



THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

GOVERNMENT LABORATORY

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VICTORIA March 31st 1921.

Honourable Wm. Sloan,
Minister of Mines,
Victoria, B. C.

DEPT. OF MINES
Office of Chief Mining Engineer
Rec'd. JAN 27 1944
Referred to _____
Ans'd. _____

Sir:-

I beg to submit herewith my final report on the
Keystone Drilling operations at Harpers Camp. As you will see
by the report, further drilling might be useful, but I would not
recommend it at the present time. Sufficient information is now
available for any of the interested parties to intelligently
carry out prospecting work.

I have included a copy of this report in my report for
printing in the Annual Report. If you consider that my part of
my report on the drilling should not be printed you might
"blue pencil" your copy and turn it over to Mr. Robertson.

I am, Sir,

Yours faithfully,

John D. Galloway

Resident Engineer.

HARPERS CAMP.Keystone Drilling.

Introductory.- The prospecting by Keystone-drilling of certain placer-gravels in the vicinity of Harpers' camp was commenced in December, 1919, by the British Columbia Department of Mines. The drilling was continued until April of this year, when it was stopped pending the arrival of new casing and other equipment. Drilling was recommenced early in August and was continued until December when the work was again stopped.

Harpers' Camp is situated on the Horsefly river, 35 miles in an easterly direction from 150-Mile House on the Cariboo road. A weekly stage from 150-Mile House gives access to the Camp.

The history of placer-mining in this section is much the same as in other parts of the Cariboo District, namely:- vigorous mining in the early sixties by hand work in the easily available rich ground, followed later by the working of the ground on a larger scale with the aid of modern machinery.

The important productive ground near Harpers' camp was a small area lying in and along a bend of the Horsefly river, the original location being known as Harpers' Bar. The estimates of the amount of gold taken from this area vary considerably, ranging up to \$500,000 or more. This ground was first drifted by the old-timers, and was eventually worked by R. T. Ward by hydraulic methods and using an hydraulic elevator to raise the gravel from pits to the sluice-boxes. It is quite certain that the early work paid handsomely, but it is difficult to ascertain whether or not any profit resulted from the operations of R. T. Ward. Some portions of the ground paid, but others did not, and the whole average result is unknown. It must be remembered, though, that the Ward ground had the best of the gold taken out by the old-timers.

The character of the gold taken from this ground (known as Ward's Horsefly) was uniformly fine, flat, and well worn; grains the size of flax-seed formed the greater portion of the gold taken out. It is quite evident that the gold in this area of ground had travelled a considerable distance and is not of local origin. Presumably it had its origin at some unknown point away up the Horsefly river.

PROPERTY FILE

The Horsefly river, both above and below Ward's Horsefly, has been fairly thoroughly prospected and a little gold has been taken out in places; no place comparable in richness with the Ward ground has, however, been found. The conclusion has therefore been reached by many that the gold in Ward's Horsefly did not get there by following the present river-channel. An old channel of the river is postulated in order to account for this remarkably rich spot with barren ground above and below.

It has been supposed that the present Horsefly river at this point cuts across an old (pre-glacial) channel rich in gold-bearing gravel, and that the pay-ground was thereby exposed. Assuming this theory to be correct the conclusion was reached by many that the old channel if explored further would yield similar rich gold-bearing gravel.

Considerable work has been done at different times in the past in an endeavour to explore this supposed old channel at points not far distant from the Ward ground.

A considerable amount of money was spent in what is known as the "Miocene" shaft. This enterprise was carried out by the Miocene Gravel Mining Company with the expectation of finding a continuation of the rich channel worked at Ward's Horsefly.

The main shaft was sunk at a point about one-third of a mile south of Ward's Horsefly pit; it was put down 500 feet before striking bed-rock. The whole work was well done, the shaft being 3-compartment and well timbered and the machinery complete for the purpose. In sinking this shaft the gravel was found to be capped with about 100 feet of boulder clay, after which about 400 feet of gravel was passed through *in places small amounts of* containing gold, but not in paying quantities. This gravel is free and very uniform in size, being composed almost entirely of smooth, worn, white quartz pebbles. In this it differs materially from the wash as seen at Ward's Horsefly, which is bluish in general colour and contains many different rocks besides quartz pebbles.

During the spring of 1900 the pumps, pumping-station, and machinery generally were over-hauled and the shaft sunk 50 feet deeper in bed-rock. From this level a drift was run for 500 feet in the direction of and under the channel. From this rock drift upraises were made into the gravel-channel. When the last upraise was put up which struck gravel in 15 feet, the rush of water and gravel flooded the workings. Since this occurred no further work has ever been done in the shaft.

Reports vary as to the gold-tenure of the gravel taken from the upraises into the channel, but it would seem only low values were *obtained*, not sufficient to pay by drifting operations. It is to be regretted that when so much capital was expended in this enterprise the testing of the channel was not carried further.

A number of shallow shafts were put down by hand-work in the vicinity of Ward's pit, but owing to the amount of water to be handled, none of these were sunk to any great depth and practically none of them reached bed-rock.

Some Keystone drilling was done in the area by an Eastern syndicate some years ago.

Physical Features.- Attached to this report is a map showing that portion of the Horsefly which includes Ward's Horsefly pit and adjacent territory, and the location of drill holes put down by the Government. The country is rolling and the actual channel of the Horsefly is cut down from 20 to 30 feet below the general level. The grade of the river is slight, not being sufficient to carry off hydraulic tailings. In all the work done here it has been necessary to elevate the gravel in order to make an artificial dump.

The original discovery at "Harpers Bar" (Ward's Horsefly) was at a point in the river channel where bedrock was naturally exposed. From this high point the bed-rock apparently pitches off in all directions. To the north-east, east, and south the ground has been worked with the bedrock pitching gradually and consequently the workings getting deeper. The limiting depth with Ward's hydraulic elevator was reached at between 50 and 60 feet.

Before mining operations commenced in this area the Horsefly river flowed to the west of the present course. Wing-damming of the stream and the piling up of hydraulic tailings deflected the course of the river locally.

There is a considerable depression or old valley crossing the Horsefly river, running in a general east and west direction at this point. Beaver valley may be a continuation of this old valley in the westerly direction, while to the east the old valley connects with the present Horsefly river.

A topographic map of the Harpers Camp area was made in the season of 1919 by a party of the Geological Survey of Canada under the direction

of Dr. B. R. MacKay. This map has not been issued yet.

Drilling.- The main object in the Government drilling at Harpers Camp was to find if possible some extension of the rich area and to obtain information as to whether or not there was a rich gold-bearing channel feeding this area.

The drilling done may be divided into two parts, that done from December, 1919, to April, 1920, and that done from August to December, 1920.

To begin with a hole was started a short distance from Williams House on what was believed might be the rim of the old channel of the Horsefly. This was sunk about 100 feet at which point it had to be stopped until more casing and cable was secured.

A number of shallow holes were then put down on the ground controlled by the International Dredging Company. This company's plant consists of a drag-line scraper system capable of digging and elevating gravel to a height of about 30 to 40 feet. This plant was erected with the idea of reworking the ground in the vicinity of Ward's pit, and where it was hoped some extension of the rich area, previously unworked, would be found. The plant was operated during parts of the summers of 1918 and 1919, but very little gold was recovered. Apparently the ground handled consisted mainly of old hydraulic tailings.

As will be seen from the attached plan 12 holes were drilled at different points ahead of the International plant. These holes ranged up to 50 feet in depth but in no case reached bedrock. The drilling results were mainly negative but proved that there was no important area of ground in this vicinity carrying sufficient gold to pay to work with the plant of the International Dredging Company. The company has therefore ceased operations entirely.

When the drilling was recommenced in August with an adequate equipment of casing, etc., the No. 1 hole (near Williams house) was continued and sunk down to bedrock, a total depth of 216 feet. This depth was greater than had been expected and showed there was a deep channel at this point. It was obvious that to continue a cross-section of holes south-easterly from this point across the old channel of the Horsefly would involve very deep drilling as the indications showed that the ground would be progressively deeper to the south-east.

The drilling was therefore continued to the north-west where

shallower ground was believed to exist. Seven holes were put down ranging from $17\frac{1}{2}$ to 55 feet, all being sunk to a bedrock and some holes a short distance into bedrock. Some values were disclosed by this drilling but not sufficient to make pay ground. This completed the drilling on the eastern side of the river as it was believed that sufficient information had been obtained.

The last hole put down was on the western side of the river near an old drill hole put down some years ago. In this vicinity R. H. Campbell and partners had sunk three shafts during the summer by hand-work, without getting definite results. It had been reported that good values had been disclosed by the old drill hole, and so at the request of Campbell a hole was put down to check this and thereby assist the work of exploring this area.

The following table shows the holes drilled, total depths and depths to bedrock.

Hole No.	Depth (feet)	Depth to Bedrock (feet)	Remarks
1	211	206	Norma lease
1 C	25	unknown	Lease 1360
2 C	28	"	"
3 C	28	"	"
4 C	38	"	"
5 C	36	"	"
6 C	42	"	"
7 C	46	"	"
8 C	41	"	"
9 C	37	"	"
10 C	52	"	"
11 C	39	"	"
12 C	37	"	"
1 A	49	$43\frac{1}{2}$	Kahm Group
2 A	$44\frac{1}{2}$	44	"
3 A	53	45	"
1 B	55	54	"
2 B	$21\frac{3}{4}$	$17\frac{1}{2}$	"
3 B	22	21	"
4 B	$17\frac{1}{2}$	$16\frac{1}{2}$	"
1 D	51	50	Campbell Group

Values.- No. 1 hole showed no value whatever throughout the length of the hole.

Of the holes No. 1 C to 12 C only one showed important values; that one being No. 4 C. The following table shows the distribution of the values in this hole.

Footage	Mg. of gold	Value per Cubic Yard
0' to 10'	Nil
10' to 12'	Nil
21' to 24'	60	\$1.20
24' to 26'	Nil
26' to 28'	Some fine colors	Practically nil
28' to 30'	590	\$17.70
30' to 32'	613.5	\$18.40
32' to 33'	270	\$16.20
33' to 34'	110	\$ 6.60
34' to 38'	40	.60

Average value per yard for the total depth of 38 feet of hole \$2.66.

It will be seen that the main values are contained in a strata lying from 28 to 33 feet in depth, about 87 per cent of the total gold occurring in this 5 feet. This section of the hole has a value per yard of \$17.68.

From the log of the hole as turned in by the Foreman, the first 12 feet of the hole was in surface river wash gravel; then came 9 feet of slum; from 21 feet to 32 feet the drill passed through a fine blue gravel with some streaks of clay; from 32 to 38 feet the material was a coarse blue gravel with some streaks of heavy sticky clay. This blue gravel from 21 to 38 feet was cemented sufficiently to render it unworkable by a scraper or dredge. Apparently the only feasible way to work this ground would be by drifting operations and in that case the water might prove difficult to handle.

The series of holes 1 A to 4 B showed certain values in places, but in none of them are the values sufficient to make it profitable to work the ground.

The following table shows the results:-

<u>Hole No.</u>	<u>Value per Cubic Yard.</u>
1 A	Practically Nil
2 A	12 cents
3 A	Practically Nil
1 B	" "
2 B	14 cents
3 B	1 cent
4 B	4 cents

Hole No. 1 D showed little or no values.

Tests were made on a number of samples from the drill cores to determine if the concentrates carried any combined gold. The samples were panned down and the colors of free gold removed from the concentrates. These concentrates, consisting of black and ruby sand, were separated into magnetic and non-magnetic samples, and these samples assayed for gold and platinum.

The assays results showed that where the concentrates had had the free gold entirely removed that there was practically no contained gold content in them. A low platinum content was obtained in one sample but too slight to have any commercial importance.

Conclusions regarding origin of deposit.- There is now available a certain amount of information regarding the deposit of rich auriferous gravel situated at Ward's Horsefly. This information may be divided into:-

- (a) Facts deducible from surface topographic features.
- (b) Information from old workings, shafts, etc.
- (c) Information from Government drilling.

From the available information different theories as to the origin of the rich deposit might be derived. The following ideas are advanced by the writer but are subject to modification in the light of fuller information.

From a consideration of the present topographic features together with information of the depth of ground from shafts and drilling it is quite apparent that an old channel of the Horsefly is crossed at this point by the present Horsefly river. This channel flowed in from the east occupying the flat which stretches easterly from Williams house. Apparently the Miocene shaft explored a continuation of this channel to the west. The available evidence indicates that but little gold

was found in the gravels of this old channel as explored by the Miocene shaft. The evidence from other old shafts and Keystone drilling tends to confirm the conclusion that the gravels of this old channel contain but small amounts of gold.

The rich ground in Ward's pit contained the gold partly in a yellow gravel and partly in a lower strata of blue gravel, the latter perhaps being the most important gold-bearing strata. The blue gravel at this point is nearly identical with the gold-bearing gravel at Hobson's Horsefly, five miles down stream from Ward's pit. At Hobson's Horsefly the present stream gravels were not worked, the deposit representing an old channel of the river which lies a short distance from and runs parallel with the present channel of the river.

It is apparent that the gold bearing gravels at Ward's pit are quite different from the white quartz gravel of the old east and west channel of the Horsefly which was partially explored by the Miocene shaft. The blue gold-bearing gravel, which as a rule has been fairly well cemented, has been previously classified as pre-glacial in age,* but complete evidence of this is lacking. It at least is older than the present stream gravels, but is apparently younger than the gravels of the east and west ancient channel.

The occurrence of gold in the yellow gravel, which is a modern stream gravel, would appear to have originated by erosion and concentration of the blue gravel. The problem is therefore reduced to the origin of the blue gravel and its gold content. It would seem to be fairly well established that this blue gravel has been deposited by the Horsefly river while occupying more or less its present channel. This blue gravel as originally coming down the river probably carried a small gold content, and at certain favorable points, depending on local conditions, this gold would be concentrated to a greater or less degree. Where the Horsefly river crossed the old east and west channel local conditions were such as to cause a considerable concentration of gold in the blue gravel deposited at that point. Here the river crossed a wide deep gravel-filled channel with a high rim of bed-rock on the northerly side over which rim the river necessarily had to carry its burden of sand, clay, and gravel. This high

* B. R. MacKay--Summary Report G. S. C. 1918, Part B.

rim-rock acted as a natural riffle to prevent the free flow of gold down the river, with the result that a concentration of gold was made at this point, a sufficient concentration to make the rich diggings of Harpers' Bar.

After the deposition and partial cementation of the blue gravel, which may have occurred during an interglacial period, the course of the Horsefly was slightly but not materially altered, as is shown at Hobson's Horsefly. At Harper's Bar the river continued to occupy approximately the same channel. Partial reworking of the blue gravel resulted in the formation of the gold-bearing yellow gravel, with the rich ground again concentrated at and near the high bed-rock or old rim-rock, exposed in the river channel. It is significant that phenomenally rich ground was found around a large boulder lying on bed-rock near the point where the bed-rock was originally exposed in the channel.

The bed-rock, as previously stated, dips away in all directions from the high point originally exposed and as the workings went deeper the gold values as a rule decreased.

The evidence from drilling and shafts is that the blue gravel carries slight amounts of gold wherever it is explored, but that only in the original workings of Ward's pit does it carry pay values. The drilling done along the A & B lines prospected the rim of the ancient east and west channel and the logs of the holes show that after going through modern river gravel or clay the drill penetrated blue gravel down to bedrock. While these holes were on the rim of the old channel they were also along the rim of the present channel, which may account for the blue gravel having but little or no gold in at that point. The gold-bearing blue gravel was carried along in the centre of the stream with but little gold distributed to the rims.

Hole No. 4 C yields interesting results in that it shows that the paystreak of Ward's pit extends at least that far to the south. It must be remembered though that this hole is only about 150 feet south of old workings. At the time that the series of C holes were put down the drilling equipment only permitted the sinking of shallow holes. It is unfortunate that some of these holes were not put down to bed-rock as they might have yielded useful information.

The nearest holes to hole No. 4 C are No. 3 C, 5 C, and 10 C.

The logs of these holes show that blue gravel was penetrated in each case but that no appreciable gold was found. The holes were shallow, however, and the blue gravel at greater depths might contain some gold.

Conclusions.- The following tentative conclusions have been arrived at regarding this deposit of auriferous gravel, which, however, may have to be modified when fuller information is obtained:-

(1) The physical character of the gold found at Ward's Horsefly is such that it must have been transported a considerable distance, it therefore probably had its origin near the headwaters of the Horsefly river.

(2) The gravels coming down the Horsefly river, either in the present or older channels, carried small amounts of gold, but only in workable quantities where a very considerable natural concentration of the gravels took place. It follows therefore that a long continuous channel of rich gold-bearing gravel feeding the Ward's Horsefly area will not be found.

(3) The high gold content of the auriferous gravels at Ward's Horsefly was due to the local physical conditions at that point causing an extreme concentration of the gold in a small area.

(4) Some extensions of the present known and worked out area of rich gravels may yet be found. This extension is most likely to exist in a direction upstream from the old workings. The ground will probably be deep and may prove difficult to mine owing to water.

(5) The drilling so far carried out by the Government has been of a prospecting nature. If a policy of further drilling is decided upon the ground in a southerly direction from the old workings should be further prospected. An extension of the pay ground shown in Hole No. 4 C might be located by further drilling.

(6) The pay ground shown in Hole No. 4 C warrants further investigation. This ground could probable be mined by a shaft sinking if some arrangement was made to handle the water.