

O T T A W A      March 21st, 1944.

R E P O R T  
of the  
ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1613.

Determination of the Nature of the Gold in a  
Sample of Flotation Tailing from O'Brien  
Gold Mines Limited, Kewagama, Quebec.

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Sample of Flotation Tailing from O'Brien  
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Shipments:

One small sample of this material, weighing  $2\frac{1}{2}$  pounds, was received on November 16th, 1943. A second sample, weighing 45 pounds, was received on January 14th, 1944. The samples were submitted by the O'Brien Gold Mines Limited, Kewagama, Quebec.

Location of Property:

This material originated at the property of O'Brien Gold Mines Limited, in Cadillac township, Abitibi County, northwestern Quebec.

Sampling and Assaying:

Assay samples were riffled from each of the lots submitted. The samples were assayed and reported as follows:

SAMPLE NO. 1. - SCREEN ANALYSIS					
Size	: Weight, : per : cent	: A s s a y s			
		: Gold, : oz./ton	: Sulphur, : per cent	: Arsenic, : per cent	
+ 65 mesh	: 2.62	: 0.053	: 0.20	: *	
- 65+100 "	: 9.94	: 0.025	: 0.17	: 0.016	
-100+150 "	: 16.64	: 0.015	: 0.12	: 0.011	
-150+200 "	: 10.36	: 0.015	: 0.10	: 0.007	
-200 "	: 60.44	: 0.02	: 0.07	: 0.014	
Feed (cal.)	: 100.00	: 0.020	: 0.095	: --	

\* No material left on which to make the determinations.

A bulk sample assay checked the screen analysis at 0.02 ounce gold per ton and 0.09 per cent sulphur.

SAMPLE NO. 2. - SCREEN ANALYSIS					
Size	: Weight, : per : cent	: A s s a y s			
		: Gold, : oz./ton	: Sulphur, : per cent	: Arsenic, : per cent	
+ 65 "	: 5.24	: 0.057	: *	: *	
- 65+100 mesh	: 15.21	: 0.025	: 0.20	: 0.017	
-100+150 "	: 10.77	: 0.02	: 0.16	: 0.014	
-150+200 "	: 10.07	: 0.025	: 0.14	: 0.011	
-200 "	: 58.71	: 0.02	: 0.13	: 0.014	
Feed (cal.)	: 100.00	: 0.023	: --	: --	

\* No material left on which to make the determinations.

A bulk sample assayed 0.024 ounce gold per ton.

CONCLUSIONS:

Approximately 80 per cent of the gold is soluble in cyanide solution, and this figure includes the gold that is also recoverable by amalgamation. This part of the gold must be free or exposed and may be associated with either gangue or sulphides.

Of the gold not soluble in cyanide solution, about 6 per cent seems to have been shielded by carbonates, 10 per cent enclosed in sulphides, and 4 per cent enclosed in gangue. The gold enclosed in gangue could be in fine sulphides which

(Conclusions, cont'd) -

are themselves enclosed in gangue but in either case nothing but finer grinding will liberate it.

Recovery by amalgamation was low, less than 20 per cent of the gold having been extracted as shown by the difference in assays of the amalgamation tailings and the original material. This would indicate that if anything more than a small amount of the gold is present in the free state it must be extremely fine and therefore not recoverable by amalgamation.

The tests failed to establish a definite relationship between the gold and the sulphides, but it would be difficult to do this on a sample of flotation tailing alone. More information could be gained from a sample of ore or from both concentrate and tailing since there are not sufficient free sulphides in the tailing sample to get enough out for an assay of clean sulphides.

Failure to find free gold with the aid of the superpanner and microscope, together with the high assays in the plus 65 mesh fractions of the original material, would indicate that finer grinding might result in higher recovery in the concentrate and lower tailing assays, but this might not be economical.

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Character of the Sample:

No polished sections were prepared for examination under the ore microscope, but with the aid of the superpanner and a binocular microscope a few grains of pyrite and arsenopyrite were detected. No free gold was found by this means. The samples were practically all finer than 48 mesh and about 60 per cent finer than 200 mesh.

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DETAILS OF INVESTIGATION:

Tests Nos. 1 and 2. - Amalgamation.

Samples from the second lot of ore were amalgamated with mercury for one hour. The amalgamation tailings were assayed for gold and sulphur on screened and infrasized fractions.

Screen Analysis of Amalgamation Tailing, Test No. 1.

Size	A S S A Y S			
	Weight, : per : cent :	Gold, : :oz./ton:	Sulphur, : per cent:	Arsenic, : per cent
+ 65 mesh	: 3.17:	0.03 :	0.23 :	⊙
- 65+100 "	: 15.26:	0.03 :	0.19 :	0.014
-100+150 "	: 12.78:	0.025 :	0.15 :	0.014
-150+200 "	: 10.16:	0.02 :	0.11 :	0.014
-200 mesh + 56 microns:	1.33:	0.03 :	0.38 :	⊙
- 56+ " + 40 "	: 11.32:	0.015 :	0.07 :	0.007
- 40 " + 28 "	: 10.45:	0.015 :	0.05 :	0.007
- 28 " + 20 "	: 7.86:	0.01 :	0.05 :	0.010
- 20 " + 14 "	: 6.01:	0.005 :	0.05 :	0.010
- 14 " + 10 "	: 7.02:	0.005 :	0.10 :	0.097
- 10 "	: 14.64:	0.02 :	0.21 :	0.188
<u>Average tailing</u> -	: 100.00:	0.0188:	0.130 :	--

Screen Analysis of Amalgamation Tailing, Test No. 2.

+ 65 mesh	: 2.71:	0.061 :	0.25 :	⊙
- 65+100 "	: 11.60:	0.03 :	0.21 :	0.014
-100+150 "	: 13.15:	0.02 :	0.17 :	0.014
-150+200 "	: 10.53:	0.02 :	0.13 :	0.010
-200+mesh + 56 microns:	3.37:	0.034 :	0.31 :	⊙
- 56 " + 40 "	: 11.56:	0.02 :	0.08 :	0.005
- 40 " + 28 "	: 10.47:	0.015 :	0.07 :	0.006
- 28 " + 20 "	: 7.89:	0.005 :	0.05 :	0.007
- 20 " + 14 "	: 6.03:	0.005 :	0.08 :	⊙
- 14 " + 10 "	: 7.30:	0.005 :	0.10 :	0.001
- 10 "	: 15.39:	0.025 :	0.22 :	0.188
<u>Average tailing</u> -	: 100.00:	0.0198:	0.144 :	--

⊙ No material left on which to make the determinations.

Taking 0.0235 ounce per ton as the average feed sample assay and 0.0193 as the average amalgamation tailing assay, 17.87 per cent of the gold has been extracted by amalgamation.

The screen analyses of the amalgamation tailing samples may show a general tendency for the gold assays to go up and down with the sulphur assays, but too many irregularities creep in to permit of any definite conclusion on this point.

(Details of Investigation, cont'd) -

Test No. 3. - Cyanidation Followed by Acid Treatment.

A sample of the flotation tailing as received was agitated in cyanide solution for 48 hours to remove any free or soluble gold. The cyanide tailing was sampled for assay and a portion of it treated with dilute (10 per cent) hydrochloric acid to decompose carbonates and expose any gold they might be shielding. The loss in weight was noted and the leached residue was again treated with cyanide solution to dissolve out any gold exposed by the action of the dilute acid.

The second cyanide tailing was assayed and a correction factor applied to it to compensate for the loss in weight resulting from the acid treatment. A further 10 assay tons of the recyanided HCl residue was treated with aqua regia to destroy sulphides and at the same time dissolve out any gold with which it came in contact. The aqua regia residue was then assayed as being 10 assay tons of HCl recyanided residue and the same correction factor as used above was applied to it.

The following table shows the amount of gold extracted at each step and the amount remaining in the final tailing. All assays shown here have been corrected if acid leaching was used in their processing.

	<u>Assay,</u> <u>gold,</u> <u>oz./ton</u>	<u>Extraction</u> <u>of gold,</u> <u>per cent</u>	<u>Gold in</u> <u>residue,</u> <u>per cent total</u>
Feed sample - - -	0.0235	--	(100.00)
First cyanide tailing -	0.0045	80.85	19.15
Second cyanide tailing from HCl residue -	0.00303	6.26	12.89
Aqua regia residue -	0.00087	9.19	3.70

The gold dissolved in the first cyanide treatment

(Test No. 3, cont'd) -

must have been free or exposed to the cyanide solution through fractures or in some other way. The gold dissolved in the second cyanide treatment had been shielded by carbonates and was freed or exposed when the carbonates were decomposed by the acid. The gold dissolved by aqua regia was most probably locked up in sulphides and the gold in the final residue is enclosed in gangue or possibly in fine sulphides which are themselves enclosed in gangue and can only be liberated by finer grinding.

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