R.647 Reject fraction of gold concentrate, Jane River

A sample of pyritic material was submitted by Senior Geologist, D.J. Jennings. The material was stated to be half the reject fraction from a gold concentrate obtained by boxing and panning approximately 15 m³ of gravels and silts at Warnes Lookout, Jane River.

Some free gold had been observed in the sample and it was desired to ascertain the total gold content and what proportion of the gold occurred in the free state.

SAMPLE

A visual examination indicated that the sample consisted of a mixture of pyrite and quartz, generally individual grains, but with some composites in the coarser sizes. Free gold was abundantly present (<0.2%), but no significant amounts of other heavy minerals were observed.

The total sample weight was 434.4 g.

TREATMENT METHOD

The total sample was screened on a series of screens in the range 75 μm–1.204 mm. The fractions finer than 1.204 mm were concentrated on the superpanner to produce a concentrate containing the free gold, a pyrite fraction and a quartz fraction.

The +1.204 mm fraction was examined visually for the presence of free gold with negative results, and then separated by hand into pyrite and quartz fractions. All fractions so produced were weighed.

The pyrite fractions were then roasted and retreated on the superpanner with hand grinding of tailings to produce a further quantity of free gold concentrate and a roasted pyrite tailing.

All end products were assayed for gold and the free gold concentrates were also assayed for silver.

A small amount of superpanner concentrate from the +300 and +150 μm fractions was tested qualitatively for the presence of heavy minerals.

TEST RESULTS

The results of the sample treatment are given in Tables 1-4 below:

Table 1. WEIGHT DISTRIBUTION OF THE VARIOUS PRODUCTS

Size Fraction	% Weight			
	Gold Conc.	Pyrite	Quartz	Total
+1.204 mm	Nil	7.3	3.6	10.9
+600 μm	Tr.	6.9	0.7	7.6
+300 μm	1.6	17.5	4.0	23.1
+150 μm	0.7	32.3	9.7	42.7
+106 μm	0.1	6.6	3.7	10.4
+ 75 μm	0.2	2.1	1.6	3.9
– 75 μm	0.1	0.7	0.6	1.4
Total	2.7	73.4	23.9	100.0

Table 2. GOLD RECOVERED FROM EACH FRACTION BY SMELTING THE TOTAL AMOUNTS

Size Fraction	Gold Conc.(mg) (before roast)	Gold Conc.(mg) (after roast)	Pyrite	Quartz	Total
+1.204 mm	Nil	Nil	0.07	Tr.	0.07
+600 µm	28.42	Nil	0.66	Tr.	29.08
+300 µm	156.36	9.04	0.78	0.72	166.90
+150 µm	394.46	33.40	1.04	Tr.	428.90
+106 µm	103.33	3.55	1.43	0.07	108.38
+75 µm	60.42	0.52	0.72	0.24	61.90
−75 µm	7.84	0.20	0.19	Tr.	8.23
Total	750.83	46.71	4.89	1.03	803.46

Note: The gold determinations on the pyrite and quartz fractions have not been corrected for silver content. As a percentage, the correction would not be significant.

Table 3. SILVER OBTAINED FROM THE GOLD CONCENTRATES (mg of Silver)

Size Fraction	Silver Conc.(mg) (before roast)	Silver Conc.(mg) (after roast)
+1.204 mm	Nil	Nil
+600 µm	2.00	Nil
+300 µm	5.27	0.18
+150 µm	7.16	0.30
+106 µm	4.21	0.55
+75 µm	3.23	0.21
−75 µm	1.56	0.04
Total	23.43	1.28

Purity of Gold

Total "free" gold recovered	750.83 + 46.71 =	797.54 mg
Total silver from free gold	23.43 + 1.28 =	24.71 mg
Total "free" metal recovered		822.25 mg
Au in metal recovered	$\frac{797.54}{822.25}$ × 100 =	97.0%

Table 4. SIZING ANALYSIS AND GOLD DISTRIBUTION

Size Fraction	% W	Total Contained Au (mg)	% Au Dist
+1.204 mm	10.9	0.07)	
+600 µm	7.6	29.08)	3.6
+300 µm	23.1	166.90	20.8
+150 µm	42.7	428.90	53.4
+106 µm	10.4	108.38	13.5
+75 µm	3.9	61.90	7.7
−75 µm	1.4	8.23	1.0
H	100.0	803.46	100.0

Test Results Summary

The total reject sample of 434.4 g, contained 803.5 mg of gold. This is equivalent to 1.84 mg Au/g of sample.

Since it is not known how much gold was recovered by the panning the original concentrate, it is not possible to assess the loss on a percentage basis.

The mode of occurrence of the gold can be expressed as below: (percentage derived from Table 2.)

Free (PC 'as is')	93.5%
Probably Free (PC after roast)	5.8%
Probably Composite with pyrite	0.6%
Probably Composite with quartz	0.1%

P = superpanner   C = concentrate

The gold is relatively coarse, 77.8% occurring in the +150 μm size range.

Extremely careful operation of the superpanner was required to effect the separations shown above on sized material. It is therefore unlikely that the free gold recovered in this investigation could be recovered by simple panning.

The sizing analysis shows little gold present in the -75 μm fraction, 1% only of the total. This raises the question of a possible gold loss in this size range from the boxes.

Small amounts of zircon, ilmenite and possibly rutile were detected in a superpanner concentrate. Arsenic, antimony, bismuth and copper which could be harmful in amalgamation, were not detected in the samples.

CONCLUSIONS

Apparently the concentrate will be produced intermittently and in comparatively small lots. In these circumstances cyanidation cannot be considered and in any case, the gold is probably too coarse to be amenable to rapid dissolution in cyanide solutions.

If, as suggested, the amount of concentrate from 15 m^3 of gravel is only 0.9-1.4 kg, mortar amalgamation would be the most economic and practical method of extracting the gold from the type of material submitted. There seems no useful objective in omitting the panning stage provided the gold is recovered in a realizable form.

Mortar amalgamation of pan tailings would be a useful insurance against loss of gold by inefficient panning and should be put into practice.

The possibility of losses of fine gold from the boxes should be investigated. A strip of hessian or corduroy in the last metre of the boxes could do much to prevent loss of fine gold.

There was insufficient sample for an amalgamation test but from the minerals present there appears nothing to preclude successful amalgamation.