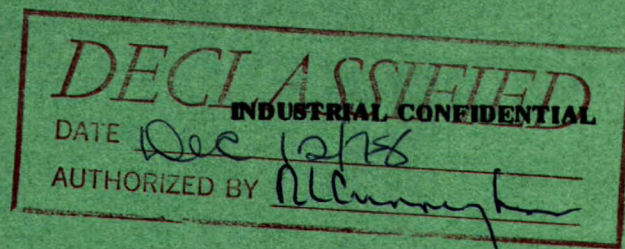


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CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 63-87

**CONCENTRATION TESTS ON TULAMEEN
RIVER SAND FROM BRIGITTE MINING
AND CONSULTING COMPANY LIMITED,
VANCOUVER, B. C.**

by

T. F. BERRY

MINERAL PROCESSING DIVISION

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CONCENTRATION TESTS ON TULAMEEN RIVER SAND FROM
BRIGITTE MINING AND CONSULTING COMPANY LIMITED, VANCOUVER, B.C.

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SUMMARY OF RESULTS

The sample of Tulameen River sand was very low grade. A head analysis calculated from the treatment of 85 lb of material in Test 2 gave a precious metal content of -- gold - 0.0082 oz/ton, and platinum - 0.0042 oz/ton.

In Test 2 jig concentration of sized fractions yielded a combined concentrate containing 84.4% of the gold and approximately 100% of the platinum in 2.6% of the feed.

A further concentration of the platinum was obtained in Test 3 by a high intensity wet magnetic separation of an amalgamation residue from Test 2.

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INTRODUCTION

The Tulameen River in south central British Columbia flows through an area covered by a large glacial drift which, in some places, is 400 feet deep and is known to contain gold and platinum.

Accurate sampling of this area, in which pockets of relatively high grade gold-bearing sand are believed to be present in bands of almost barren sand, is very difficult.

Many mining companies and individuals have attempted to concentrate the precious metals in the sand using the conventional placer mining technique of sluice-box concentration. Most of these attempts failed because of the presence of heavy magnetite in the sand which tended to pack in the sluice-box riffles and allowed the precious metals to be washed away.

Nature of Investigation Requested

On December 3, 1962, Mr. Robert Steiner, Geological Consultant for Brigitte Mining and Consulting Company Limited, Suite 6, 8686 Oak Street, Vancouver 14, B.C., asked the Mines Branch to investigate the possibility of producing a gold-platinum concentrate of sufficiently high grade for smelting to a base bullion.

Origin and Description of Sample

On December 26, 1962, a sample of sand weighing 375 lb was received at the Mines Branch. This sample had been riffled from 2200 lb of a rougher concentrate obtained by processing about 20 tons of placer sand in a Ditta jig, which is a concentrating device developed by Mr. Steiner to recover the precious metals from sand.

The sand in the area of the river bank, from which the original sample was taken for pre-concentration, was extremely low grade, and even after processing in the Ditta jig, where a concentration ratio of 20:1 was obtained, the resulting rougher concentrate was very low in gold and platinum.

Sampling and Analysis

A 2000 g sample of the sand was riffled from the shipment and was ground to 42.6% -200m. The ground pulp was amalgamated for one hr with 15 ml of Hg and the amalgam and the amalgamation residue were analysed for gold. The results were as follows:

TABLE 1

Analysis of Head Sample^{*}

| | |
|----------------------|-------------------|
| Amalgam | 0.00569 oz Au/ton |
| Amalgamation residue | 0.0012 " " |
| Head (calcd) | 0.00689 " " |

^{*}From Internal Report MS-AC-63-314

Because of the difficulty of obtaining a representative head sample, no platinum analysis on a head sample was made.

MINERALOGICAL EXAMINATION^{*}

A sample of the sand was submitted to the Mineralogy Section of the Mineral Sciences Division, for examination. The sample was separated into fractions by means of heavy liquids. The resulting fractions were weighed and the minerals were identified by a microscopic study. The results are shown in the following table:

TABLE 2

Mineralogy of Sand Sample from the
Tulameen River Area, B.C.

| Minerals | Weight % |
|---|----------|
| Quartz and feldspar | 57 |
| Pyroxene, hornblende, biotite) chlorite, olivine, epidote) | 33 |
| Magnetite | 10 |
| Total | 100 |

^{*}From Internal Report MS-63-8, January 29, 1963, by Dr. W. Petruk.

DETAILS OF INVESTIGATION

Test 1

About 8000 g of -14m sand was obtained by riffing and screening. The +14m material, composed principally of coarse gravel, was discarded. The sand was magnetically separated on a Ball Norton dry magnetic separator to remove the magnetite which was retained for analysis. The non-magnetic fraction was jigged in a Denver laboratory jig and the concentrate obtained was ground and amalgamated for 1 hr with 15 ml Hg and 0.5 g lime. This amalgamation step was done merely as an aid to analysis. The mercury-amalgam mixture, the amalgamation residue, and the jig tailing were analysed for gold and platinum. The results were as follows:

TABLE 3

Results of Test 1

| Product | Weight % | Analysis oz/ton [*] | | Distribution % | |
|----------------------|----------|------------------------------|--------|----------------|-------|
| | | Au | Pt | Au | Pt |
| Amalgam | - | 0.082 ^{***} | - | 64.6 | - |
| Amalgamation residue | 3.0 | 0.00125 | 0.025 | 1.0 | 47.9 |
| Jig tailing | 92.2 | 0.00125 | n.d. | 29.8 | - |
| B-N magnetics | 4.8 | 0.00375 | 0.017 | 4.6 | 52.1 |
| Head (calcd) | 100.0 | 0.00387 | 0.0016 | 100.0 | 100.0 |

* From Internal Report MS-AC-63-194 and 63-314.

*** oz Au/ton jig concentrate

n.d. - none detected

Test 2

To investigate the distribution of the gold and platinum in the sand, and the amenability of these elements to a more refined jig concentration, about 85 lb of the sand was carefully wet screened to obtain the four screen fractions -- +10m, -10+48m, -48+100m, and -100m.

The discrepancy between the calculated gold values in Tables 1 and 3 is indicative of the sampling difficulty, and emphasizes the need for the much larger sample used in this test.

The +10m fraction was analysed directly for gold and platinum. The other three fractions were jigged under conditions designed to give the best concentrate from each fraction.

As in Test 1, the concentrates were amalgamated and the amalgam-mercury mixtures, the amalgamation residues, and the jig tailings were analysed for gold and platinum. Magnetic separation of the magnetite was not done in this test. The results were as follows:

TABLE 4
Results of Test 2

| Product | Weight % | Analysis oz/ton [*] | | Distribution % | |
|--------------------------|----------|------------------------------|--------|----------------|-------|
| | | Au | Pt | Au | Pt |
| +10 mesh | 20.8 | 0.0005 | n.d. | 1.2 | - |
| -10+48m amalgam | - | 0.384 ^{**} | - | 65.4 | - |
| " " amalgamation residue | 1.4 | 0.0025 | 0.211 | 0.5 | 70.9 |
| " " jig tailing | 51.6 | 0.0005 | n.d. | 3.2 | - |
| -48+100m amalgam | - | 0.099 ^{**} | - | 9.6 | - |
| " " amalgamation residue | 0.8 | 0.005 | 0.108 | 0.5 | 20.7 |
| " " jig tailing | 15.0 | 0.0015 | n.d. | 2.7 | - |
| -100m amalgam | - | 0.169 ^{**} | - | 8.2 | - |
| " amalgamation residue | 0.4 | 0.005 | 0.083 | 0.2 | 8.4 |
| " jig tailing | 10.0 | 0.007 | n.d. | 8.5 | - |
| Head (calcd) | 100.0 | 0.0082 | 0.0042 | 100.0 | 100.0 |

* From Internal Report MS-AC-63-362 and 63-400.

** oz Au/ton jig concentrate

n.d. - none detected

Test 3

The ground -10+48m amalgamation residue from Test 2, after removal of coarse metallics, was treated in a Jones high intensity wet magnetic separator to concentrate the platinum minerals.

The original amalgamation residue assayed 0.211 oz Pt/ton. However, after removing the metallics, the feed to this magnetic separation test assayed 0.173 oz Pt/ton.

The feed was passed through the machine at 0 amp and the middling and tailing from this operation were combined and reprocessed at 7 amp. The two magnetic fractions and the non-magnetic tailing were analysed for platinum. The results were as follows:

TABLE 5
Results of Test 3

| | Weight % | Analysis [*] oz/ton Pt | Distribution % Pt |
|-------------------|-------------|------------------------------------|----------------------|
| 0 amp magnetics | 41.0 | 0.30 | 75.5 |
| 7 " " | 20.3 | 0.14 | 17.4 |
| 7 " non-magnetics | 38.7 | 0.03 | 7.1 |
| Head (calcd) | 100.0 | 0.163 | 100.0 |

* From Internal Report MS-AC-63-1071

CONCLUSIONS

The pre-concentrated sand sample was extremely low grade as shown by the calculated head in Test 2, in which a large amount of material (about 85 lb) was used to ensure as nearly representative a sample as possible.

The results of Test 2 show that if a careful jig concentration program is followed, a high recovery of the gold and platinum can be obtained in a small volume of material. In this test a calculated final composite concentrate from three screen fractions (-10+48m, -48+100m, and -100m) totalling 2.6% of the feed weight, analysed 0.267 oz Au/ton and 0.160 oz Pt/ton, representing a recovery of 84.4% of the gold and approximately 100.0% of the platinum.

In Test 3 an additional up-grading of the platinum was obtained by the use of high intensity wet magnetic separation. The fact that 75% of the platinum was concentrated at 0 amps indicates a close association of the platinum minerals with magnetite.

ACKNOWLEDGEMENT

The gold and platinum analyses were done by the Analytical Chemistry Sub-division of the Mineral Sciences Division of the Mines Branch.