50 % solids
Na ₂ CO ₃ : 25 kg/t	Initial pH: 10.3
Temp.: 75°C	Final pH: 10.5

2. Chlorination Stage

Solution Volume: 750 mL	Pulp Density: 40 % solids
Cl ₂ : 25 kg/t (in 12 additions of 1.04 g Cl ₂ /h)	Initial pH: 10.5
Temp.: 55°C	Final pH: 6.2

3. Cyanidation Stage

Solution Volume: 929 mL	Pulp Density: 35 % solids
Solution Comp.: add 1.0 g/L NaCN but maintain 0.5 g/L pH Range: 10.5-11 with Ca(OH) ₂	

Test No. 4 - Continued

Reagent Balance:

Time Hours	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
	NaCN	Ca(OH) ₂	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0-12	0.98	1.85	0.93	1.41	0.85	0	0.08	1.41	10.7-10.3
12-20	-	0.17	-	0.13	0.81	0	0.04	0.13	10.9-10.7
20-36	-	0.10	-	0.08	0.81	0	0.00	0.08	11.0-10.7
36-48	-	0.08	-	0.06	0.81	0.02	0.00	0.04	11.0-10.7
Total	0.98	2.20	0.93	1.68	0.81	0.02	0.12	1.66	-

Reagent Consumption(kg/t of cyanide feed) NaCN: 0.24 CaO: 3.32

Metallurgical Results

Product	Amount	Assays, mg/L, g/t	% Distribution
		Au	Au
Preg+Wash Solution	1940 mL	0.83	66.3
48 h Cyanide Residue	498.0 g	1.64	33.7
Head (Calculated)	498.0 g	4.87	100.0

Test No. 5

Aeration, Chlorination and Cyanidation

Purpose: As for test No. 4 but with a higher amount of Cl₂ added to the chlorination stage.

Procedure: As for test No. 4.

Feed: 500 g -10 mesh Composite No. 1.

Grind: 1 kg ground in the laboratory ball mill at 50 % solids for 7 minutes.

1. Aeration Stage

Solution Volume: 500 mL

Na₂CO₃: 25 kg/t

Temp.: 75°C

Pulp Density: 50 % solids

pH Initial: 10.4

pH Final: 10.7

2. Chlorination Stage

Solution Volume: 750 mL

Cl₂: 50 kg/t (in 12 additions of 2.08 g Cl₂/h)

Temp.: 55°C

Pulp Density: 40 % solids

pH Initial: 10.7

pH Final: 5.9

3. Cyanidation Stage

Solution Volume: 929 mL

Solution Composition: add 1.0 g/L NaCN but maintain at 0.5 g/L
pH Range: 10.5-11 with Ca(OH)₂

Pulp Density: 35 % solids

Test No. 5 - Continued

Reagent Balance:

Time Hours	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
	NaCN	Ca(OH) ₂	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0-12	0.98	3.00	0.93	2.28	0.88	0	0.05	2.28	10.7-10.2
12-20	-	0.22	-	0.17	0.84	0	0.04	0.17	10.9-10.7
20-36	-	0.20	-	0.15	0.84	0	0	0.15	11.0-10.6
36-48	-	0.20	-	0.15	0.84	0.14	0	0.01	11.0-10.8
Total	0.98	3.62	0.93	2.75	0.84	0.14	0.09	2.61	-

Reagent Consumption (kg/t of cyanide feed) NaCN: 0.18 CaO: 5.22

Metallurgical Results

Product	Amount	Assays, mg/L, g/t	% Distribution
		Au	Au
1. Preg+Wash Solution	2000 mL	0.57	63.6
2. 48 h Cyanide Residue	505.7 g	1.29	36.4
Head (Calculated)	505.7 g	3.54	100.0

Test No. 6

Purpose: To repeat test No. 2 but maintain the pH below 4 using H₂SO₄.

Procedure: As noted below.

Feed: 2 kg -10 mesh Composite No. 1.

Grind: 2 kg ground in the laboratory ball mill at 65 % solids for 14 minutes.

Conditions:

Stage	Reagents Added, grams per tonne			Time, minutes			pH
	A350	H ₂ SO ₄	MIBC	Grind	Cond.	Froth	
Rougher 1	25	-	-	-	-	-	7.7
	-	14600	-	-	15	2	4.0-3.5
Rougher 2	25	1500	32	-	1	15	4.0-3.5
Rougher 3	25	500	8	-	1	4	4.0-3.5
Rougher 4	25	500	8	-	1	4	4.2-3.5
Rougher 5	25	750	10	-	1	5	4.4-3.5
Rougher 6	25	750	10	-	1	5	4.2-3.5
1st Cleaner	-	-	-	-	-	-	5.8
	-	850	-	-	-	8	3.5
	10	250	10	-	-	7	4.0-3.5
	10	250	6	-	-	5	4.0-3.5
2nd Cleaner	-	100	6	-	-	15	4.2-3.5
	5	100	4	-	-	3	4.2-3.5

Stage	Rougher	1st Cleaner	2nd Cleaner
Flotation Cell	1000	500	250
Speed: r.p.m.	1800	1500	900

Test No. 6 - Continued

Metallurgical Results

Product	Weight	Assays, g/t	% Distribution
	%	Au	Au
1. 2nd Cleaner Conc.	18.24	25.0	96.3
2. 2nd Cleaner Tail.	3.24	0.46	0.3
3. 1st Cleaner Tail.	12.21	0.30	0.8
4. Rougher Tail.	66.31	0.19	2.6
Head (Calculated)	100.00	4.73	100.0

Calculated Grades and Recoveries

Products 1 and 2	21.48	21.3	96.6
Products 1 to 3	33.69	13.7	97.4

Test No. 7

Purpose: To investigate the effect of carbon adsorption of gold with the carbon changed at 8 and 24 hours at a finer grind.

Procedure: The sample was pulped with water in a 2.5 litre bottle. NaCN, lime and carbon were added and the cyanidation was carried out on rolls in one 48 hour stage. The carbon was changed at 8 and 24 hours. The carbon was screened at 48 hours and the residue washed three times with water.

Feed: 500 g Composite 1.

Solution Volume: 611 mL Pulp Density 45 % solids

Solution Composition: 1.0 g/L NaCN

pH Range: 10.5-11 with Ca(OH)₂

Carbon: 10 g/L Preattritioned carbon (GRC 22, 6 x 16)

Grind: 1 kg sample ground in the lab ball mill at 50 % solids for 15 minutes.

Reagent Balance:

Time Hours	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
	NaCN	Ca(OH) ₂	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0-3.5	0.64	0.30	0.61	0.23	0.09	0.01	0.52	0.22	10.7-10.5
3.5-8	0.55	0.06	0.42	0.05	0.37	0.01	0.15	0.05	10.8-10.6
8-12.5	0.16	0.06	0.15	0.05	0.43	0.01	0.18	0.05	10.9-10.5
12.5-24	0.19	0.04	0.18	0.03	0.46	0.01	0.15	0.03	10.9-10.4
24-28.5	0.16	0.05	0.15	0.04	0.40	0.02	0.21	0.03	10.7-10.4
28.5-48	0.22	0.05	0.21	0.05	0.61	0.03	0.00	0.03	10.5-10.4
Total	1.92	0.56	1.82	0.44	0.61	0.03	1.21	0.41	-

Reagent Consumption (kg/t of cyanide feed) NaCN: 2.46 CaO: 0.83

Test No. 7 - Continued

Metallurgical Results

Product	Amount	Assays, mg/g,mg/L,g/t	% Distribution
		Au	Au
1. Carbon 8 h	6.3 g	0.143	40.5
2. Carbon 24 h	6.2 g	0.074	20.7
3. Carbon 48 h	6.3 g	0.018	5.1
4. 48 h Barren Sol'n	2080 mL	0.003	0.3
5. 48 h Cy. Residue	492.2 g	1.51	33.4
Head (Calculated)	492.2 g	4.52	100.0

Calculated Grades and Recoveries

Products 1 and 2	12.5 g	-	61.2
Products 1 to 3	18.8 g	-	66.3

Screen Analyses

48 Hour Residue

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	0.1	0.1	99.9
100	0.5	0.6	99.4
150	2.1	2.7	97.3
200	5.0	7.7	92.3
270	7.9	15.6	84.4
400	9.8	25.4	74.6
- 400	74.6	100.0	-
Total	100.0	-	-

Test No. 8

Purpose: To investigate the effect of pH on the flotation of a sulphide concentrate.

Procedure: As for below.

Feed: 2 kg -10 mesh Composite 1.

Grind: 2 kg ground in the laboratory ball mill at 65 % solids for 14 minutes.

Conditions:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	A350	DF250	CuSO ₄	H ₂ SO ₄	Grind	Cond.	Froth	
Rougher 1	50	75	-	-	-	1	6	7.8
Rougher 2	50	15	-	-	-	-	5	-
Condition	-	-	250	-	-	3	-	-
Rougher 3	50	7.5	-	-	-	1	6	-
Condition	-	-	500	-	-	3	-	-
	-	-	-	250	-	-	7	6
	-	-	-	250	-	-	-	6
	-	-	-	1500	-	-	2	-
Rougher 4	50	-	-	-	-	1	3	-
	-	-	-	500	-	-	-	4.5
	25	-	-	-	-	1	5	-
	25	-	-	750	-	1	3	4.5
	25	-	100	750	-	1	5	-
	-	-	-	1750	-	-	5	4.0
1st cleaner	-	-	-	-	-	-	15	7.4
2nd Cleaner	10	5	-	-	-	-	-	-
	-	-	-	-	-	-	5	-

Stage	Rougher 1st C	1st Cleaner	2nd Cleaner
Flotation Cell	1000	500	250
Speed: r.p.m.	1800	1500	900

Test No. 8 - Continued

Metallurgical Results

Product	Amount	Assays, g/t	% Distribution
		Au	Au
1. 2nd Cleaner Conc.	20.0	19.4	93.3
2. 2nd Cleaner Tail.	16.1	0.80	3.0
3. 1st Cleaner Tail.	6.5	0.48	0.7
4. Rougher Tail.	57.4	0.23	3.0
Head (calculated)	100.0	4.16	100.0

Calculated Grades and Recoveries

Prodcuts 1 and 2	36.1	11.1	96.3
Products 1 to 3	42.6	9.47	97.0

Test No. 9

Purpose: To investigate the effect of carbon adsorption of gold with the carbon changed at 8 and 24 hours.

Procedure: The sample was pulped with water in a 2.5 L bottle. NaCN, lime and carbon were added and the cyanidation was carried out on rolls in one 48 hour stage. The carbon was changed at 8 and 24 hours. The carbon was screened out at 48 hours, and the residue washed three times with water.

Feed: 425 g Float concentrate from test No. 8.

Solution Volume: 850 mL Pulp Density 33 % solids

Solution Composition: 1.0 g/L NaCN

pH Range: 10.5-11 with Ca(OH)₂

Carbon: 10 g/L preatritioned carbon (GRC22, 6 x 16)

Grind: Reground in a lab pebble mill for 28 minutes at 50 % solids.

Reagent Balance:

Time Hours	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
	NaCN	Ca(OH) ₂	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0-3.5	0.90	0.20	0.85	0.15	0.21	0.01	0.64	0.14	11.1-10.0
3.5-8	0.67	0.20	0.64	0.15	0.68	0.02	0.17	0.14	11.1-10.6
8-12.5	0.18	0.06	0.17	0.05	0.72	0.01	0.13	0.06	10.9-10.4
12.5-24	0.14	0.10	0.13	0.08	0.72	0.01	0.13	0.08	10.8-10.3
24-28.5	0.14	0.04	0.13	0.03	0.77	0.01	0.08	0.03	10.6-10.2
28.5-48	0.08	0.10	0.08	0.08	0.80	0.06	0.05	0.03	10.6-10.4
Total	2.11	0.70	2.00	0.54	0.80	0.06	1.20	0.48	-

Reagent Consumption (kg/t of cyanide feed) NaCN: 3.08 CaO: 1.23

Test No. 9 - Continued

Metallurgical Results

Product	Amount	Assays, mg/g,mg/L,g/t	% Distribution	
		Au	Ind.	O'all
1. Carbon 8 h	8.6 g	0.647	73.9	68.9
2. Carbon 24 h	85. g	0.150	16.9	15.8
3. Carbon 48 h	8.8 g	0.023	2.7	2.5
4. 48 h Barren Sol'n	1995 mL	0.004	0.1	0.1
5. 48 h CN Residue	388.9 g	1.24	6.4	6.0
Head (Calculated)	388.9 g	19.4	100.0	93.3

Calculated Grades and Recoveries

Products 1 and 2	17.1 g	-	90.8	84.7
Products 1 to 3	25.9 g	-	93.5	87.2

Screen Analyses

48 Hour Cyanide Residue

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 150	0.1	0.1	99.9
200	0.3	0.4	99.6
270	0.6	1.0	99.0
400	1.4	2.4	97.6
- 400	97.6	100.0	-
Total	100.0	-	-

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